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OPD CUSTOMER ENGINEERING



SELECTRIC ADJUSTMENT THEORY

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ADJUSTMENT THEORY

MOTOR AND DRIVE

1. Drive Belt - Adjust the motor mounting brackets forward or back to obtain a minimum amount of belt noise.

Both ends of the motor must be adjusted the same in order to maintain the rotor shaft perpendicular to the drive belt.

The belt must never be so loose that jumping cogs on the motor pulley is a possibility. Check by operating the shift mechanism while holding the carrier with the carrier return in operation. This loads the motor to a point where failure will be most probable.

2. Motor Pulley - Adjust the motor pulley left or right so that the drive belt rides fully on the teeth of both pulleys without rubbing the flange of either.
3. Motor Clutch Pawl Stops (Fig. 1) - Form for a clearance of $.010''$ to $.020''$ between the clutch pawl tip and pulley ratchet when the pulley is manually rotated.

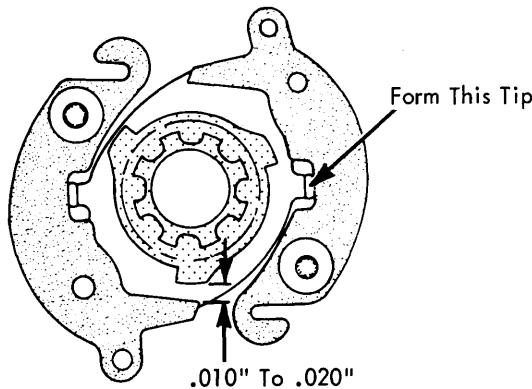


FIGURE 1. Motor Clutch Pawls

4. Idler Gears - Adjust the idler gear studs so that minimum backlash is present between mating gears. The mechanism must be free of binds throughout 360° rotation of the gears.

Minimum backlash is necessary to prevent erratic operation of the drive train and to insure minimum overthrow of the driven shafts.

The lower idler gear must be adjusted first because the upper idler gear is adjusted to the final position of the lower gear.

CAUTION: After any removal and replacement of the left hand cycle shaft bearing, the mesh of the lower idler gear must be checked. The lower idler gear stud is mounted to the bearing plate; therefore any slight rotation of the plate will affect the gear mesh.

KEYBOARD SECTION

1. Filter Shaft - With the cycle shaft in the rest position, the working surface of the filter shaft should clear a depressed interposer by $.005''$ to $.015''$ (Fig. 2).

Adjust by rotating the filter shaft to the correct position after loosening the filter shaft gear.

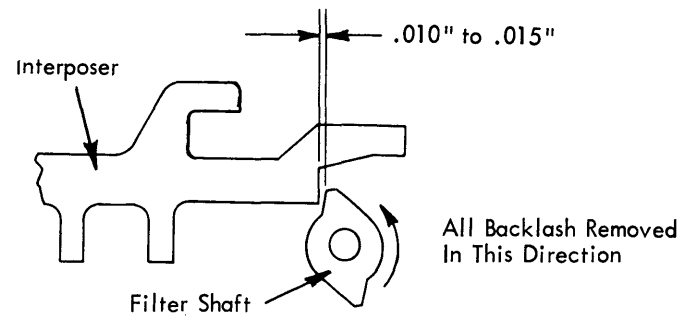


FIGURE 2. Filter Shaft Adjustment

All backlash of the gear train should be taken out forward when checking the filter shaft adjustment. This simulates a powered operation in which the momentum rotates the top of the filter shaft to its extreme forward position.

Insufficient clearance between the filter shaft and the interposers could allow the filter shaft to stop just under the rear of the interposers. The keyboard would then be inoperative, because the interposers could not be depressed.

Excessive clearance would delay the operation of the interposers. The selector latches would not be pulled forward until after having been pulled down slightly by the latch bail. This would result in excessive wear and a noisy operation as the latches were snapped forward from under the bail.

CAUTION: Excessive clearance will also cause malselection.

NOTE: Be sure to maintain $.002''$ to $.004''$ end play of the filter shaft within the left hand filter shaft bearing. The mounting of the left hand filter shaft bearing allows $.011''$ lateral play of the bearing. Do not confuse this lateral play of the bearing with the filter shaft end play.

2. Rear Interposer Guide Comb - Adjust the interposer guide comb up or down so there is $.020''$ to $.030''$ clearance between the bottom edge of the interposers and a vane of the filter shaft (Fig. 3).

The four interposer guide screws are accessible by inserting the medium screwdriver between the letter keylevers, beneath the front row of keybuttons.

CAUTION: Check the clearance at several points along the filter shaft.

NOTE: The purpose of this adjustment is to prevent "bridging". "Bridging" is a form of malselection caused by two or more interposers being depressed in front of the filter shaft and driven forward at the same time. Proper adjustment of the rear interposer guide comb al-

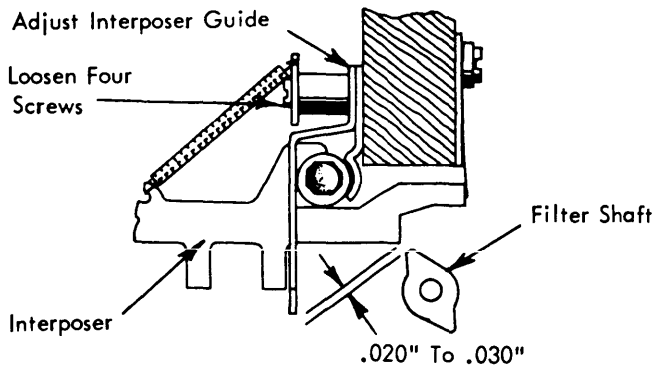


FIGURE 3. Rear Interposer Guide Comb

allows only one interposer to be positioned in the path of the filter shaft at one time. An easy method of checking the guide comb adjustment is to latch one interposer down, depress an adjacent interposer until it is locked out by the selector compensator, and then slowly hand cycle the machine. The filter shaft should contact the interposer that is latched down and miss the adjacent interposer by at least $.005''$. This check should be performed at several places along the filter shaft.

WARNING: The selector compensator tube is mounted to the rear of the interposer guide comb by four clamps and must move up and down with the guide comb when the guide comb adjustment is made. Be sure to loosen the guide comb mounting screws completely before attempting to move the guide comb. Do not hammer the guide comb into position as this can cause the compensator tube to shift with respect to the guide comb. The vertical position of the tube on the guide comb is set with respect to the stop strap riveted along the bottom of the guide comb and should not be disturbed.

3. Bail Parallel

- a. Loosen cycle bail up stop and move it up out of the way of the cycle bail.
- b. Adjust the left hand bail anchor plate forward or back in its oversized mounting holes so that the selector bails will be parallel to the lugs on the interposers.
- c. Adjust the bail anchor plate up or down so that the cycle bail will rest as evenly as possible on all the interposers.

NOTE: The selector bails must be parallel to the interposer lugs so that the same travel will be given to the bails by the various interposers. A loss of motion to the selector latches could result from an unparallel condition. The cycle bail must be parallel so that the interposer latch springs can be adjusted evenly.

4. Interposer Latch Springs (Preliminary) With the \pm interposer (position 44) latched down, adjust the right hand end of the right hand section of latch springs so that there will be approximately $.010''$ remaining travel of the \pm interposer before it bottoms (Fig. 4). Check this clearance by pulling the interposer down with a spring hook.

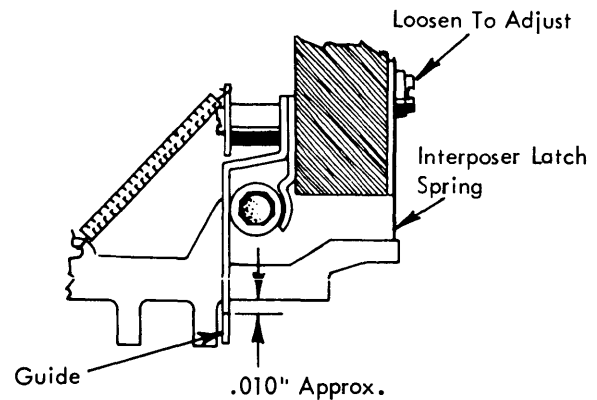


FIGURE 4. Interposer Latch Spring Adjustment

5. Cycle Clutch Latch Bite - Adjust the cycle clutch keeper bracket forward or back so that the cycle clutch latch overlaps the step on the cycle clutch sleeve by $.030''$ to $.035''$ (the thickness of the metal plate). (Fig. 5)

The overlap can readily be observed from the bottom of the machine.

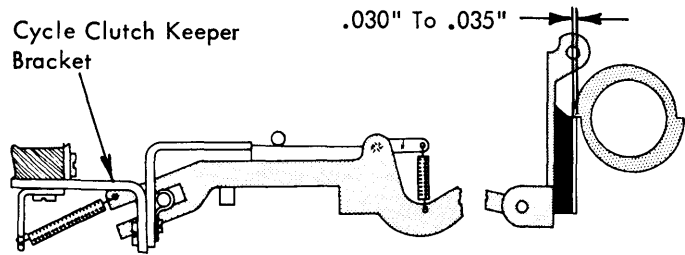
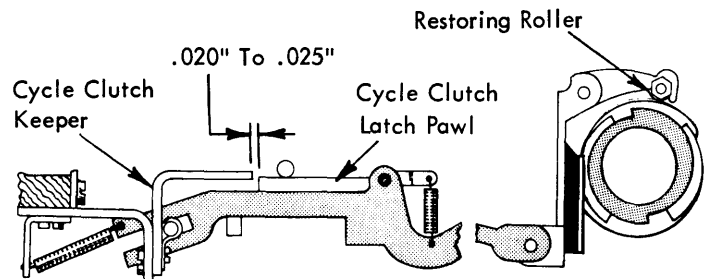


FIGURE 5. Cycle Clutch Latch Bite Adjustment

Insufficient overlap could allow the cycle clutch sleeve to kick past the latch and cycle again. Excessive overlap would slightly delay the unlatching action of the latch and create a sluggish action.

6. Cycle Clutch Latch Restoring

- a. New Style - Position the restoring roller so that the latch pawl overthrows the keeper by $.020''$ to $.025''$ with the restoring cam on its high point. Check on both restoring cam lobes and adjust on the lobe providing the least motion (Fig. 6).



Do Not Overthrow Into Sleeve

FIGURE 6. Cycle Clutch Latch Restoring, New Style

- b. Old Style - Adjust the restoring lever so that the latch pawl overthrows the keeper by .030" to .045" (Fig. 7).

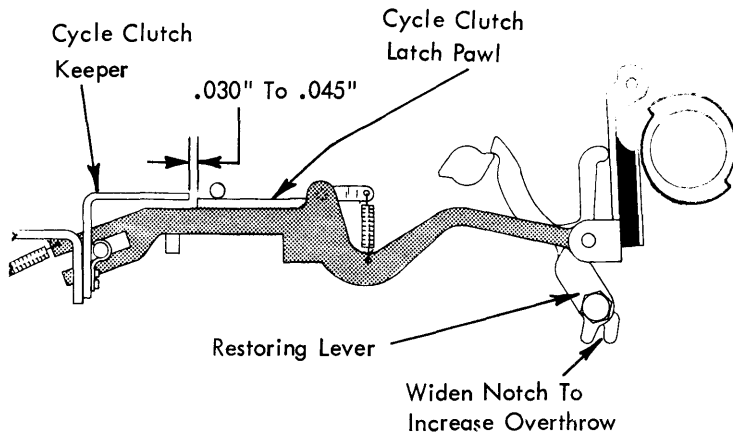


FIGURE 7. Cycle Clutch Latch Restoring Adjustment

7. Cycle Clutch Release Point - Adjust the cycle clutch keeper vertically for .000" to .002" clearance between the pawl and the keeper with the +/- interposer latched down. The clearance must be observed at the point of unlatching because it increases as the latch moves forward (Fig. 8).

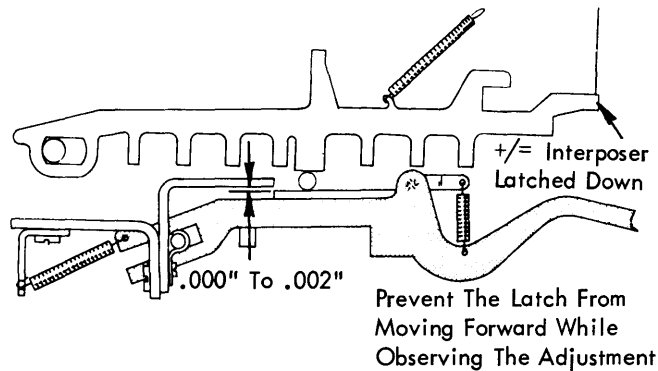


FIGURE 8. Cycle Clutch Release Point Adjustment

Too much clearance indicates that the clutch is being released too early in the travel of the interposer. Erroneous selection can occur because a flicking action on the key-levers can cause the cycle clutch to be released without latching an interposer down. As a result, the filter shaft will not drive an interposer forward and the hyphen or underscore will be printed.

Insufficient clearance does not insure that the clutch will be released when an interposer is latched down. If an interposer is latched down without releasing the clutch, the keyboard will be locked because the interposer will remain in the compensator. The keyboard can be unlocked only by depressing the latched interposer a second time sufficiently to unlatch the clutch.

8. Interposer Latch Spring Adjustment, Final - Position the left and right interposer latch spring sections vertically so that the .000" to .002" latch pawl to keeper clearance is maintained with various interposers latched down.

NOTE: Adjusting the interposer latch springs by this method provides a simultaneous interposer latching with respect to cycle clutch release for all interposers. It also compensates for any deviation in parallelness between the rear interposer guide comb and the cycle bail.

The interposer latch springs are adjusted as low as possible to minimize "flicking". "Flicking" is caused by the interposer failing to remain in the path of the filter shaft vane when the shaft is operated. By adjusting the latch springs as low as possible, a lower cycle clutch release point can be achieved. This helps to minimize "flicking" because the interposer must now travel further into the path of the filter shaft vane in order to release the cycle clutch and remains in the path of the filter shaft for a longer period of time during a "flicking" condition.

9. Cycle Clutch Latch Pawl Bite - Adjust the cycle clutch bail upper stop to provide .030" to .035" bite between the latch pawl and its keeper (1/2 the thickness of the keeper) (Fig. 9).

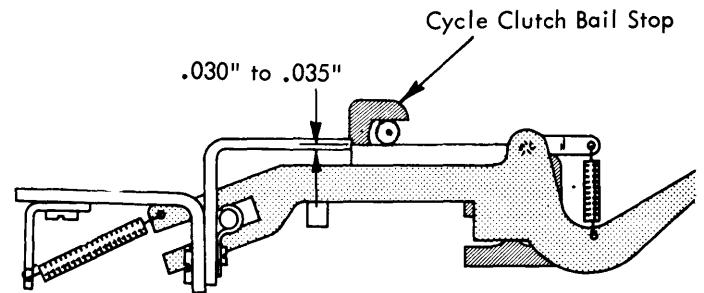


FIGURE 9. Cycle Clutch Latch Pawl Bite Adjustment

The bail stop is mounted with two nuts and two screws. These nuts and screws also control the position of the character interrupter bail plate. In order to adjust the cycle clutch bail stop it is only necessary to loosen both nuts and the front screw. Do not loosen the rear screw.

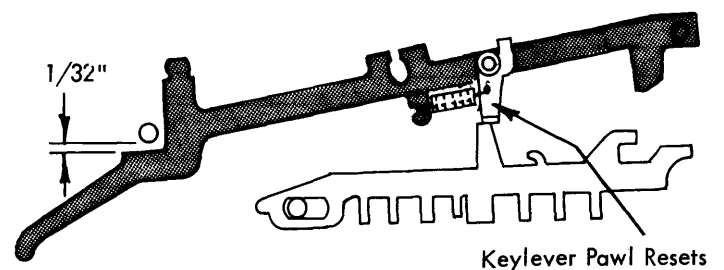


FIGURE 10. Front Keylever Guide Comb

Insufficient bite increases the possibility of a repeat cycle because positive latching is not insured. Excessive bite will affect the touch of the keyboard because the latch pawl must be moved farther in order to trip the clutch.

10. Front Keylever Guide Comb - Position the guide comb vertically to allow the keylevers to travel $1/32$ " after the keylever pawl resets (Fig. 10).

NOTE: An individual keylever may be adjusted by opening or closing the horseshoe slot on the keylever.

CAUTION: Movement of the front keylever guide comb will affect the adjustment of the operation keylevers.

The character interposer should not bottom in the rear interposer guide comb slots when the keylever bottoms in the front keylever guide comb. This could result in a keyboard touch problem and possibly keylever pawl breakage.

11. Selector Compensator - Adjust as follows:

- a. New Style (Fig. 11)
 1. Loosen locking set screws in the LH and RH nylon blocks.
 2. Latch the extreme RH interposer down.
 3. Tighten the RH adjusting plug so that the end ball will trap the interposer in the latched position when the interposer latch is manually disengaged.
 4. While holding the latch spring away from the interposer, back out the adjusting plug slowly until the interposer restores freely - then back out $1/6$ turn more (one flat on the hexagon nut is $1/6$).

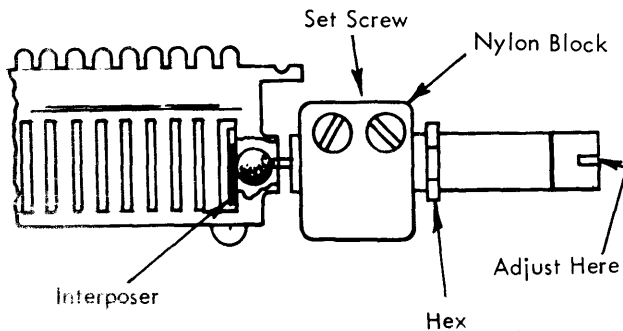


FIGURE 11. *Compensator Adjustment, New Style*

5. Repeat the same procedure on the LH side.
6. Tighten the locking screws in the nylon blocks.
- b. Old Style (Fig. 12) - With the extreme RH interposer latched down and held against the right side of its guide slot, adjust the adjusting screw (or slider) until the extreme RH ball is trapped between the interposer and the adjusting screw (or slider). Follow the same procedure for the left side.

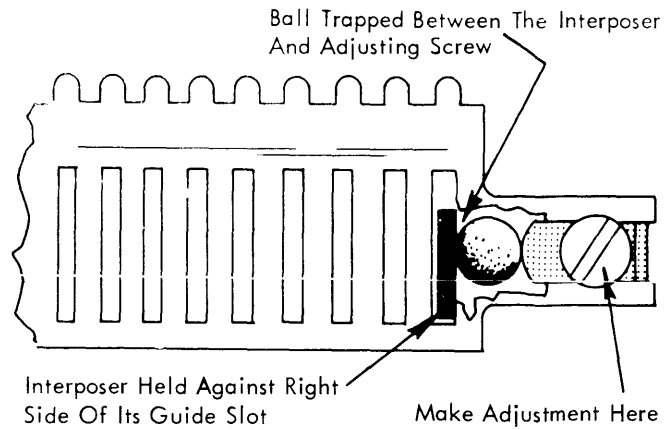


FIGURE 12. *Compensator Adjustment, Old Style*

12. Latch Bail Shaft - Adjust the plate that supports the right end of the bail shaft so that the bail shaft is parallel to the cycle shaft.

This adjustment is extremely important because the rollers on the latch bail MUST contact their respective selector cams at the same point and with the same pressure in order to insure that both cams operate the bail together.

The bail shaft is set at the factory and should not require a readjustment unless the plate becomes loosened or parts replacement is necessary. This is a difficult adjustment to make and should not be loosened unless absolutely necessary.

The adjustment can be made most easily if the keyboard is removed; however it can be adjusted with the keyboard installed if necessary by loosening and tightening the bail shaft plate mounting screws with a hammer and screwdriver. The screws should be left friction-tight until the correct position of the plate is obtained in order to facilitate the adjustment.

The bail shaft plate must be adjusted both vertically and horizontally in order to make the rollers of the latch bail ride their respective cams equally. Changing either the vertical or horizontal position will affect the other; therefore both adjustments must be considered together and adjusted alternately until both are correct. If a readjustment is necessary, the following procedure may be used.

- a. The correct vertical position is obtained by raising or lowering the bail shaft mounting plate until both bail rollers have equal pressure against their respective cams. Check by testing the drag on strips of paper inserted between the rollers and the cams.
- b. The front to rear position of the bail shaft plate can be set relative to the cycle shaft. Set the Hooverometer to span the distance between the cycle shaft and the left end of the bail shaft as illustrated in Fig. 13. Move the Hooverometer to the right and adjust the bail shaft plate forward or back to the same clearance as at the left side. With the bail shaft parallel to the cycle shaft, the bail rollers should be contacting their respective cams at the same point.

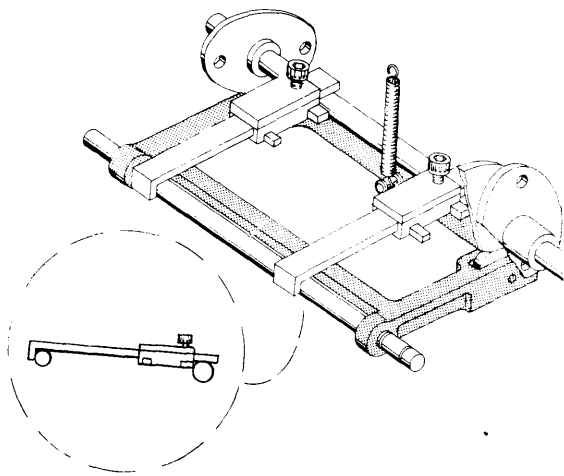


FIGURE 13. Latch Bail Shaft Plate Adjustment

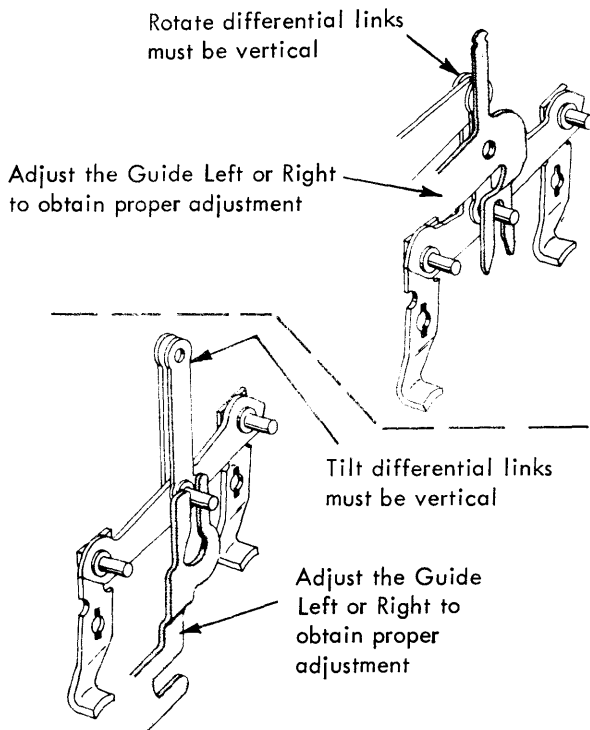


FIGURE 14. Selector Latch Guides

NOTE: As a final check for the adjustment of the latch bail plate, hand cycle the machine using the letter "Z" (all latches removed from the bail). Both latch bail rollers should maintain contact with their respective cams throughout the cycle.

CAUTION: On early level machines the cycle bail stop and the character interrupter must be readjusted after any change in the position of the bail shaft plate, because both of these parts are mounted on the plate.

13. Differential Guides

- a. The rotate and tilt differential guides should be adjusted left or right so that the vertical links of the two systems hang in a true vertical position (Fig. 14)

The guide for the rotate differential is attached to the top of the differential mounting bracket by two screws just behind the balance lever. The screws are accessible from the rear with the motor removed.

The tilt differential guide is attached to the bottom of the differential mounting bracket and is easily accessible from beneath the machine.

- b. The latch bail guide should be adjusted left or right so that all positive rotate and tilt selector latches hang vertically in the latch bail. The guide is attached to the lower left corner of the differential mounting bracket.

14. Latch Bail Stop - The latch bail stop, located just beneath the bail, prevents the bail from getting beneath the selector latches during shipment. Adjust the stop to clear the latch bail by .005" to .015" when the bail is at the high point of the cycle shaft cams.

15. Latch Interposer Stop - Form the stop lugs to obtain .001" to .005" clearance between each latch interposer and its respective selector bail (Fig. 15 or 16).

NOTE: On the new style, be sure that the left to right position of the front interposer mounting bracket is such that the latch links will exert a straight pull on the selector latches.

The latch interposer stop lugs establish a position for the latch interposers so that the correct adjustment of the selector latch links can be obtained. Selection timing will be directly affected by an erroneous stop lug adjustment.

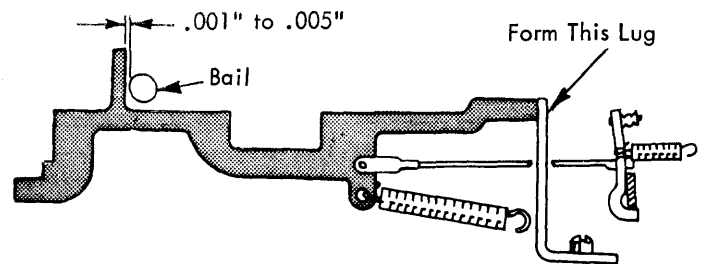


FIGURE 15. Latch Interposer Stop (Old Style)

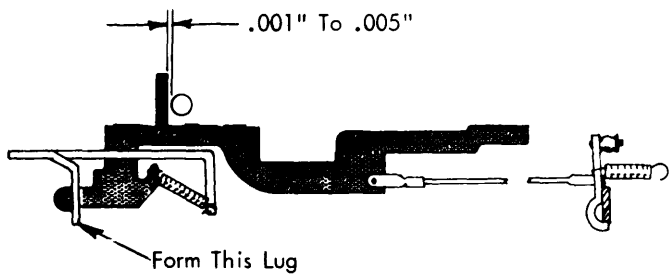


FIGURE 16. Latch Interposer Stop (New Style)

16. Selector Latch Links

a. With the machine at rest adjust the negative 5 latch link so that the negative 5 latch will overlap the stop screw head by .050" to .060" (Fig. 17).

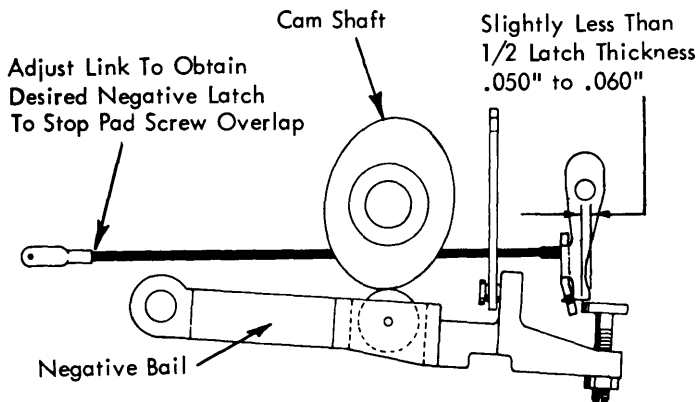


FIGURE 17. Negative Latch Link

b. With the machine at rest adjust the tilt and positive latch links so that their latches will overlap the latch bail with .000" to .010" overhang (Fig. 18).

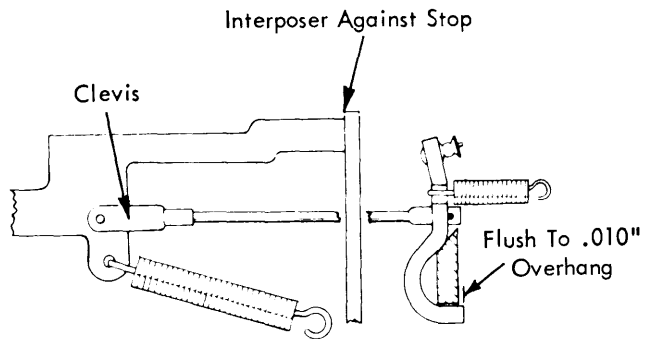


FIGURE 18. Tilt and Positive Latch Links

Adjusting a link too short can result in erroneous selection because the latch will not have a secure bite on the latch bail plate (or negative-five stop screw). The force of operation could cause the latch to slip off part of the way through a cycle and cause a noisy operation as well as erroneous selection.

17. Switch Link - Adjust the switch link so that the front of ON/OFF keybutton is 1/16" above the sideframe in the OFF position (Fig. 19).

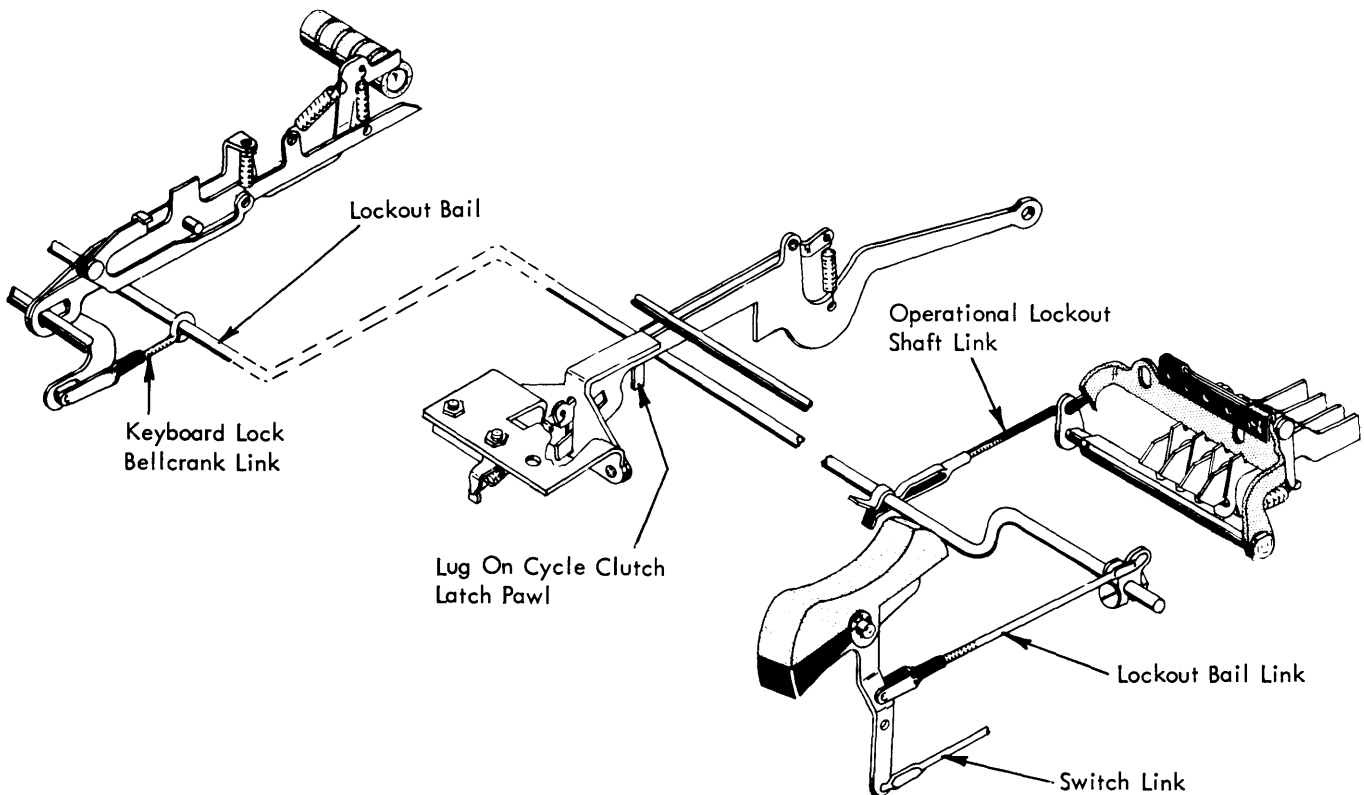


FIGURE 19. Keyboard Lock Mechanism

18. Lockout Bail Link - Adjust the link so that the bail is centered under the lug of the cycle clutch pawl with the switch in the OFF position (Fig. 19). Be sure that the lockout bail bellcrank has equal over-center motion.
19. Lockout Bail Bracket - With the switch in the OFF position, adjust the bracket at the left end of the lockout bail vertically to provide .005" to .010" clearance between the bail and the lug on the cycle clutch latch pawl (Fig. 19).
20. Keyboard Lock Bellcrank Link - Adjust the link so that the bellcrank is fully bottomed in the selector compensator without choking off the action of the lockout bail (Fig. 19).
21. Operational Lockout Shaft Link - With the switch in the OFF position and the operational lockout shaft link fully forward, adjust the clevis to match the keyboard lockout bail position (Fig. 19).

The link is restricted in its forward movement when the tail of the link contacts the top of the shaft. This prevents the link from toggling past center as the switch is turned OFF.

CAUTION: Be sure the flat of the shaft is forward when making the adjustment. Be sure the switch lever operates easily after making the adjustment. Be sure that the operational keys are positively locked and unlocked in the two switch positions. Be sure the keyboard lockout bail is not restricted by the adjustment.

SHIFT MECHANISM

1. Shift Cam Back-Up Roller - Adjust the back-up roller eccentric left or right so that .001" to .004" of the cam bearing extends beyond the cam (Fig. 20). The eccentric should be kept in the bottom half of its orbit.

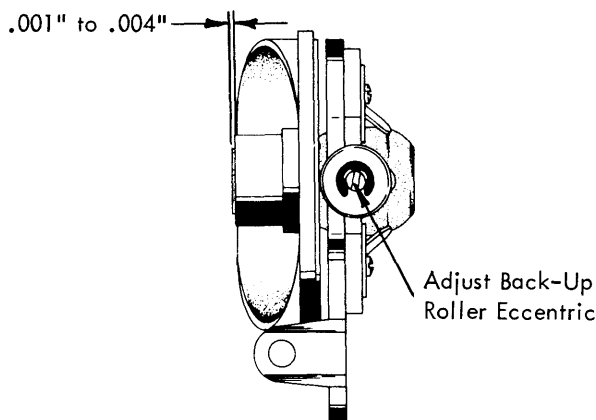


FIGURE 20. Shift Cam Back-Up Roller Adjustment

If the bearing did not extend beyond the cam, the shift clutch arbor could rub against the cam and create a noise as well as a drag on the cam when the cam was stationary.

Two problems could be created by having too much of the bearing extending beyond the cam. A gap would exist between the cam and the shift clutch arbor. This could allow a coil of the shift clutch spring to wedge into the gap and lock the machine. If the back-up roller were excessively far to the left, the cam would be forced to the left at the rear causing it to cock and bind at the pivot.

The set screw for the back-up roller eccentric is accessible through a hole in the cam with the cam in the lower case position. The shift clutch mechanism including the arbor should be removed in order to best observe the adjustment. Be sure that .002" to .004" end play exists in the operational shaft when the arbor is replaced.

CAUTION: Any change in the position of the back-up roller directly affects the typehead homing and the shift arm motion adjustments. Be sure to recheck these adjustments.

2. Shift Clutch Spring Retaining Plate - Adjust the retaining plate attached to the shift cam (Fig. 21) to satisfy the following condition. With the machine turned OFF and the shift cam detented, the shift clutch ratchet should rotate 1/16" to 3/32" when the shift release arm releases the ratchet. The rotation can be observed relative to the shift interlock (Fig. 23). The distance from the center of one ratchet tooth to the next is 3/32".

The adjustment of the retaining plate determines how much the clutch spring will be expanded when the shift mechanism is at rest. Expanding the spring too much may cause failure of the cam to reach the detented position, because the spring would be expanded too soon. Insufficient expansion would allow the clutch spring to drag when at rest creating a load on the motor and on the shift release mechanism.

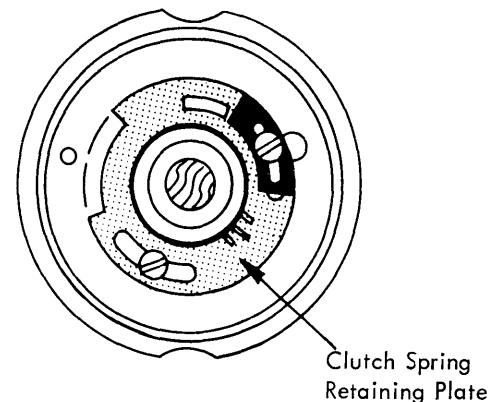
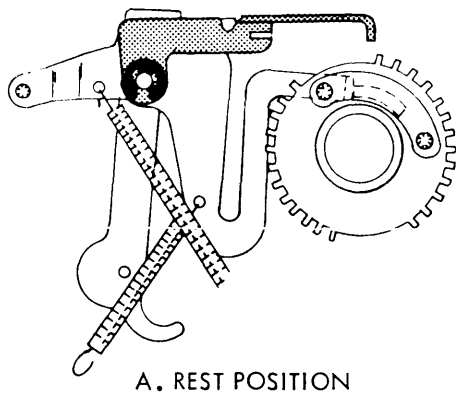
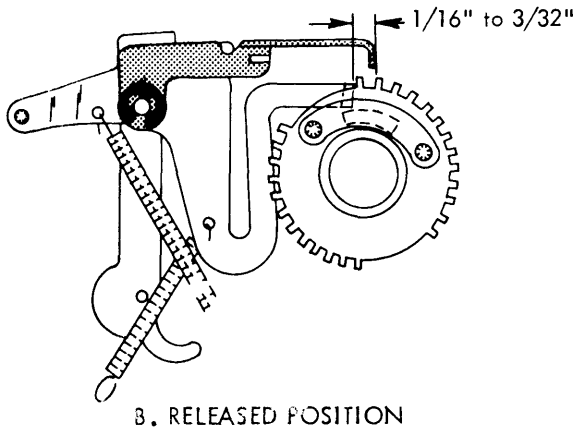


FIGURE 21. Shift Clutch Spring Retaining Plate



A. REST POSITION



B. RELEASED POSITION

FIGURE 22. Shift Clutch Spring Retaining Plate Adjustment

NOTE: If sufficient adjustment cannot be obtained with the retaining plate, the right end of the clutch spring may be placed in another hole in the ratchet. The adjustment can then be refined with the plate.

3. Shift Cam Stop - Adjust the stop so that the shift clutch ratchet has .010" to .030" rotary motion between the shift cam stop and the shift release arm with the mechanism at rest (Fig. 23).

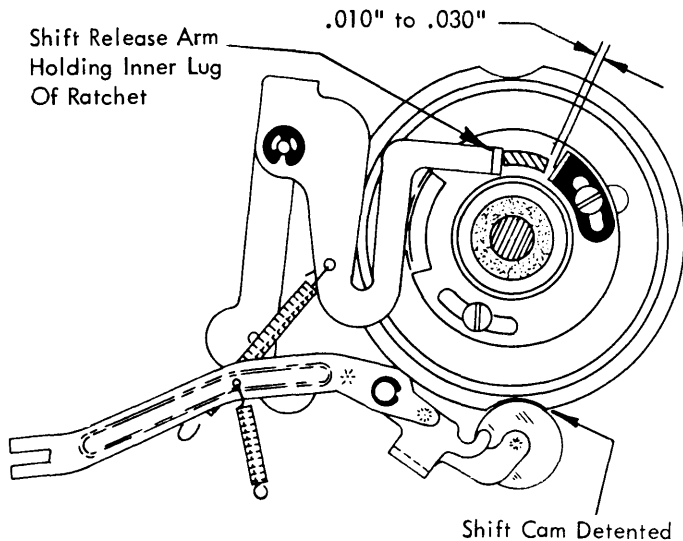


FIGURE 23. Shift Cam Stop Adjustment

The adjustment insures that the shift cam will not be allowed to travel past the detented position.

NOTE: The stop should not bind against the spring clutch when the adjustment is made.

CAUTION: Be sure the cam is detented at the time the stop adjustment is checked.

4. Shift Cam Brake - The shift cam brake should be adjusted to have .035" to .040" bite on the braking rib of the cam (Fig. 24). That is approximately 1/2 the thickness of the rib.

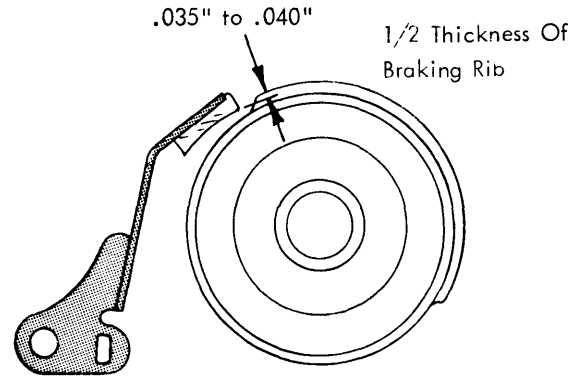


FIGURE 24. Shift Cam Brake Adjustment

Excessive braking action could prevent the cam from reaching the detented position in the lower case. Insufficient braking action would result in a noisy shift operation and expose the mechanism to possible parts breakage.

5. Shift Release - Adjust the shift release link so that the release occurs when the keylever has been depressed 2/3 of the full travel. As the keylever is allowed to restore from a fully depressed position, the shift should again operate when 2/3 travel of the keylever has been reached. A balance between the two releasing points insures the proper adjustment.

NOTE: The shift bellcrank attached to the right end of the bail should be set prior to making the link adjustment. For proper leverage the bellcrank should operate with some over-center travel in both directions.

6. Shift Lock - Adjust the shift lock bracket up or down so that the shift lock engages just as the shift release occurs or slightly afterward. The lock should never engage before the shift release occurs. Keep the lock bracket vertical during the adjustment.

The shift lock must be released easily by depressing either shift keybutton.

7. Shift Interlock

- a. 723 and 725 - With the shift interlock on the high point of the cam, adjust the interlock by its adjusting screw so that the tip just bottoms between two teeth on the shift clutch ratchet (Fig. 25a).

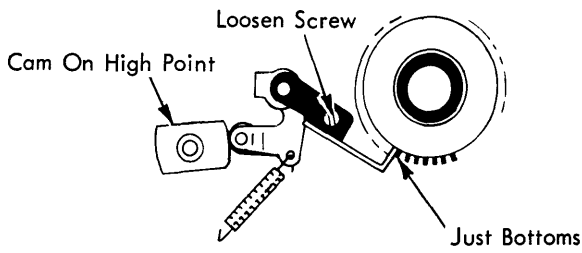


FIGURE 25a. Shift Interlock

- b. 721 Only - With the shift interlock on the high point of the cam, form the interlock so that the tip just bottoms between two teeth on the ratchet (Fig. 25b).

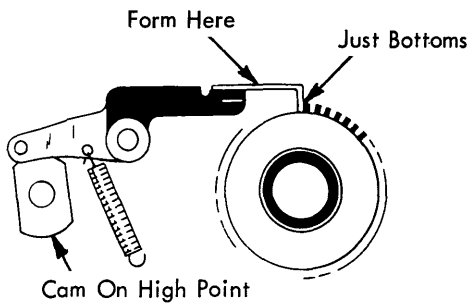


FIGURE 25b. Shift Interlock

8. Shift Interlock Cam - With the cycle clutch latched at rest and the backlash of the cycle shaft and filter shaft removed in the operating direction, advance the cam until a clearance of .040" to .060" exist between the tip of the interlock and the top of a tooth on the shift clutch ratchet (Fig. 26).

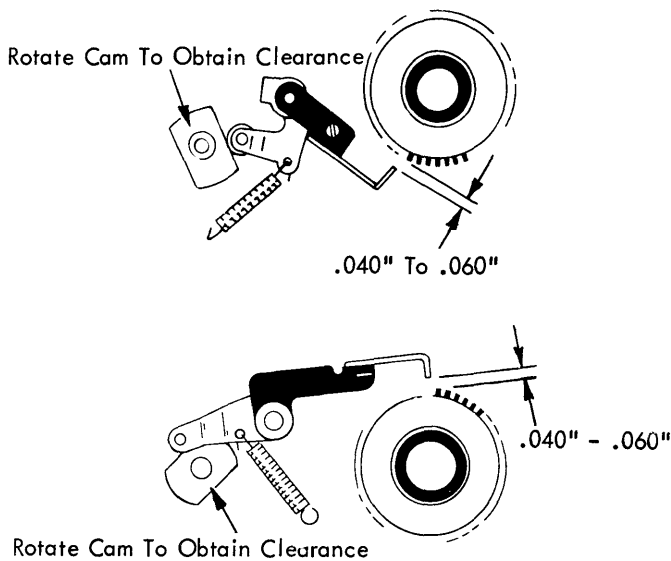


FIGURE 26. Shift Interlock Cam

9. Character Interrupter - The character interrupter bail plate is adjusted in its elongated slot to satisfy 2 conditions.
- With the shift cam detented in lower case and the cycle clutch latch link released forward, the character interrupter pawl should clear the bottom of the link by .015" to .020" (Fig. 27a).
 - With the shift cam undetented and the cycle clutch latched to the rear, the character interrupter pawl should clear the front of the cycle clutch latch link by .015" to .020" (Fig. 27b).

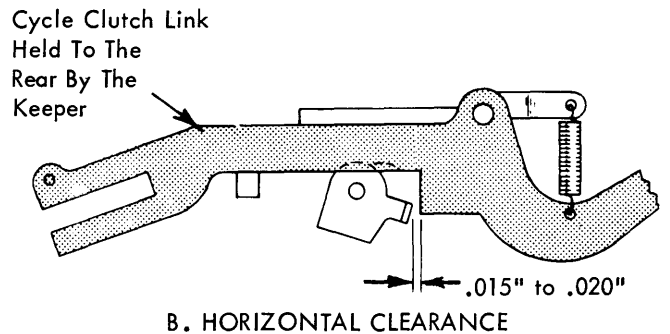
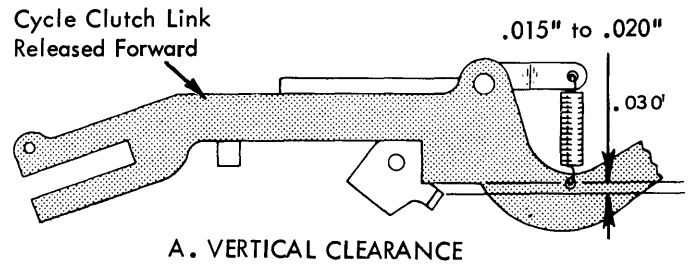


FIGURE 27. Character Interrupter Adjustments

CYCLE CLUTCH

- Cycle Shaft - Shim the cycle shaft to obtain .001" to .003" end play of the shaft. The shims are placed between the left hand bearing and the check ratchet. The shims are available in various thicknesses and are coded by shape as described in the Part. Catalog.

CAUTION: The slight end play of the shaft insures that it will rotate freely. Excessive play could allow a coil of the cycle clutch spring to wedge between the two hub members of the clutch causing a machine lock-up. (End play can most easily be measured with the spring clutch removed.)

NOTE: With the end play removed to the right, maintain .002" clearance between the cycle shaft gear and the left hand bearing.

- Cycle Clutch Latch Bracket - Adjust the bracket vertically so that the steps of the cycle clutch sleeve are horizontal when the sleeve is stopped by the latch (Fig. 28).

If the bracket were adjusted too low, the steps would be at an angle to the line of motion of the cycle clutch latch. The latch would have difficulty in moving forward to release the clutch sleeve, and a slow, hesitant operation would result.

With the bracket too high, the force of stopping the cycle shaft through the cycle clutch sleeve would tend to cam the latch forward. A repeat cycle operation could result.

When properly adjusted the top of the latch pivot pin is 1.546" below the top of the print shaft. This distance can be measured with the use of the Hoovermeter. With the head of the Hoovermeter set at the #3 scribe line, the head should rest on top of the print shaft with the handle touching the latch pivot pin (Fig. 28). Be sure the Hoovermeter handle is vertical. It will be vertical if the base of the handle is centered over the latch pivot pin.

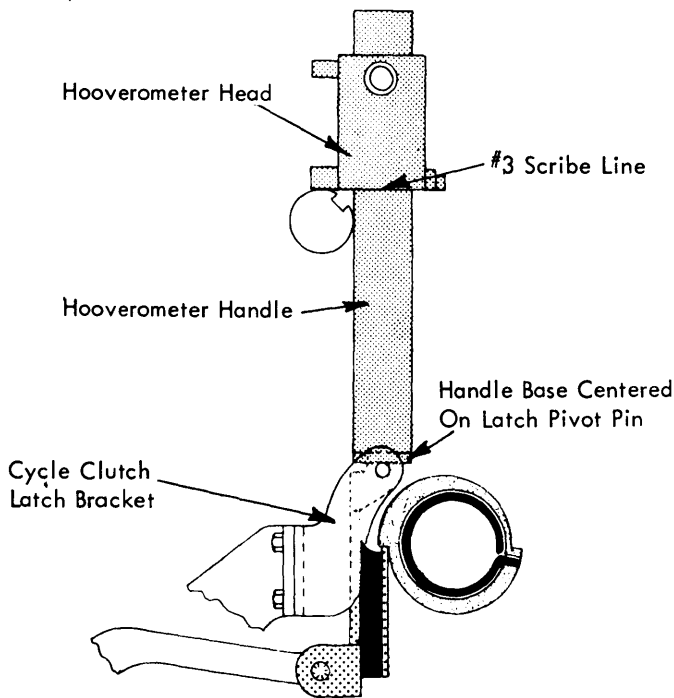


FIGURE 28. Cycle Clutch Latch Bracket Adjustment

NOTE: Changing the height of the cycle clutch latch necessitates a readjustment of the cycle clutch collar, cycle clutch stop, and the cycle clutch latch restoring mechanism.

CAUTION: The latch bracket must not become cocked so that only a corner of the latch plate is stopping the sleeve. Excessive wear could result. The cycle clutch sleeve could also be tilted by the latch causing it to bear against the cycle clutch pulley hub creating a noisy operation.

3. Cycle Clutch Spring and Collar Adjustments

a. Lateral position of the spring - Loosen the collar and position the spring left or right on its hubs so that the right hand end of the spring will clear the face of the cycle clutch pulley by .004" to .012" (Fig. 29).

NOTE: This adjustment insures that a maximum number of coils of the spring clutch will grip the driving hub during a cycle operation. Any slippage between the driving hub and the spring clutch could decrease the typehead velocity during a print operation resulting in intermittent light impression. A lack of clearance between the right end of the spring clutch and the face of the cycle clutch pulley would create a bind causing the spring clutch to place a heavy torque on the cycle clutch sleeve. This excessive torque on the sleeve results in a sluggish keyboard because the cycle clutch latch link spring has difficulty in pulling the latch off the sleeve.

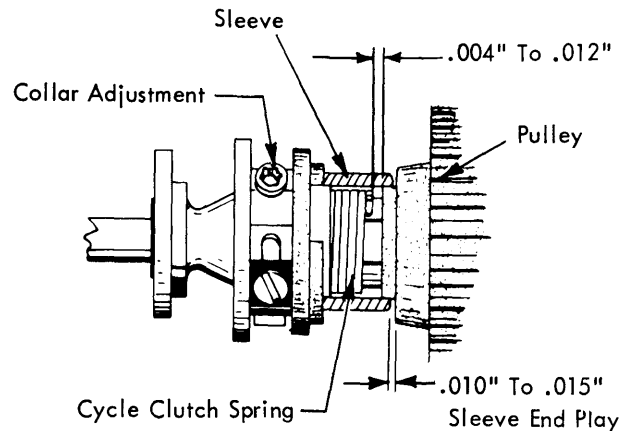


FIGURE 29. Lateral Position of the Cycle Clutch Spring and Collar

b. Lateral position of the collar - position the collar left or right so that the sleeve will have .010" to .015" end play.

NOTE: This adjustment insures that there will be no binds between the right end of the sleeve and the cycle clutch pulley. A bind will cause a sluggish keyboard just as in the previous adjustment.

c. Radial position of the collar - (The position of the collar directly controls the radial position of the left hand end of the cycle clutch spring with respect to the cycle shaft. It determines how much the spring clutch will be expanded when the cycle clutch sleeve is latched and the cycle shaft is in its rest position.) Adjust the collar so that when a zero tilt, negative-five rotate character is hand cycled the cycle clutch spring will begin to slip (expand) when the cycle shaft is 1/16" to 3/32" from its rest position measured on the surface of check ratchet (Fig. 30).

This adjustment is difficult to observe at the check ratchet. A 1/16" to 3/32" rotation of the cycle shaft will cause the print shaft gear to turn approximately one tooth. The adjustment can easily be read at the print shaft gear by the following method.

1. Hand cycle a zero tilt, negative-five character until the cycle clutch begins to slip.
2. Pencil mark the print shaft bearing in line with a tooth on the gear.

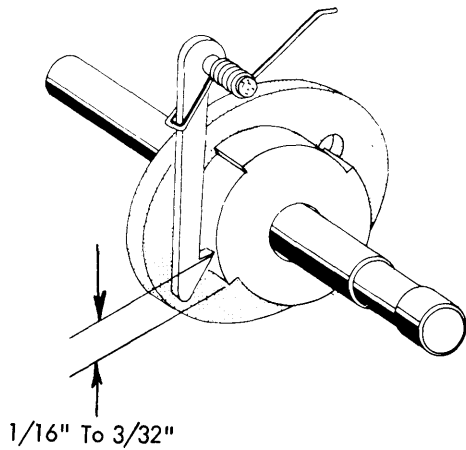


FIGURE 30. Radial Position of Cycle Clutch Collar

3. Release the cycle clutch again by depressing a keybutton.
4. Slowly hand cycle the machine until the check pawl just drops into a tooth on the check ratchet. The print shaft gear should have rotated one tooth so that the next tooth is in line with the pencil mark. If the print shaft gear rotated further than one tooth the collar must be moved top toward the rear. Less than one tooth, move it top toward the front.

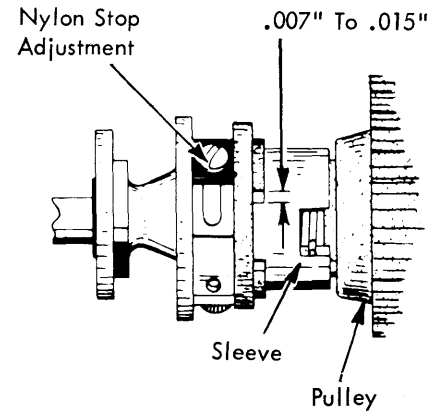
A zero tilt, negative-five rotate character is used because it offers the greatest resistance to the cycle shaft during the restoring portion of a cycle, causing the cycle clutch spring to slip at the earliest possible time.

NOTE: If the collar should become completely loose, a good starting point may be obtained by positioning the collar so that its adjusting screw head is approximately in line with the high point of the negative-five cam.

CAUTION: The cycle clutch stop attached to the collar may prevent the shaft from reaching the latched position. Any change in the cycle clutch collar adjustment will necessitate a readjustment of the stop; therefore it is usually best to loosen the stop before attempting to adjust the collar.

4. Cycle Clutch Overthrow Stop - with the cycle clutch latched and the cycle shaft backed up against the check pawl in its rest position, advance or retard the overthrow stop on the cycle clutch collar so that it will allow the cycle shaft to overthrow its latched position by .007" to .015" (Fig. 31-New Style or Fig. 32-Old Style).

NOTE: It is best to set this adjustment on the low side of the tolerance. Too much cycle shaft overthrow combined with excessive backlash in the gear train could allow the filter shaft to overthrow into the path of the character interposers. This condition could result in intermittent keyboard lock-up or intermittent touch problems.



Cycle Shaft Must Be Detented When Setting The .007" To .015" Overthrow

FIGURE 31. Cycle Clutch Overthrow Stop, New Style

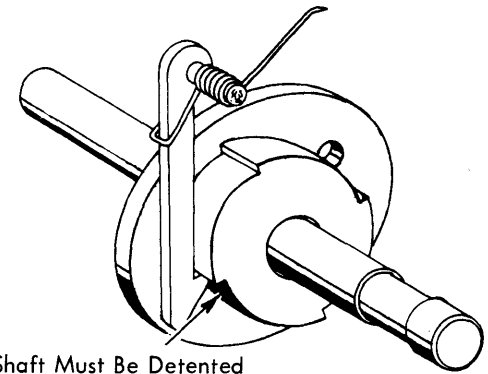


FIGURE 32. Cycle Clutch Overthrow Stop, Old Style

CAUTION: After adjusting the cycle clutch overthrow stop check the cycle clutch sleeve end play as the overthrow stop may bind against the sleeve.

ALIGNMENT

Fine Alignment

1. Tilt Tube End Play - (machines prior to gearless tilt). The tilt pulley should be adjusted up or down on the tilt tube so that .002" to .004" end play exist in the tilt tube (Fig. 33).

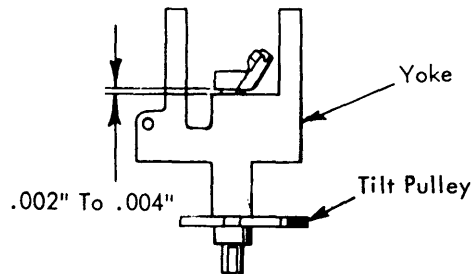


FIGURE 33. Tilt Tube End Play Adjustment

The tilt pulley is attached to the tilt tube by a set screw and key against a flat surface on the tilt tube. The set screw is accessible through a hole in the left side of the carrier. Move the carrier to the right and remove the tilt pulley spring and tilt detent spring. The tilt detent spring stud can then be removed through the hole in the carrier. The hole in the carrier and rocker will make the tilt pulley set screw accessible with a Bristow wrench.

NOTE: The height of the tilt sector gear is established by shimming between the gear and the top of the yoke. The height is set to obtain the proper backlash between the tilt sector gear and the tilt ring gear. Be sure to re-install the shim if disassembly is necessary.

2. Rotate Shaft End Play - Adjust the rotate pulley up or down on the rotate shaft so that .002" to .004" end play exists in the rotate shaft relative to the tilt tube (Fig. 34).

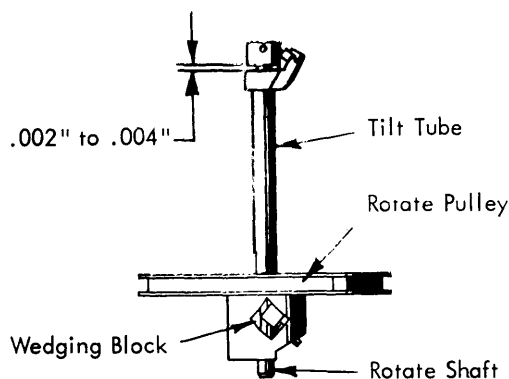


FIGURE 34. Rotate Shaft End Play Adjustment

The rotate pulley is secured to the rotate shaft by a wedging block and a set screw. The pulley set screw is accessible from below with the carrier centered over the cycle shaft and the shift in the upper case. After loosening the set screw the grip of the block on the shaft must be broken by rotating the type head counterclockwise manually while blocking rotation of the pulley. This can be done by inserting the 3" screwdriver at the rear between the notch in the pulley and the tape guide block. Be careful not to damage the tape or pulley with the screwdriver. DO NOT rotate the type head clockwise against the tension of the tape in an effort to break the pulley loose. Tape breakage or other parts damage may result.

NOTE: The height of the lower ball socket is controlled by a shim located between the lower ball socket and the tilt tube. The height relative to the tilt ring must be controlled in order to insure proper operation of the ball joint. If disassembly of the rocker is ever necessary, the shim must be reinstalled.

3. Tilt Ring - The upper ball socket should be centered over the lower ball socket within .002". It is adjusted by moving the tilt ring left or right after loosening the tilt ring pivot pin set screws. All side play of the tilt ring should be removed by the pivot pins while still allowing the tilt ring to pivot freely.

If the tilt ring is not properly centered, the rotate position of the head can vary slightly as the head is tilted to the different tilt positions. This could constitute a portion of the band width in the rotate system.

The tilt ring is centered at the factory and every effort should be made to maintain its centered position. If tilt ring removal or replacement is necessary, a feeler gauge should be inserted between the tilt ring and the yoke to determine the clearance before the tilt ring is removed. The tilt ring should be replaced to the same clearance.

The tilt ring can easily be removed if the machine is half cycled to a two tilt position. On machines prior to the gearless tilt mechanism, care should be taken to insure that the tilt sector gears are properly meshed whenever the tilt ring is installed. The rear tooth of the tube sector gear should enter the second notch of the tilt ring sector gear (Fig. 35).

CAUTION: Side play in the tilt ring can cause poor horizontal and vertical alignment. It can also affect impression.

4. Upper Ball Socket - The upper ball socket must rotate completely free of binds with little or no up and down play. The adjustment is made by raising or lowering the tilt ring spacer by installing thicker or thinner shims at the front and rear (Fig. 35).

In order to check the upper ball socket for binds it is necessary to remove the ball joint so that the upper ball socket can be rotated by hand. This can be done either by removing the tilt ring and upper ball socket together and checking them off the machine or by removing the

upper ball socket and replacing it without the ball joint. If the tilt ring is removed, its position relative to the yoke must be checked by a thickness gauge before removal.

NOTE: If the upper ball socket, tilt ring, or tilt ring spacer are ever replaced by new parts, the shimming adjustment must be checked.

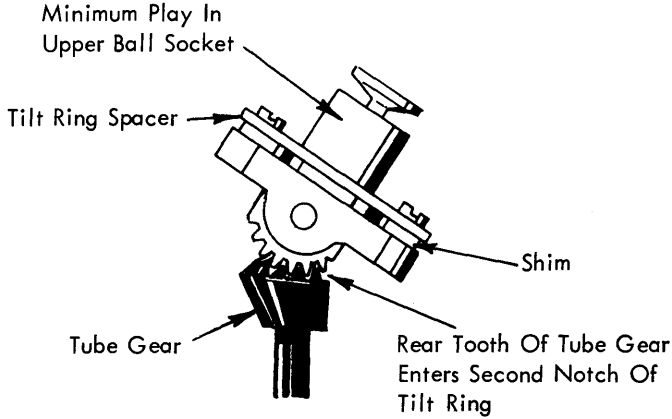


FIGURE 35. Upper Ball Socket Adjustment

CAUTION: Vertical play in the upper ball socket will affect vertical alignment and impression because the typehead will not maintain a definite position.

Also, care must be taken to insure that the entire rotate system is free from binds. A bind in the upper ball socket can result in poor horizontal alignment if the rotate detent fails to fully seat in the detent notch before print occurs. An excessive bind can cause unwanted roller droppage in the wear compensator during a negative selection. Binds in the system (carrier area) can be checked by manually operating the shift arm in and out.

5. Tilt Detent - Adjust the guide and pivot screw so that the tilt detent will operate freely with no side play (Fig. 36).

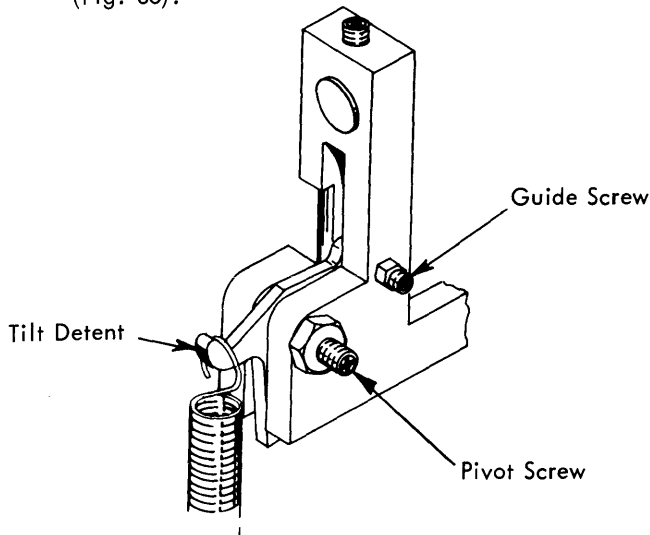


FIGURE 36. Tilt Detent Adjustment

Excessive side play in the tilt detent will cause poor vertical alignment. A bind in the tilt detent will affect both the vertical and horizontal alignment because it will retard or restrict the seating of the tilt detent which, in turn, will retard or restrict the seating of the rotate detent.

6. Rotate Detent - Adjust the front and rear guides so that the rotate detent will operate freely with no side play (Fig. 37).

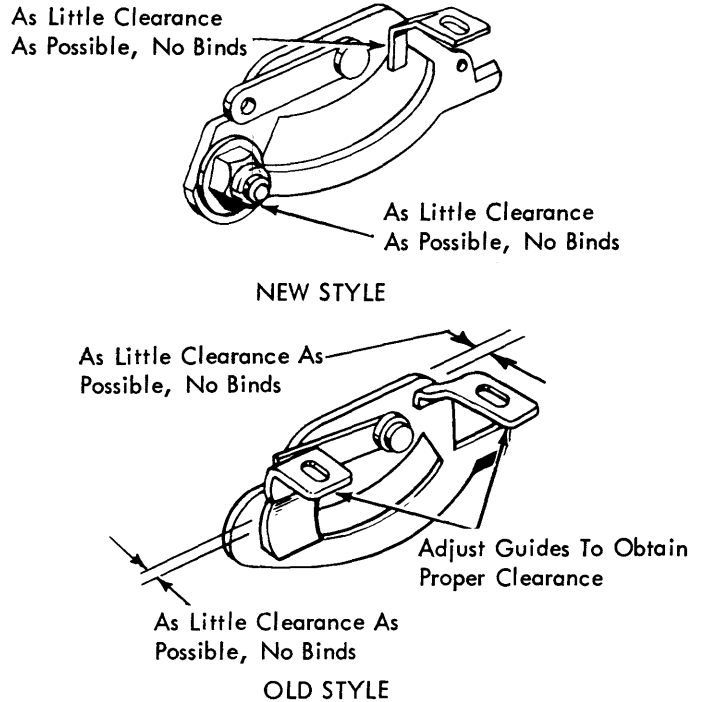


FIGURE 37. Rotate Detent Guides

Excessive play in the detent will result in poor horizontal alignment because the detent cannot positively position the type head.

7. Rocker Shaft - Adjust the rocker shaft left or right to obtain .002" to .004" side play in the rocker (Fig. 38).

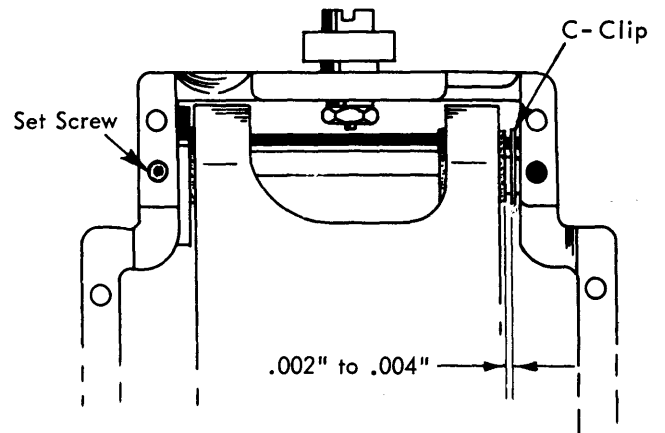


FIGURE 38. Rocket Shaft Adjustment

The side play exists between a C-clip around the shaft at the right of the rocker and a thrust washer against the carrier casting at the left of the rocker. The rocker shaft is held in place by a set screw at the left end of the shaft.

Excessive play in the rocker could affect horizontal alignment by allowing the rocker to shift its position left to right.

8. Print Sleeve End Play - Adjust the print sleeve end play to be .002" to .004". The end play is controlled by the print cam on the right hand end of the sleeve. The adjustment should not be gained with the ribbon lift cam because its set screw tightens down into a dimple in the print sleeve fixing the position of the cam (Fig. 39).

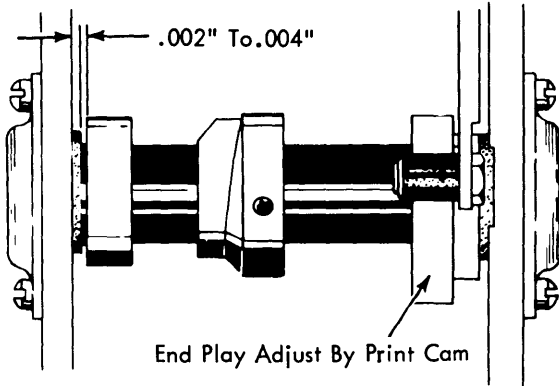


FIGURE 39. Print Sleeve End Play

On machines equipped with an impression control lever just the opposite is required: the set screw in the print cam tightens down into a dimple in the print sleeve and the end play of the print sleeve is gained by laterally positioning the ribbon lift cam on the print sleeve. Also, the print sleeve key must be positioned to the extreme left of the keyway slot in the print sleeve before the detent cam set screw is tightened down on the key.

9. Detent Cam Follower Bracket - Position the detent cam follower bracket which is mounted to the left side of the carrier by two screws to satisfy the following conditions:

- a. Front to rear for a clearance of .015" between the print sleeve and the end of the pin on the cam follower (Fig. 39a).

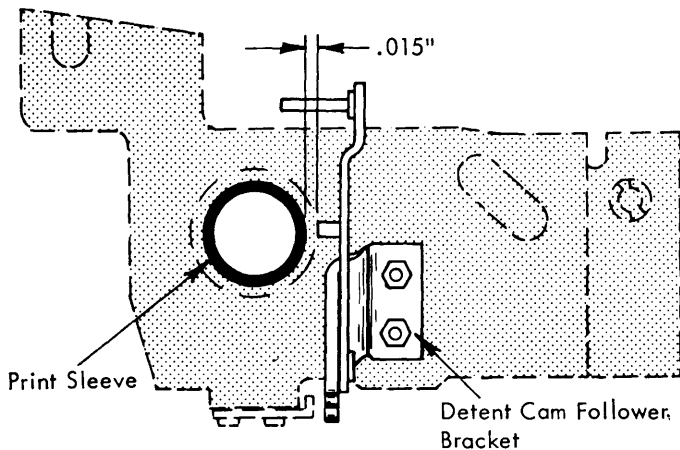


FIGURE 39a. Detent Cam Follower Bracket

- b. Vertically so that the bottom surface of the pin on the cam follower lines up with the scribe line #1 on the Hooverometer when the Hooverometer is placed against the print sleeve as shown in Figure 39b.

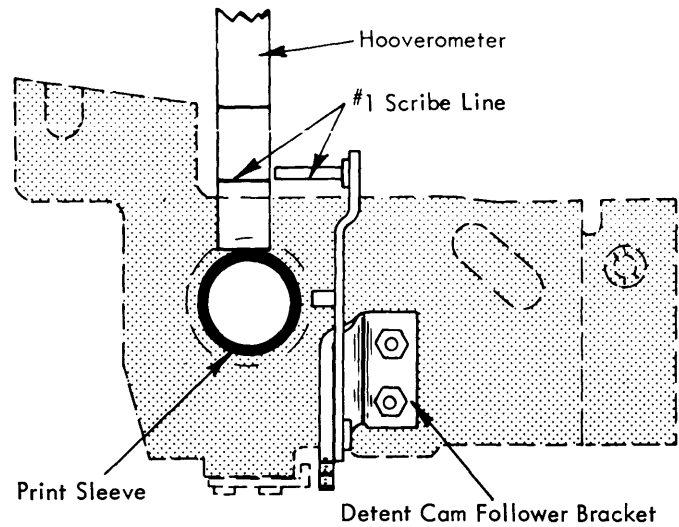


FIGURE 39b. Detent Cam Follower Bracket

This bracket is set at the factory with a dial indicator and should not require readjustment unless it becomes loose.

NOTE: The position of the bracket directly affects the timing relationship between the detent cam and the print cam. An improperly adjusted bracket may cause the detents to begin to withdraw before the typehead prints, or the typehead to print before the detents have fully seated. If this occurs it will generally show up as poor vertical alignment because the tilt detent always seats and withdraws ahead of the rotate detent.

10. Detent Mechanism (Machines prior to gearless tilt) The detent mechanism must be adjusted to satisfy the following conditions:

- a. Position the ribbon feed and detent cam left or right on the print sleeve so that the inside rib of the cam will be in line with the left hand edge of the ribbon feed cam follower (Fig. 40).

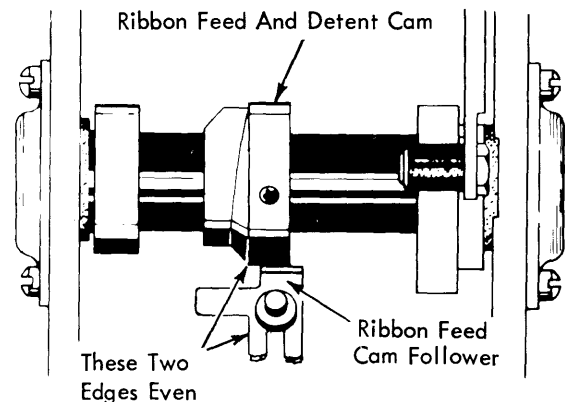


FIGURE 40. Ribbon Feed Cam

- b. Adjust the detent actuating lever support front or rear (under its locking screw) so that the rotate detent will clear the teeth on the type head skirt by .025" to .035" when the cycle shaft is at rest (Fig. 41). This clearance should be observed when the type head is manually tilted to a two tilt position since the two tilt position provides the rotate detent with the least amount of motion.

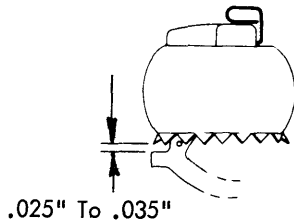


FIGURE 41. Skirt Clearance

Moving the actuating lever support to the rear will increase skirt clearance.

- c. With the detent cam follower on the low dwell of the detent cam (detents fully seated) rotate the actuating lever support until .001" clearance is felt between the detent actuating lever and the detent cam follower roller. Rotating the support clockwise will increase the clearance.

NOTE: The adjustments of the detent mechanism directly affect each other and must be adjusted alternately to obtain the correct clearances.

The .001" lost motion adjusted into the system between the detent actuating lever and the detent cam follower insures that the tilt detent will fully seat in the detent notch of the tilt ring. Too much clearance would allow the detents to enter their notches too early and withdraw too late. This could cause an intermittent erroneous character to print, parts breakage, or roller droppage in wear compensator.

The .025" to .035" skirt clearance allows the rotate detent to enter and withdraw from the type head notch area at the proper time with respect to the rotating type-head. If this clearance is too small the rotate detent will enter the notch area too early and withdraw too late. This will also cause an intermittent erroneous character to print, parts breakage, or unwanted roller droppage. Too much skirt clearance will only cause premature wear on the detent mechanism due to the leverage gain.

Since the detent cam and print cam are both keyed to the print shaft, the relationship between the detent timing and the point at which the type head prints is non-adjustable. The designs of the two cams is such that the detents will be fully seated in their notches when the type head contacts the platen during a print operation. The only thing that can effect this timing relationship is the position of the detent cam follower mounting bracket. The position of this bracket is fixtured at the factory and should not be changed.

11. Detent Mechanism (Gearless Tilt)

The detent mechanism must be adjusted to satisfy the following conditions:

- a. With the cycle shaft at rest and the typehead manually held in a two tilt position, adjust the ribbon feed and detent cam left or right on the print sleeve (Figure 42) so that the rotate detent will clear the detent teeth on the typehead skirt by .025" to .035" (Fig. 43).

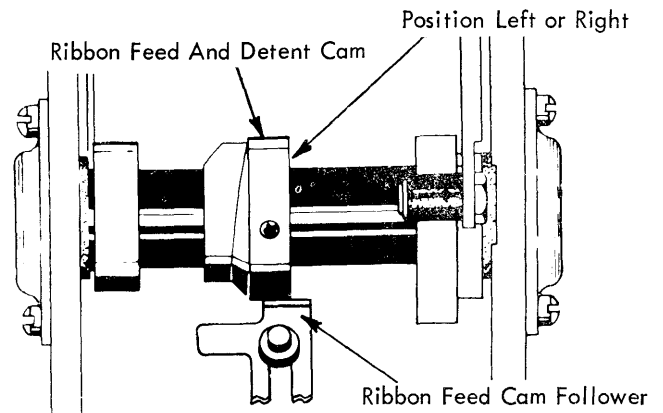


FIGURE 42. Detent Cam Adjustment

Moving the cam to the left will increase the clearance.

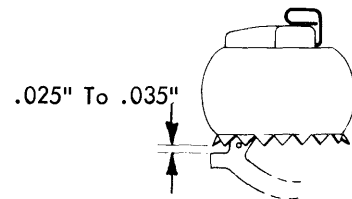


FIGURE 43. Skirt Clearance

- b. With the detent cam follower on the low dwell of the cam (detents fully seated), loosen the locknut on the detent actuating lever support and adjust the Bristo screw up or down until there is a clearance of .001" felt between the detent actuating lever and the detent cam follower roller (Fig. 44).

Adjusting the Bristo screw up will increase the clearance.

NOTE: Read the "note" under Adjustment #9 as it pertains to the gearless tilt mechanism also.

Coarse Alignment

1. Preliminary Print Shaft Timing - With the cycle shaft latched in its rest position, loosen the print shaft gear and rotate the print shaft so that the keyway is approximately in line with the end of the ribbon lift cam follower pivot screw (Fig. 45). The keyway will be about 45° to the rear from the top of the shaft.

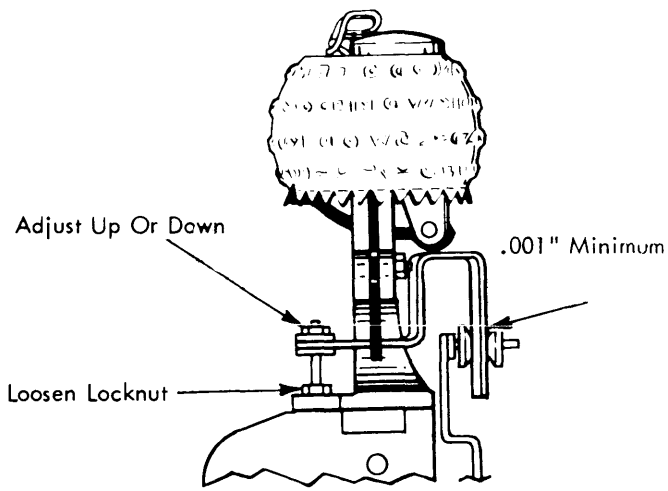


FIGURE 44. Detent Lever Support

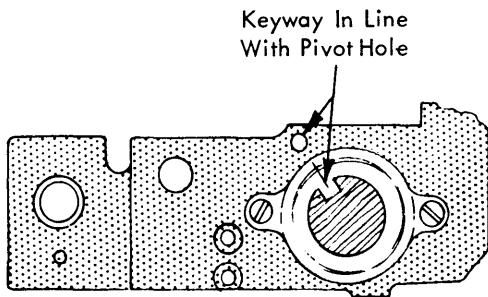


FIGURE 45. Preliminary Timing

The preliminary setting of the print shaft establishes a coarse timing of the two detent entry and withdrawal so that the detents will not be engaged in their notches when the type head and tilt ring are in motion. A more accurate timing adjustment will be made later.

2. Tilt Selector Latches - Form the two stop lugs (Figure 46) above the tilt selector latches so that the latches will reset simultaneously (under the latch bail) just as the cycle clutch check pawl drops into the notch on the check ratchet at the rest position (Fig. 47).

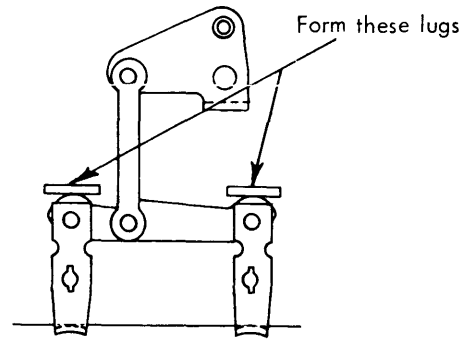


FIGURE 46. Selector Latch Stop Lugs

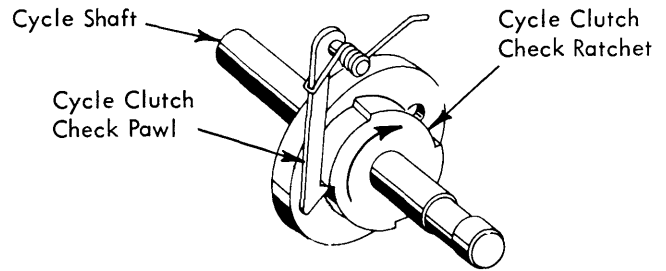


FIGURE 47. Latches Reset As Check Pawl Drops In

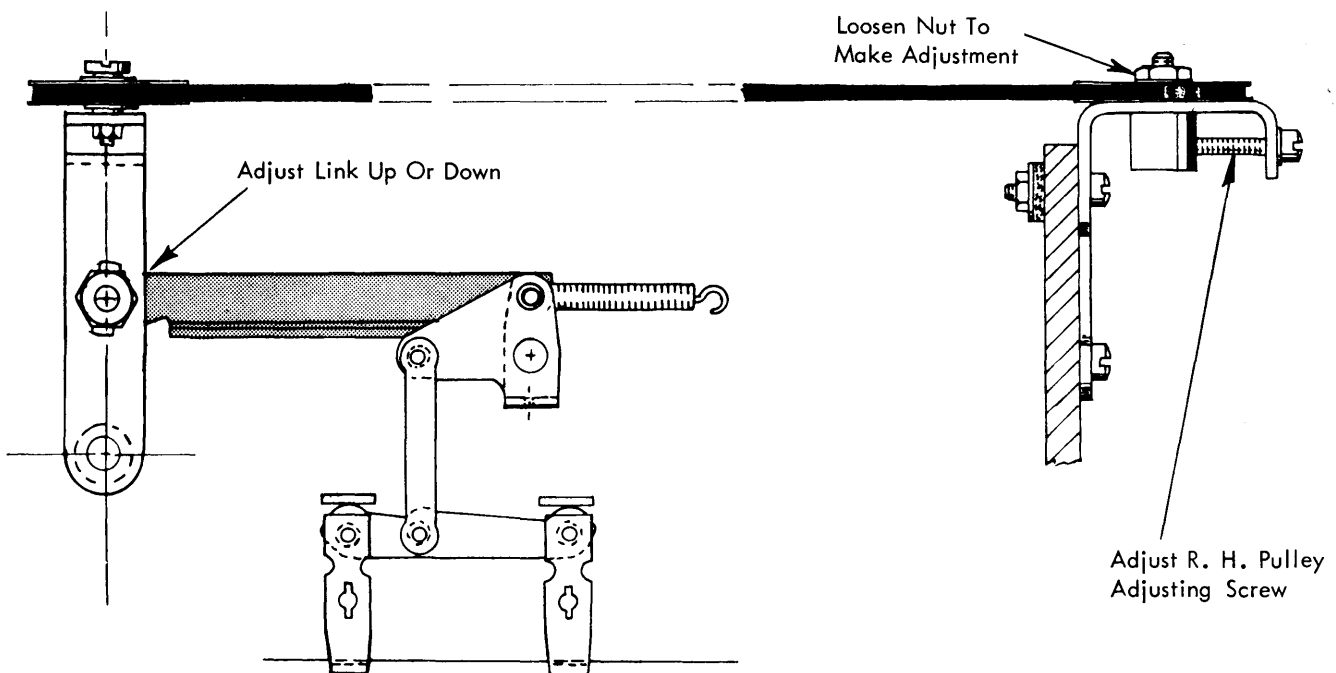


FIGURE 48. Tilt Mechanism

The adjustment can easily be checked by hand cycling a zero-tilt character twice in succession. As the cycle shaft begins to pass its rest position, place your finger lightly against the cycle clutch check pawl while observing the selector latches. If the adjustment is correct you should feel the check pawl drop into the rest position notch on the check ratchet simultaneously as the two selector latches reset under the latch bail.

Form the stop lugs by tapping them up or down with a hammer and screwdriver. The stop lugs should be over-formed slightly then brought back to the correct position, otherwise the "memory" of the metal will cause them to restore toward their original position.

NOTE: It is very important for each selector latch to receive the same amount of motion from the latch bail, when operated, in order to produce the proper amount of motion to the tilt arm link for a desired selection. If one of the stop lugs is adjusted too low, its respective latch will reset early under the latch bail producing an

excessive amount of latch clearance for that latch. This means that this latch when operated will not receive as much motion from the latch bail as the other latch will when it is operated. This condition which is undesirable causes the band width of the system to increase.

3. Tilt Arm Motion - Adjust the tilt link up or down on the tilt arm (Figure 48) to control the tilt ring motion so that the tilt ring will coarse align the same for a 3-tilt character as it does for a zero-tilt character.

In order to check this adjustment, it is necessary to roughly home the tilt ring first. To rough home, half-cycle a zero-tilt character and adjust the right hand tilt pulley (Figure 48) so that the tilt detent will enter slightly on the rear side of the V-shaped detent notch in the tilt ring when the tilt ring play is removed in the restoring direction (Fig. 49). As the tilt detent is allowed to seat itself, the rear of the tilt ring should rise slightly. This is a preliminary adjustment and will require refinement after the proper tilt arm motion is obtained.

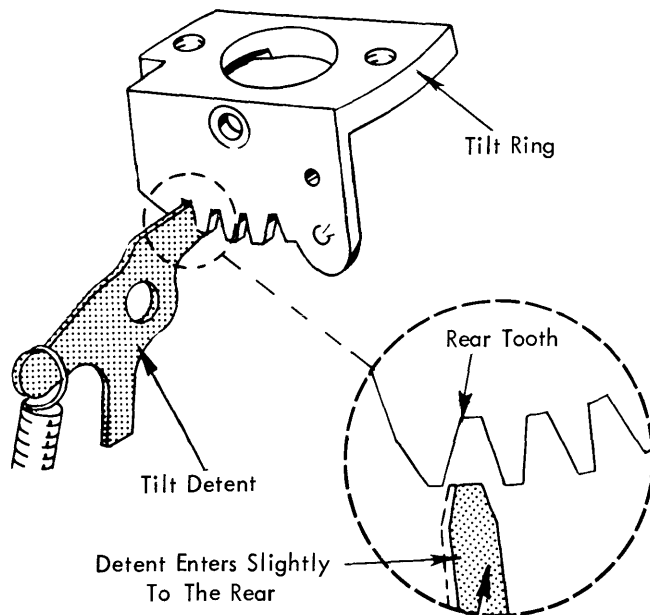


FIGURE 49. *Rough Homing*

Once the print shaft has been preliminarily timed and the tilt ring rough homed, all of the following adjustments that require half-cycling should be done under power so as to include all the stresses on the system.

When the tilt arm motion is adjusted properly, a half-cycled letter "J" (3-tilt) will coarse align the same as a half-cycled letter "Z" (0-tilt). That is, both selections will provide the same rising action to the rear of the tilt ring as the detent is allowed to seat in the detent notch. If the "Z" and "J" coarse align the same, the 1-tilt and 2-tilt selections will also coarse align the same because of the leverage designed into the system.

NOTE: The right hand tilt pulley lock nut may be left loose while making the tilt arm motion adjustment, because a slight readjustment of the pulley may be necessary during the tilt arm motion adjustment.

On late level machines the tilt arm link has a horizontal elongated mounting hole where it fastens about the shouldered screw on the tilt arm and the tilt arm is lightly spring loaded away from the side frame by a hairpin spring. The tilt pulley spring is far stronger than the hairpin spring thus holding the tilt arm against the right hand end of the elongated mounting hole in the link. Although this modification has no definite effect on a tilt operation, its function is to remove any slack that may appear in the tilt tape. An example is when an operator changes the typehead she may accidentally tilt the head causing the tape to slacken.

4. Tilt Ring Homing - With a zero-tilt character half-cycled and the tilt ring play removed in the negative direction (restoring direction), adjust the right hand tilt pulley so that the rear of the tilt ring will rise about .005" when the detent is manually allowed to seat in the detent notch (Fig. 50A).

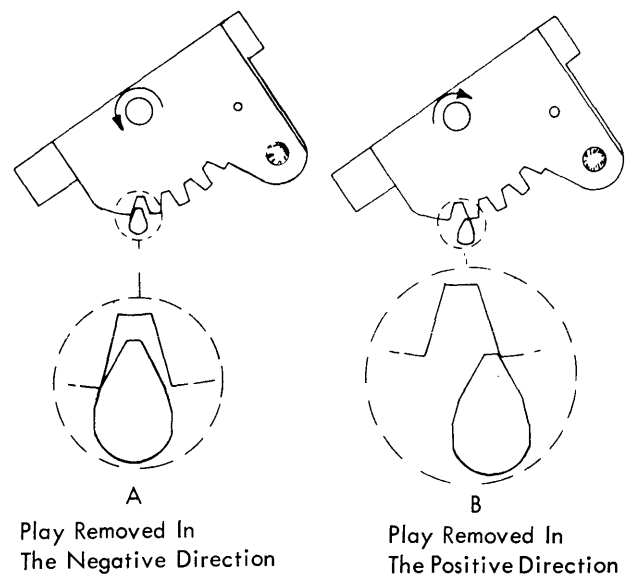


FIGURE 50. *Tilt Detent Entry*

Check the other tilt positions and then refine the homing adjustment on the tilt selection that provides the least amount of rise to the rear of the tilt ring.

As a further check, remove the tilt ring play in the positive direction and observe the detent entry on the forward side of the detent notch (Fig. 50B). The detent should enter far down the forward slope of the detent notch but not so far that it contacts the tip of the tooth. By homing the tilt ring off center, favoring the positive side of the detent notch, a maximum amount of wear potential is achieved.

5. Rotate Spring Tension - Adjust the rotate spring in the rocker so that it will have 1-7/8 to 2 pounds tension when the machine is half-cycled using a lower case "m" (negative 5). The least amount of tension is present in the spring when it is in this position. The typehead must be removed when making this adjustment.

The rotate spring tension is adjusted by turning the spring cage from the front (Fig. 50A). The cage can be turned clockwise to increase the tension by pulling the cage toward the left with a spring hook. The spring drum retainer automatically snaps into position to retain the adjustment. If tension is to be decreased, the retainer must be pulled forward to allow the cage to rotate counter-clockwise. Care must be taken to decrease the tension slowly so that the cage does not spin freely. Spring damage could otherwise result.

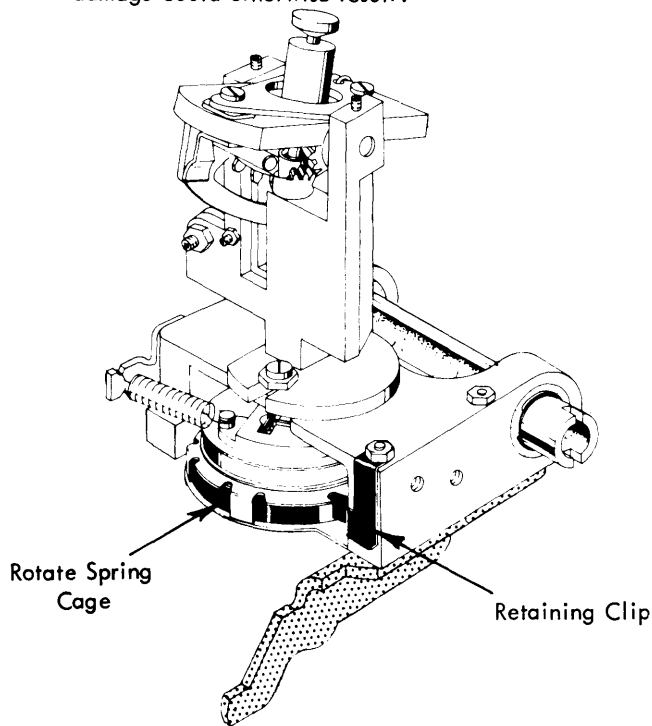


FIGURE 51-A. *Rocker Assembly*

Tension of the spring is critical in that it must be properly balanced with the springs of the wear compensator. Excessive tension will overload the levers system and increase wear. Insufficient tension will not provide the torque necessary for rapid lower case negative rotate operations. It will also affect the wear compensator operation if the tension is not sufficient to overcome the compensator damper spring in the negative-5 position.

The rotate spring tension should be measured with a spring scale as indicated by Fig. 51B. Using a lower case "m", read the spring scale while slowly allowing the shift arm to move in towards its stopscrew. The spring scale should read 1-7/8 to 2 pounds just as the arm reaches its stop screw. To overcome static friction, read the spring scale while the arm is moving.

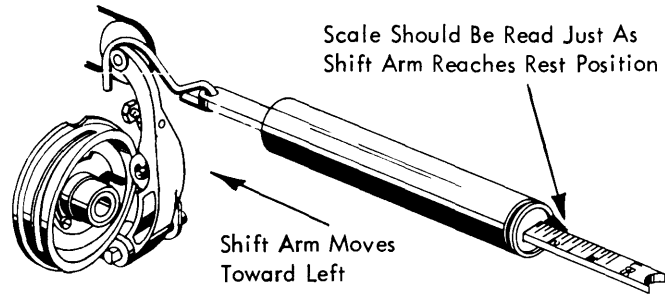


FIGURE 51-B. *Spring Scale Measurement For Rotate Spring Adjustment*

NOTE: The accuracy given to the next seven coarse alignment adjustments determines the "band width" (detenting variation) of the rotate system. Each one of these seven adjustments contributes to the band width in a different manner. Generally, it takes experience in making each adjustment to learn how much accuracy is needed to end up with an accumulated band width which is acceptable. The band width of the rotate system should never exceed .030" nor should any extra time be spent in trying to obtain one any less than .020".

6. Rotate Selector Latches

- a. Form the stop lugs above the positive rotate selector latches (Fig. 52) so that the latches will reset simultaneously (under the latch bail) just as the cycle clutch check pawl drops into the notch on the check ratchet at the rest position.

NOTE: The adjustment theory under "tilt selector latches" also pertains to the rotate selector latches.

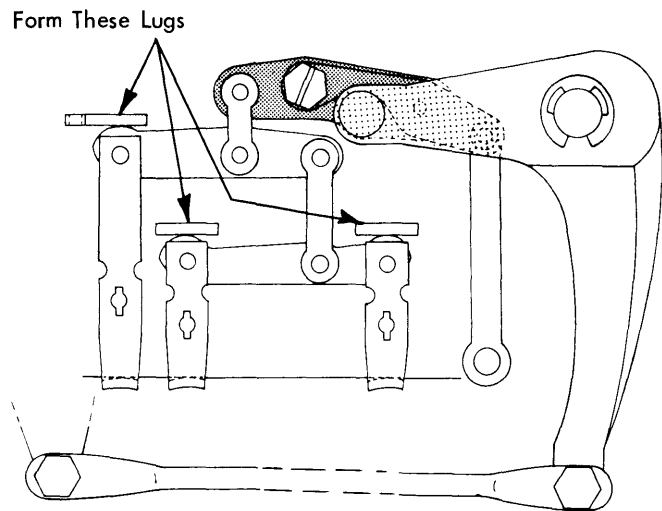


FIGURE 52. *Rotate Selector Latches*

- b. Adjust the negative-5 latch stop screw so that the negative-5 latch (Fig. 53) will reset simultaneously as the check pawl drops into the notch on the check ratchet at the rest position.

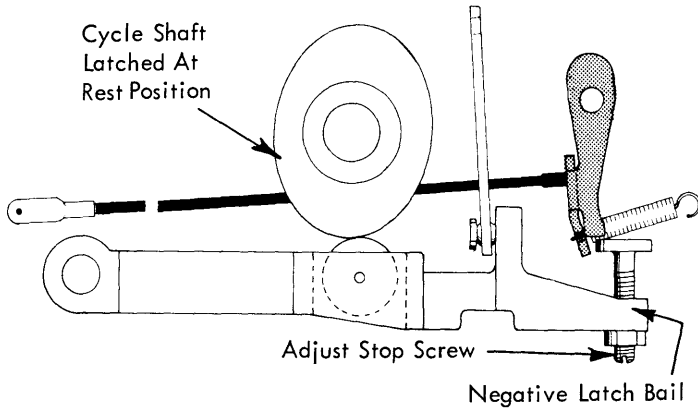


FIGURE 53. Negative 5 Latch Stop Screw

The negative-5 latch controls the position of the negative latch bail during zero and all positive rotate selections. Changing the latch adjustment causes the coarse alignment of the zero and all positive rotate selections to change equally with respect to the negative selections. No change is felt in the coarse alignment of the negative rotate selections when the negative-5 latch adjustment is altered because the latch is out of the system during all negative selections (Fig. 54).

Considering the balance lever to be properly adjusted, the effects of the negative-5 latch adjustment on the system can be explained by the following: From the rest position the amount of movement in the negative direction given to the rotate bellcrank

is fixed because the negative latch bail moves from the high point of the negative cam to its low point. From the rest position the amount of movement in the positive direction given to the rotate bellcrank can be increased or decreased by changing the negative-5 latch adjustment. In other words, when the machine is at rest the negative-5 latch bail is resting on the high point of the negative-5 cam. Whenever a no-rotate or positive selection occurs, the negative-5 latch bail is allowed to follow its cam towards the low point until it is restricted by the negative-5 latch. This small increment of negative motion to the negative-5 latch bail during a no-rotate or positive selection causes the positive motion to be reduced by an equal increment. There-

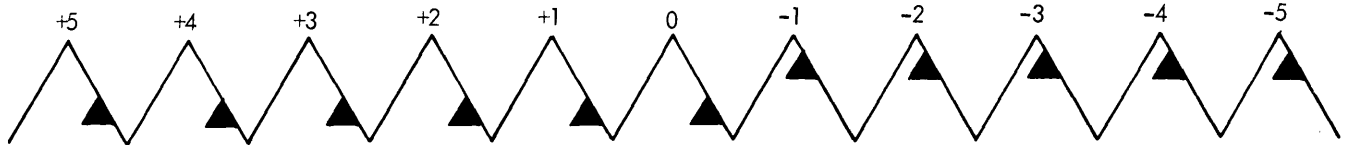


FIGURE 54. Excessive Negative 5 Latch Clearance

fore, the adjustment of the negative latch can change the balance of motion between positive and negative selections. Even though it is possible, it is not permissible to use the negative latch adjustment for balancing purposes. The negative latch should always be adjusted for the proper reset clearance. This allows the system to operate with optimum leverage loads in both positive and negative selections. Balancing between positive and negative should always be accomplished by adjusting the balance lever.

NOTE: Figure 54 illustrates how the coarse alignment detenting would change at the typehead if only the negative-5 latch adjustment were maladjusted on a machine. It is possible for this same detenting pattern to show upon a machine that has the correct negative-5 latch adjustment but other adjustments maladjusted. For this reason it is best to adjust the negative latch as specified in the adjustment rather than by adjusting it while observing the effects that the adjustment change will produce at the typehead.

7. Rotate Arm Vertical - With the typehead removed and the machine half-cycled using the letter "F", adjust the rotate link so that the point at the top of the rotate arm is $15/32$ " from the machine sideframe. The compensator roller should be $1/16$ " from the top of the slot when this adjustment is made.

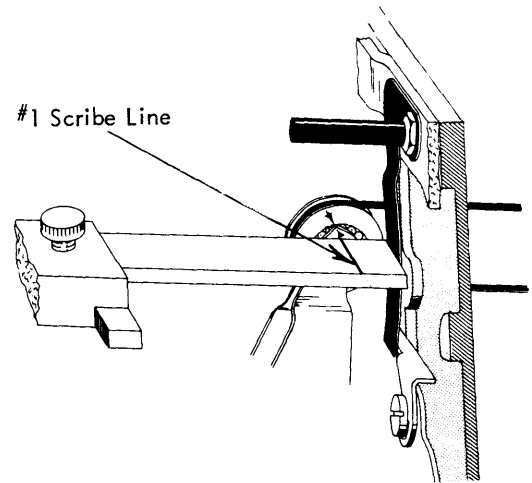


FIGURE 55. Rotate Link Adjustment Measurement

The adjustment sets up a vertical condition for three points in the rotate arm, the center of the pulley, the rotate arm pivot point, and the rotate link connection. With the rotate arm vertical at a half-cycled zero rotate position, the leverage within the rotate arm will be the same for positive and negative movements of the arm.

The adjustment can be measured using the #1 scribe line on the Hooverometer handle as illustrated in Figure 55. The scribe line measurement makes allowance for the thickness of the compensator damper spring.

It is important that this adjustment be set as carefully as possible and maintained, because subsequent adjustments are dependent upon the correct starting point of the rotate arm.

NOTE: The eccentric stud at the top of the rotate arm should be turned all the way to the left at this point to prevent interference with subsequent adjustments.

8. Preliminary Typehead Homing - Half-cycle the machine under power using the upper case letter "T". Loosen the set screw in the bottom of the rotate pulley and slip the typehead so that the detent will enter .010" to .020" from the center of the detent notch, on the negative side of the notch, when the head play is lightly removed in the negative direction (Fig. 56).

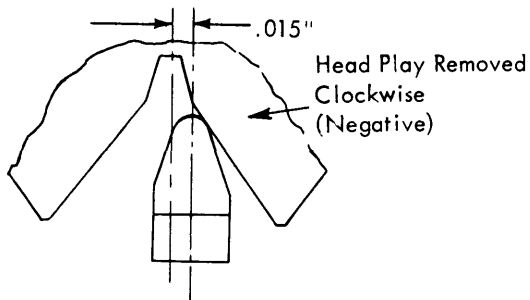


FIGURE 56. Type Head Homing

The main purpose of this preliminary homing adjustment is to aid the Customer Engineer in making the rest of the coarse alignment adjustments. It places the typehead in approximately the correct position so that its rotation, for a given selection, may be easily measured and used as a tool in making the next four adjustments. After completing this sequence of adjustments the preliminary homing adjustment may have to be refined.

NOTE: Be sure to maintain .002" to .004" end play in the rotate shaft when making this adjustment. Also, make sure that the compensator roller is 1/16" from the top of the slot.

9. Balance Lever - With the machine in upper case loosen the lock nut on the balance lever and move the right hand member of the balance lever (Fig. 57) left or right until a half-cycled +5/-5 combination detents (coarse aligns) the same as a half-cycled letter "T". The combination can easily be obtained by holding the negative-5 latch interposer forward with the fore finger while striking the letter "B" with the thumb (a letter "T" will result).

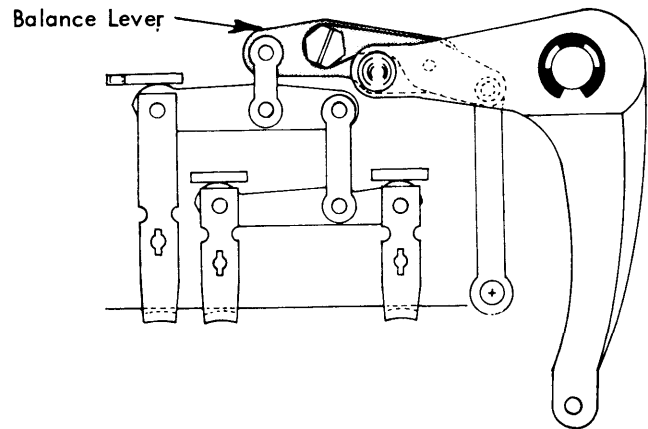


FIGURE 57. Balance Lever Adjustment

Begin the adjustment by half-cycling the letter "T" in the normal manner. Check the detent entry to see exactly how much off-center the detent enters with the head play removed clockwise. Next half-cycle the letter "T" using the cancellation method described above and check the detent entry. If it is different from the normal "T", it indicates that the typehead has moved because of an unbalanced condition between the positive and negative motions.

With the machine in the half-cycled position using the cancellation method, adjust the right hand member of the balance lever left or right until the detenting is exactly as it is when the letter "T" is half-cycled normally. Changing the balance lever adjustment will not appreciably affect the detenting of the half-cycled letter "T".

NOTE: The nut on the balance lever screw can be left loose until the correct adjustment is obtained. Be sure not to move the adjustment when tightening the nut.

In Figure 58 the effects of the wear compensator are disregarded and all adjustments are correct except the balance lever. The right hand member of the balance lever is maladjusted too far to the left creating too much negative motion and not enough positive motion. Looking at the positive side of Figure 58 you can see that the maladjusted balance lever causes a progressive loss of motion to the rotate bellcrank from the zero to a positive five rotate position. The greatest loss of motion is felt at the positive five position because the left end of the balance lever receives the most motion for this selection. When the negative side of the balance lever is operated, the

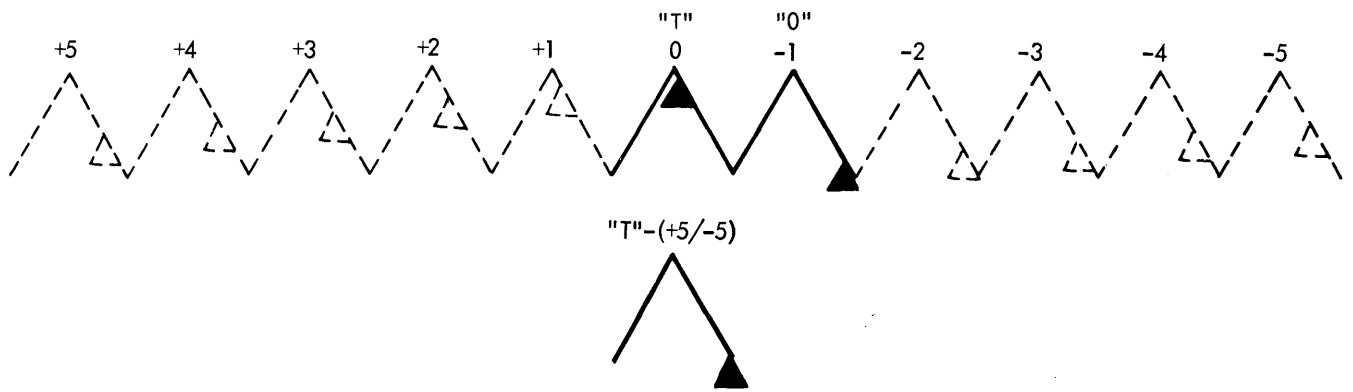


FIGURE 58. Excessive Negative Balance

maladjusted balance lever causes the rotate bellcrank to receive an excessive amount of motion as illustrated by the detenting of the negative five rotate position. This excessive motion is felt equally in all of the negative selections because the negative end of the balance lever receives the same motion from the cam for all negative selections. The progressive loss of motion felt from the negative five to the negative one rotate position is caused by the positive side of the balance lever. It produces a deficiency of motion in the negative selections just as it did during the positive selections.

Notice the detenting of a negative one selection in Figure 58. This selection combines the error of a positive four and a negative five causing the negative one ("0") to be the worst detenting selection with respect to the zero rotate selection. Although the cancellation method (+5/-5) combines even a greater error than the negative one selection, either one may be used to effectively make the balance lever adjustment. Checking the detenting of the other positions is not necessary.

If the balance lever were out of adjustment in the opposite direction so that there was too much positive and not enough negative motion, the error pattern would remain the same except that the detents would move towards the opposite side of the detent notches.

10. **Rotate Arm Motion** - The adjustable plate on the bottom of the rotate arm (Fig. 59) should be adjusted up or down so that a half-cycled upper case letter "W" (+5) detents the same as a half-cycled upper case letter "R" (-3). When observing the detenting remove the head play lightly in the negative direction.

The rotate arm motion is measured only as far as the negative three position in the negative direction. The negative four and five positions are not used because these two positions are affected by the ratio change operation of the wear compensator.

By comparing the detenting of the "R" (-3) and "W" (+5), it can be determined whether or not the rotate arm is multiplying the motion, received from the rotate link, enough to rotate the typehead to the selected position. Once the "R" and "W" are detenting the same, then all of the selections between positive five and negative three will detent well within the acceptable band width provided that all of the previous adjustments have been made correctly. If a slight difference in detenting must

exist between the "R" and "W" it is permissible and sometimes desirable provided that the "R" detents more negative than the "W". In other words, it is better to have too much rotate arm motion than too little. The reason for this is to place a small amount of wear potential into the system for the areas of the differential mechanism where wear cannot be compensated for (positive latches and latch bail). Thus, as wear occurs in these areas causing the rotate arm motion to decrease, the detenting variation between the "W" and "R" will also reduce.

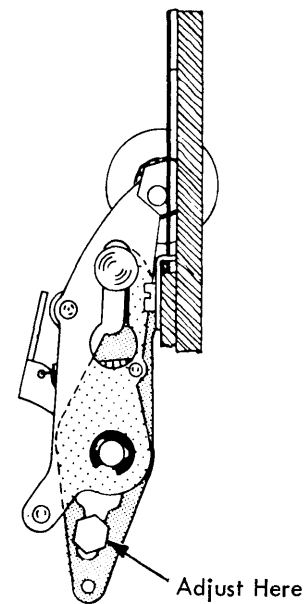


FIGURE 59. Rotate Arm Movement

Figure 60 illustrates the effects on detenting caused by insufficient rotate arm motion. Notice that the largest detenting variation occurs between the "W" and "R". This is because the "W" and "R" operate in opposite directions and the error that appears when these two positions are compared is the combined error of both positive and negative motion.

If the rotate arm motion was excessive the detenting pattern would remain the same except that each detent would be on the opposite side of its detent notch.

NOTE: The adjustment may be left loose during each check until the correct position is obtained.

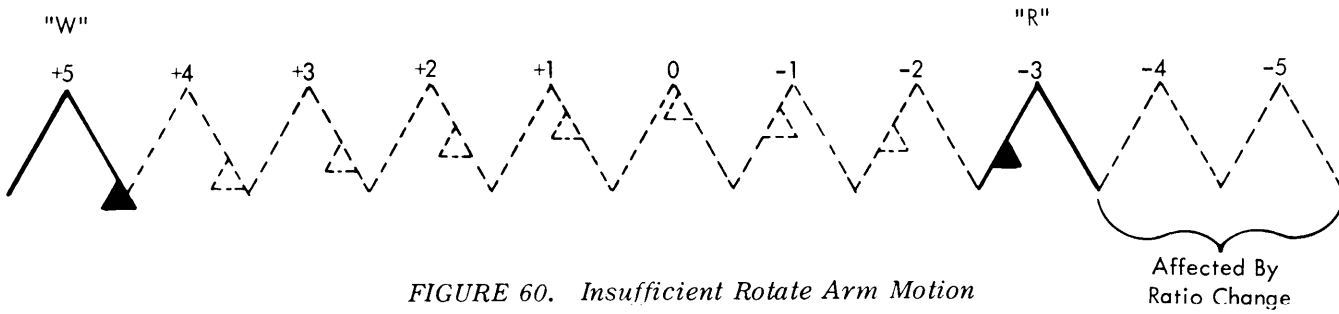


FIGURE 60. Insufficient Rotate Arm Motion

11. Eccentric Stud Adjustment - (Typehead Homing) Use the following procedure to adjust the eccentric stud:

- a. Damper spring stop - as a preliminary adjustment, slide the damper spring stop down as low as it will go behind the damper spring (Fig. 61).

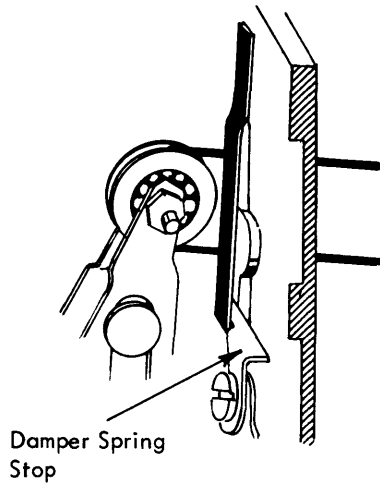


FIGURE 61. Damper, Spring Stop - Preliminary Adjustment

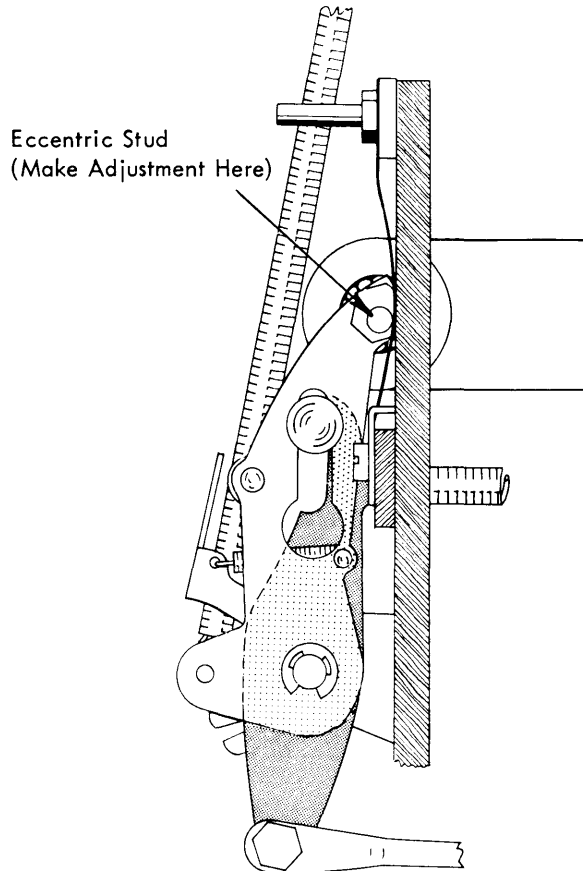


FIGURE 62. Eccentric Stud

- b. Raise the compensator roller all the way to the top of the V-shaped wedging slot.
- c. Half-cycle an upper case "M" (-5) and adjust the eccentric stud (Fig. 62) in against the machine side-frame until the "M" detents .010" to .020" in the negative direction from the center of the detent notch when the head play is lightly removed in the negative direction (Fig. 63). Make sure that the damper spring is fully collapsed against the machine sideframe.

After the eccentric stud has been properly adjusted the compensator roller must be reseat by raising it to the top of the V-shaped slot and striking a series of "M's". The compensator roller should seat 1/16" down from the top of the slot. If it drops too little or too much the rotate link should be adjusted and the roller reseat until the 1/16" is obtained. Having the roller seat 1/16" from the top of the slot sets up a vertical condition between the compensating arm and the rotate arm so that the leverage within the arm assembly will be the same for both positive and negative movements of the arm.

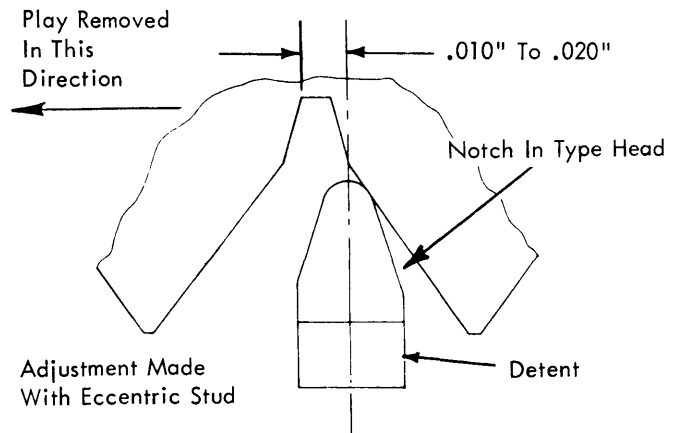


FIGURE 63. Eccentric Stud

In some cases it may be found that after the eccentric stud is adjusted the roller will not drop but remain trapped at the top of the V-shaped slot. If this occurs, lengthen the rotate link and then recheck the eccentric stud adjustment.

NOTE: The eccentric stud should always be kept in the lower half of its orbit so that it will tend to turn in the tightening direction as it operates against the sideframe. Also, if the correct detenting of the "M" (-5) cannot be easily obtained with the eccentric stud adjustment the preliminary homing adjustment (Adj. #8) must be readjusted.

- d. Damper spring stop - with the typehead removed, raise the stop so that when a lower case "M" is half-cycled the damper spring will just collapse against the sideframe. Check by pulling the compensator arm away from the sideframe with a spring hook and then allow it to go back in slowly (Fig. 64).

Machine Half Cycled
To Negative 5 Lower
Case Character

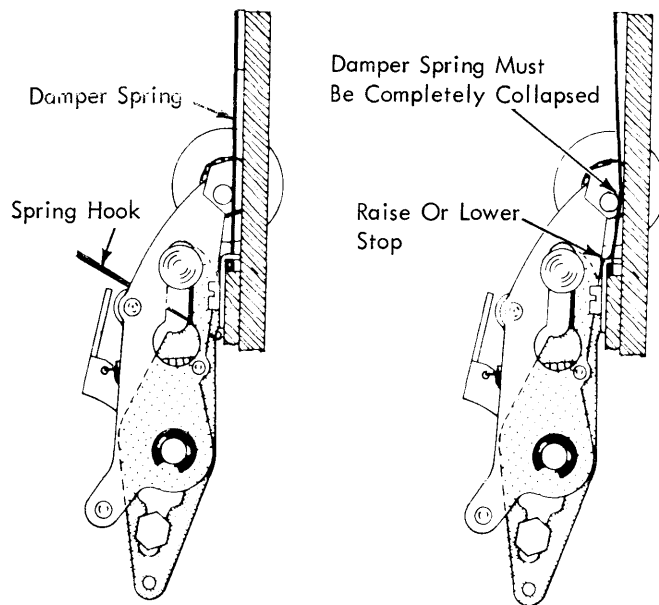


FIGURE 64. Damper Spring Stop

The main purpose of the eccentric stud adjustment is to stop the negative motion of the rotate arm as it approaches the negative five position so that all of the pressure on the compensator roller will be relaxed when the compensating arm has reached its full negative position. Assuming that no ratio change was felt in the system at the time of making the eccentric stud adjustment, stopping the rotate arm early to relax the pressure on the roller will cause the negative motion of the rotate arm between the negative four and negative five rotate positions to be reduced, or the detenting of the negative five to be positive with respect to all the other rotate positions.

Since the ratio change adjustment will not affect the negative five position, the typehead is then rehome to the negative five position making it detent properly but causing all of the other positions (-4 through +5) to detent too far negative. The lost motion of the rotate arm is still felt between the negative four and negative five rotate positions. The rotate arm motion in this area can be controlled by the ratio change adjustment which will be discussed under the next adjustment. This re-homing of the typehead to the negative five position (which is usually a slight refinement of the original homing adjustment) is accomplished by the eccentric stud adjustment rather than by slipping the rotate shaft within the rotate pulley. It has been found that the homing adjustment can readily be refined to the negative five position with the eccentric stud while at the same time obtaining a relaxed condition for the compensator roller (accomplished by controlling the length of the rotate link and reseating the compensator roller).

- 12. Ratio Change Adjustment - With the machine half-cycled under power to an upper case "R", form the paddle on the rotate eccentric arm until the upper case "R" (-3) detents the same as the upper case "M" (-5). Each time the paddle (Fig. 65) is formed the machine must be recycled under power before observing the detenting of the "R". This allows the eccentric shoulder to reseat itself in the compensating arm.

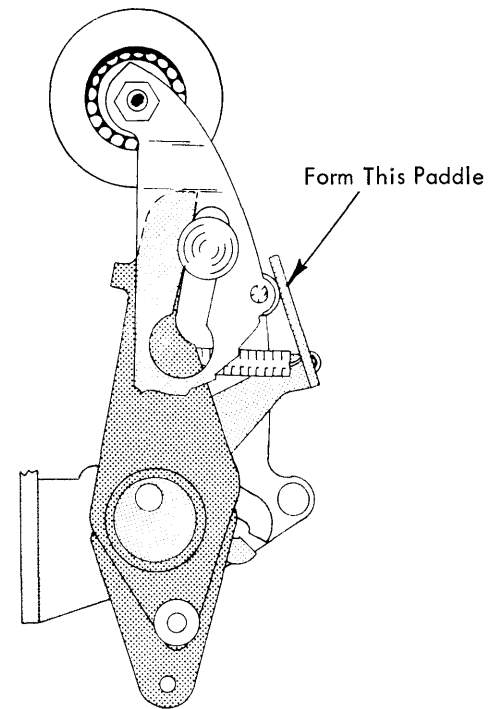


FIGURE 65. Arm Assembly In -3 Position

CAUTION: When forming the paddle the V-shaped wedging slot may accidentally open up causing the roller to drop. If this occurs, reseat the roller by raising it to the top and striking a series of "M's".

Forming the paddle has no effect on the negative five position. This can be easily seen by looking at Figure 66 which shows the arm assembly in a negative five posi-

tion. In this position there is a large clearance between the paddle and the barrel on the rotate arm therefore any change in the paddle position just increases or decreases this clearance without affecting the negative five position of the rotate arm.

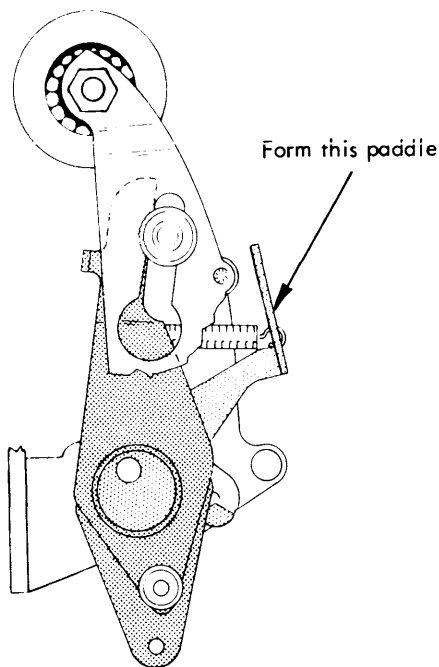


FIGURE 66. Arm Assembly in -5 Position

The paddle adjustment does affect all of the rotate positions from a negative three to a positive five position equally because it controls how long the compensating arm will rotate about the eccentric shoulder on the rotate eccentric arm as it travels from the negative five position towards the negative three position. In other words the

more clearance there is between the rotate arm and the paddle, the farther the compensating can travel under a ratio change condition as it moves towards the negative three position.

Figure 67 illustrates how the detenting pattern of the typehead is affected by the ratio change adjustment.

Notice in Figure 67A that all the rotate positions from the -3 to the +5 detent equally but much less negative than the -5. This indicates that there is too much ratio change (too much motion) in the system between the "M" (-5) and the "R" (-3). The paddle should be formed in until the "R" detents the same as the "M".

Figure 67B illustrates the detenting pattern of a system that lacks a sufficient amount of ratio change. All the rotate positions from -3 to +5 detent alike but too far negative with respect to the -5. The system lacks motion between the "M" (-5) and the "R" (-3) therefore the paddle should be formed out to increase the amount of ratio change. Note that the negative four position is detenting the same as the "R" in Figure 67B. This is because the ratio change is not occurring at the negative four position, thus the arm assembly is operating as one solid arm at this position.

In Figure 67C the correct amount of ratio change is in the system. All positions from the -3 to the +5 detent the same as the -5. Note that when the "R" detents the same as the "M", the detenting of the -4 is slightly different. This is caused by the ratio change. No attempt should be made to control the detenting of the -4 position because its position may vary on each machine depending on the amount of ratio change required (of each machine) to make the "R" detent the same as the "M".

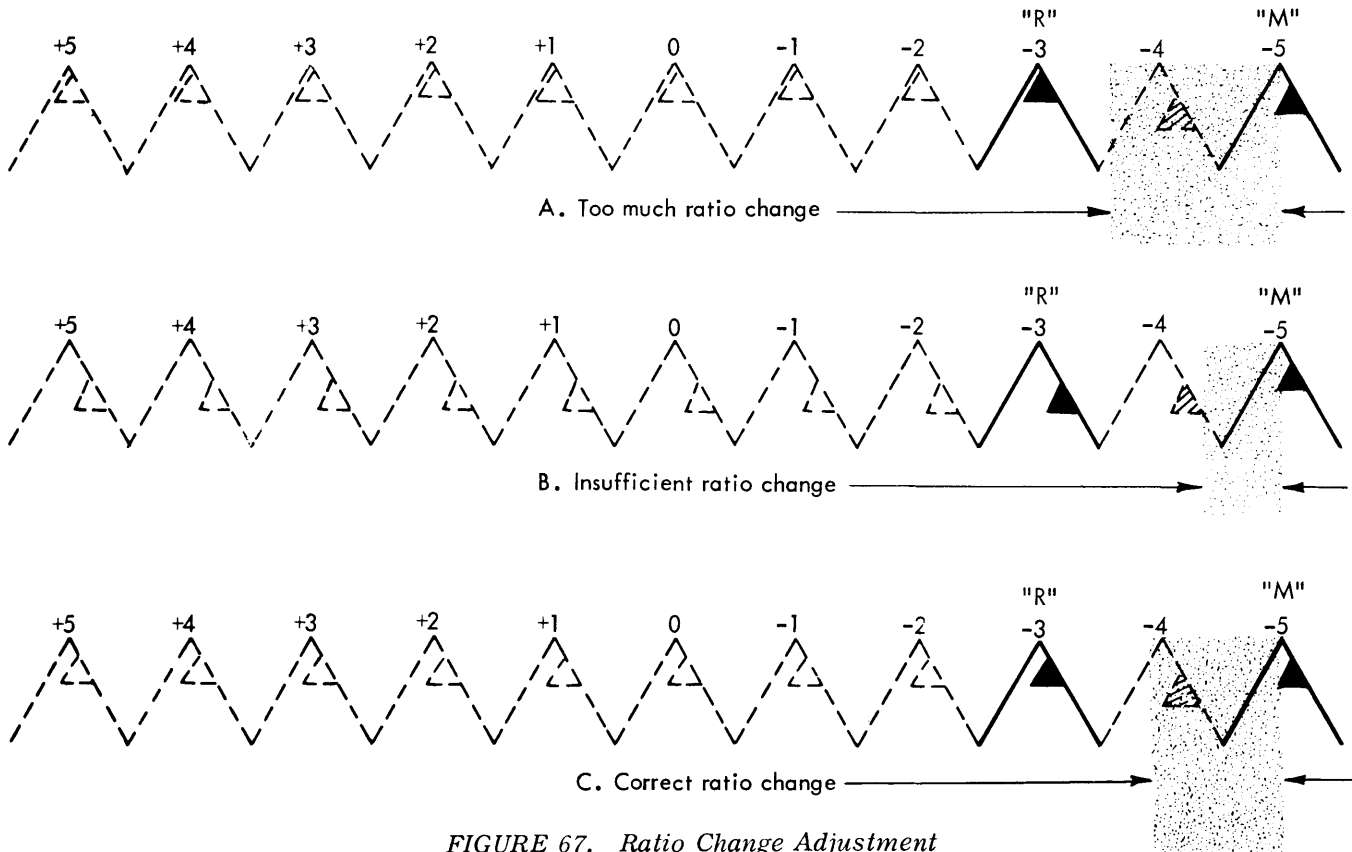


FIGURE 67. Ratio Change Adjustment

13. Print Shaft Timing - Advance or retard the print shaft relative to its gear to obtain the proper timing of the rotate detent. Because of a slight redesign of the rotate detent on machines equipped with an impression control lever, the specifications of the timing adjustment for these machines is slightly different than the adjustment required for machines that are not equipped with an impression control lever. Be sure to use the correct adjustment:

a. Machines Equipped With An Impression Control Lever - While slowly hand-cycling an upper case "M" (-5) remove the head play lightly in the positive direction (against the direction of rotation) and observe how the rotate detent ENTERS the detent notch. It should clear the side of the detent notch by .001" to .015" just as it enters (Fig. 68a). This entry clearance should cause the detent to scrub on the side of the detent notch during withdrawal when the machine is hand-cycled back to rest. During a powered operation the dynamics of the system causes the typehead to lag behind by as much as 12° during the restoring portion of the cycle, therefore this scrubbing on withdrawal is not felt in the system when the machine is operated under power.

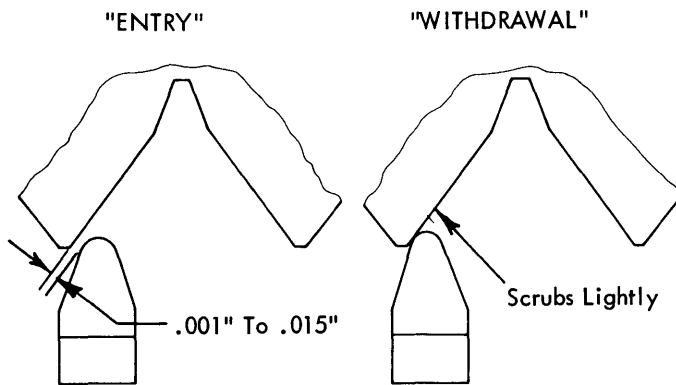


FIGURE 68a. Detent Timing Of The "M"

Adjusting the detent timing so that the detent scrubs lightly on withdrawal when the machine is hand-cycled insures that the detent withdrawal will not begin to occur before the typehead prints.

NOTE: Check the detent entry for an upper case "W". The detent must enter the correct detent notch.

CAUTION: After hand-cycling the machine the compensator roller must be raised to the top of the wedging slot and resealed under power by striking a series of "M's".

b. Machines Not Equipped With An Impression Control Lever - Hand-cycle an upper case "M" (-5) and observe the rotate detent as it operates in the type-head notch. The detent must enter the correct detent notch and withdraw without restricting the restoring of the typehead. There should be .002" to .004" backlash felt in the typehead when the detent has withdrawn approximately half-way down the slope of the detent notch (Fig. 68b).

After adjusting the timing of the rotate detent to the upper case letter "M" (-5), check the detent entry and withdrawal of an upper case letter "W" (+5). If the detent restricts the typehead from restoring on withdrawal when the "W" is slowly hand-cycled, advance the print shaft slightly until the "W" has a withdrawal backlash of .002" to .004". When the withdrawal adjustment has been completed check the detent entry on both the "W" and "M". The detent must enter the correct notch.

CAUTION: After hand-cycling the machine the compensator roller must be raised to the top of the wedging slot and resealed under power by striking a series of "M's".

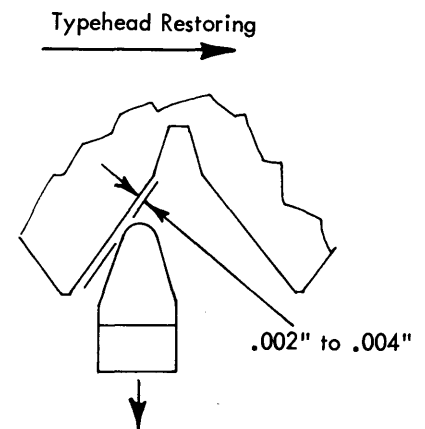


FIGURE 68b. Withdrawal Clearance For The "M" (-5)

If difficulty is encountered in obtaining the correct detent timing, check the following items:

- Detent skirt clearance - favor the high side of the tolerance.
- Typehead homing - favor the high side of the tolerance.
- Band width - make sure that it is not excessive.
- Head play - it should be .048" to .067" measured at the typehead skirt. If excessive head play is suspected the ball joint should be replaced and the typehead homing adjustment refined.

CAUTION: Excessively advanced or retarded timing can cause parts damage as well as poor horizontal alignment or improper selection. This could happen if the detent entered the wrong notch or remained in the notch too long.

NOTE: Be sure to maintain .002" to .004" end play in the print shaft.

14. Shift Motion - The shift arm adjusting screw (Fig. 69) should be adjusted in or out to obtain 180° rotation of the typehead during a shift operation.

The adjustment can be checked by observing the detenting in the lower case compared to the upper case using the letter "M". The detent **MUST** enter the lower case notch **EXACTLY** the same as it does the upper case notch. Check by half-cycling the machine and manually withdrawing the detent. Remove the head play clockwise and allow the detent to re-enter slowly. A final check can be made by comparing the detent withdrawal timing of the upper and lower case. They must be exactly alike.

Maladjustment can cause misalignment in the lower case while the upper case remains good.

CAUTION: Be sure that the shift cam is detented at each position during the check and that the cycle shaft is properly latched at the half-cycle position.

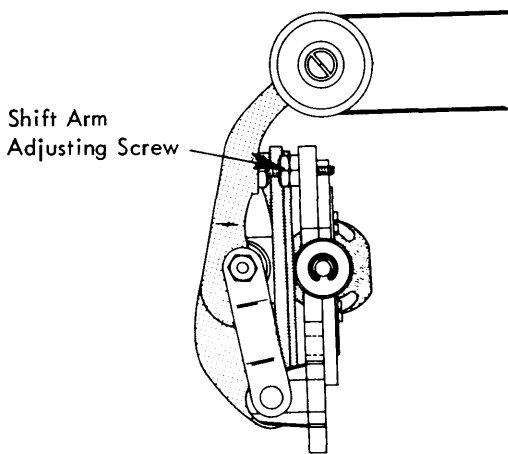


FIGURE 69. *Shift Motion Adjustment*

15. Final Check - After completing the foregoing adjustments, a final check should be made to see if any refinements are necessary. Compare the coarse alignment detenting for the letters WORMT. The band width of this group should not exceed .030" and none of the group should detent closer than .010" to the center of the notch when the head play is removed in the negative direction.

The following table can be used to diagnose the cause of excessive band width between the letters WORMT. These letters are chosen because of their rotate selections. If an excessive band width exists, it will be greatest among these characters. In making the diagnose, follow the sequence as listed.

<u>Excessive Band Width Between</u>	<u>Cause</u>
T (zero) and O (-1)	Incorrect balance
R (-3) and W (+5)	Incorrect rotate arm motion
R, W, and T	Incorrect latch clearances
M (-5) and R (-3)	Incorrect paddle adjustment

Unwanted compensator roller droppage may result from one or more of the following.

- a. "Beating the shift"
- b. Improper detent timing
- c. Malselection (popping latches)
- d. Incorrect rotate spring tension or damper spring tension.
- e. Binds in the typehead, upper ball socket, rotate shaft, rotate pulley, or rotate spring.
- f. Binds in the compensator or lever system.
- g. Loose differential mounting bracket.
- h. Excessive band width or head play.

If the band width appears to be all right but the alignment is not satisfactory, check the following items:

- a. Detent timing.
- b. Play or binds in the tilt or rotate detents. Side play in the rotate detent can be checked by holding down the interposer for the letter "N" so that it repeats for a full line. Move the carrier back manually and repeat the operation without indexing. The second line should cover the first line exactly. If any of the characters are shadowed, side play in the rotate detent could be the cause.
- c. Loose fitting upper ball socket.
- d. Excessive play in the carrier or rocker.
- e. Binds in the rocker parts.
- f. If the -5 characters vary horizontally, improper damper spring tension could be the cause.
- g. Improper tilt adjustments can cause poor horizontal alignment by delaying the detent seating.

NOTE: After the machine has been in use for some time, wear in the tape system will allow the typehead to drift in the negative direction. It is not necessary to slip the rotate shaft within the rotate pulley to REFINe the typehead position. The proper position may be gained by refining the eccentric stud adjustment. Be sure to RESEAT the compensator roller after changing the eccentric stud adjustment. (Maintain the roller position 1/16" from the top of the slot by adjustment of the rotate link.)

PRINT MECHANISM - OLD STYLE

1. Copy Control Lever - With the copy control lever detented in the forward position, the high points of the eccentrics should be vertical (Fig. 70). Adjust the copy control lever on the shaft to satisfy this condition.

This adjustment provides the most effective operation of the eccentrics in moving the platen forward and back.

NOTE: The stop ears on the copy control detent spring should be formed to provide positive detenting in the extreme front and rear positions of the lever.

CAUTION: The adjustment of the copy control lever, while important as a preliminary setting, should not require adjustment unless it becomes loose or parts replacement is necessary. Any change in the adjustment will affect the front to rear position of the platen requiring that other adjustments be altered to compensate.

2. Eccentric Retaining Plates - For maximum efficiency of the copy control eccentrics, adjust the plate on each side of the machine so that no front to rear play exists between the eccentrics and the retaining plates (Fig. 70). Be sure that no binds exist.

3. Platen Latches - Adjust the platen latch eccentrics with the high part down so that the platen is held firmly in position vertically and horizontally. The latches should latch and unlatch freely with the feed rolls released.
4. Platen Position - To properly adjust the print mechanism, the correct position of the platen must be established first and then the print adjustments made relative to the platen position. This involves both a height adjustment and a front to rear position. Because of the method used in measuring these positions, it is necessary to consider them together and adjust them alternately until both are correct.

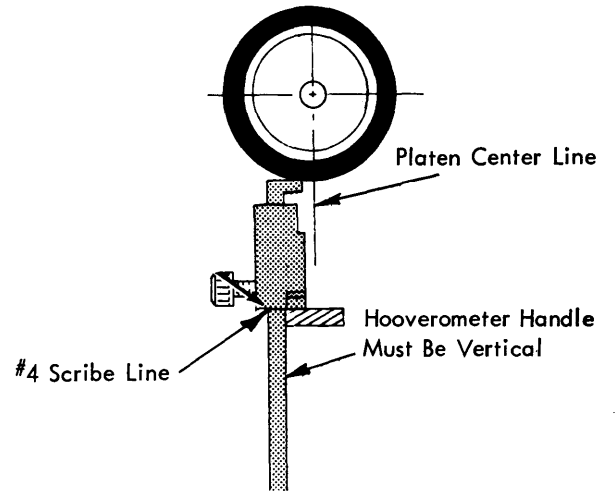


FIGURE 71. Platen Height Adjustment

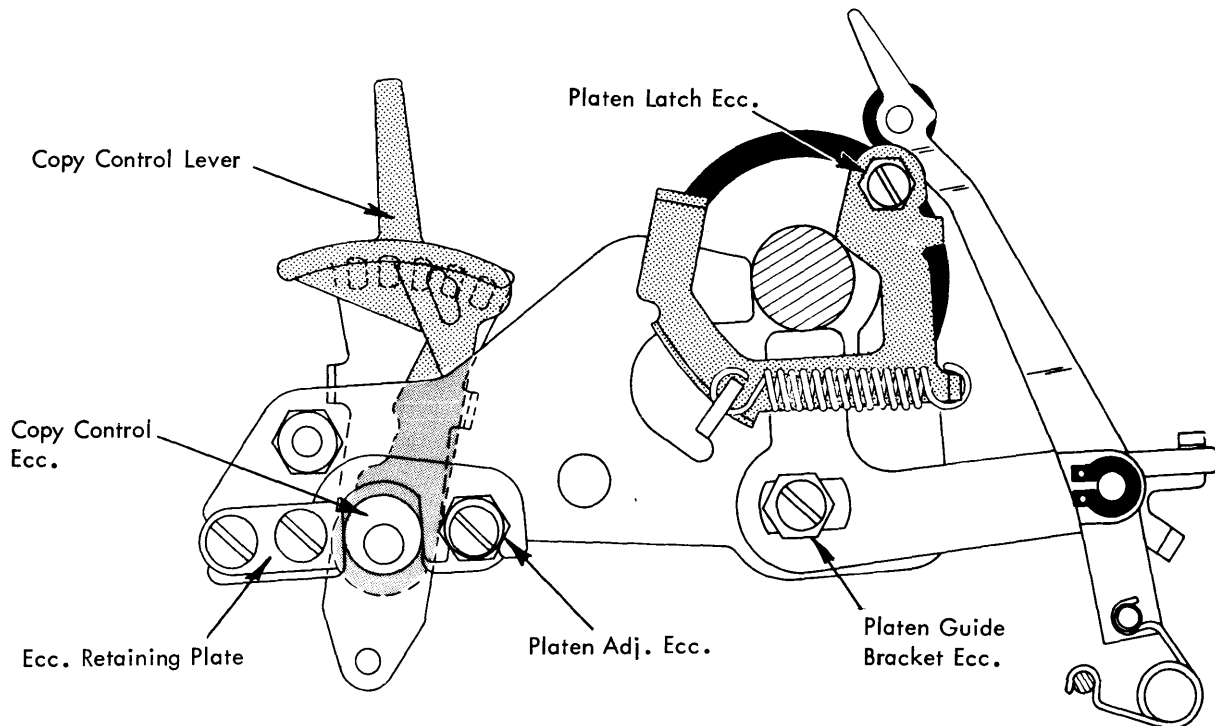


FIGURE 70. Copy Control Mechanism

- a. Platen Height - With the head of the Hooverometer set at the #4 scribe line, the platen should just touch the base of the handle when the head is resting on the escapement rack (Fig. 71).

Adjust the platen guide bracket eccentrics to obtain this condition (Fig. 70). The high part of the eccentrics should be kept to the rear. It is necessary to remove the deflector and front feed rolls when checking the adjustment with the Hooverometer.

NOTE: The Hooverometer should be inserted at a position just to the left of the escapement cord drum when checking the right side and directly in line with the rotate-two latch when checking the left side. The handle of the Hooverometer must be as nearly vertical as possible during the checks. The base of the handle does not reach the center line of the platen when the handle is vertical, but the difference in height has been compensated for in the location of the scribe line.

- b. Platen Front to Rear - With the head of the Hooverometer set at the #2 scribe line, the tool should just span the distance between the platen and the print shaft as illustrated in Fig. 72. Adjust the platen adjusting eccentrics to obtain this condition (Fig. 70).

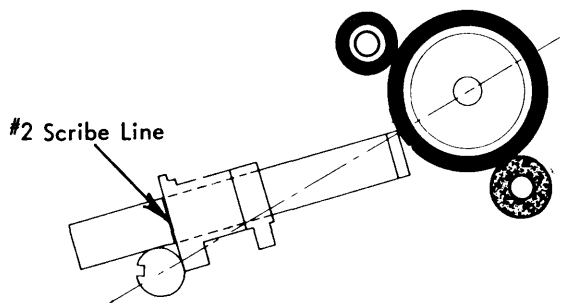


FIGURE 72. Front to Rear Platen Adjustment

Check at both ends of the platen. In order to adjust the platen adjusting eccentrics it is also necessary to loosen the front screws in the eccentric retaining plates. (Be sure that the Hooverometer does not rest on the print shaft keyway.)

NOTE: After the correct vertical and horizontal positions of the platen are obtained with the Hooverometer, the vertical position may be refined to provide even printing between the tops and bottoms of the characters. Check at both ends of the writing line.

CAUTION: Any change in the front to rear position of the platen necessitates a readjustment of the velocity control plate and anvil. Also, any change in the platen position may alter the paper feed adjustments. All paper feed adjustments should be checked and readjusted if necessary.

5. Carrier Shoe Adjustment

- a. Carrier Shoe (Old Style) - Adjust the upper carrier shoe eccentric mounting stud to provide .001" to .004" vertical motion of the carrier at the rear (Fig. 73). Check at several points along the writing line.

This amount of play insures free lateral movement of the carrier yet restricts the vertical movement to help prevent variation in the vertical alignment of the type.

NOTE: The eccentric is accessible with the 3" screwdriver through the opening in the escapement bracket just above the tab torque bar. The side of the screwdriver blade should be used if possible.

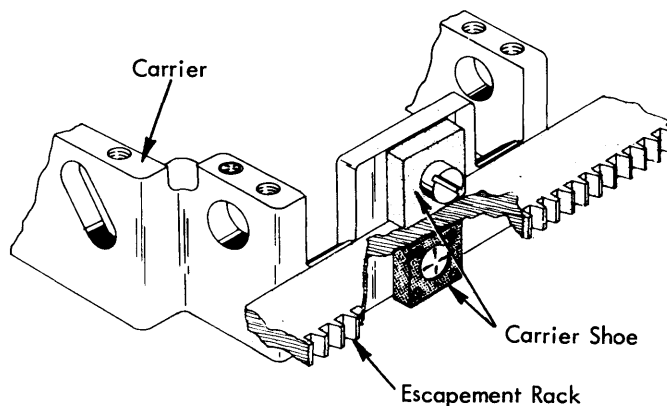


FIGURE 73. Carrier Shoe - Old Style

- b. Carrier Shoe (New Style) - Adjust the upper carrier shoe eccentric mounting stud to provide .002" to .006" vertical motion of the carrier at the rear (Fig. 74) when the spring load on the upper shoe is suppressed.

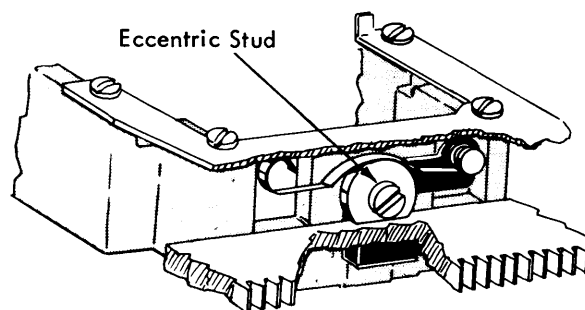


FIGURE 74. Carrier Shoe - New Style

NOTE: The vertical motion may be felt by firmly moving the carrier up and down at the rear, so as to overcome the effects of the spring load on the upper shoe.

6. Velocity Control Plate - The velocity control plate must be adjusted to satisfy the following two conditions.
- With the cam follower held lightly against the low point of the print cam, the center of the home character should clear the platen by .260" to .270".
 - With the cam follower held lightly against the high point of the print cam, the home character should clear the platen by .020" to .030".

The copy control lever should be forward for both adjustments. These adjustments should be made with the carrier positioned in the center of the writing line. On long carriage machines the adjustments should be made with the carrier at the extreme left hand position.

The print cam has a fixed amount of rise from its low point to its high point. For this reason, the print cam follower always receives the same amount of powered travel or motion from the print cam. However, the amount of powered travel that the rocker and typehead receive, from the print cam follower, is directly dependent upon the position of the velocity control plate pin in the forked slot of the follower (Fig. 75). Moving the pin to the front of the slot decreases the powered travel of the typehead as shown by dimension A (Fig. 75). Moving it to the rear increases the powered travel, as shown by dimension B.

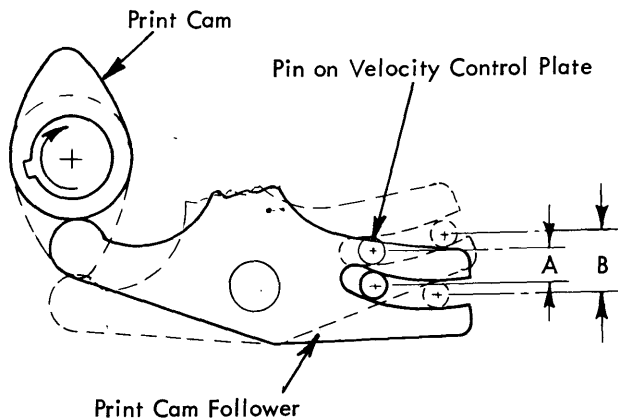


FIGURE 75. *Velocity Control Plate Adjustment*

Because of the constant operational speed of the print cam and follower, the typehead velocity must increase or decrease proportional to the increase or decrease in powered travel. An accompanying change in typehead velocity occurs when the powered travel is changed because the typehead must always travel from its rest position to its active position in the same amount of time regardless of what this distance may be.

The proper impact velocity of the typehead can be achieved by controlling the amount of powered travel of the typehead while maintaining at the same time the correct amount of free flight. Since the position of the platen has been previously fixed and the amount of free flight is determined by the point at which the limit of powered travel occurs relative to the platen, only the rest position (beginning of powered travel) may change when the amount of powered travel is changed. There-

fore, in order to maintain a fixed amount of free flight to the typehead when the amount of powered travel is changed, the velocity control plate pin must also be adjusted up or down relative to the rocker.

The eccentric shouldered nut (Fig. 76) on the velocity control plate provides a means of controlling the vertical position of the velocity control plate pin relative to the rocker thereby controlling the free flight of the typehead. The elongated hole in the velocity control plate (behind the binding screw) allows the velocity control plate pin to be adjusted front or rear in the forked slot of the follower thereby controlling the amount of powered travel that the typehead will receive. Each adjustment affects the other and must be adjusted alternately until both are correct.

The adjustments can be made easily if the following procedure is used.

- Raise the anvil adjusting eccentrics and the restoring cam follower eccentric to prevent any interference, and remove the ribbon feed plate for accessibility.
- If the velocity control plate is loose or completely out of adjustment, set the high part of the eccentric forward and tighten it in place. Adjust the plate so that about 1/32" of the adjusting slot is visible above the binding screw and tighten the screw friction tight. These settings provide a good starting point.
- Hand cycle the machine using the letter "Z" until the print cam follower is on the high point of the cam. Do not hold the typehead toward the platen. With the mechanism in this position, adjust the

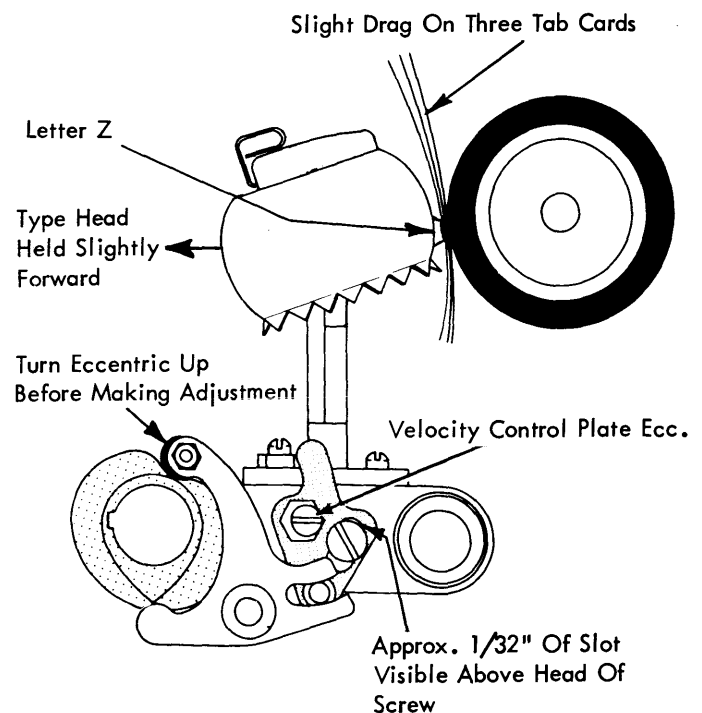


FIGURE 76. *Velocity Control Plate Eccentric Adjustment*

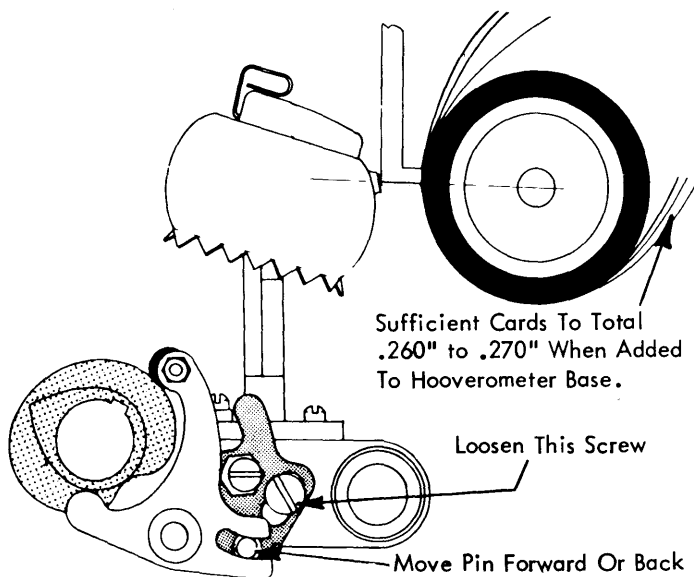
velocity control plate eccentric until a slight drag is felt on three tab cards inserted between the typehead and the platen (Fig. 76). A heavy drag should be felt on four cards. No drag should be felt on two cards. You should not be able to insert five cards.

This will place the limit of powered travel of the typehead .020" to .030" away from the platen (providing the typehead with the proper amount of free flight).

- d. Hand-cycle the machine until the print cam follower is at the low point of the cam. This may not be at the rest position. The low point of the cam can be determined by observing the movement of the head toward the front of the machine. With the typehead at its most forward point, adjust the velocity control plate pin forward or back in the cam follower slot until a clearance of .260" to .270" exists between the center of the letter "Z" and the platen (Fig. 77).

Since this .260" to .270" is measured between the typehead and the platen it is not a measurement of the powered travel of the typehead. The .020" to .030" free flight is included in this .260" to .270" and must be subtracted in order to determine the amount of powered travel. The powered travel must never exceed .265" as this will cause typehead breakage.

The base of the Hooverometer handle can be used as a measuring device as illustrated in Fig. 77. The handle base is about .250" thick; however they do not all measure the same. Each handle should be measured with a dial indicator or micrometer to determine its exact size. When the size of the handle base is determined, a thickness of tab cards should be placed around the platen that will total .260" to .270" when added to the thickness of the handle base.



- e. Both adjustments must be rechecked and refined until these conditions are obtained. Be sure to tighten both screws firmly when the adjustments are completed.

NOTE: The adjustments should be checked with the ribbon removed.

These adjustments are designed to produce optimum print quality for most applications; however, a certain amount of variation in velocity is permissible in order to satisfy a customer's application. Be cautious of creating an excessive increase or reduction in velocity as this will adversely affect the uniformity of impression between characters and the general appearance of the printed copy.

7. Anvil - The eccentric at each end of the anvil is adjusted so that the anvil properly restricts the free flight of the typehead. The adjustment can be checked by typing a period with the copy control lever set all the way back. The period should fail to print or print very faintly. With the copy control lever pulled forward one notch (fourth position), the period should print lightly. The ribbon and one sheet of paper should be used when making the check. The check should be made at each end of the platen only, because flexing of the parts will allow a slightly different condition in the middle of the platen. The high part of each eccentric should be kept to the rear.

NOTE: The restoring cam follower eccentric should be adjusted all the way up while the anvil is being set. On 723's and 725's the carrier buffers must also be moved up out of the way of the anvil (Fig. 78).

The free flight must be restricted to insure that the characters will all emboss the paper to the same depth. If no restriction were applied, the smaller characters such as punctuation marks would be allowed to emboss too deeply. The surface area somewhat restricts the amount of embossing for the larger characters; thus if the free flight of the rocker is stopped at the right point, even impression between all characters will result.

CAUTION: Raising or lowering either end of the anvil will slightly affect the adjustment at the other end. Be sure to recheck each adjustment. A clearance of .010" to .045" must be maintained between the left anvil bracket and the sideframe for noise reduction purposes. Adjust the bracket left or right on the anvil to obtain the clearance (721 only)

8. Carrier Buffers (723 and 725 only) - A buffer plate attached to the right side of the carrier and an adjusting screw under the left side strike the top of the anvil to prevent the print shaft from flexing downward. Each should have .002" to .004" clearance with the top of the anvil (Fig. 78).

FIGURE 77. Velocity Control Plate Adjustment

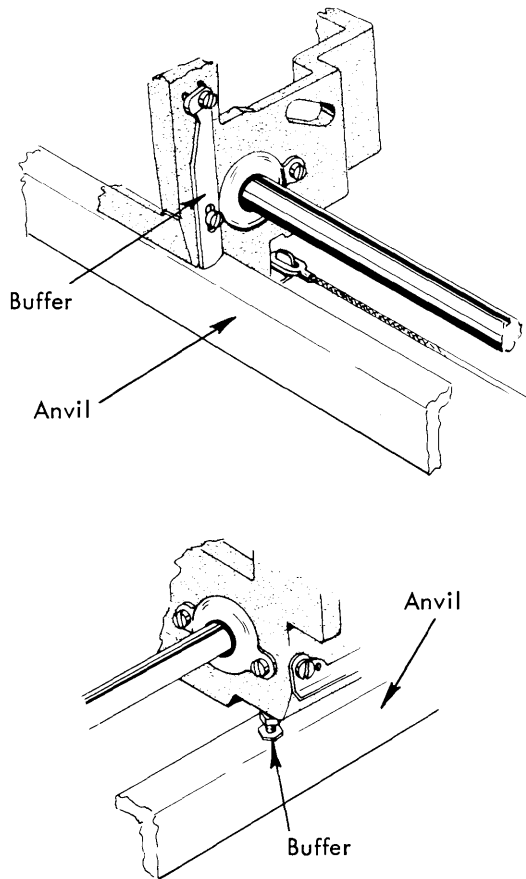


FIGURE 78. Carrier Buffers (723 & 725)

9. Print Cam Follower

- a. Print Cam Follower Stud - Adjust the pivot stud left or right so that the rubber roller on the follower is centered on the surface of the restoring cam. The stud is held in place in the carrier by a set screw that is accessible from the bottom of the machine.
- b. Restoring Cam Follower Eccentric - With the print cam follower at the high point of the cam and the platen removed, hold the typehead toward the rear until it is restricted by the anvil and striker. The rubber roller should just touch the restoring cam (Fig. 79). Adjust the eccentric, keeping the high point forward, to satisfy the condition.

NOTE: If the roller is too close to the restoring cam, it may bind against the cam during print shaft rotation. If too much clearance exists, the typehead may not be restored as quickly as it should and blurred characters may result.

10. Even Printing - Position the yoke under its mounting screws so that the density of the left and right sides of a printed character will be uniform.

CAUTION: This adjustment affects the tilt ring homing adjustment, the typehead homing adjustment, and the detent cam and actuating lever adjustments (skirt clearance). Be sure to check these after changing the position of the yoke.

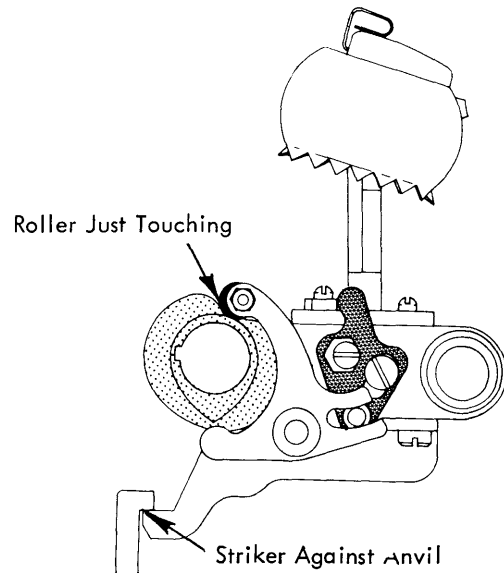


FIGURE 79. Restoring Cam Follower Eccentric Adjustment

PRINT MECHANISM - NEW STYLE

1. Adjustments one through five remain exactly the same as they appear on the old style print mechanism. After completing these five adjustments, begin here with adjustment number six.
6. Carrier Support (long carriage machines) - Adjust both ends of the support vertically to maintain .001" to .004" clearance with the bottom of the ribbon feed bracket along the entire length of the writing line (Fig. 80).

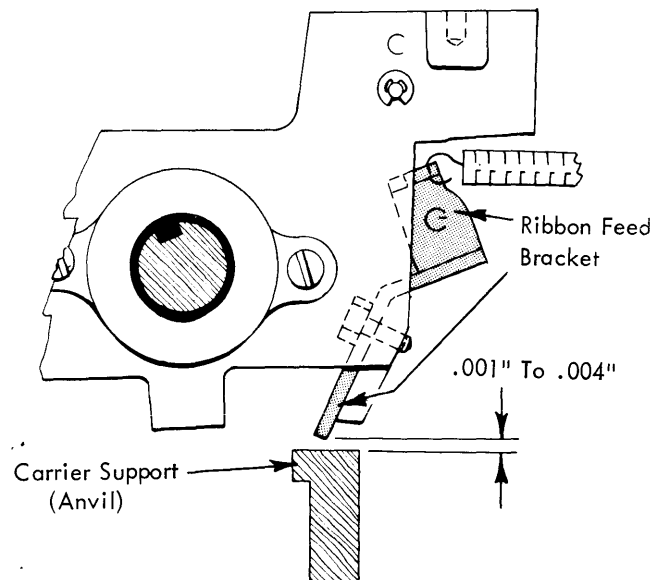


FIGURE 80. Carrier Support (Long Carriage Machines)

The support is secured to the machine power frame by two binding screws at each end. Elongated holes in the machine power frame enables the support to be adjusted vertically. This adjustment serves the same purpose as the carrier buffers on the early level machines.

7. Print Cam Follower Stop Screw - Adjust the cam follower stop screw so that the print cam follower roller clears the print cam by .020" when the machine is at rest (Fig. 81). This clearance allows the roller to shift from one lobe to the other without rubbing on the cam. Use the following procedure to obtain this adjustment:

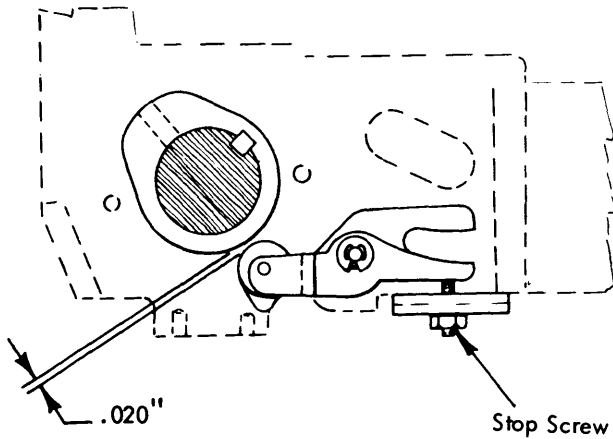


FIGURE 81. *Print Cam Follower Stop Screw*

- a. With the machine resting on its back, slowly hand cycle a high velocity character until the leading edge of the print shaft keyway lines up with the center of the roller pin on the cam follower (Fig. 82).

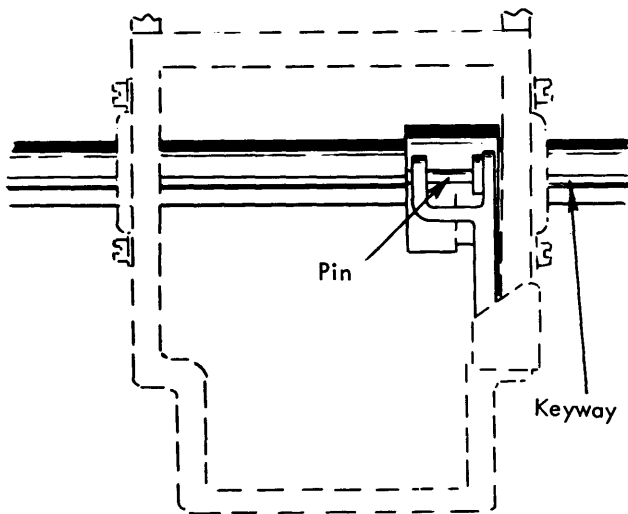


FIGURE 82. *Keyway In Line With Roller*

- b. Loosen the stop screw locking nut and back out the stop screw approximately two turns. (The roller should be resting against the cam at this point.)
- c. With the machine resting on its back, place a .001" or .002" feeler gauge between the print cam and the follower roller (Fig. 83). This can be accomplished by manually holding the rocker toward the platen while inserting the feeler gauge from the front of the carrier (to the right of the carrier pointer) just above the line lock bracket. With the gauge

in position, allow the rocker to come back to rest. The feeler gauge should become trapped between the roller and the cam. Then, slowly turn the stop screw in until a minimum drag is felt on the feeler gauge as it is withdrawn.

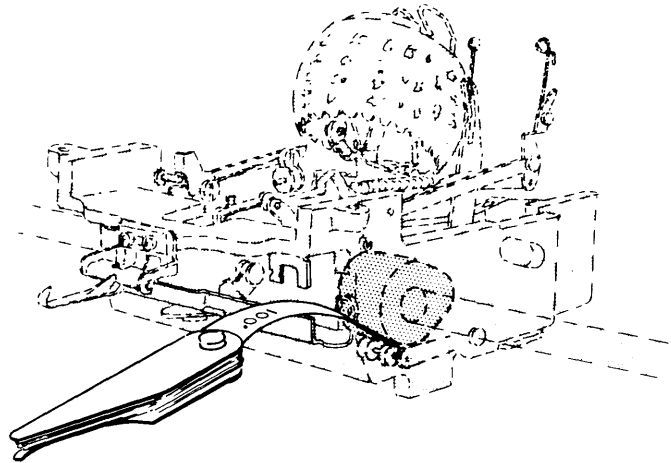


FIGURE 83. *Feeler Gauge Trapped*

- d. Tighten the locking nut without moving the screw.

NOTE: This adjustment may be checked by applying a light film of #17 grease on the print cam (in the area indicated in Fig. 84) and then observing the track that the roller makes in the grease when the machine is hand-cycled. If the stop screw has been adjusted properly, the roller track in the grease should begin at point "A" (Fig. 84) which is the beginning of the second low dwell on the print cam.

If the roller track begins before point "A", the roller is adjusted too close to the print cam when the machine is at rest. Improper roller to cam clearance may cause the roller to drag on the print cam as it shifts during a low velocity selection. Thus, the roller may fail to shift, or shift improperly. If the roller is adjusted too close to the cam at rest, it may receive a ski-jump effect from the print cam as it attempts to follow the print cam from the first low dwell to the second low dwell. This will create excessive noise and wear along with an adverse effect on the typehead impact velocity.

If the roller track begins after point "A", the roller rests too far away from the first low dwell of the print cam and a loss in typehead velocity may result.

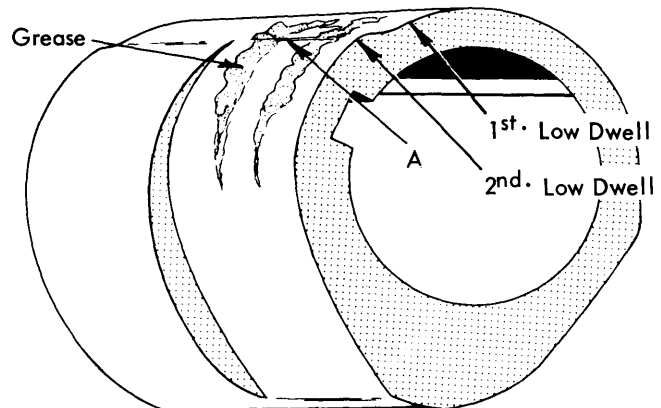


FIGURE 84. *Roller Track In Grease*

8. Velocity Control Cable Adjustments - The velocity control cable is adjusted to satisfy the following conditions:

- a. **Carrier Cable Clamp** - Loosen the clamp screw and slide the cable sheath left or right under the clamp until the end of the sheath is flush to .010" recessed with the right hand edge of the clamp (Fig. 85). This adjustment prevents the yoke actuating lever from choking off against the cable sheath.

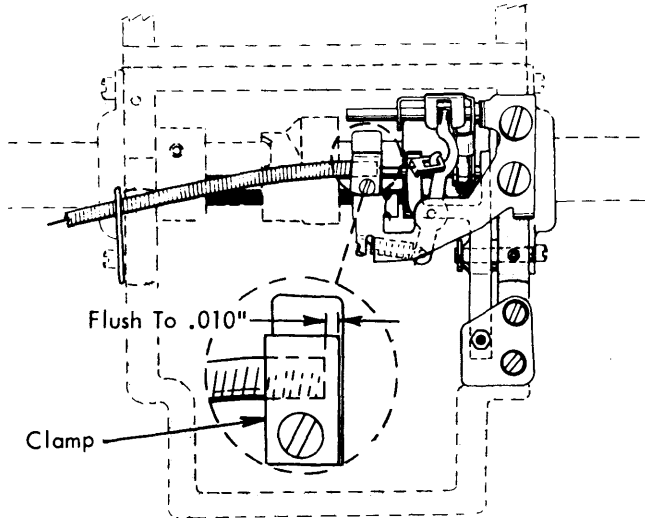


FIGURE 85. Carrier Cable Clamp

- b. **Carrier Cable Guide** - Position the cable guide horizontal and as high as possible without binding the cable against the carrier (Fig. 86). This adjustment holds the cable up as high as possible yet allows it to slide freely front and rear as the carrier moves along the writing line.

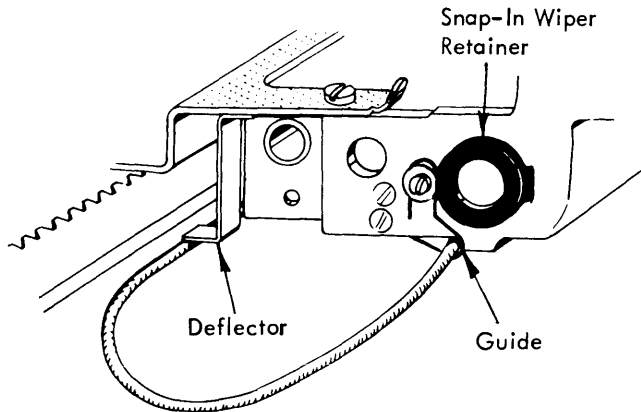


FIGURE 86. Carrier Cable Guide

- d. **Center Cable Clamp** - Position the cable sheath left or right within the center cable clamp so that the bend in the cable will just touch the machine sideframe (left) when the carrier is resting two spaces from the extreme left hand margin. This adjustment allows the carrier to operate freely along the entire length of the writing line and allows the velocity control cable to operate with a minimum of flexing.

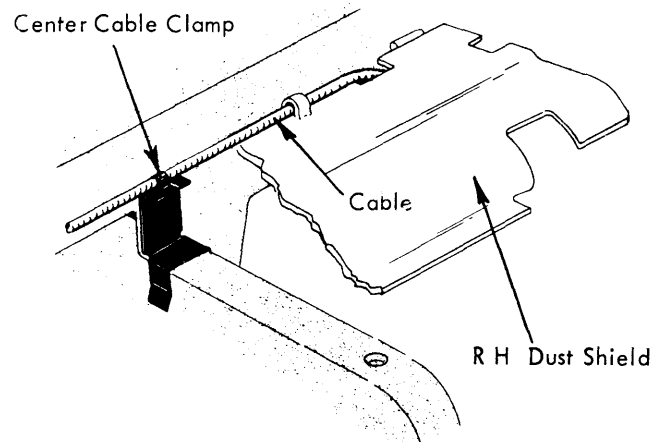


FIGURE 86A. Dust Cover And Clamp

- e. **Keyboard Cable Clamp** - Loosen the clamp screw (Fig. 87) and move the cable sheath forward or back under the clamp to satisfy the following condition:

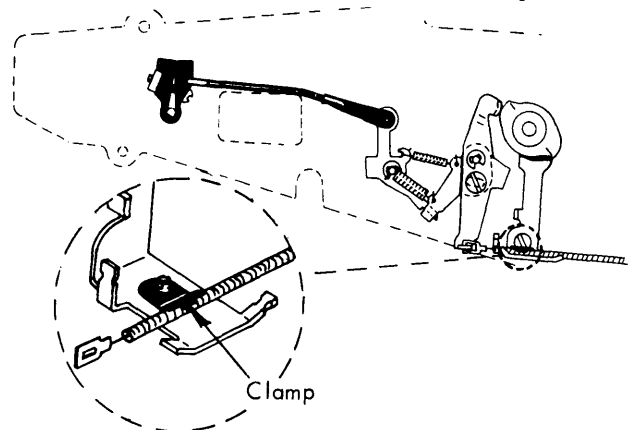


FIGURE 87. Keyboard Cable Clamp

When a low velocity character is half-cycled, the print cam follower roller must shift onto the low velocity lobe of the print cam by the width of the roller plus .030" to .040" (Fig. 88). Moving the cable sheath to the rear will produce more motion to the roller by reducing the amount of lost motion felt within the oversized eyelets of the cable.

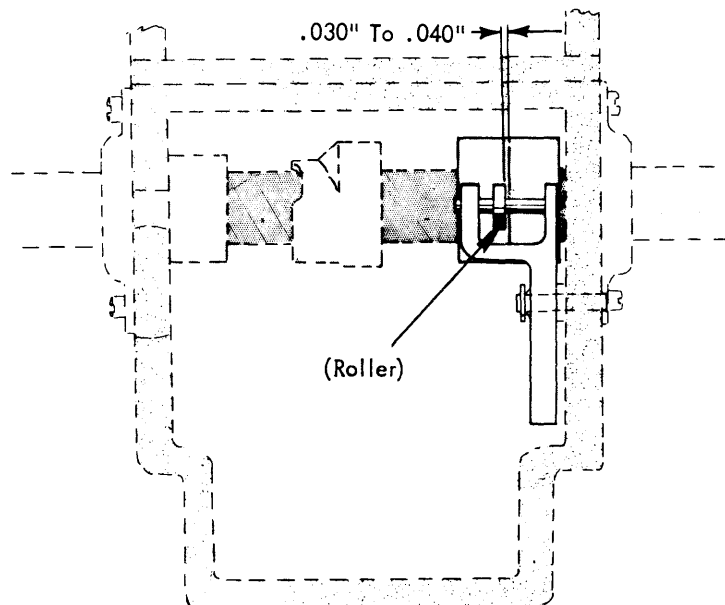


FIGURE 88. Roller Shifted To Low Velocity Lobe

NOTE: This adjustment may be checked by alternately cycling a low and high velocity character after applying a light film of #17 grease to both lobes of the print cam. Observe the tracking of the roller in the grease to determine if the roller is shifting properly. Make certain that the roller re-stores fully under the high velocity lobe when the machine is at rest.

9. Low Velocity Latch Link - Adjust the low velocity latch link (Fig. 89) in the following manner: With the machine latched at rest and the low velocity latch held against the adjusting stop on the cam follower, match the pin clevis on the link with the hole in the latch. When matching the clevis, be sure to hold the link toward the rear of the machine so that the low velocity vane will be against the tail of the interposers.

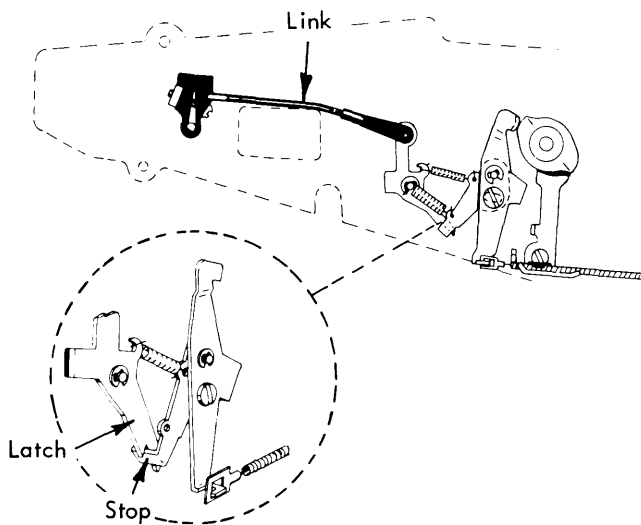


FIGURE 89. Low Velocity Latch Link

NOTE: The link adjustment insures that the latch will take a full bite on the adjusting stop and that there will be no lost motion in the system.

10. Low Velocity Cam Adjustment - The cam should be adjusted radially on the filter shaft so that the following condition will exist: When a low velocity character is slowly hand-cycled, the low velocity latch should clear the adjusting stop on the cam follower by .008" to .012" (Fig. 90) just as the cam follower begins to move down off the high dwell of the low velocity cam. Advance or retard the cam to satisfy this condition.

This adjustment can be easily made in the following manner:

- a. Slowly hand-cycle a low velocity character until one of the scribe marks on the cam is in line with the center of the shoe on the cam follower (Fig. 90).
- b. Without moving the cam, loosen its set screws and then slightly advance or retard the filter shaft (within the cam) until the .008" to .012" between the latch and the stop is obtained. Advancing the filter shaft will increase the clearance; retarding will decrease it.

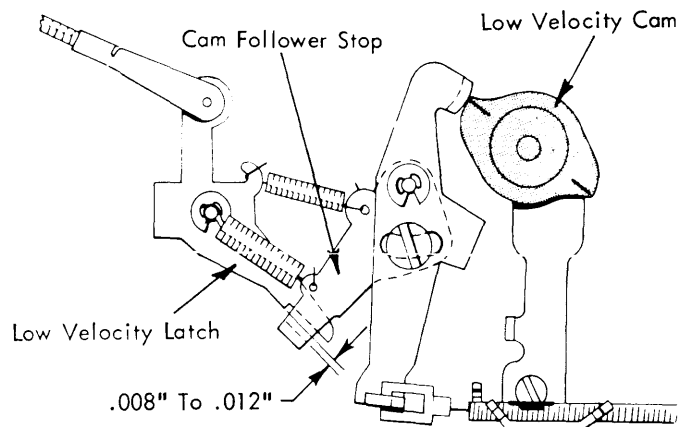


FIGURE 90. Low Velocity Cam Adjustment

- c. Tighten the low velocity cam set screws. Make sure that the cam does not move in relation to the follower. Also make certain that the cam is positioned laterally on the filter shaft so that it is centered between the cable anchor bracket and the shift release arm.

NOTE: This adjustment insures that the print cam follower roller will shift to the low velocity lobe at the earliest possible time during a low velocity print cycle.

CAUTION: "Safety" - be sure to disconnect the line cord before attempting to rotate the filter shaft by hand.

11. Low Velocity Cam Follower Stop - With the cycle shaft latched at rest, adjust the stop for .008" to .012" clearance with the low velocity latch (Fig. 91). Loosen the binding screw "A" to make this adjustment.

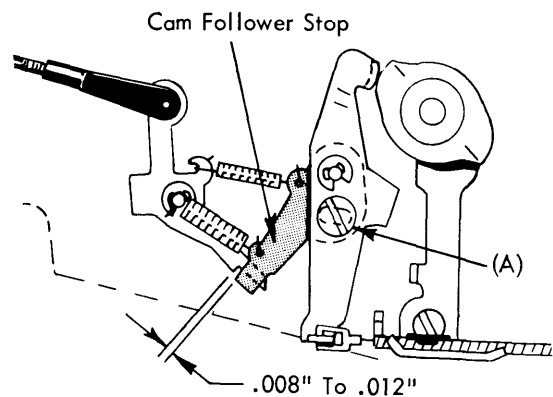


FIGURE 91. Cam Follower Adjusting Stop

NOTE: Too little clearance may prevent latching of the low velocity latch resulting in a continuous low velocity operation for all characters. Too much clearance might allow a slight pull to be produced on the cable during a high velocity operation which could shift the follower roller partially onto the low velocity lobe.

12. Powered Travel - With the cycle shaft latched at rest and the impression control lever set at position 4, loosen the binding screw and move the detent plate forward or back until a clearance of .250" exists between the platen and the center of the letter "Z" (Fig. 92). This clearance can easily be measured with the Hooverometer which is approximately .250". When measuring the adjustment, remove the tilt ring play by depressing lightly on the rear of the tilt ring.

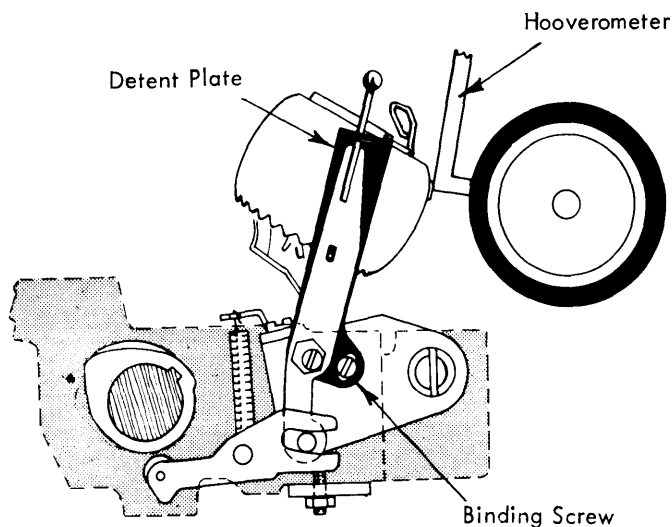


FIGURE 92. Powered Travel

CAUTION: The copy control lever must be positioned all the way forward when making adjustments #12 and #13.

13. Free Flight - Set the impression control lever at 4 and then hand-cycle the machine until the print cam follower roller is resting on the high point of the print cam. At this point .035" of free flight should exist between the platen and the center of the letter "Z". Adjust the eccentric on the impression control lever to obtain this condition (Fig. 93). Keep the high part of the eccentric forward.

NOTE: The pusher end of the large spring hook measures approximately .033" and may be used to gauge this clearance. When measuring this clearance, remove the tilt ring play by depressing lightly on the rear of the tilt ring.

CAUTION: Each of these adjustments (powered travel and free flight) directly affect each other and must be adjusted alternately until both are correct.

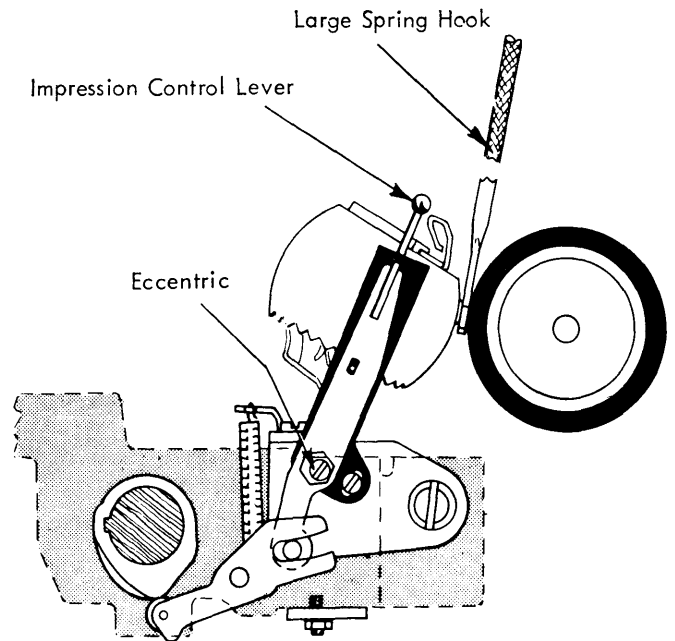


FIGURE 93. Free Flight

ESCAPEMENT MECHANISM

1. Escapement Bracket - Adjust the escapement bracket front to rear so that .011" to .017" clearance exists between the escapement bracket and the tab torque bar (Fig. 94). Keep the rear surface of the bracket parallel to the torque bar. The clearance should be observed between the flat part of the bracket and the torque bar. Disregard the raised area that acts as a back-up for the torque bar on later level machines.

NOTE: The following relationships are affected by the position of the escapement bracket - tab lever trigger to tab torque bar, tab lever pawl to tab rack, tab lever to escapement and backspace pawls, tab lever trigger to tab overthrow stop, escapement and backspace pawls to escapement torque bar, escapement torque bar to pawl pivot stud, and escapement torque bar to tab latch. Each of these relationships must be checked and re-adjusted if necessary after any adjustment of the escapement bracket.

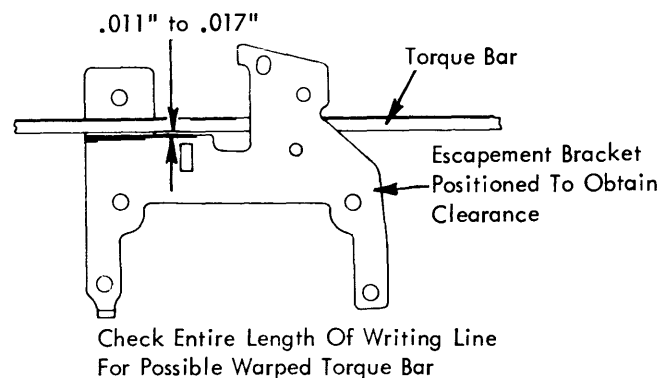


FIGURE 94. Escapement Bracket

2. Escapement Torque Bar Stop

- a. New Style - The torque bar stop located at the right end of the torque bar should be adjusted for a rest position clearance of .008" to .010" between the torque bar and the lug on the escapement pawl (Fig. 95).

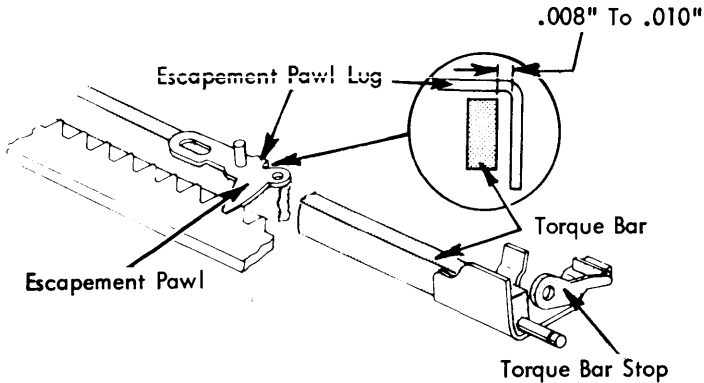


FIGURE 95. *Torque Bar Stop (New Style)*

- b. Old Style - Form the torque bar stop located at the left end of the torque bar so that a clearance of .002" to .006" exists between the torque bar and the lug on the escapement pawl (Fig. 96).

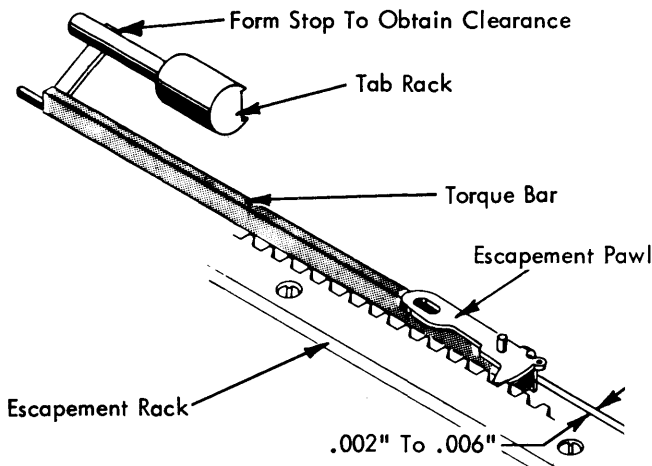


FIGURE 96. *Torque Bar Stop (Old Style)*

The escapement cam used with the new style escapement mechanism provides greater available travel for all escapement parts; therefore more clearance is permissible and desirable between the torque bar and the escapement pawl lug.

CAUTION: Make certain that the escapement trigger does not prevent the escapement torque bar from resting against the stop when making the torque bar stop adjustment. Also, check the pawl mounting stud and, on long carriage machines, the torque bar back stop. Neither one of these should be touching the torque bar when the stop adjustment is being made.

3. Pawl Mounting Stud - Rotate the pawl mounting stud so that it clears the escapement torque bar by .001" at the closest point along the writing line (Fig. 97). Keep the high part of the eccentric toward the left so that the force of the torque bar will tend to tighten the stud instead of loosen it.

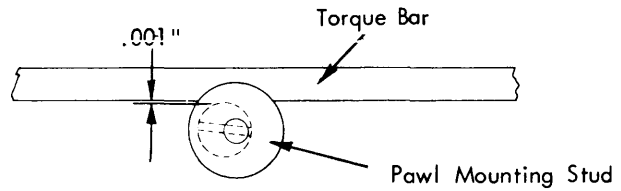


FIGURE 97. *Pawl Mounting Stud Adjustment*

4. Torque Bar Back Stop (long carriages only) - Adjust the back stop forward or back on its mounting stud so that there is a .001" to .005" clearance with the torque bar (Fig. 98).

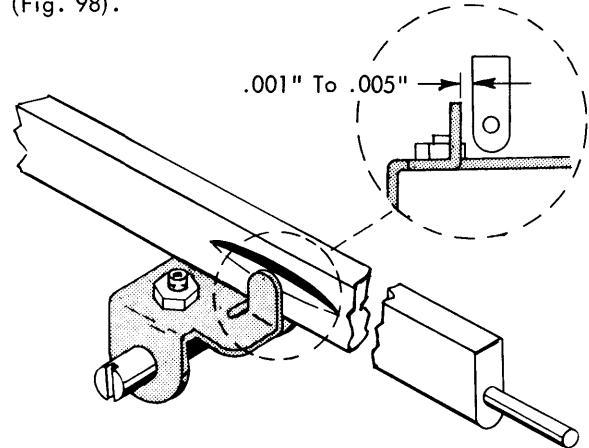


FIGURE 98. *Torque Bar Backstop*

5. Pivot Pin Eccentric (found on early level machines only) The eccentric collar should be adjusted with the high point up so that it just touches the operational latch bracket (Fig. 99). This prevents the pivot pin from bowing during a print escapement operation. On long carriage machines the eccentric should also be adjusted laterally on the pivot pin so that the end play of the pivot pin will be .002" to .005".

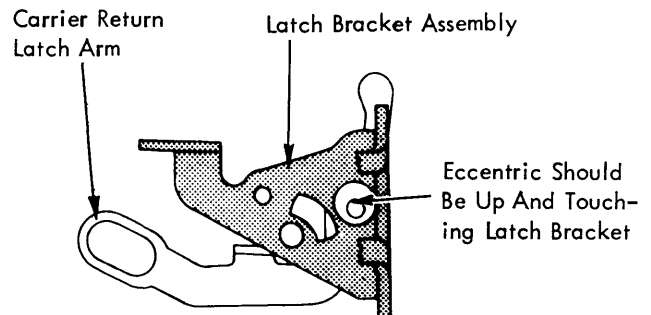


FIGURE 99. *Pivot Pin Eccentric (Early Level Machines Only)*

NOTE: The eccentric may require a readjustment if the rest position of the pivot pin is changed during carrier return adjustments.

6. Escapement Cam - Adjust the cam by rotating it on the filter shaft so that the cam follower roller just reaches the low point of the cam at the rest position (Fig. 100).

The cam is accessible from the top by inserting the Bristol wrench between the carrier return and backspace key-levers just in front of the margin rack.

Check the adjustment by holding the cycle clutch check pawl out of the way so that the cycle shaft can be rotated backward. Rotate the filter shaft gear backward slightly and observe that the escapement trip link moves forward immediately. This will insure that the escapement cam is not resting past the low point. To insure that the cam follower has fully reached the low point, hand-cycle a print operation. The escapement trip link should not move during the first part of the cycle.

The cam adjustment affects the timing of the print escapement. Advanced timing could cause the trip to occur before the print action, resulting in crowding or blurring of the printed characters. Retarded timing will cause the cam follower to rest part of the way up the incline of the cam. This could restrict the escapement trigger from resetting over the torque bar lug as the filter shaft returns to its rest position. The spacebar mechanism would then be disabled.

On machines equipped with the old style spacebar lock-out mechanism, the lockout cam adjustment must be checked each time the escapement cam adjustment is changed. Advancing or retarding the escapement cam could allow the lockout cam to disable the spacebar mechanism.

CAUTION: On machines equipped with the old style spacebar lockout mechanism, a lateral position of the escapement cam on the filter shaft must be maintained. When the machine is at rest the lateral position of the escapement cam should allow .050" to .060" left to right movement of the spacebar lockout cam.

7. Escapement Trip Link - Adjust the trip link so that a clearance of .007" to .010" exists between the torque bar lug and the hook of the escapement trigger in the rest position (Fig. 100).

The adjustment insures that the torque bar will always be rotated far enough to trip the pawls from their racks.

If excessive clearance is present, the escapement may eventually fail as wear occurs in the system and reduces the amount of travel given to the trigger.

Insufficient clearance may prevent the trigger from re-setting over the torque bar lug at the end of each cycle. It may also cause the escapement trip to occur too early in the cycle. The trip should not occur before the print action.

CAUTION: In adjusting the escapement trip link be sure that the trigger lever stop (if present) and the adjustable screw in the spacebar latch lever do not restrict the upward travel of the trigger lever.

8. Escapement Trigger Action - Adjust the trigger guide (early style machines) or the trigger knock-off eccentric stud (new style machines) so that the escapement trigger will become disengaged from the torque bar lug when the escapement pawl clears the rack by .010" to .015" (Fig. 101).

9. Trigger Lever Upstop (long carriage machines) - With the machine at rest and a clearance of .007" to .010" existing between the trigger and the lug on the torque bar, adjust the trigger lever upstop so that it has a clearance of .001" to .005" with the trigger lever (Fig. 102).

The trigger upstop prevents the trigger lever from bouncing as it returns to its rest position.

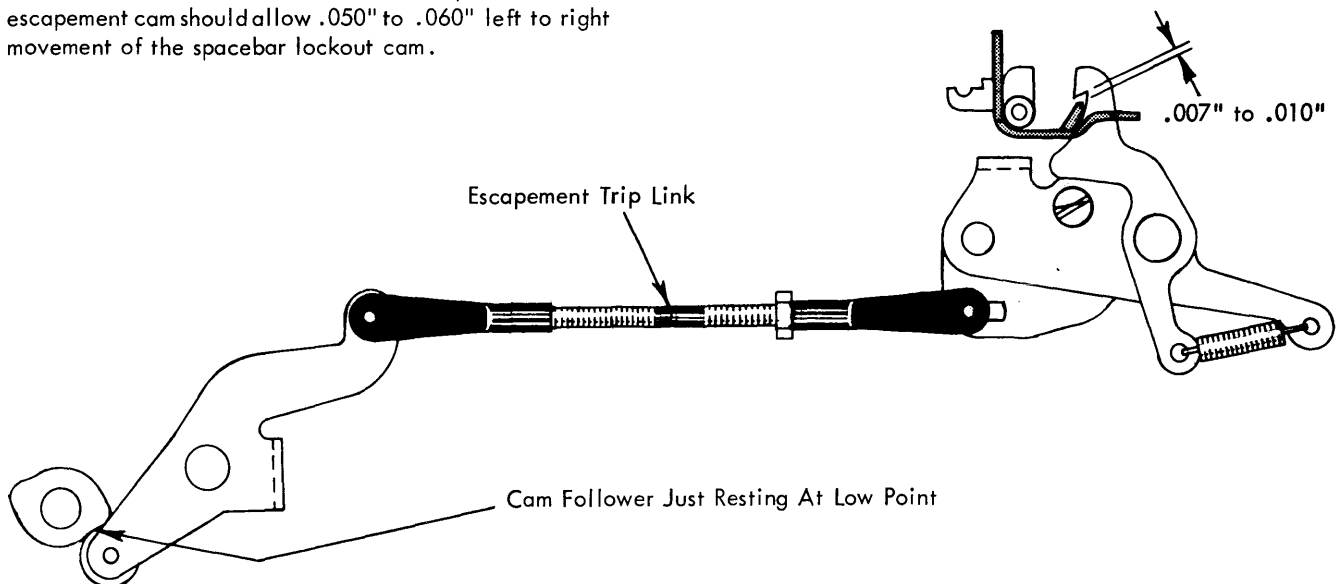
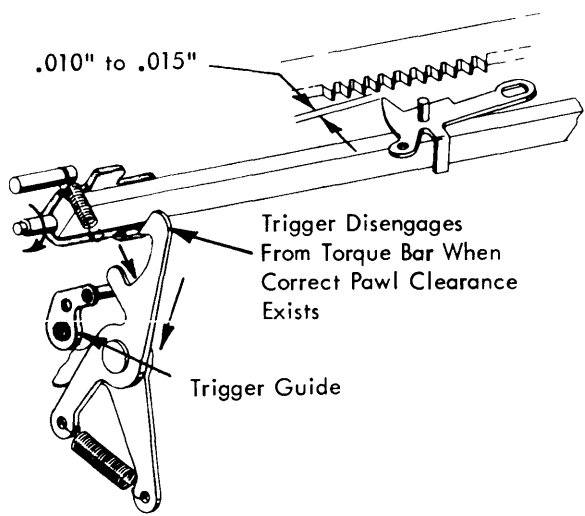
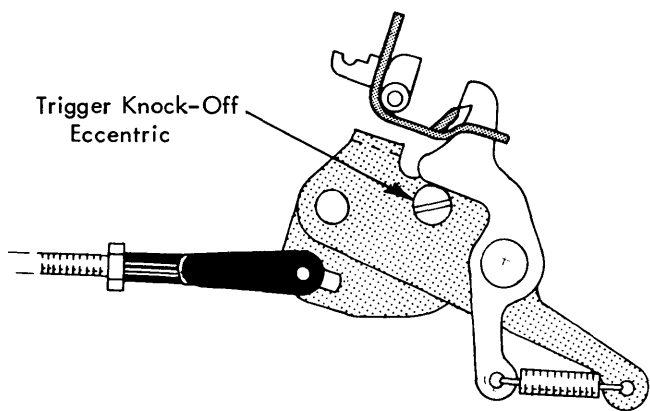


FIGURE 100. Escapement Cam And Link Adjustment



OLD STYLE



NEW STYLE

FIGURE 101. Escapement Trigger Guide Adjustment

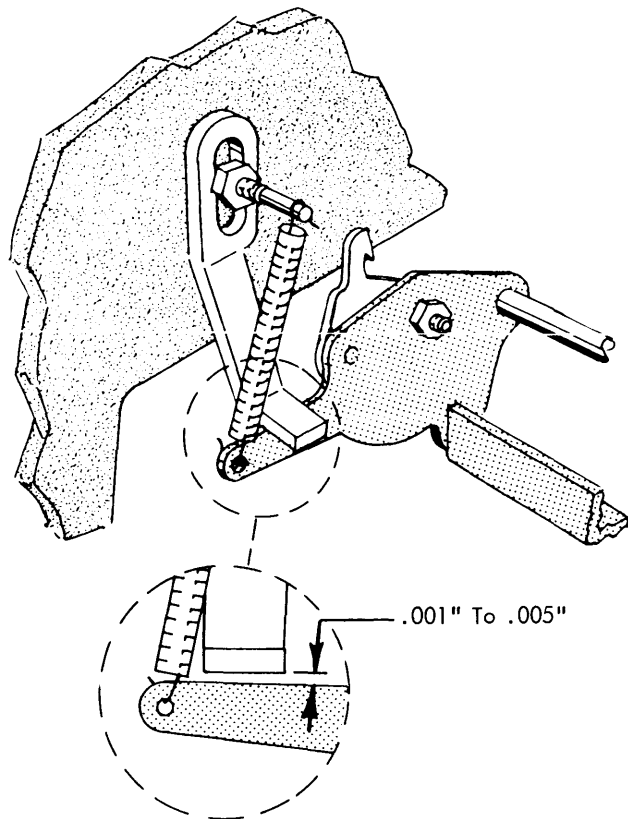


FIGURE 102. Trigger Lever Upstop (Long Carriage Only)

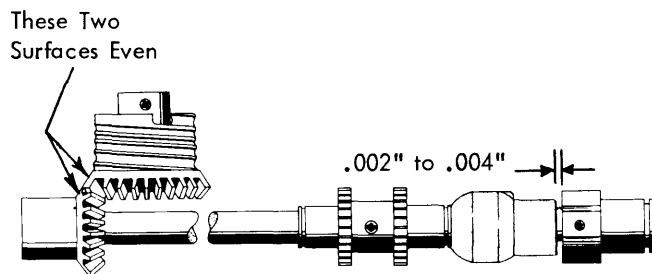


FIGURE 103. Gear Mesh And Operational Shaft Adjustment

MAINSRING AND CORDS

1. Gear Mesh - The proper gear mesh between the escapement cord drum and the carrier return pinion involves two adjustments. Both must be considered together.
 - a. Adjust the operational shaft laterally so that the crown surfaces of the escapement cord drum gear and the carrier return pinion are even (Fig. 103). On the 721, the position of the operational shaft is controlled by the operational cam ratchet and the shift clutch arbor. On long carriage machines the position is controlled by a collar set screwed to the shaft and the shift clutch ratchet. Be sure to maintain .002" to .004" end play in the operational shaft.
 - b. The escapement cord drum gear should be adjusted forward or back to obtain .002" to .004" backlash at the point of tightest mesh with the carrier return pinion. Be sure that no binds exist throughout the travel of the carrier.

CAUTION: The mainspring tension should be RELAXED before the escapement cord drum gear is loosened. The cord tension should also be relaxed by removing the cord from the pulley on the cord tension arm. Be sure that no end play exists in the escapement shaft before attempting the gear mesh adjustment.

NOTE: No attempt should be made to adjust the cord tension with the escapement cord drum because the drum is set-screwed to a flat spot on the escapement shaft.

2. Tab Governor Pinion - Adjust the tab governor pinion to have .002" to .004" backlash at the point of closest mesh with the escapement cord drum gear. Adjust the pinion by moving both the tab governor hub and collar located on each side of the pinion. The pinion should have a minimum of end play yet still rotate freely.

3. Cord Tension - With the cords properly threaded, adjust the carrier return cord drum so that the inner flange of the cord tension pulley is $3/16''$ to $1/4''$ from the power-frame.

The position of the pulley insures that it will not contact the cover as it compensates for the cord stretch. Adjusting the pulley nearer the powerframe puts an unnecessary load on the cords.

CAUTION: Be sure to remove all end play from the escapement shaft before tightening the carrier return cord drum. End play is removed by holding the escapement shaft forward while the cord drum is moved to the rear against the rear bearing.

NOTE: The eccentric mounting stud for the front idler pulley should be set so that the pin is horizontal and above center on the eccentric. The pin will then be angled toward the left slightly.

4. Mainspring Tension - The mainspring tension should be $1/2$ to $3/4$ pounds measured at the carrier as it escapes through the line lock load at the extreme right hand margin. Adjust by turning the mainspring cage. The capacitor (if present) and the cage stop screw must be removed in order to make the adjustment.

NOTE: An approximate setting can be obtained by making 5 full turns on the mainspring with the carrier at the extreme right hand limit of its travel.

CAUTION: The mainspring should be handled carefully to prevent it from slipping when the tension is being increased or decreased.

OPERATIONAL CONTROL MECHANISM

1. Keylever Pawl Overlap - Adjust each keylever pawl guide stud so that all the keylever pawls, except the index keylever pawl, overlap their respective interposers by $.035''$ to $.045''$ with both parts at rest (Fig. 104). The index keylever pawl guide should be adjusted for $.040''$ to $.050''$ overlap. The overlap insures proper repeat/non-repeat action.

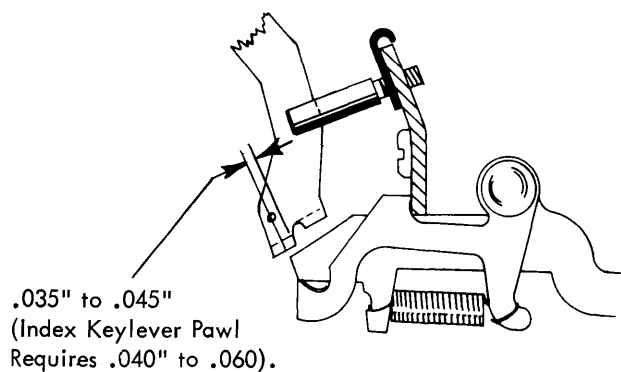


FIGURE 104. Keylever Pawl Overlap Adjustment

2. Keylever Pawl To Interposer Clearance

- a. Adjust the height of the interposers by positioning the keylever pawl guide bracket up or down to obtain a clearance of $.020''$ to $.025''$ between the index keylever pawl and the index interposer at rest (Fig. 105). The keylever pawl guide bracket should be kept horizontal.
- b. The adjusting slot in the carrier return keylever should be formed to obtain $.020''$ to $.030''$ clearance between the keylever pawl and the interposer at rest (Fig. 105).
- c. The adjusting slot in the backspace keylever should be formed to obtain $.030''$ to $.040''$ clearance between the keylever pawl and the interposer at rest (Fig. 105).
- d. Adjust the spacebar lever eccentric with the high part forward to obtain a keylever pawl to interposer clearance of $.005''$ to $.015''$ (Fig. 105).

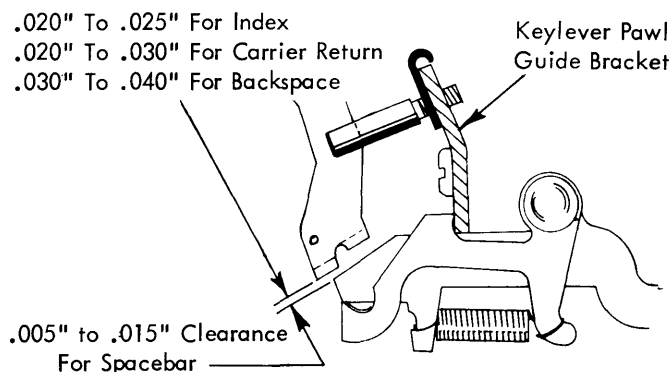


FIGURE 105. Keylever Pawl To Interposer Clearance Adjustment

These clearances insure proper timing of the interposer release during the depression of a keylever.

3. Operational Latch Height - Adjust the latch adjusting screws for the backspace and spacebar operational latches so that the latches will pass under the cam follower lever with a clearance of $.001''$ to $.015''$ (Fig. 106).

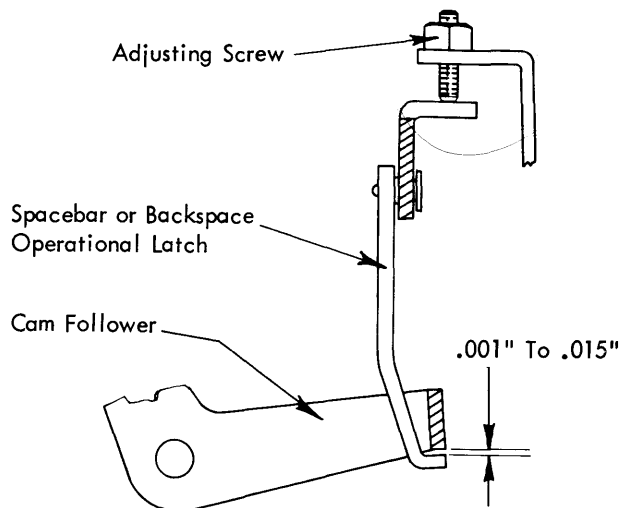


FIGURE 106. Latch Height

CAUTION: Be sure that the cam is latched at rest when the clearance adjustments are observed.

NOTE: The clearances may be observed by pulling the latches to the rear with a spring hook while the machine is at rest.

4. **Interposer Adjusting Screws** - Adjust the interposer adjusting screws so that a front to rear clearance of .005" to .015" exists between all the operational latches and their respective cam followers (Fig. 107).

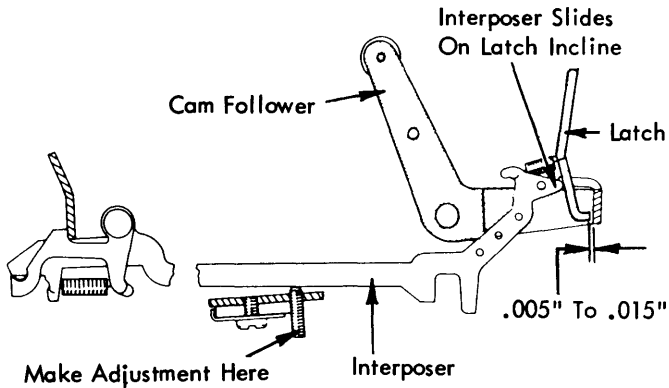


FIGURE 107. Interposer Adjusting Screw

The adjustment directly affects the timing between the cam release and the positioning of the operational latches under the cam follower. Excessive clearance can allow the cam follower to move down at the rear before the latch has moved fully under the follower.

The adjustment may be checked after operating the cams enough to move the cam followers down slightly at the rear. With the machine on its back the latches can be pushed against the cam followers to estimate the clearance.

All of the operational interposer springs should be placed in the middle hole at the rear of the interposer except the spacebar interposer spring which should be placed in the lower hole.

NOTE: The keylever pawl to interposer clearance should be rechecked after this adjustment.

5. **Cam Check Ring** - Adjust the cam check ring eccentric (Fig. 108a) so that a clearance of .010" to .015" exists between the tip of the cam pawl and the teeth of the cam ratchet with the cam latched in the rest position (Fig. 108b). Keep the high part of the eccentric radially outward. The check ring mounting screws must be loosened before the adjustment can be made.

The adjustment insures that the pawl will clear the ratchet and that the check ring will latch positively at the completion of each cam operation.

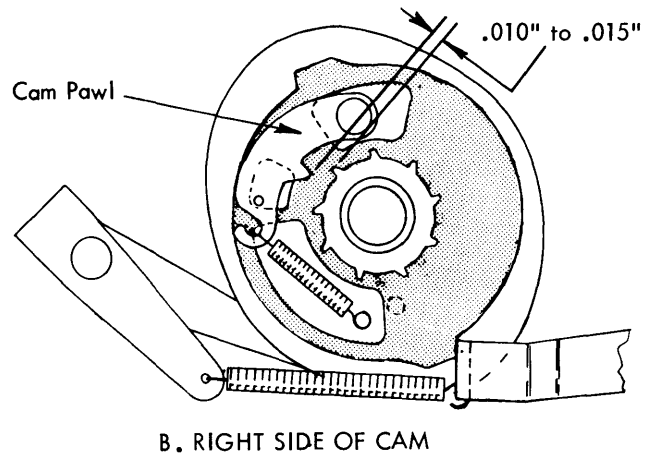
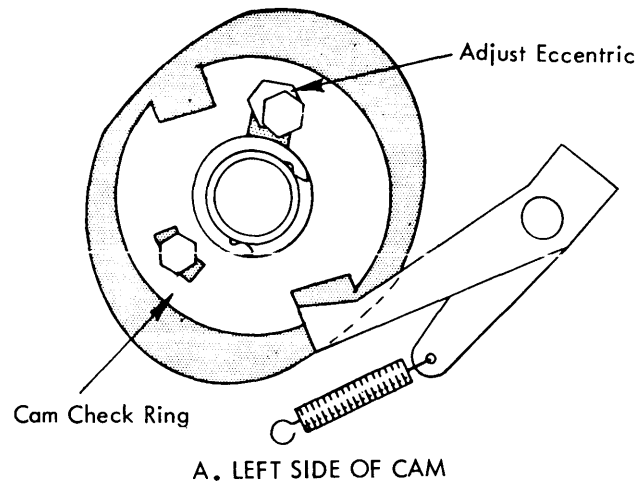


FIGURE 108. Cam Check Ring Adjustment

6. **Clutch Release Arm Stops** - Form the adjustable stop lugs on the operational control bracket to control the amount of bite that each clutch release arm will take on its respective clutch wheel. This adjustment is observed by measuring the amount of clearance that exists between the stop lugs and the lower extension of each clutch release arm (when the release arm has released the clutch wheel and is resting against the high portion of the tooth on the clutch wheel). (Fig. 109). This clearance should be .030" to .040".

Make certain that the interposers are latched forward and are not in contact with the clutch release arms when observing this adjustment.

NOTE: On long carriage machines the operational clutch ratchet must be positioned laterally on the operational shaft so that each clutch release arm will take an equal lateral bite on its respective clutch wheel. This insures that neither clutch release arm can slip sideways off its respective clutch wheel causing an unwanted cam operation. This condition is most serious on the carrier return/index cam as it will cause an index operation to occur each time the cam is released.

7. **Clutch Release Arms** - Form the lug at the bottom of each clutch release arm so that it clears the interposer lugs by .030" to .040" (Fig. 110). The interposers and cams must be latched when the adjustment is observed.

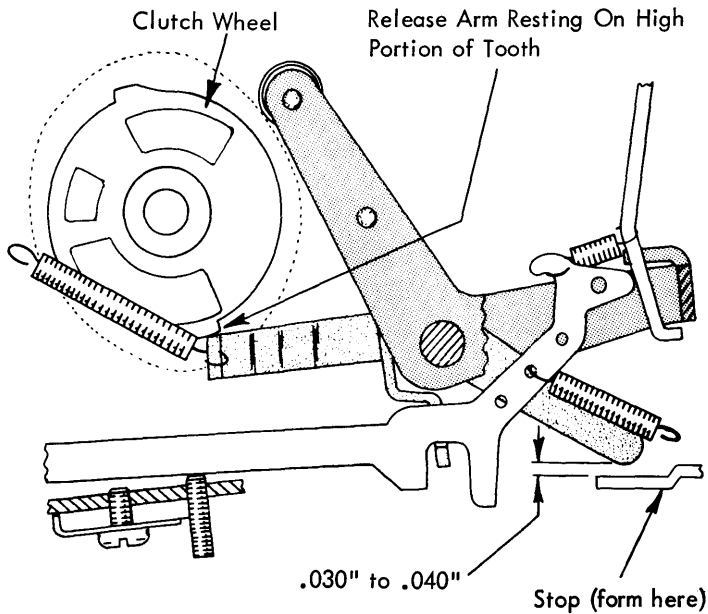


FIGURE 109. Clutch Release Arm Bite

Insufficient clearance will cause the cams to be released too early in the rearward travel of the interposers; consequently the operational latch involved will not have sufficient bite on the cam follower lever as it is operated down at the rear. The operational latch may slip from beneath the cam follower and result in an incomplete operation. Excessive clearance could allow the interposer to reach the limit of its travel before the cam is released.

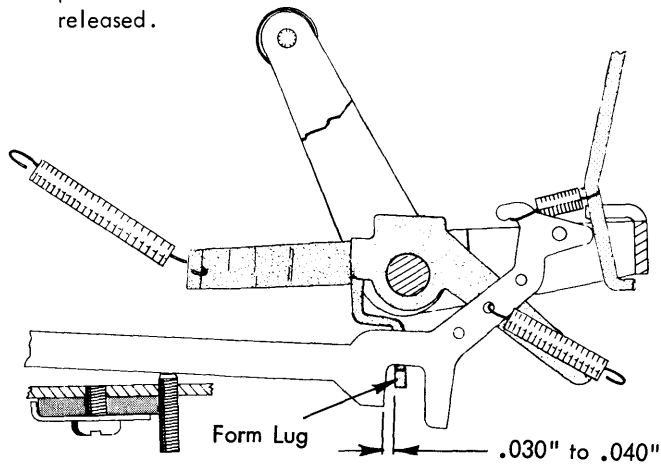


FIGURE 110. Clutch Release Arms Adjustment

NOTE: The clearance may be judged with the use of the push end of the large spring hook. The end of the spring hook is approximately .035" thick.

8. Interposer Restoring Bail - Form the lug at each side of the restoring bail so that the interposers will be restored forward .010" to .030" past the latching point (Fig. 111) when either cam is operated. Be sure to check the interposers at each side and form the lug on the side being checked.

The adjustment insures positive relatching of the interposers without excessive overthrow.

NOTE: The lugs should be formed forward or back to obtain the adjustment. Forming the lugs forward increases the throw of the interposers.

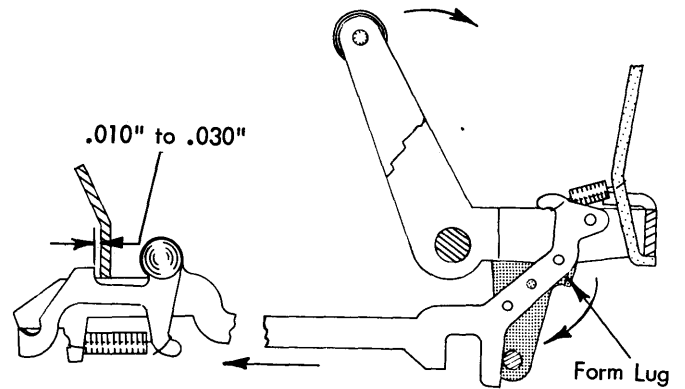


FIGURE 111. Interposer Restoring Bail Adjustment

SPACEBAR MECHANISM

1. All print escapement and operational control adjustments must be correct before attempting adjustments of the spacebar.
2. Spacebar Latch Lever Screw - Adjust the screw so that .007" to .010" clearance exists between the escapement trigger and the escapement torque bar (Fig. 112). Disconnect the escapement trip link before making this adjustment.

This adjustment insures that the trigger will properly reset over the lug on the escapement torque bar at the completion of each spacebar operation. It also insures that there will be a maximum transfer of motion from the spacebar operational latch to the trigger lever assembly, thereby placing a sufficient amount of wear potential into the system (which is felt as trigger overthrow).

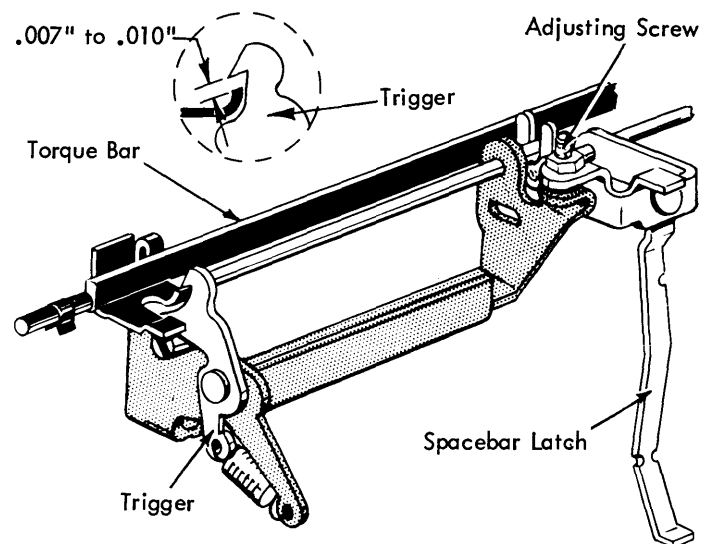


FIGURE 112. Spacebar Latch Lever Screw (Long Carriage)

On long carriage machines the trigger upstop should be moved up out of the way when making this adjustment. After completing the adjustment the upstop should be adjusted so that it clears the trigger lever by .001" to .005" (Fig. 102).

- b. New Style - The spring anchor should be adjusted up or down so that .001" to .005" clearance exists between the spring and the anchor, when a single operation takes place as the spacebar is depressed slowly (Fig. 118).

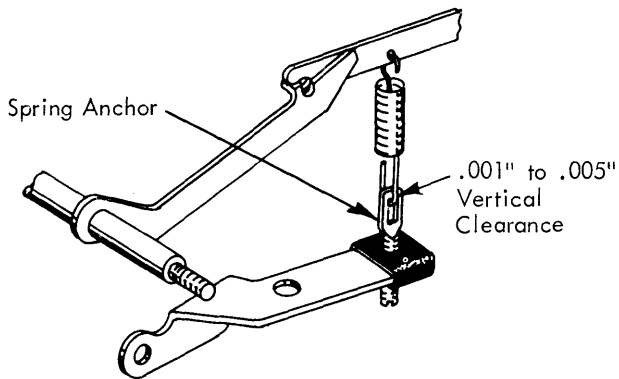


FIGURE 118. Spacebar Repeat Stop (New Style)

6. Spacebar Final Stop - On early level machines, adjust the stop located on the keylever guard to obtain .005" to .020" clearance between the stop and the spacebar center stem at the time a repeat operation occurs (Fig. 119). On current level machines the final stop has been eliminated.

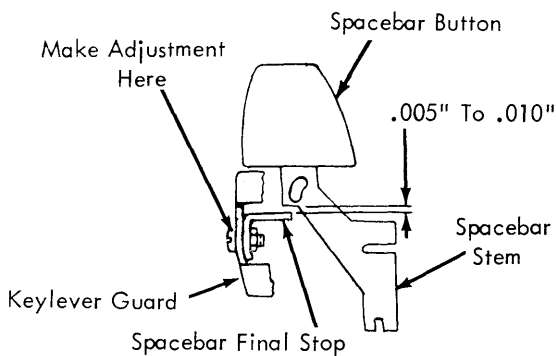


FIGURE 119. Spacebar Final Stop (Early Style)

7. Spacebar Interlock Mechanism (Old Style) - Perform the following adjustments:

- a. Lockout Cam - Adjust the escapement cam left or right on the filter shaft so that when the lockout cam is on the high point of the escapement cam the lockout cam will have .050" to .060" lateral motion remaining toward the left (Fig. 120).

Be sure to maintain the proper radial position of the escapement cam. It should be adjusted so that the escapement cam follower is resting on, and at the beginning of, the low dwell of the cam when the filter shaft is in its rest position.

- b. Lockout Cam Guide - Adjust the guide up or down so that the spacebar interposer will be allowed to move to the rear .015" to .025" when the interposer is unlatched (Fig. 121). The filter shaft must be rotated until the lockout cam moves fully to the right to check this adjustment.

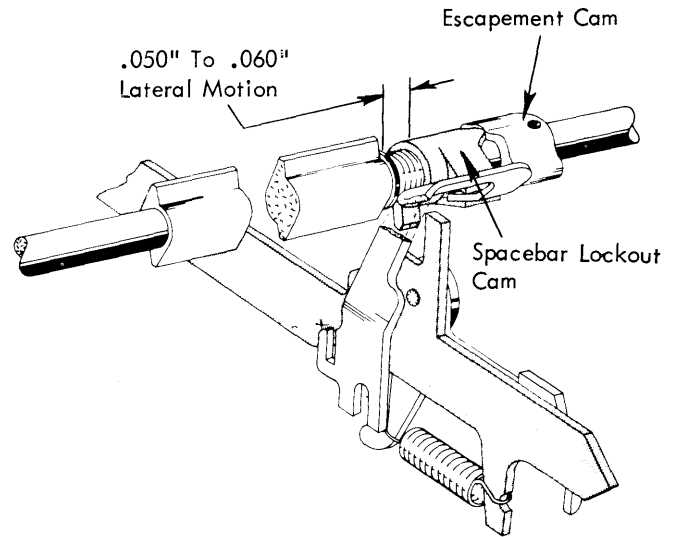


FIGURE 120. Lateral Adjustment Of The Escapement Cam

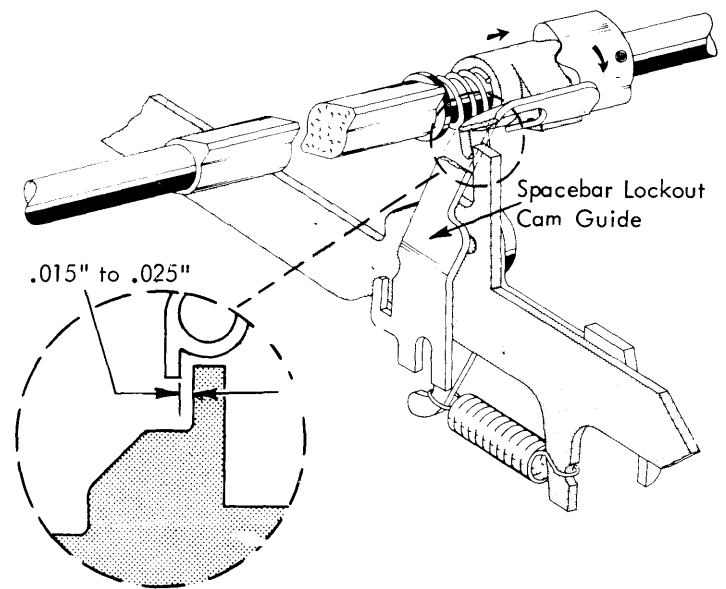


FIGURE 121. Spacebar Lockout Cam Guide Adjustment

CAUTION: Make certain that the spacebar interposer, when released and interlocked, clears the clutch release arm by .005" to .025".

- c. Spacebar Interposer Guide - Adjust the interposer guide left or right to obtain .015" to .025" clearance between the interposer and the lockout cam (Fig. 122). The filter shaft should be in its rest position and the spacebar interposer released to the rear when making this adjustment.

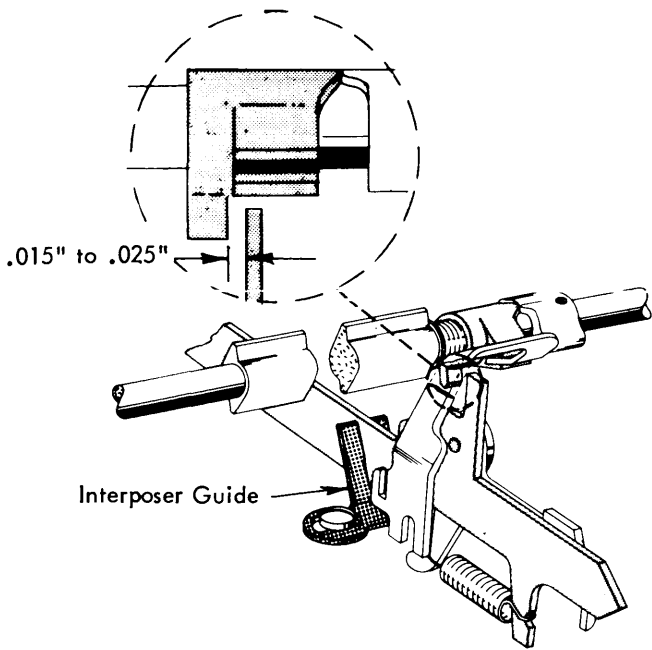


FIGURE 122. Spacebar Interposer Guide Adjustment

8. Spacebar Interlock Mechanism (New Style) - Perform the following adjustments:

- a. With the machine latched at rest adjust the spacebar interlock cam radially on the filter shaft so that the tip of the interlock interposer rests on the high point of the cam (Fig. 123).

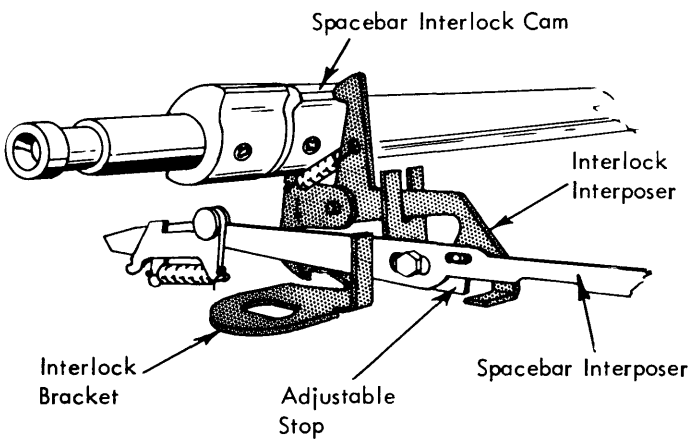


FIGURE 123. Spacebar Interlock Mechanism (New Style)

Also, position the interlock cam laterally on the filter shaft so that the cam is against the flutes of the filter shaft and the set screw is toward the right hand side of the machine.

- b. With the machine latched at rest and the spacebar interposer released to the rear, adjust the interlock bracket front or rear to obtain a clearance of .040" to .050" between the interlock interposer and the adjustable stop on the spacebar interposer (Fig. 124).
- c. Position the adjustable stop on the spacebar interposer forward or back so that .020" to .025" clearance will exist between the stop and the interlock interposer when the machine is half-cycled and the spacebar interposer is latched at rest (Fig. 125).

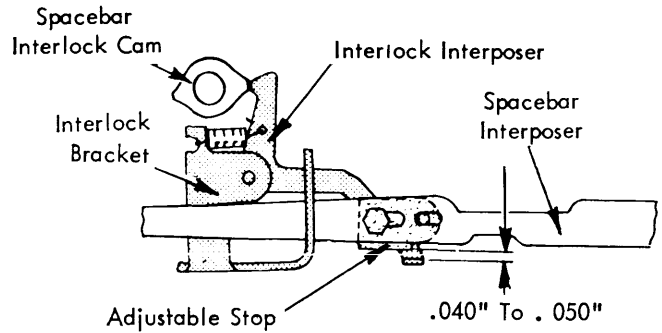


FIGURE 124. Interlock Bracket Adjustment

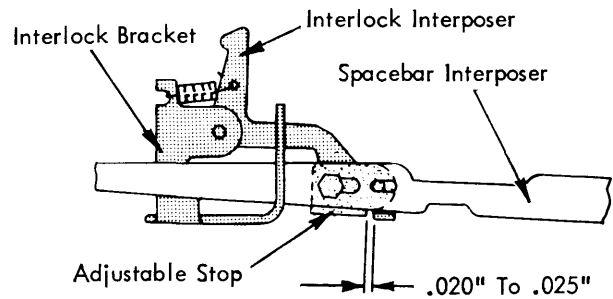


FIGURE 125. Adjustable Stop

BACKSPACE MECHANISM

1. Be sure that print escapement and operational control adjustments are correct before attempting backspace adjustments.
2. Tab Lever Stop - The rest position of the tab lever is controlled by a lug on the escapement bracket called the tab lever stop (Fig. 126). The stop should be formed front or rear so that a clearance of .001" to .003" exists between the vertical lug on the tab lever and the backspace pawl when the backspace pawl is bottomed in its rack.

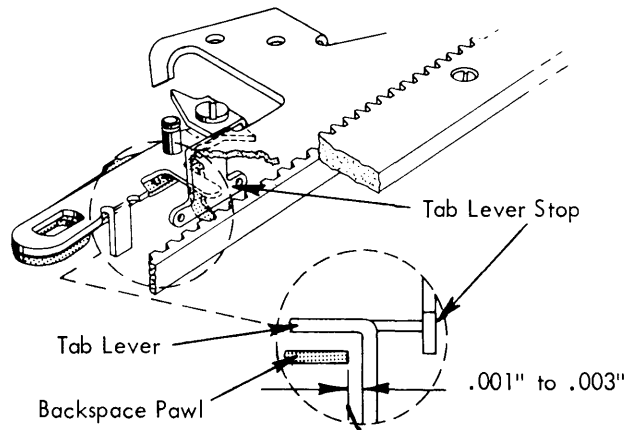


FIGURE 126. Tab Lever Stop Adjustment

The tab lever stop may be formed by inserting the T-bender from the upper right side. It will be necessary to force the tab torque bar to the rear in order to insert the T-bender.

This adjustment insures that the backspace pawl will not be prevented from bottoming in its rack during a backspace operation. The tab lever rest position also directly affects the adjustments of the tab mechanism. It determines how much motion must be provided to the tab lever to properly remove the backspace and escapement pawls from their racks during a tab operation.

3. **Backspace Rack** - With the backspace rack in the rest position, a clearance of .005" to .015" should exist between the working surfaces of the rack tooth and the backspace pawl (Fig. 127). Adjust the hexagon headed stud in the backspace bellcrank to obtain this condition.

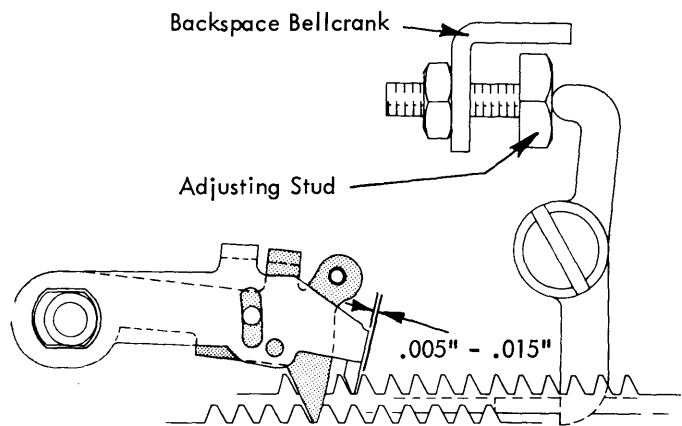


FIGURE 127. *Backspace Rack Adjustment*

The adjustment minimizes lost motion in the mechanism and insures that the backspace pawl will positively reset into the next rack tooth at the completion of a backspace operation. Excessive clearance can contribute to escapement problems as well as backspace failures by allowing the backspace pawl to hold the carrier against a backspace rack tooth. Partial spacing will result if the carrier alternates holding on the escapement pawl and the backspace pawl.

The adjustment may be gauged by feeling the motion of the rack as it is manually moved from its rest position into contact with the backspace pawl. The movement should be equal to the adjustment clearance. The check should be made at both extreme positions of the carrier so as to include the difference in mainspring tension in the check. Check the resetting of the pawl at both positions by operating the backspace bellcrank manually and releasing it slowly.

4. **Intermediate Lever** - With the backspace cam manually operated to the high point, the escapement pawl should just fail to drop into the preceding rack tooth causing the manual backspace operation to fail. Adjust the intermediate lever pivot screw forward or back in its elongated mounting hole to obtain this condition (Fig. 128).

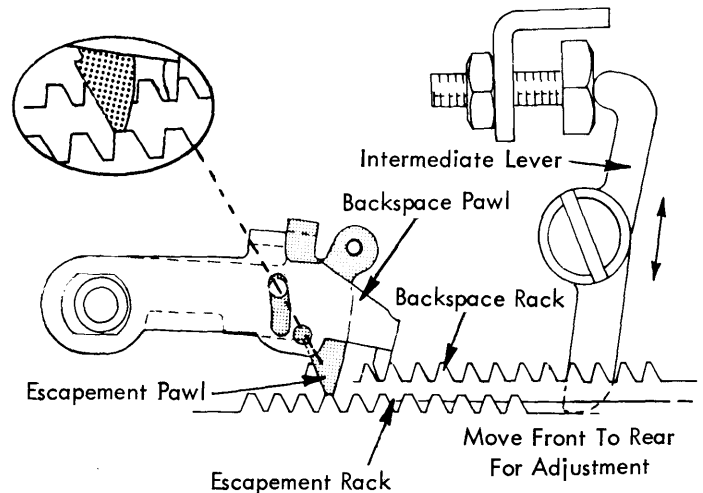


FIGURE 128. *Intermediate Lever Adjustment (Late Level)*

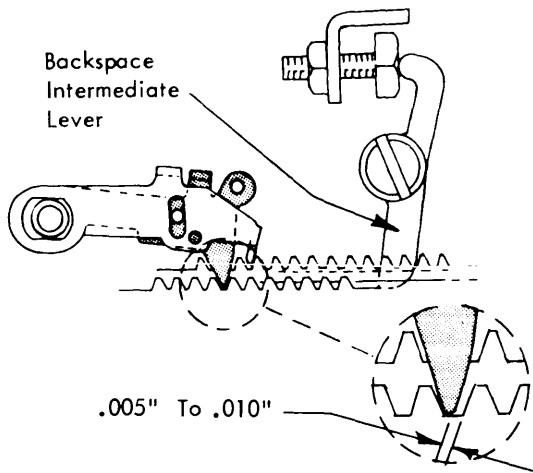
The rear portion of the intermediate lever is supplied with the same amount of motion from the hexagon headed screw on the bellcrank regardless of any change in the front to rear position of the intermediate lever. Therefore; the difference in throw to the backspace rack is achieved, when changing the front to rear position of the intermediate lever, by increasing or decreasing the leverage or distance between the pivot point of the intermediate lever and the point of contact between the intermediate lever and the backspace rack. Moving the intermediate lever to the rear will increase the backspace rack motion.

During a powered backspace operation the carrier develops enough momentum (allowing the escapement pawl to properly overthrow and drop into the preceding rack tooth) for a positive operation.

Too much motion to the backspace rack will cause double backspacing. Check the operation at both ends of the carriage so as to include the variation in the mainspring tension.

CAUTION: The rest position of the backspace rack should be checked and readjusted, if necessary, after any change in the front to rear position of the intermediate lever.

NOTE: On 721 machines below serial number 4012015, the contour or rise to the spacebar backspace operational cam is slightly different than those found on later level machines. This cam provided much less momentum to the carrier, therefore the backspace rack required more motion in order to produce a positive backspace operation. Adjust this early level backspace mechanism as follows: With the backspace cam manually operated to the high point, the escapement pawl must drop into the preceding rack tooth and overthrow by .005" to .010" (Fig. 129). Obtain this condition by adjusting the intermediate lever forward or back in its elongated mounting hole.



**FIGURE 129. Intermediate Lever (Early Level)
CARRIER RETURN MECHANISM (OLD STYLE)**

Be sure that the print escapement and operational control adjustments are correct before attempting the carrier return adjustments.

1. Carrier Return Latch Height (721 only) - With the carrier return/index cam at rest, adjust the carrier return latch height by the adjusting screw on the backplate (Fig. 130) so that the latch will pass under the cam follower by .001" to .010" when it is released to the rear.

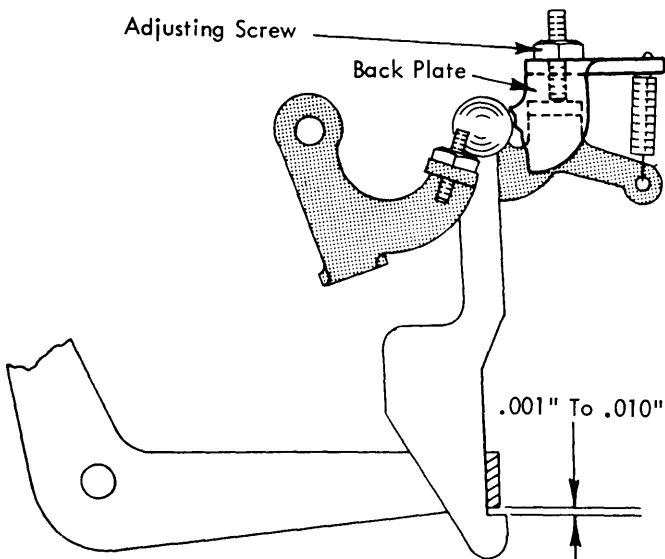


FIGURE 130. Carrier Return Latch Height Adjustment (721)

The latch height adjustment insures maximum throw for the latch and that it will move under the cam follower freely.

CAUTION: Any change in the carrier return latch height directly affects the front to rear position of the latch (with respect to the cam follower) when the machine is at rest. See adjustment #4 in the Operational Control section.

NOTE: On early level long carriage machines the carrier return latch height cannot be obtained until after the correct pawl clearance and clutch latch overthrow adjustment is obtained.

2. Pawl Clearance (721, 723 and 725) - Adjust the clutch latch eccentric so that the escapement pawl will clear the rack teeth by .005" to .015" when the latch is being held down by the keeper (Fig. 131).

The adjustment insures that the escapement pawl will not drag along the rack during a carrier return operation and that the pawl will be allowed to re-enter the rack quickly at the completion of the return operation.

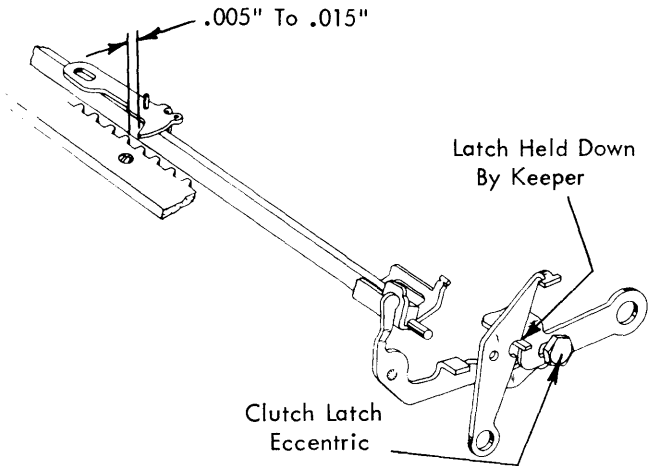


FIGURE 131. Pawl Clearance Adjustment

3. Clutch Latch Overthrow (721 only) - With the platen and feed rolls installed and the index selector lever set in the double index position, manually operate the carrier return cam to the high point while observing the motion of the clutch latch. It should overthrow the latching surface of the keeper by .030" to .040" (Fig. 132). Adjust the carrier return latch arm adjusting screw to obtain this condition.

NOTE: Installing the platen and feed rolls, plus setting the index selector lever in the double index position, permits the overthrow adjustment to be measured while the system operates under a load.

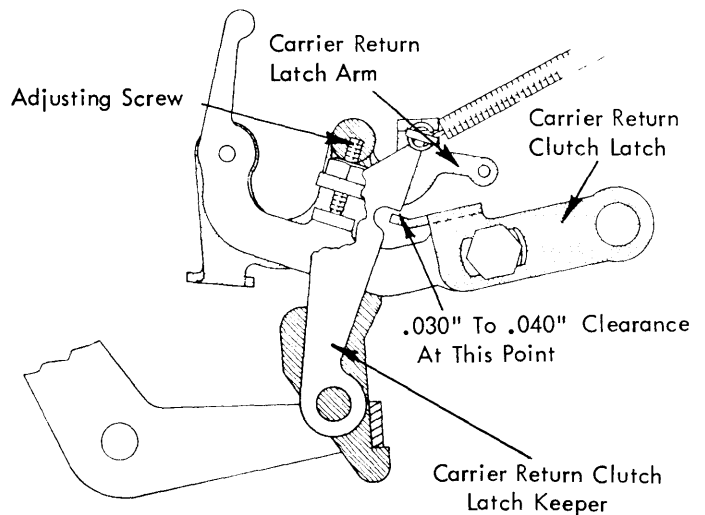


FIGURE 132. Clutch Latch Overthrow Adjustment (721)

4. Clutch Latch Overthrow (723 and 725) - Use the following procedure to obtain the correct clutch latch overthrow and operational latch height on this early style mechanism:

- a. Carrier Return Lever - Position the carrier return lever laterally on the latch actuating arm pin so that the carrier return latch will hang vertical without binding against its interposer. Be sure to tighten the Bristol screw in the lever onto the flat portion of the pin.
- b. Carrier Return Latch Arm Adjusting Screw (overthrow) With the carrier return cam on the high point adjust the latch arm adjusting screw (Fig. 133) so that the clutch latch will overthrow the latching surface of the keeper by .030" to .040". Be sure that the platen and feed rolls are installed and the index selector lever is in the double index position when checking this adjustment.

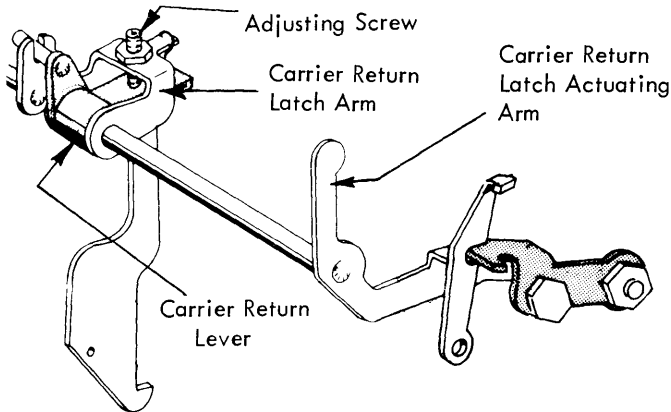


FIGURE 133. *Clutch Latch Overthrow Adjustment (723 And 725)*

- c. Carrier Return Latch Actuating Arm Adjusting Screw (latch height) - With the carrier return cam latched in the rest position, adjust the screw so that the carrier return latch will pass under the cam follower by .001" to .010" (Fig. 134).

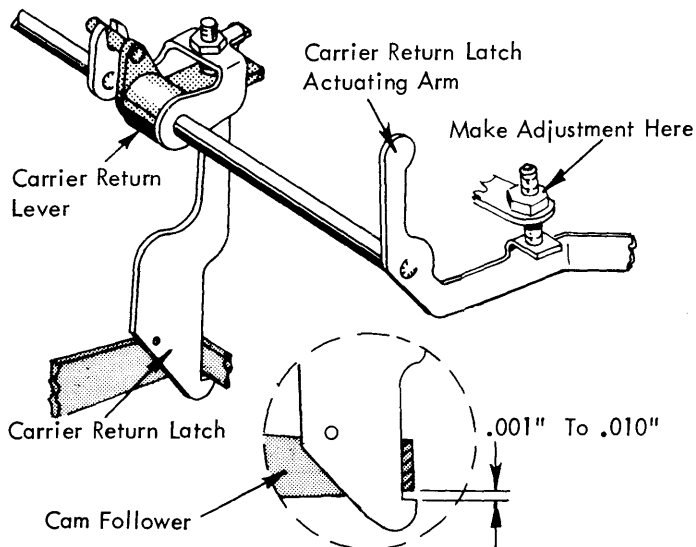


FIGURE 134. *Carrier Return Latch Height (723 And 725)*

CAUTION: Any change in the carrier return latch height directly affects the front to rear position of the latch (with respect to the cam follower) when the machine is at rest. See adjustment #4 in the Operational Control section.

NOTE: On a limited number of Model 725's equipped with the early style carrier return mechanism, a carrier return latch actuating arm was used that did not have a flat surface machined on the left end of its pivot pin. These early production latch actuating arms should be replaced, using Code 32, before attempting to make the carrier return adjustments. The flat surface machined on the left end of the pin is required to establish the proper radial position of the carrier return lever on the pin (with respect to the latch actuating arm), and insures that the carrier return lever cannot slip on the pin.

5. Carrier Return Shoe - Adjust the carrier return actuating arm bracket left or right so that the carrier return shoe overlaps the last 3 coils on the right hand end of the clutch spring. Covering the last 3 coils insures that all the coils of the spring will be used in the clutch operation (Fig. 135).

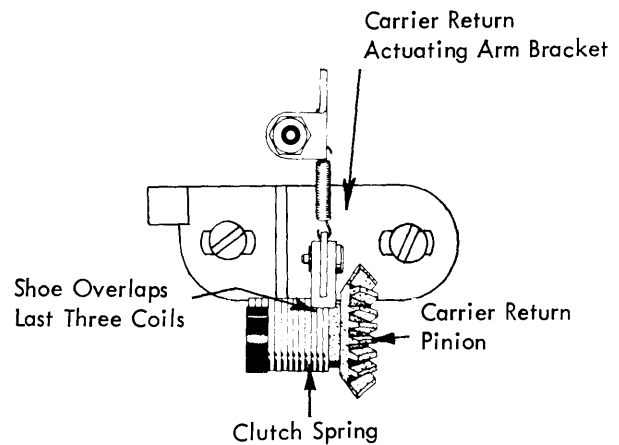


FIGURE 135. *Carrier Return Shoe*

6. Carrier Return Clutch Arm - Adjust the clutch arm on the carrier return clutch arm hub so that the formed lug which mounts the actuating arm stud will be horizontal when the machine is at rest (Fig. 136).
7. Shoe Clearance - The nylon shoe on the clutch actuating arm should clear the carrier return clutch spring by .015" to .020" when the machine is at rest (Fig. 136). Adjust the nut on the actuating arm stud to obtain the proper clearance.

NOTE: In no case should the shoe to clutch spring clearance be less than .015".

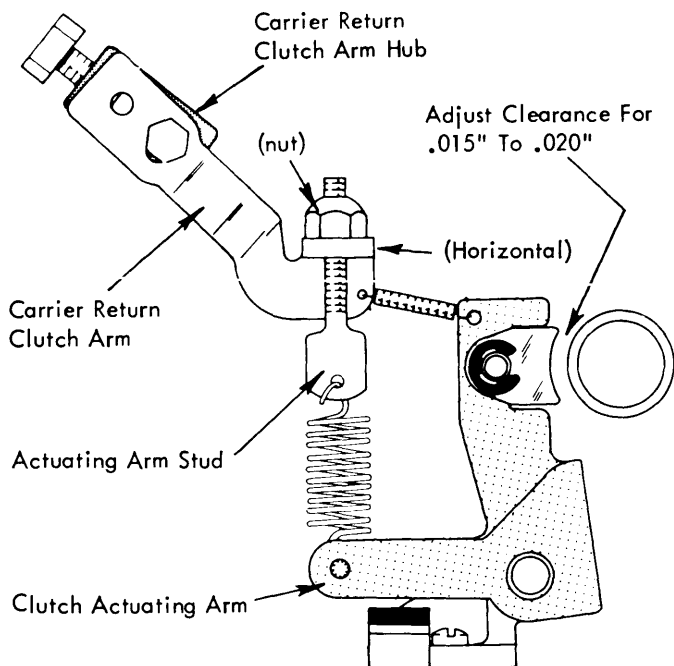


FIGURE 136. Carrier Return Actuating Arm Adjustment

8. Overbank Adjustment

- a. Old Style - With the carrier held fully to the left against the margin stop, a clearance of .003" to .008" should exist between the working surfaces of the escapement pawl and the escapement rack tooth (Fig. 137). Adjust the left hand margin rack bushing to obtain this condition (Fig. 138).

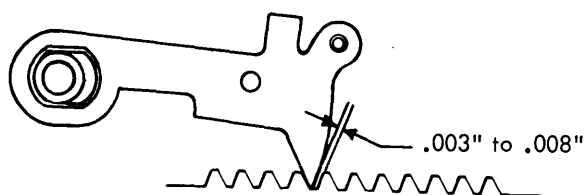


FIGURE 137. Escapement Pawl Check

The overbank adjustment insures that the escapement pawl will enter the correct escapement rack tooth when the carrier return clutch is unlatched at the left margin. The adjustment may be observed from the top with the platen and deflector removed and the left margin stop positioned toward the middle of the rack. The overbank may also be adjusted by adjusting the margin rack bushing to clear the nylon washer on the margin rack by .025" to .030" with the carrier resting at the left margin. The right hand margin rack eccentric should be loose when making this adjustment (Fig. 138) so that the left margin stop will be against the stop latch on the carrier. The .025" to .030" compensates for the .022" floating action in the escapement pawl. (The correct adjustment for the margin rack eccentric is covered under the Margin Control section.)

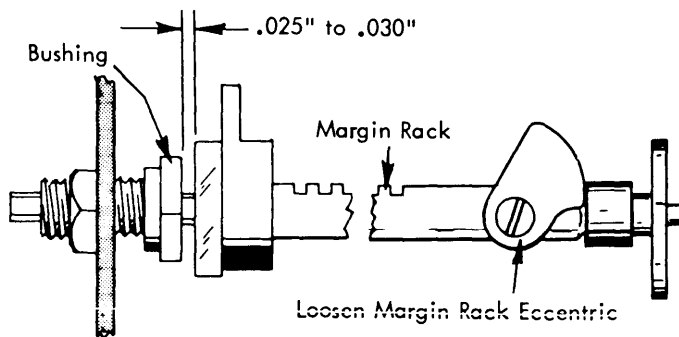


FIGURE 138. Overbank Adjustment

NOTE: Any change in overbank on machines equipped with this old style margin rack assembly will directly affect the clutch unlatching adjustment.

- b. New Style - With the carrier resting at the left margin stop, adjust the margin rack overbank guide (Fig. 139) left or right on the margin rack to obtain a clearance of .001" to .005" between the stop latch on the carrier and the left hand margin stop. On machines equipped with a floating stop latch, the floating action of the latch must be removed, by pulling the latch to the right with a spring hook, before this clearance can be observed.

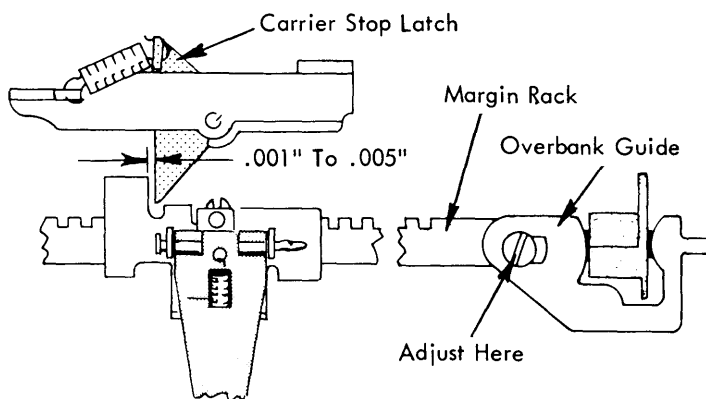


FIGURE 139. Margin Rack Overbank Guide Adjustment

The adjustment of the overbank guide on the margin rack determines the rest position of the margin rack. The adjustment insures that the left margin stop will set accurately when the stop is slid to the right against the margin stop latch on the carrier. In addition; the adjustment of the overbank guide, plus the amount of lateral motion that the guide permits the rack (due to the design of the guide) when the carrier moves into the left hand margin during a carrier return operation, automatically provides the carrier with the overbank required for proper escapement pawl re-entry at the completion of a carrier return operation.

9. Clutch Unlatching - With either style margin rack held to its extreme left position, the carrier return latch keeper should clear the latch by .005" to .015" at the unlatching point (Fig. 140). Check by manually holding the latch at the unlatching point while the machine is idling. Lengthen or shorten the carrier return unlatching link to obtain this clearance.

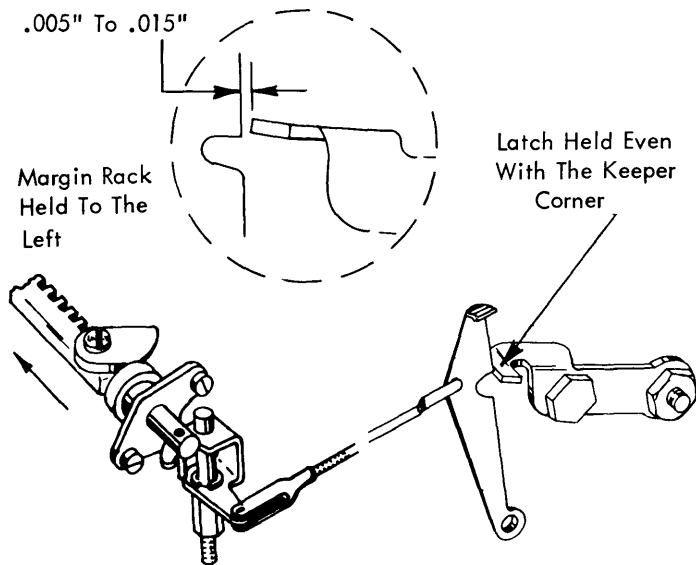


FIGURE 140. Clutch Unlatching Adjustment

NOTE: Should the clutch fail to properly latch (on machines equipped with the Old Style margin rack) after the clutch unlatching adjustment has been completed, check the margin rack eccentric adjustment which is located in the Margin Control section. The eccentric may be holding the rack too far to the left restricting the margin rack motion thereby reducing the amount of bite that the latch may take on the keeper.

10. Torque Limiter - The torque limiter should transmit 1 to 2 pounds pull on the carrier as the carrier is unlatching the clutch at the left margin.

If a spring scale is available, the adjustment may be checked by holding against the carrier with the push end of the scale and allowing the carrier to slowly unlatch the clutch at the left margin.

If no scale is available, the torque may be estimated by holding the carrier while the clutch is engaged. The torque limiter should slip readily yet return the carrier positively without any hesitation when the carrier is released.

The adjustment is made by adjusting the eccentric stud in the torque limiter hub. If sufficient adjustment is not available at the eccentric, the torque limiter spring may be shifted on the torque limiter hub by positioning the torque limiter spring clamp.

NOTE: The carrier return clutch arbor should have an end play of .004" to .006" between the torque limiter hub and the C-clip on the operational shaft. Adjust the play by positioning the torque limiter hub laterally on the shaft. The end play can be adjusted easily if the torque limiter spring is moved to the right, off the torque limiter hub.

CARRIER RETURN MECHANISM (NEW STYLE)

Be sure that the print escapement and operational control adjustments are correct before attempting the carrier return adjustments.

1. Carrier Return Latch Height - With the carrier return/index cam at rest, adjust the carrier return latch height by the adjusting screw on the backplate so that the latch will pass under the cam follower by .001" to .010" when it is operated to the rear. (For Model 721, see Fig. 141. For Model 723 or 725, see Fig. 142.)

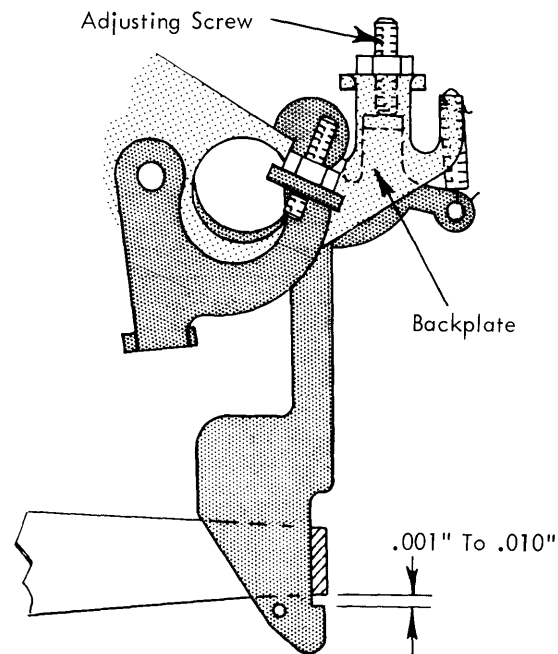


FIGURE 141. Carrier Return Latch Height Adjustment (721)

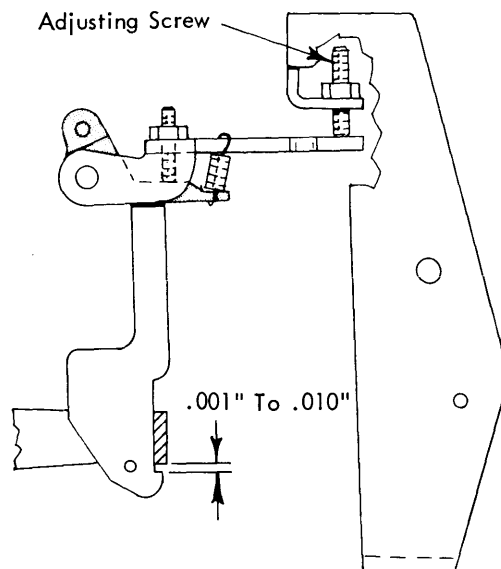


FIGURE 142. Carrier Return Latch Height (723 And 725)

The latch height adjustment insures maximum throw for the latch and that it will move under the cam follower freely.

CAUTION: Any change in the carrier return latch height directly affects the front to rear position of the latch (with respect to the cam follower) when the machine is at rest. See adjustment #4 in the Operational Control section.

2. Pawl Clearance - Form the carrier return clutch latch so that the escapement pawl will clear the rack teeth by .005" to .015" when the latch is being held down by the keeper (Fig. 143).

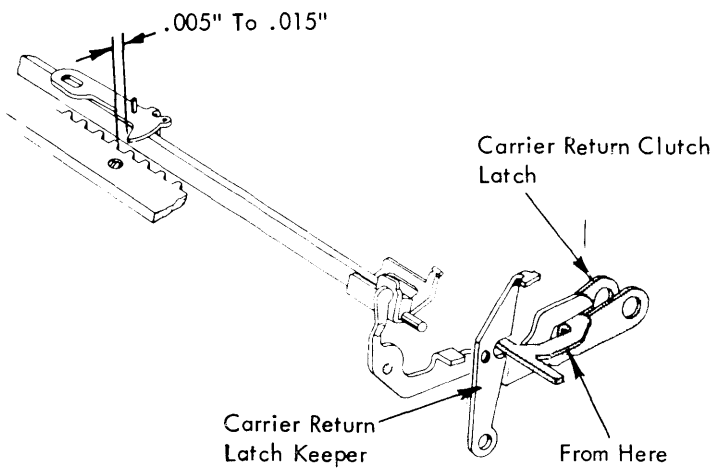


FIGURE 143. Pawl Clearance Adjustment

The adjustment insures that the escapement pawl will not drag along the rack during a carrier return operation and that the pawl will be allowed to re-enter the rack quickly at the completion of the return operation.

3. Clutch Latch Overthrow - Install the platen and feed rolls, and place the index selector lever in the double index position before making this adjustment. This will permit the adjustment to be measured while the system operates under a load.

Manually operate the carrier return cam to its high point while observing the motion of the clutch latch. It should overthrow the latching surface of the keeper by .030" to .040". Adjust the carrier return latch arm adjusting screw to obtain this condition. (For Model 721, see Fig. 144. For Model 723 or 725, see Fig. 145.)

NOTE: On long carriage machines, make certain that the carrier return latch hangs vertical without binding laterally against its interposer. The carrier return lever may be adjusted laterally on the latch actuating arm pin. Be sure to tighten the Bristol screw in the lever onto the flat portion of the pin.

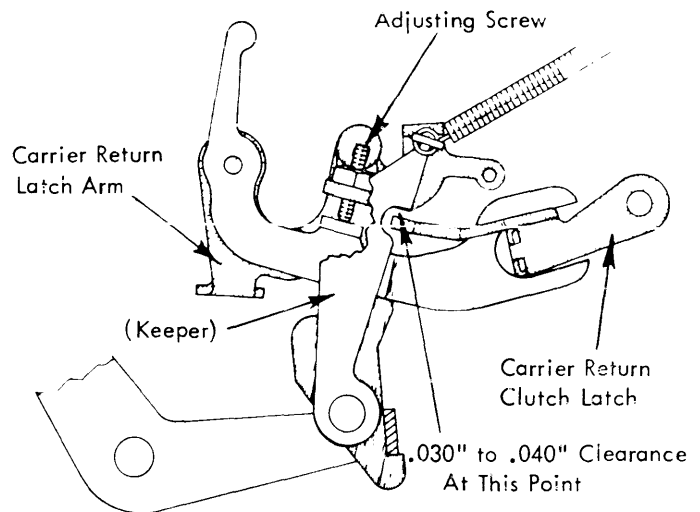


FIGURE 144. Clutch Latch Overthrow Adjustment (721)

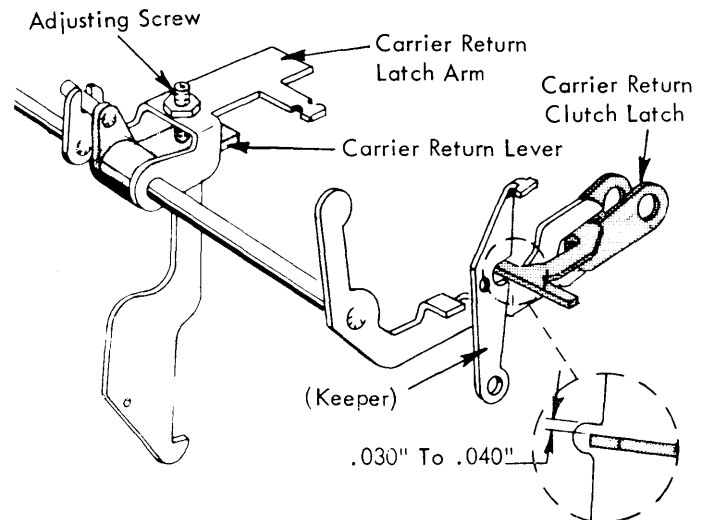


FIGURE 145. Clutch Latch Overthrow Adjustment (723 And 725)

4. Carrier Return Shoe - Adjust the carrier return actuating arm bracket left or right so that the carrier return shoe overlaps the last 3 coils on the right hand end of the clutch spring. Covering the last 3 coils insures that all the coils of the spring will be used in the clutch operation (Fig. 146).

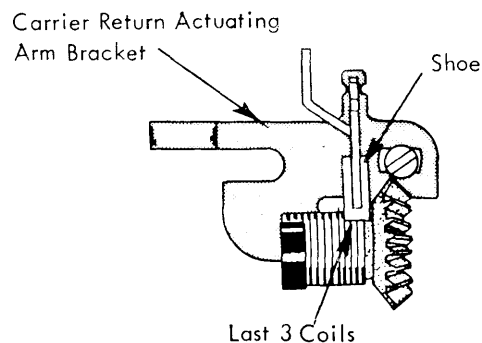


FIGURE 146. Carrier Return Shoe

- Carrier Return Clutch Arm - Adjust the arm on the carrier return clutch arm hub so that the formed lug which mounts the actuating arm stud will be horizontal when the machine is at rest (Fig. 147).

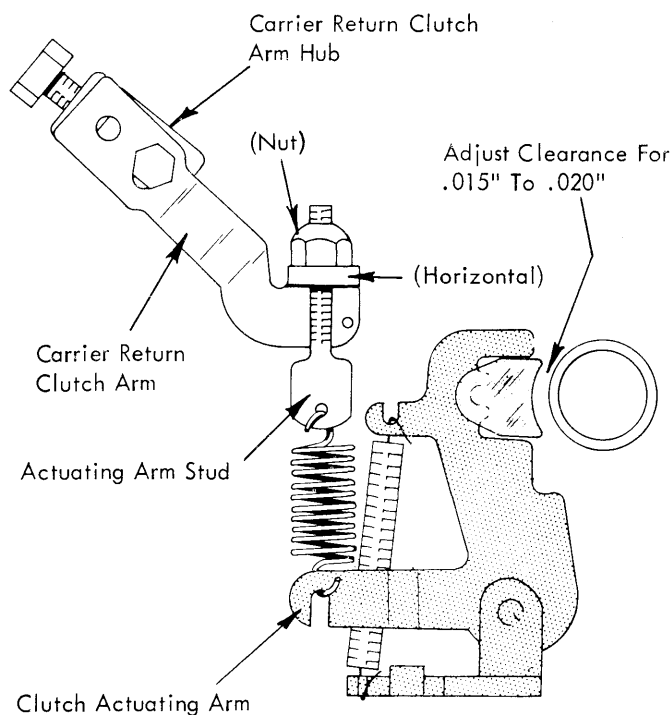


FIGURE 147. Carrier Return Actuating Arm Adjustment

- Shoe Clearance - The nylon shoe on the clutch actuating arm should clear the carrier return clutch spring by .015" to .020" when the machine is at rest (Fig. 147). Adjust the self-locking nut on the actuating arm stud to obtain the proper clearance.

NOTE: In no case should the shoe to clutch spring clearance be less than .015".

- Overbank Adjustment - With the carrier resting at the left margin stop, adjust the margin rack overbank guide (Fig. 148) left or right on the margin rack to obtain a clearance of .001" to .005" between the stop latch on the carrier and the left hand margin stop. The floating action of the stop latch must be removed, by pulling the latch to the right with a spring hook, before this clearance can be observed.

The adjustment of the overbank guide on the margin rack determines the rest position of the margin rack. The adjustment insures that the left margin stop will set accurately when the stop is slid to the right against the margin stop latch on the carrier. In addition; the adjustment of the overbank guide, plus the amount of lateral motion that the guide permits the rack (due to the design of the guide) when the carrier moves into the left hand margin during a carrier return operation, automatically provides the carrier with the overbank required for proper escape-pawl re-entry at the completion of a carrier return operation.

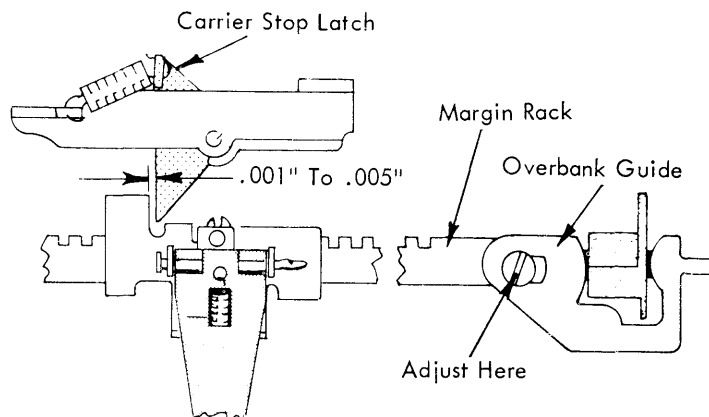


FIGURE 148. Margin Rack Overbank Guide Adjustment

- Clutch Unlatching Link - With the margin rack held to its left limit the carrier return latch keeper should clear the latch by .001" to .015" at the unlatching point (Fig. 149). Check by manually holding the latch at the unlatching point while the machine is idling. Lengthen or shorten the unlatching link to obtain this clearance.

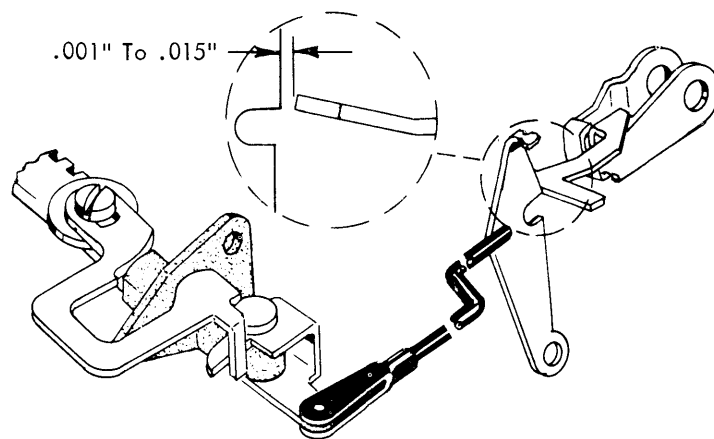


FIGURE 149. Clutch Unlatching Link

- Torque Limiter - The torque limiter should transmit 1 to 2 pounds pull on the carrier as the carrier is unlatching the clutch at the left margin.

If a spring scale is available, the adjustment may be checked by holding against the carrier with the push end of the scale and allowing the carrier to slowly unlatch the clutch at the left margin.

If no scale is available, the torque may be estimated by holding the carrier while the clutch is engaged. The torque limiter should slip readily yet return the carrier positively without any hesitation when the carrier is released.

The adjustment is made by adjusting the eccentric stud in the torque limiter hub. If sufficient adjustment is not available at the eccentric, the torque limiter spring may be shifted on the torque limiter hub by positioning the torque limiter spring clamp.

NOTE: The carrier return clutch arbor should have an end play of .004" to .006" between the torque limiter hub and the C-clip on the operational shaft. Adjust the play by positioning the torque limiter hub laterally on the shaft. The end play can be adjusted easily if the torque limiter spring is moved to the right, off the torque limiter hub.

INDEX MECHANISM (NEW STYLE)

1. All operational control adjustments must be correct before any attempt is made to adjust the index mechanism.
2. Multiplying Lever Stop - (Fig. 150)
 - a. On machines equipped with either 27 or 54 tooth ratchets, adjust the multiplying lever stop front or rear to produce .370" to .390" (approximately 3/8") motion to the index link when the carrier return/index cam is operated to its high point (platen removed).
 - b. On machines equipped with a 24 tooth ratchet, adjust the multiplying lever stop front or rear to produce .400" to .420" (approximately 13/32") motion to the index link when the carrier return/index cam is operated to its high point (platen removed).

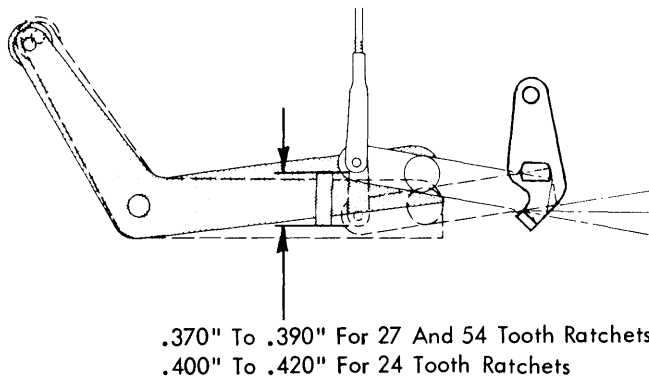


FIGURE 150. *Multiplying Lever Stop (New Style)*

NOTE: This adjustment may be measured with the Hooverometer and a feeler gauge. The handle of the Hooverometer is .375" wide. For 27 and 54 tooth ratchets the .370" to .390" motion can be measured by the width of the Hooverometer handle plus a .015" feeler gauge. For the 24 tooth ratchet the .400" to .420" motion can be measured by the width of the Hooverometer handle plus a .035" feeler gauge.

Figure 151 illustrates the first level multiplying lever stop used on the new style index mechanism. This stop should be adjusted both horizontally and vertically. The stop is adjusted vertically so that the multiplying lever will operate above and below a horizontal position by an equal amount. The horizontal and vertical adjustments of the stop must be made alternately until both are correct.

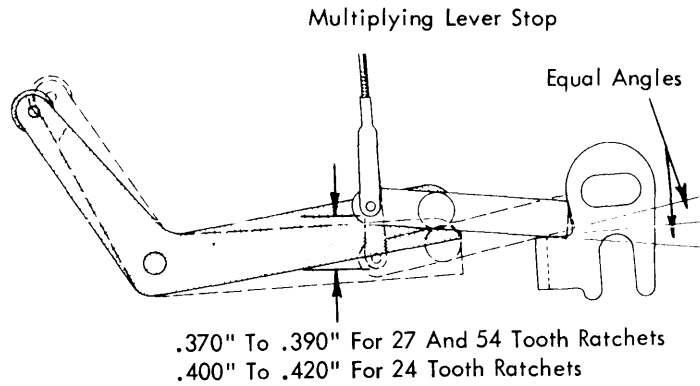


FIGURE 151. *Multiplying Lever Stop (Early Level)*

3. Index Link - Use the following procedure to adjust the index link:
 - a. As a preliminary step, loosen the platen overthrow stop and move it to the rear (Fig. 152).

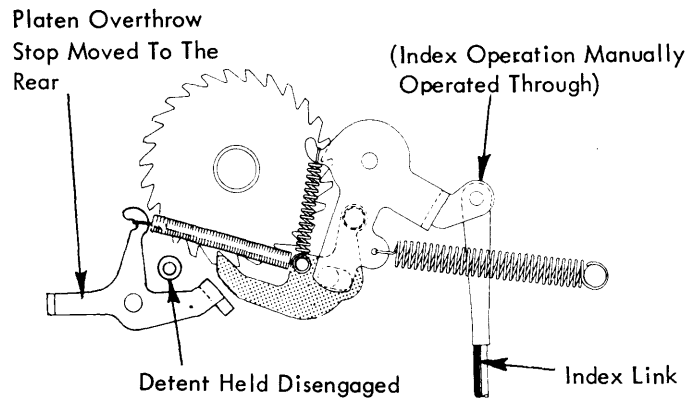


FIGURE 152. *Index Link Adjustment*

- b. With the platen installed, hold the detent roller disengaged from the platen ratchet with a spring hook while an index operation is manually cycled. At the completion of the operation allow the detent roller to re-enter the platen ratchet. If the index link is properly adjusted the detent roller will seat between two ratchet teeth without causing any rotational motion to the platen. Adjust the link to obtain this condition.
4. Platen Overthrow Stop - With the index cam rotated to its high point, adjust the platen overthrow stop to clear the index pawl by .005" (Fig. 153).

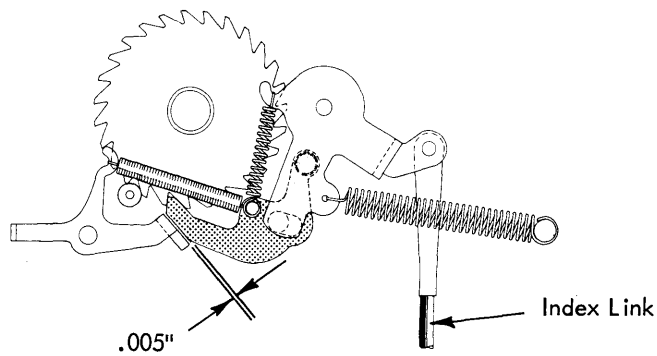


FIGURE 153. Platen Overthrow Stop

5. Index Selection Cam

- a. (24 or 27 tooth ratchets) With the index cam latched at rest and the selection lever in the double line space position, adjust the selection cam front to rear so that the index pawl clears the platen ratchet by .015" to .050" (Fig. 154).

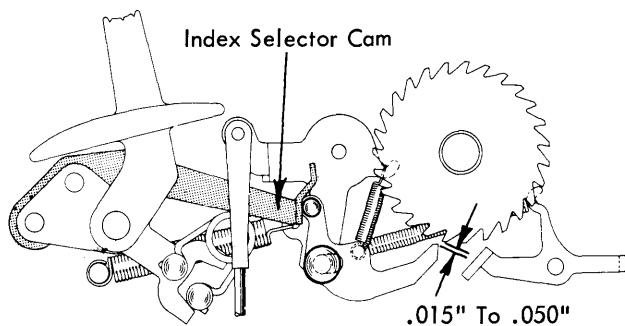


FIGURE 154. Index Selection Cam Adjustment

- b. Adjust the selection cam up or down so that the index pawl is centered on the cam surface with the selection lever in the single line space position (Fig. 155).

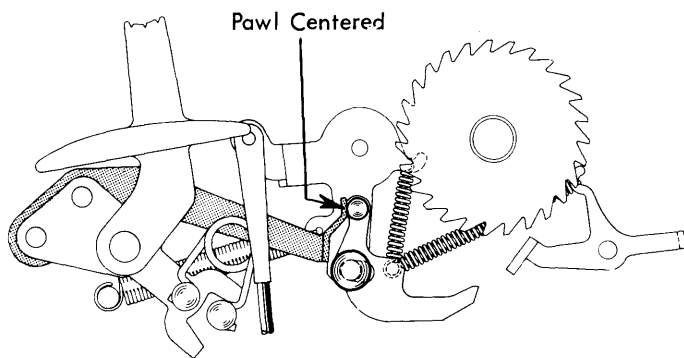


FIGURE 155. Vertical Adjustment Of Index Selection Cam

NOTE: On machines equipped with 54 tooth ratchets, adjust the index lever to reliably produce a feed of two, three, or four ratchet teeth when the index selector lever is placed in the first, second, or third index position.

INDEX MECHANISM (OLD STYLE)

1. All operational control adjustments must be correct before any attempt is made to adjust the index mechanism.
2. Index Link and Index Link Stud
 - a. As a preliminary setting position the index link stud in the middle of the slot in the pawl carrier. The setting provides an average leverage ratio for the pawl carrier. Subsequent adjustments may require that the position be altered slightly.
 - b. With the index selection lever in the single line space position, adjust the index link so that the index pawl bottoms in the ratchet against a tooth after .030" rise on the index cam (Fig. 156). Half-turn adjustments may be made by disconnecting and turning the link at the top.

The cam rise may be simulated by leaving the cam latched in the rest position and placing four strips of IBM card stock between the cam and the cam follower (Fig. 156).

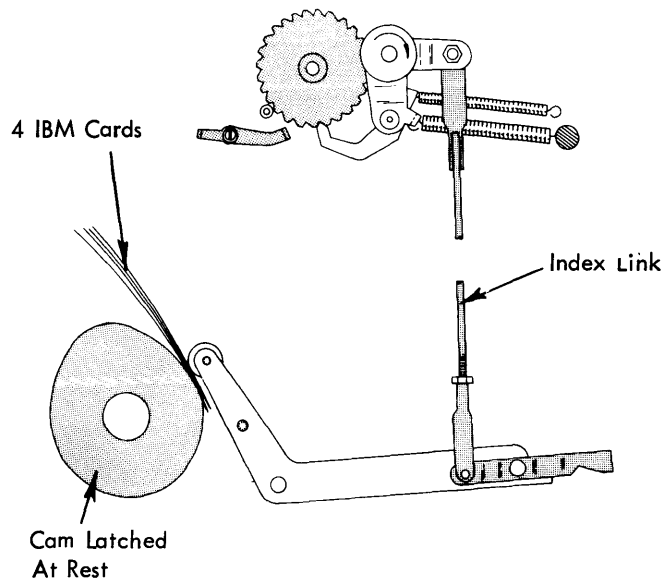


FIGURE 156. Index Link Adjustment

- c. Adjust the index link stud forward or back in the slot of the pawl carrier so that one full tooth of motion is given the index pawl after it starts to drive the platen (Fig. 157).

NOTE: Adjustment of the index link and link stud must be considered together. Make these adjustments alternately until both are correct.

The upper index pawl stop must allow the index pawl to bottom in the ratchet.

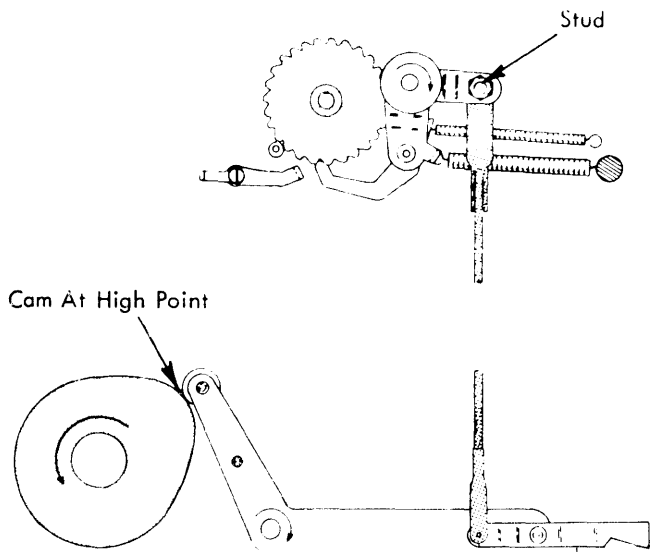


FIGURE 157. Index Link Stud Adjustment

3. Upper Index Pawl Stop - With the index cam latched adjust the upper index pawl stop so that the index pawl clears the ratchet by .015" to .030" (Fig. 158).

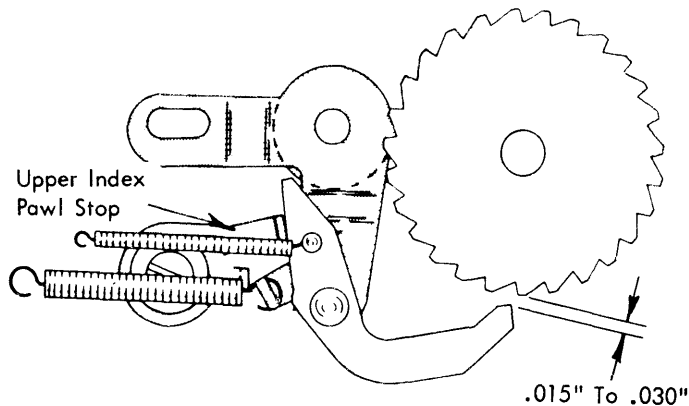


FIGURE 158. Upper Index Pawl Stop Adjustment

4. Multiplying Control Lever

- a. As a preliminary setting, position the multiplying control lever stop front to rear so that its elongated hole is centered (Fig. 159). The adjustment provides an average leverage ratio for the multiplying lever. Subsequent adjustments may require that the front to rear position be changed slightly.
- b. Adjust the multiplying control lever vertically to just clear the bottom edge of the multiplying lever when it is moved from the single to the double index position. The adjustment should be made with the index cam latched. Keep the high point of the eccentric toward the front of the machine.
- c. Adjust the multiplying control lever stop front to rear so that two full teeth of motion is given the index pawl after it starts to drive the platen (Fig. 159).

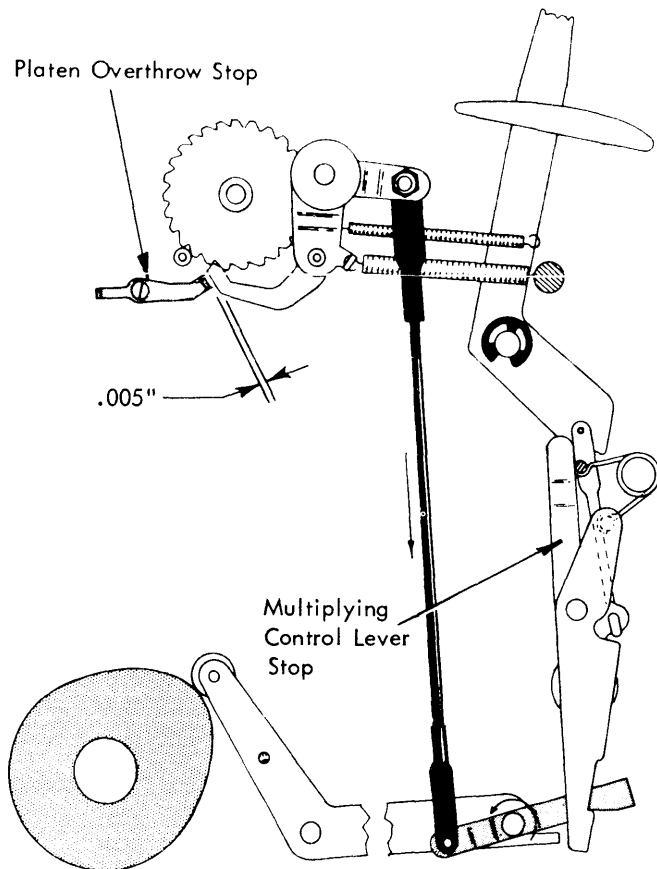


FIGURE 159. Index Travel Adjustment

CAUTION: Be sure that the indexing action is not choked off by the platen overthrow stop.

5. Platen Overthrow Stop - Adjust the stop forward or back so that .005" clearance exists between the stop and the pawl when the cam is on its high point (Fig. 159).
6. Index Selection Lever - Adjust the index selection lever link so that the lever lines up with the double mark on the case when the lever is in the double line space position.

TABULATOR SET AND CLEAR MECHANISM

1. Tab Rack Bellcrank - Adjust the bellcrank attached to the left end of the tab rack so that an unset tab stop is centered between the tab lever pawl and the tab set lug on the escapement bracket (Fig. 160). Latch the tab lever to the rear to check this adjustment.

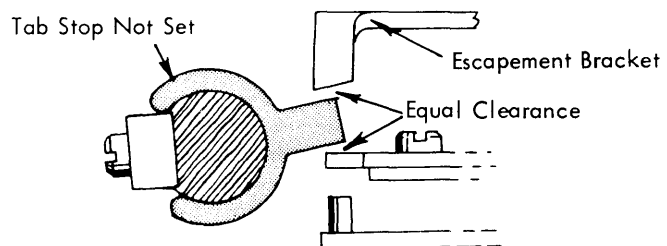


FIGURE 160. Tab Rack Bellcrank Adjustment

CAUTION: Be sure that the tab set and clear lever is fully seated on top of the two pivot pins on the left side of the powerframe.

2. Tab Set and Clear Link - Adjust the link so that the slope of the keybutton matches the slope of the ON/OFF switch keybutton with the switch in the OFF position.

NOTE: A link guide found on the 721 should be adjusted so that it will permit free operation without allowing the link to flex during a set or clear operation. The link guide must also be positioned in the slot of the selector latch bail shaft to maintain the proper lateral position of the shaft.

3. Set and Clear Arm Stops - Form the stop lugs on the set and clear lever bracket (Fig. 161) so that they limit the movement of the arm just as the tab stop fully reaches its set or cleared position. Also, form the extension on the rear stop lug so the tab set and clear arm cannot pivot sideways out of engagement with the tab rack bellcrank.

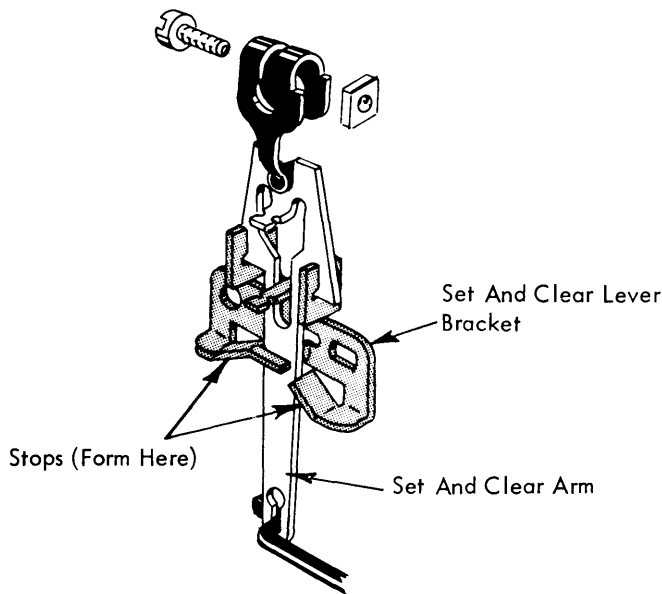


FIGURE 161. Set And Clear Arm Stops

NOTE: On the early style tab set and clear mechanism the stop lugs were anchored and adjusted by two screws on the outside of the powerframe.

4. Tab Rack Brake - Adjust the tab rack brake so that the tab rack will not flip past the rest position when released from either a set or clear position. The tab rack must return fully to the rest position when the keybutton is released slowly. The brake is located just inside the powerframe at the left end of the tab rack.

TABULATOR MECHANISM

1. Tab Lever Stop - Form the stop on the escapement bracket (Fig. 162) to obtain .001" to .003" clearance between the vertical lug on the tab lever and the backspace pawl when the tab lever is at rest and the backspace pawl is fully seated in its rack.

This small clearance insures that the backspace pawl will be allowed to bottom in its rack and that a minimum amount of tab lever motion will be required to remove both the backspace and escapement pawls from their racks during a tabulation operation.

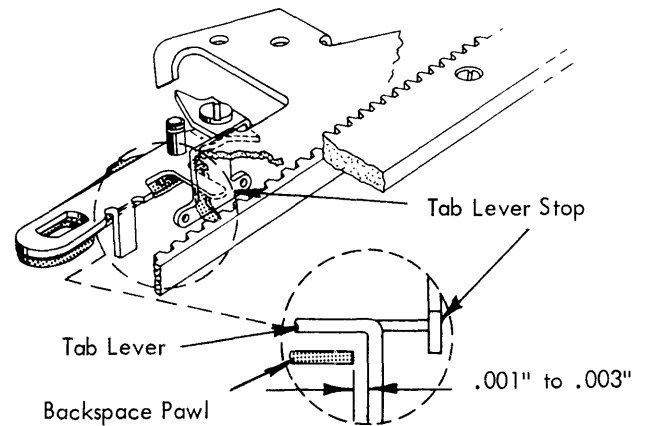


FIGURE 162. Tab Lever Stop

2. Tab Lever Pawl - Adjust the pawl forward or back on the tab lever so that the tip of the pawl clears a SET tab stop by .035" to .045" with the tab lever at rest (Fig. 163).

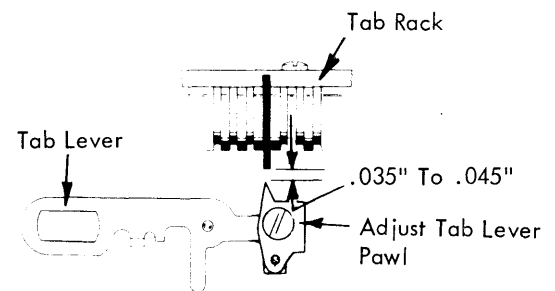


FIGURE 163. Tab Lever Pawl

The adjustment of the tab lever pawl has an effect on the amount of overlap between the tab stop and the pawl tip in the active position. It also directly affects the pawl clearance during tabulation. Unless the tab lever pawl is properly adjusted, correct pawl clearance cannot be obtained.

The adjustment of the tab lever pawl can be measured by using the push-end of the large spring hook. The push-end is approximately .035" thick.

3. Pawl Clearance - The upright lug of the tab latch should be formed forward or back so that the tip of the escapement pawl clears the escapement rack teeth by .005" to .010" when the tab lever is latched to the rear.

The adjustment insures that the escapement pawl will re-enter the rack quickly to minimize the chances of entering the wrong rack tooth. If excessive clearance is present, it is also possible that the tab keylever and associated parts might not have enough throw to positively latch the tab lever each time.

The upright lug of the tab latch may be formed with the 3" screwdriver by using it as a lever through the hole in the escapement bracket (Fig. 164). If excessive forming is required, recheck and refine the adjustment of the tab lever pawl.

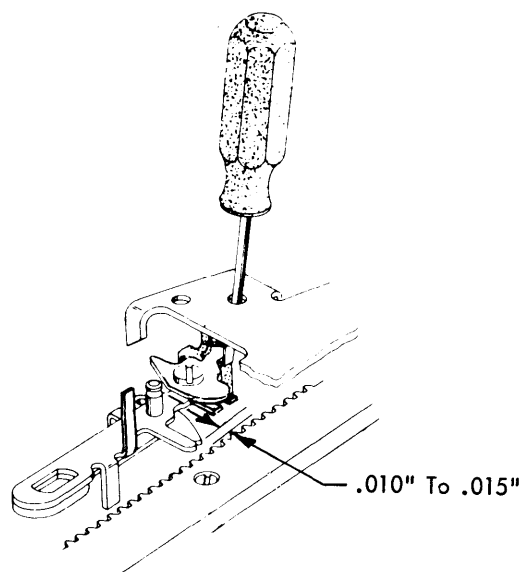


FIGURE 164. Pawl Clearance Adjustment

4. Tab Lever Linkage

- a. For the best leverage, the tab keylever link should be adjusted for a rest position clearance of $1/8$ " to $5/32$ " between the powerframe and the long arm of the tab bellcrank (Fig. 165).
- b. For minimum lost motion adjust the tab bellcrank so that a rest position clearance of $.001$ " to $.006$ " exists between the tab torque bar and the lug of the tab lever trigger (Fig. 165).

NOTE: After completing the adjustments, be sure that the tab lever will latch easily at any position of the carrier. If the tab lever does not latch before the keylever has been completely depressed, a refinement of all previous adjustments is necessary to reduce lost motion in the system.

CAUTION: Be sure that the tab lever overthrow stop does not interfere with the latching of the tab lever. It should be loosened and moved to the rear if necessary.

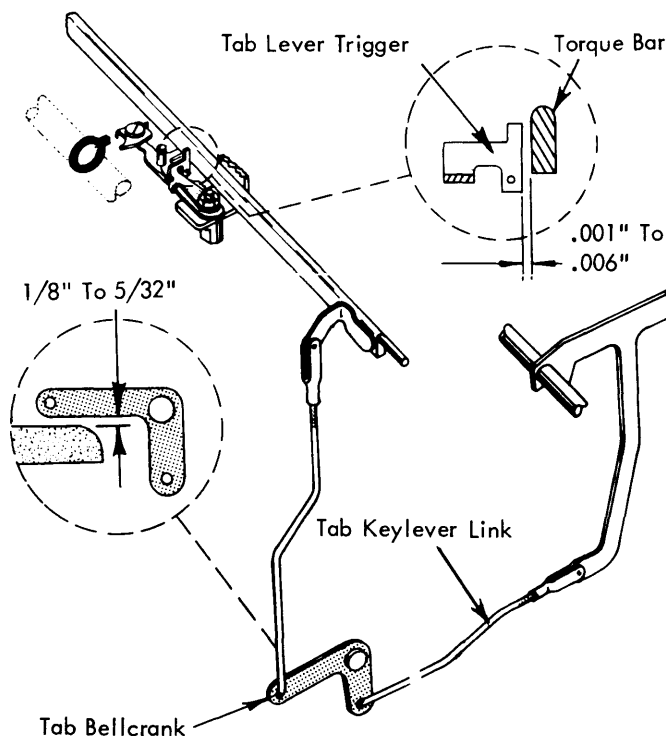


FIGURE 165. Tab Linkage Adjustment

5. Tab Lever Overthrow Stop - Adjust the stop forward or back so that $.005$ " to $.015$ " clearance exists between the lug of the tab lever trigger and the overthrow stop when the tab lever is latched to the rear (Fig. 166).

Adjustment of the overthrow stop prevents a hard depression of the keylever from throwing the tab lever to the rear into the unset tab stops.

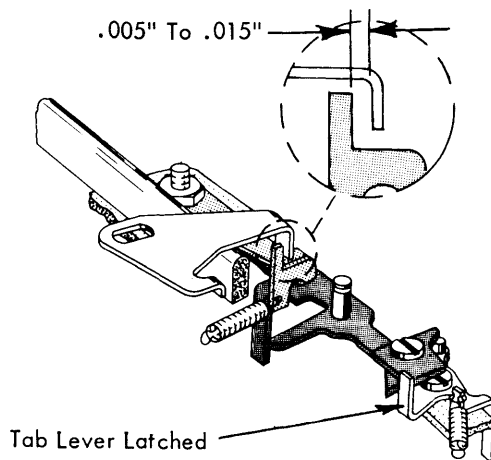


FIGURE 166. Tab Lever Overthrow Adjustment

6. Tab Rack - Set a tab stop and backspace one time. Slowly depress the tab keylever while holding the carrier to prevent it from moving to the right. A clearance of $.005$ " to $.020$ " should exist between the tip of the tab lever pawl and the tab stop as the tips are in line with each other (Fig. 167). Adjust the tab rack bushing at the right end of the tab rack to obtain this condition. The locking plate, which holds the bushing in position, must be loosened before the adjustment can be made.

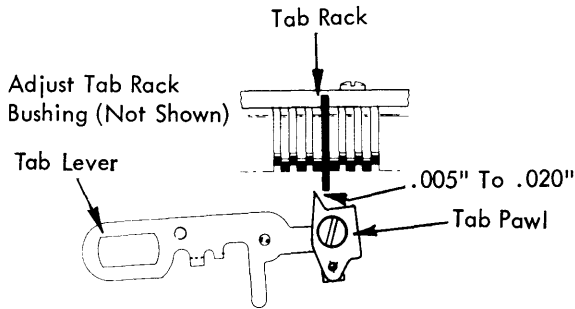


FIGURE 167. Tab Rack Adjustment

The tab rack adjustment sets up a condition whereby the escapement pawl will be released into the escapement rack at the right time to safely engage the correct tooth. If the tab rack were too far to the left, the tab lever would contact the set tab stop sooner and release the escapement pawl into the rack earlier than it should. The pawl could enter the wrong escapement rack tooth and stop the carrier one space to the left of the desired stopping point. The carrier could stop one space too far to the right if the tab rack were adjusted too far to the right.

NOTE: The head of the tab rack bushing should clear the tab rack plate by about 3/32" when the adjustment has been completed. This approximate clearance insures that the tab rack is not adjusted one full space too far to the left or right.

7. Tab Interlock - With the carrier return clutch latched, the escapement torque bar should rotate the tab latch away from the tab lever pawl by .005" to .025" (Fig. 168). Form the lug on the tab latch that extends down behind the escapement torque bar.

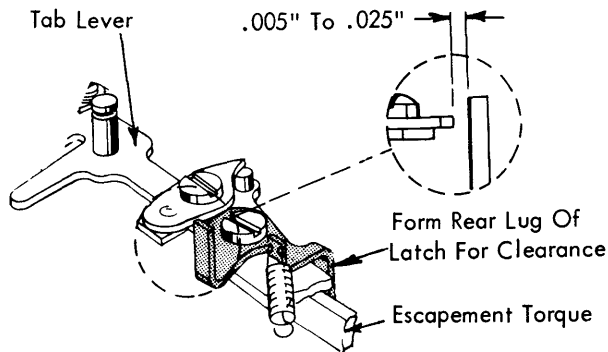


FIGURE 168. Tab Interlock Adjustment

The lug on the tab latch may be formed by using the push end of the large spring hook as a T-bender.

The adjustment insures that the carrier return and tab cannot both be latched simultaneously. If both were allowed to latch, the tab lever pawl would lock against a set tab stop during the carrier return operation.

8. Carrier Return/Tab Interlock - Form the bottom lug of the interlock (Fig. 169) to obtain the following conditions:

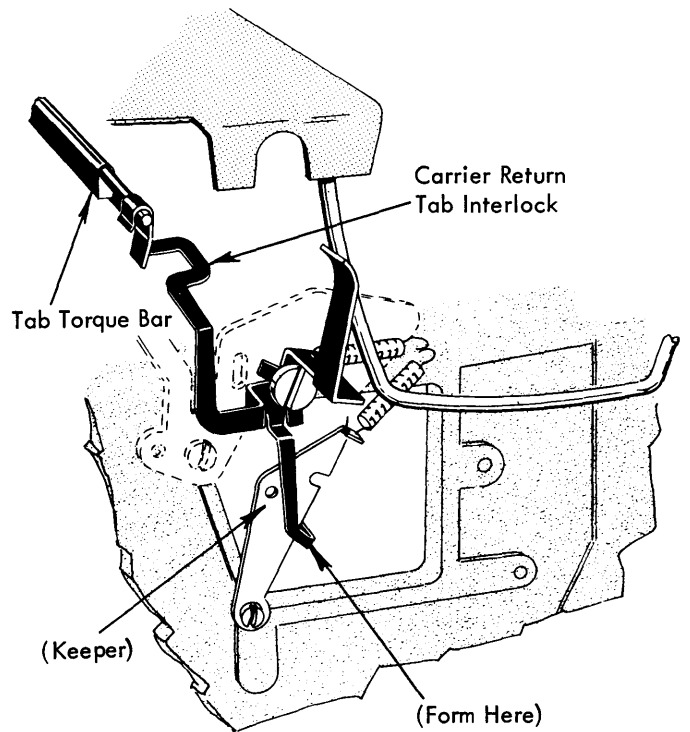


FIGURE 169. Carriage Return/Tab Interlock

- a. With the carrier return mechanism latched, the interlock should actuate the carrier return latch keeper forward just far enough to release the latch when the tab keylever is fully depressed.
- b. With the carrier return mechanism at rest, full depression of the tab keylever should not cause the carrier return latch keeper to move away from the latch.

MARGIN RELEASE MECHANISM

1. Margin Rack Overbank Guide - With the carrier resting at the left hand margin, adjust the overbank guide (Fig. 170) left or right on the margin rack to obtain .001" to .005" clearance between the margin stop and the margin stop latch on the carrier when the margin rack is in its rest position (Fig. 170). When observing this clearance remove the floating action of the margin stop latch by pulling the stop latch to the right with a spring hook.

The adjustment insures that the left margin stop will set accurately when the stop is slid to the right against the margin stop latch on the carrier.

NOTE: Machines equipped with an old style margin rack use an eccentric plate mounted on the right end of the margin rack to control the rest position of the rack. Use the same procedure indicated above to obtain the .001" to .005" clearance between the margin stop and the stop latch on the carrier.

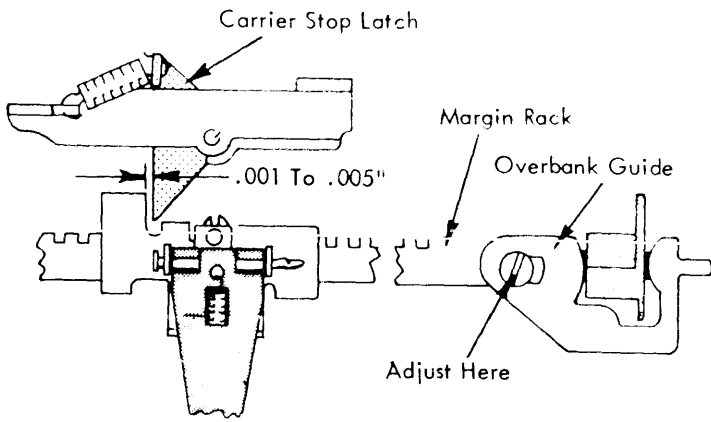


FIGURE 170. Margin Rack Overbank Guide

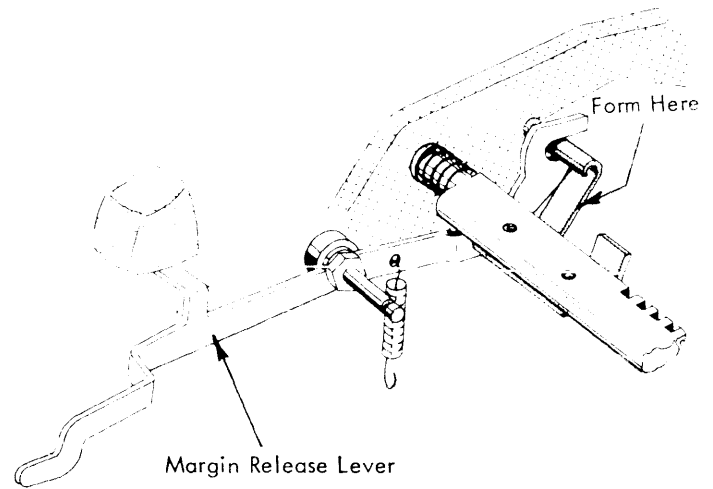


FIGURE 172. Margin Release Mechanism (721 New Style)

2. Margin Release - (721 only)

- a. Old Style - With the margin release keylever at rest, loosen the Bristol screw in the margin release lever and rotate the margin rack (within the release lever) to a level position (Fig. 171). Then tighten the Bristol screw.

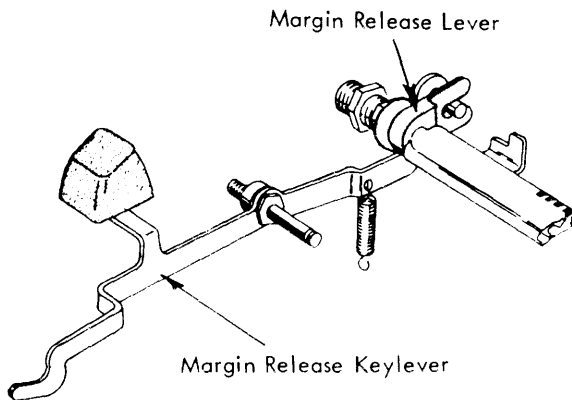


FIGURE 171. Margin Release Mechanism (721 Old Style)

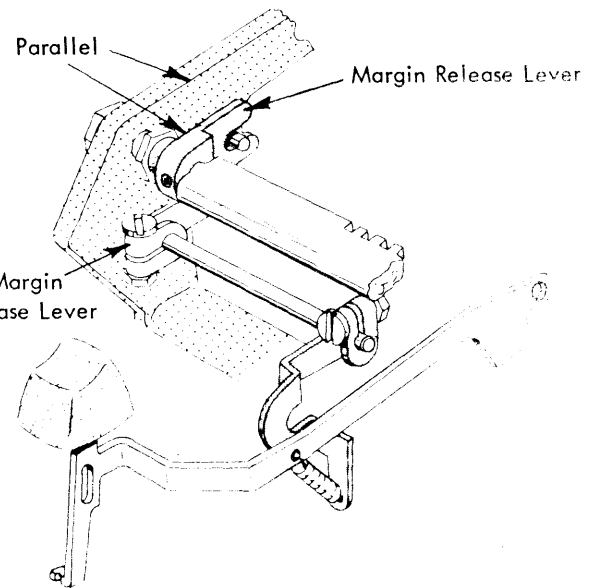


FIGURE 173. Margin Release Mechanism (723 & 725 Old Style)

2. With the margin release keylever at rest, loosen the Bristol screw in the margin release lever and rotate the margin rack (within the release lever) to a level position (Fig. 173). Then tighten the Bristol screw.

3. Margin Release - (723 and 725)

a. Old Style

1. With the margin release keylever at rest, loosen the left hand margin release lever and adjust it radially about its shaft so that the top surface of the margin release lever (Fig. 173) is parallel with the slope of the sideframe. The lever should also be positioned laterally on its shaft so that it operates freely without restricting the margin rack motion when the rack is pushed to the left into its overbank position.

b. New Style - Position the left hand margin release lever:

1. Laterally so that 1/32" of the top surface of the margin set lever stop protrudes beyond the left face of the left hand margin release lever (Fig. 174).
2. Radially so that the margin rack will be horizontal when the margin release keylever is in its rest position. (This adjustment can be obtained by adjusting either the left or right margin release lever.)

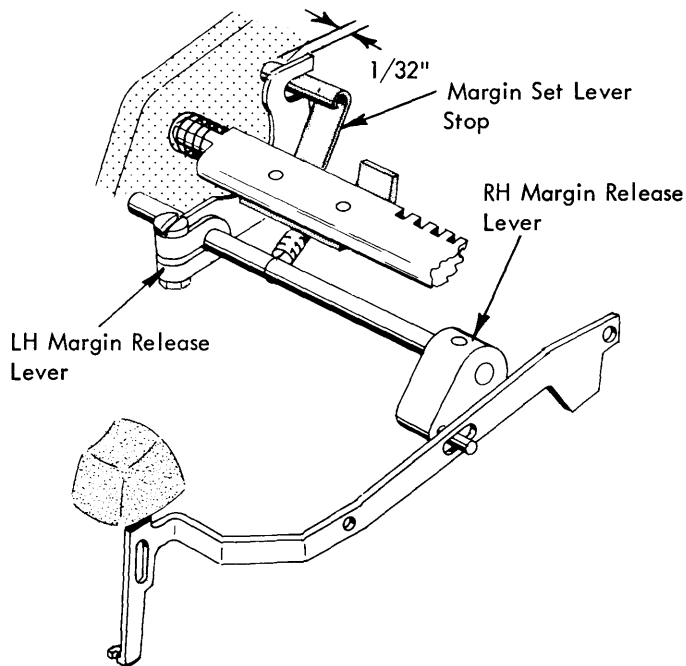


FIGURE 174. Margin Release Mechanism (723 & 725 New Style)

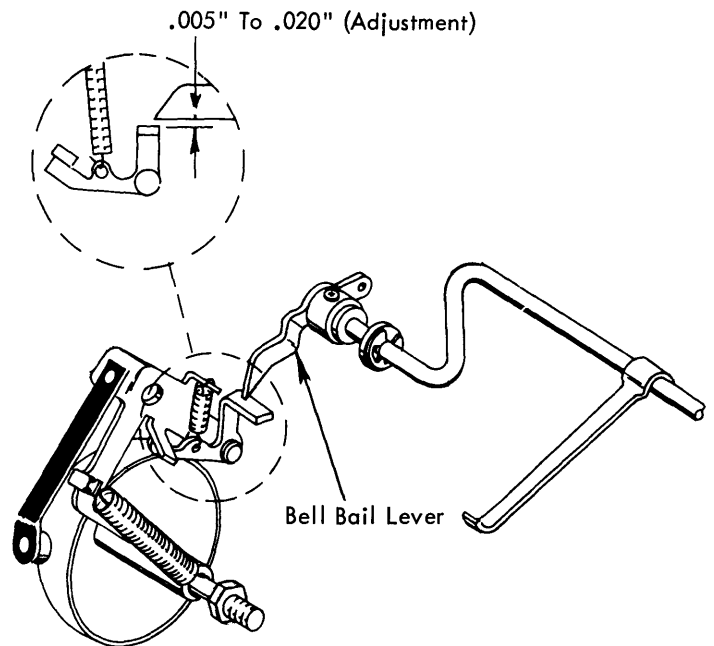


FIGURE 175. Bell Bail Lever (Old Style)

4. Margin Stop Final Stop

- a. Old Style - Form the lug on the final stop (which is welded to the bottom side of the margin rack) to obtain a clearance of .001" to .010" between the final stop and the margin stop with the margin stop pin fully seated in the extreme left tooth of the margin rack.
- b. New Style - Position the margin set lever stop left or right on the margin rack so that it will clear the margin stop by .001" to .010" when the margin stop pin is fully seated in the extreme left hand tooth of the margin rack.

The adjustment insures that the margin stop pin will always seat itself in the tooth of the rack when the margin stop is pushed to the left against the final stop.

5. Bellringer Bail Lever

- a. Old Style - With the carrier positioned away from the right hand margin stop, adjust the bell bail lever located on the left end of the bellringer bail to have .005" to .020" clearance with the bell clapper bellcrank lever when the bail is at rest against the bellringer bellcrank (Fig. 175).
- b. New Style - With the carrier positioned away from the right hand margin stop, adjust the bell bail lever located on the left end of the bellringer bail so that when the bottom portion of the lever is allowed to contact the underside of the bell clapper bellcrank lever a clearance of .005" to .020" will exist between the bellringer bail and the bellringer bellcrank (Fig. 176).

6. Line Lock Bracket - Adjust the line lock bracket up or down so that the bellringer bellcrank will ride on the front of the camming surface of the bracket 1/16" from the top as the carrier moves into the line lock position.

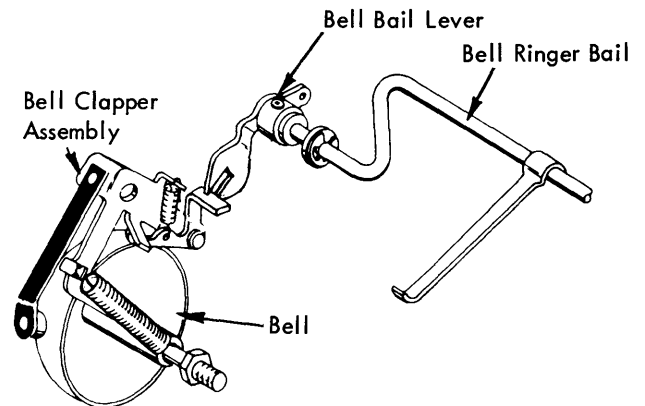


FIGURE 176. Bell Bail Lever (New Style)

The adjustment insures that the bellringer bellcrank will remain in contact with the camming surface of the line lock bracket throughout the line lock operation. It also insures that the bellringer bellcrank will ride back over the line lock bracket if the carrier is returned from a position to the right of the right hand margin.

7. Bell Clapper Bellcrank Lever - The bell should ring one space before the bellringer bellcrank moves onto the front surface of the line lock bracket.

The adjustment is obtained by forming the lug on the bell clapper bellcrank that acts as a stop for the bell clapper bellcrank lever (Fig. 177). The forming adjustment changes the amount of bite between the bail lever and the bell clapper bellcrank lever.

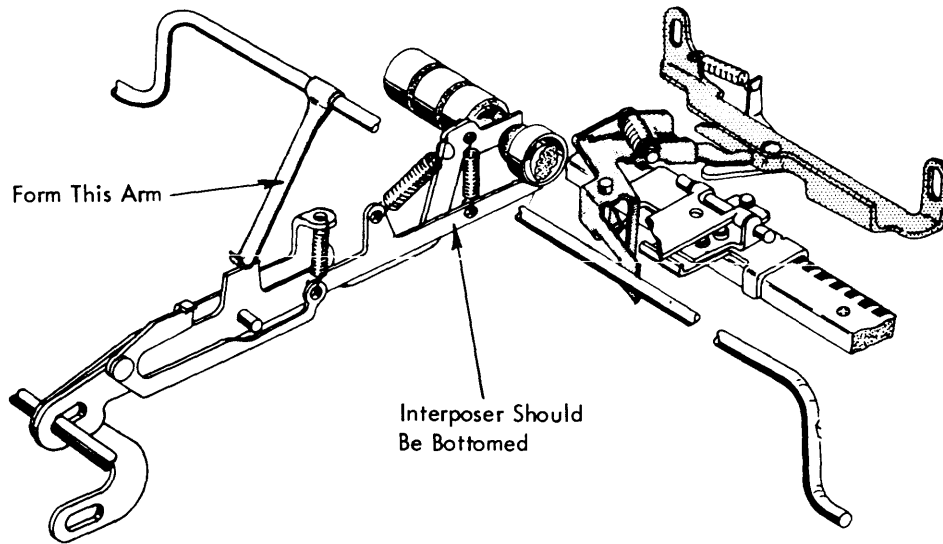


FIGURE 178. Line Lock Adjustment

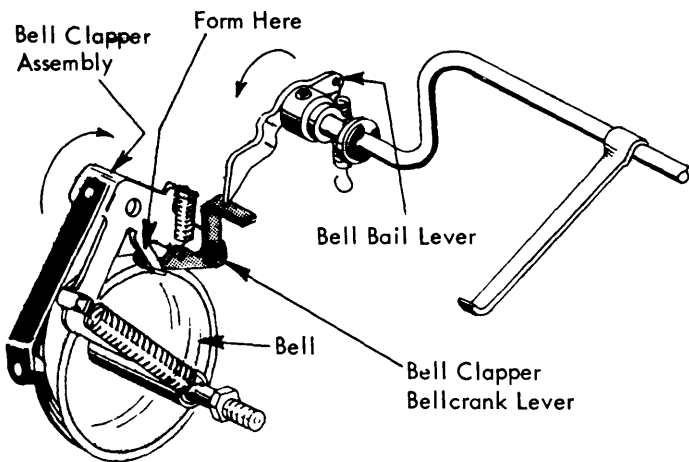


FIGURE 177. Bell Clapper Bellcrank Lever

8. Line Lock - Form the line lock actuating arm on the bell-ringer bail so that the line lock interposer is fully depressed when the carrier pointer is in line with the mark on the right hand margin stop (Fig. 178).

CAUTION: The line lock should not be felt in the space preceding the desired locking point. The line lock actuating arm should not be choked off so as to bind the carrier as the spacebar is operated through the line lock.

PAPER FEED MECHANISM

1. Before any paper feed adjustments are attempted, the position of the platen **MUST** be correct.
2. Paper Feed Braces - (old style paper feed mechanism only) With the feed roll tension springs disconnected the adjustable braces fastened to the paper feed mounting arms should be adjusted all the way forward without deflecting either the feed roll actuating shaft or the carriage tie rod (Fig. 179).

3. Paper Feed Supports

- a. Old Style Paper Feed Mechanism - With the feed roll tension springs disconnected, the vertical supports for the carriage tie rod and the feed roll actuating shaft should be adjusted to just touch the bottom of each shaft (Fig. 179). The feed roll actuating shaft support should be loose when the tie rod support is adjusted.

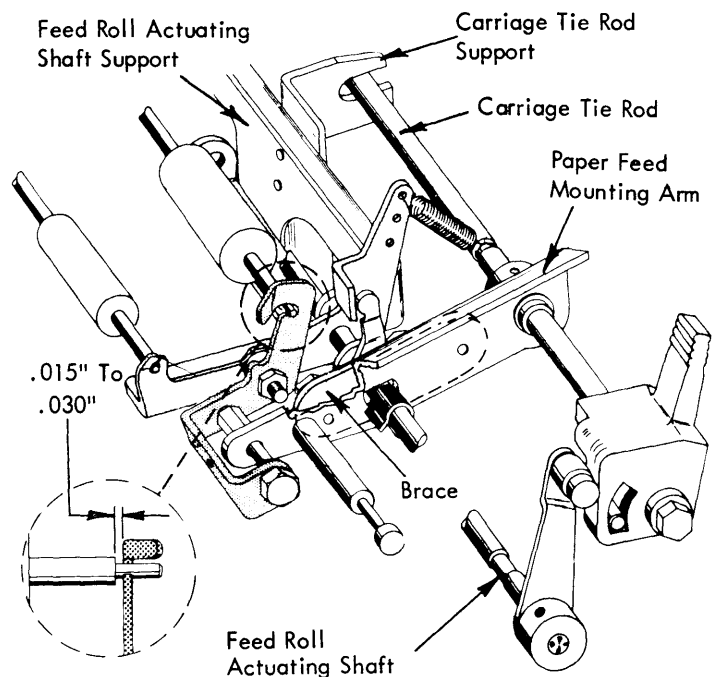


FIGURE 179. Paper Feed Mechanism

- b. New Style Paper Feed Mechanism - With the feed roll tension springs disconnected, the center support bracket (Fig. 180) should be positioned so that the forward lug just touches the underside of the feed roll shaft while the rear lug just touches the top of the carriage tie rod. The center support bracket should not bow the copy control shaft.

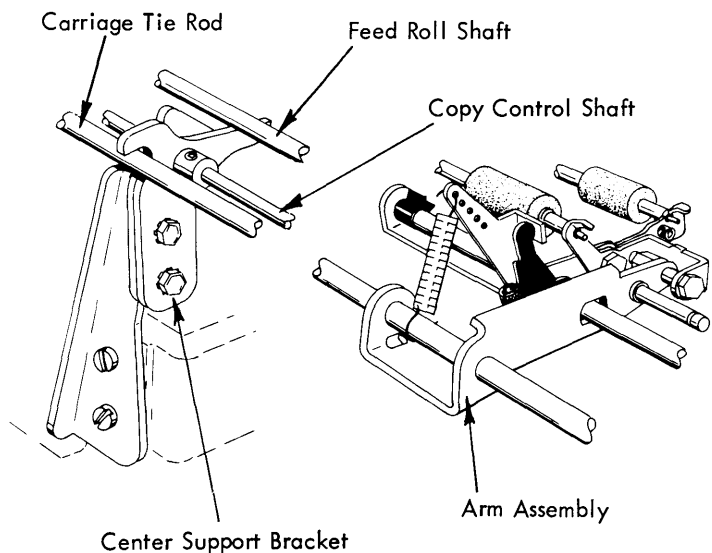


FIGURE 180. Center Support Bracket

4. Feed Roll Tension - Place the feed roll tension springs in the hole of the front feed roll arms that will provide the following tension measured at the front feed roll pivot points.

721 - 2-3/4 to 3-1/4 pounds
723 and 725 - 2 to 2-1/2 pounds

5. Feed Roll Side Play

- a. Old Style - The right hand paper feed mounting arm on the 721 and the left and right hand paper feed mounting arms on the 723 and 725 should be adjusted to provide the rear feed roll shafts with an end play of .015" to .030" when the feed rolls are against the platen (Fig. 179).
- b. New Style - The right hand front feed roll arm assembly on the 721 and the left and right hand front feed roll arm assemblies on the 723 and 725 should be adjusted to give end play to the feed roll shafts that will not permit them to contact the sides of the openings in the deflector but will permit them to roll freely (Fig. 180).

6. Feed Roll Adjustment

- a. Old Style - Adjust the eccentrics with the high points to the rear so that three tab cards inserted between the platen and the rear feed rolls will cause a clearance of .008" to .012" between the front feed rolls and the platen (Fig. 181). The clearance should be equal on both ends of the feed roll.

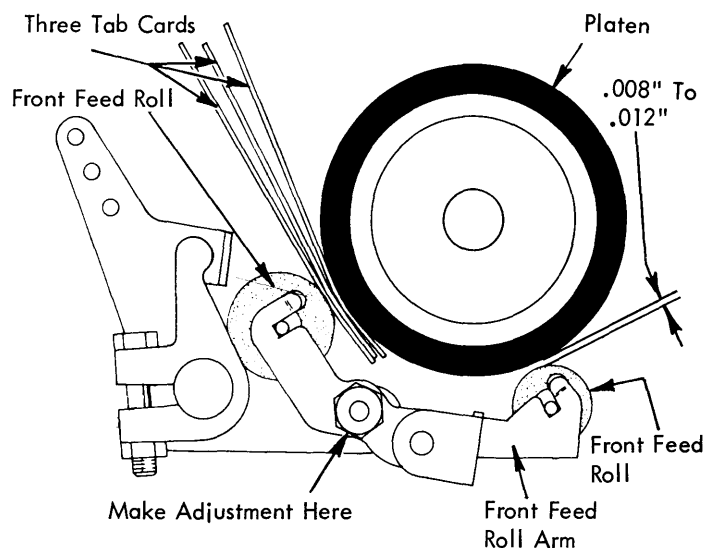


FIGURE 181. Feed Roll Adjusting Eccentrics (Old Style)

- b. New Style - The front feed roll adjusting arms should be adjusted as follows: When two tab cards are placed between the front feed rolls and the platen, the rear feed rolls should clear the platen (Fig. 182). When one tab card is placed between the front feed rolls and the platen, the rear feed rolls should touch the platen.

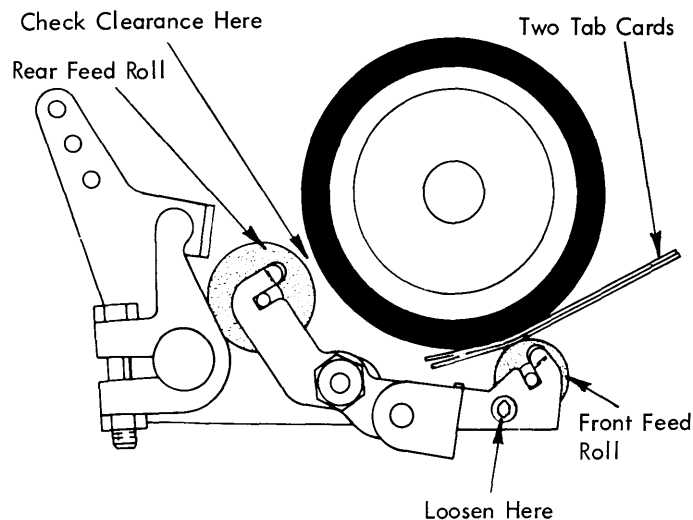
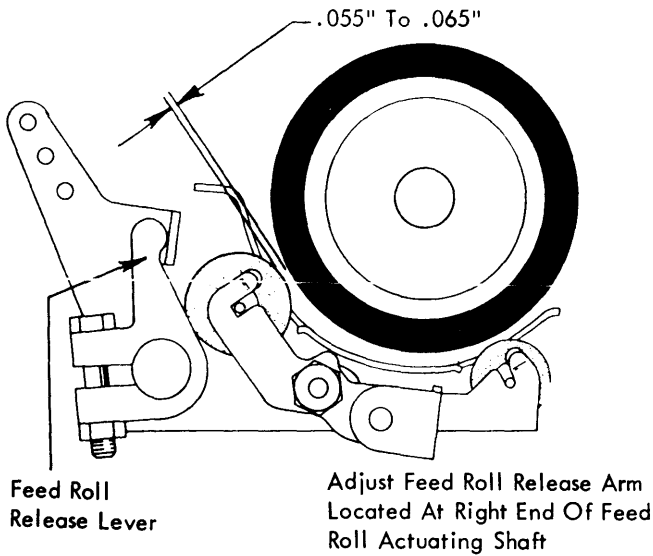


FIGURE 182. Feed Roll Adjusting Arm (New Style)

7. Paper Release - Adjust the feed roll release arm (Fig. 183) to obtain a release clearance of .055" to .065" between the rear feed roll and the platen.

Excessive clearance can cause interference between the front feed roll and the carrier; whereas insufficient clearance will not permit straightening of thick paper packs.

NOTE: The clearance should be the same at each end of the feed roll. The clearance can be equalized by adjusting either the left or right feed roll release lever (Fig. 183).



Feed Roll
Release Lever

Adjust Feed Roll Release Arm
Located At Right End Of Feed
Roll Actuating Shaft

FIGURE 183. Paper Release Adjustment

8. **Deflector** - Position the deflector by forming the deflector supporting tabs on the front and rear feed roll arms so that a clearance of .010" to .020" exist between the front and rear of the deflector and the platen (Fig. 184). Three tab cards inserted between the platen and the deflector (at the front and rear) should provide a slight drag. No drag should be felt when one tab card is inserted.

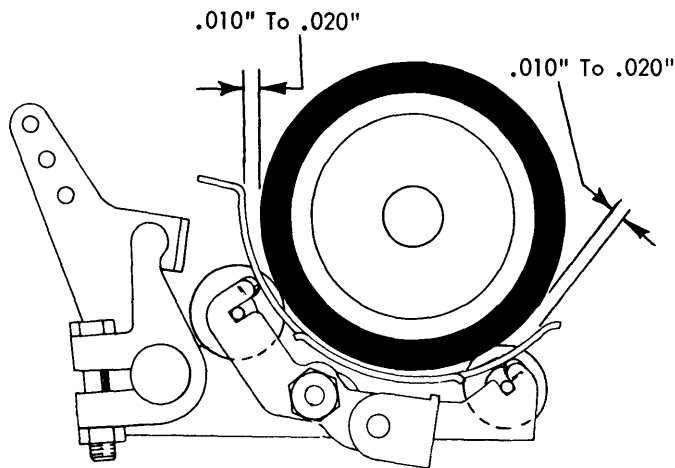


FIGURE 184. Deflector Adjustment

9. **Paper Bail**

- a. **Bail Shaft** - The shaft should be positioned in the right hand bail arm so that each arm can be pulled forward the same distance from the platen before the entire bail begins to move.

The adjustment insures that both bail rollers will have equal pressure against the platen.

CAUTION: Be sure that neither bail arm is deflected left or right after the bail shaft is tightened.

- b. **Bail Stop** - The lugs that stop the rearward movement of the paper bail arms should be formed to obtain a .005" to .010" clearance between the lugs and the bail arms when the copy control lever is at its extreme rear position.

The adjustment prevents interference between the bail arms and the line gage card holder when the platen is removed.

10. **Line Gage Card Holder**

- a. Adjust the line gage card holder forward or back for a .005" to .010" clearance with the platen.
- b. The vertical adjustment should be such that the graduated edge is parallel to and .002" to .005" below the feet of the typed characters when viewed from the operator's position.
- c. Adjust the card holder left or right so that the point of a letter "V" will align with the mark in the middle of the line gage card holder.

FABRIC RIBBON MECHANISM

1. **Centering Springs** - With the ribbon reverse interposer centered, form the lugs of the ribbon feed plate for .003" to .005" clearance in the centering spring loops (Fig. 185).

The adjustment insures that the springs are not extended when at rest and that they will properly restore the mechanism after a reverse operation.

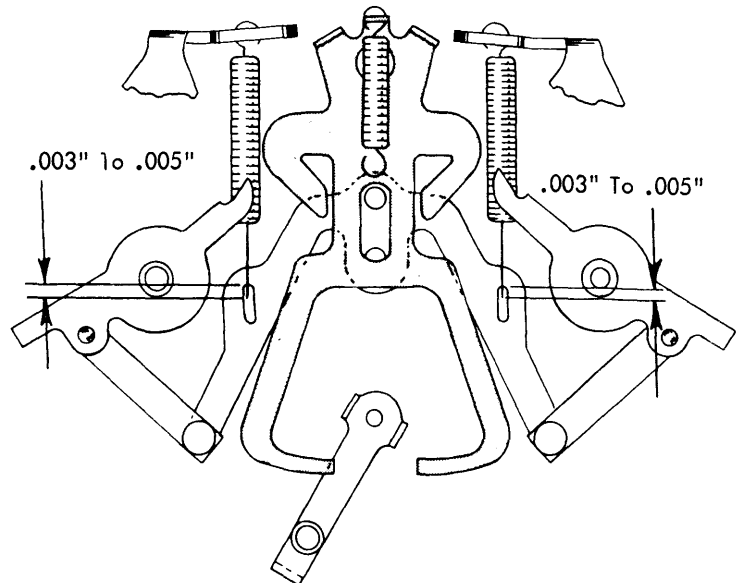


FIGURE 185. Centering Springs Adjustment

2. Ratchet Brake Spring - Form the left and right ratchet brake springs so that each will hold its ratchet in position after the ratchet has been manually rotated far enough to fully actuate the reverse mechanism.

The ratchets should be checked alternately with the cartridge removed. The check as described is merely a method of testing for the correct braking action of the springs and has little to do with the reversing action.

3. Ribbon Feed Plate - With the ribbon mechanism set for a reversing operation and the ribbon cam at its high point, adjust the ribbon feed plate forward or back so that the ribbon feed pawl holds the reverse interposer within .005" to .010" of its total travel (Fig. 186).

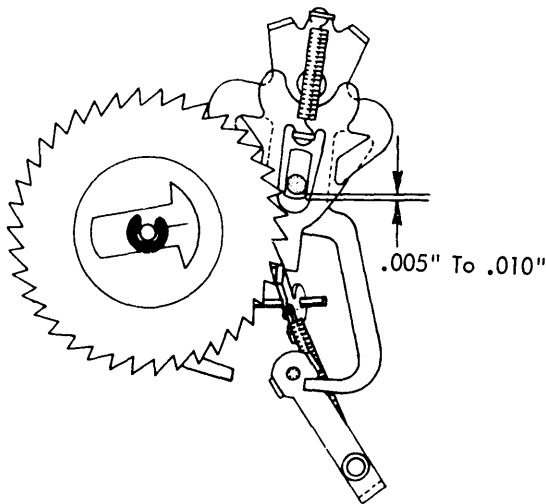


FIGURE 186. Ribbon Feed Plate Adjustment

The adjustment not only insures sufficient throw for a reversing operation, but also gives optimum ribbon feed results by determining the rest and active positions for the pawl.

CAUTION: After completing the adjustment, manually cycle a character to check that two teeth feed is obtained plus .005" to .020" overthrow.

Be sure that the feed pawl does not contact the interposer lever as the pawl is manually reversed from side to side.

4. Cartridge Guides - Form the ribbon feed plate lug that guides the cartridge into position so that the ribbon spools are centered in the holes of the cartridge and there is .005" to .010" lateral movement of the cartridge.
5. Ribbon Lift Guide Plate - Adjust the plate as low as possible without causing a change in the ribbon lift guide height as the ribbon lift lever is moved from the low lift to the high lift position (Fig. 187). The ribbon lift cam should be at the low point when the check is made.

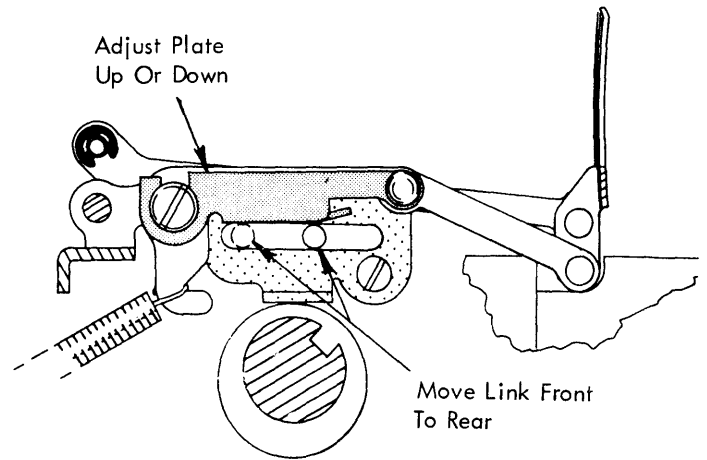


FIGURE 187. Ribbon Lift Guide Plate Adjustment

The adjustment insures the same relative throw for both the high and low lift positions.

6. Ribbon Lift Control Link - Adjust the link forward or back by means of the clevis so that the underscore will strike the ribbon 1/16" from the bottom edge. The ribbon lift lever must be in the high lift position when the check is made.

CAUTION: Do not adjust the link so short that it chokes-off in the front end of the cam follower slot as the ribbon lift lever is moved into the high lift position.

7. Ribbon Lift Lock - Adjust the ribbon lift lock so that it will positively hold the ribbon lift guide in the load position. The lock is located under the right front corner of the carrier.

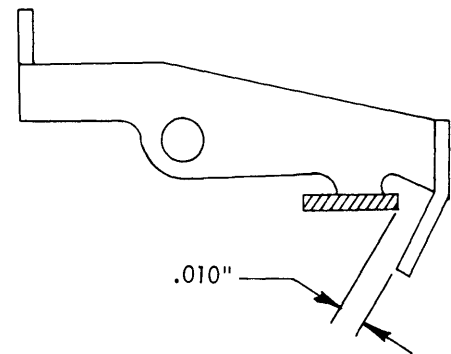


FIGURE 188. Stencil Locking

8. Stencil Lockout (Fig. 188) - With the lift lever in stencil position and the cam follower on the high point of the ribbon feed cam, form the ribbon feed latch for .010" clearance with the lug on the cam follower.

RIBBON FEED

1. Ribbon Feed Plate - Position the feed plate left or right under its mounting screws to allow the feed pawl to operate front to rear in the guide slot of the feed plate without binding (Fig. 189).

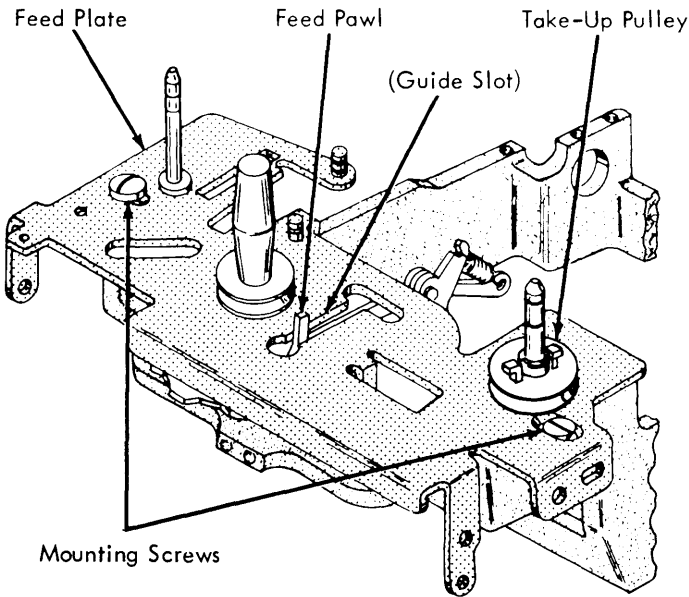


FIGURE 189. Ribbon Feed Plate

CAUTION: Before loosening the right hand mounting screw remove the drive spring from the take-up pulley so that you will not damage the drive spring with your screwdriver.

NOTE: If additional adjustment is necessary to prevent the pawl from binding in the slot of the feed plate, the feed cam follower mounting bracket may be adjusted left or right under its mounting screws (Fig. 190). If it is ever necessary to adjust this bracket be sure to maintain .001" to .004" vertical clearance between the bottom of the bracket and the carrier support. See Figure 80 in the adjustments of the print mechanism.

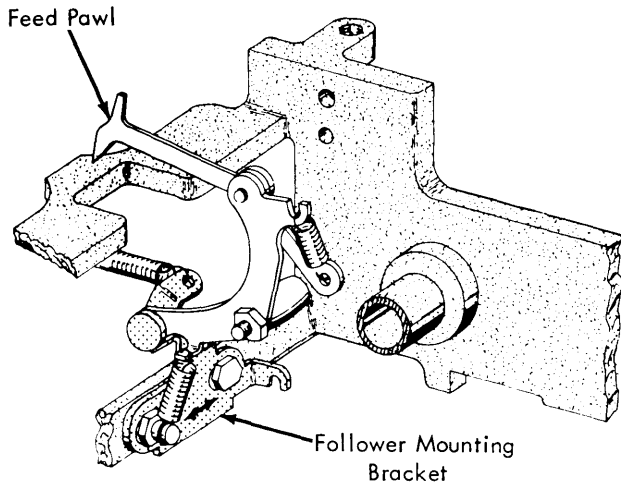


FIGURE 190. Feed Cam Follower Mtg. Brkt.

A bind between the feed pawl and the guide slot in the feed plate will cause intermittent ribbon feed failures. The bind prevents the feed pawl from dropping into the next feed window as it is operated to the rear during a feed operation.

CAUTION: After changing the position of the feed plate check the lift control lever to make sure that it does not strike the vertical lug on the left hand corner of the feed plate (when the control lever is in its highest lift position).

2. Feed Cam Follower Eccentric - Adjust the follower eccentric so that the feed pawl will rotate the feed and lift wheel 1/16 of a turn for each ribbon feed operation (Fig. 191).

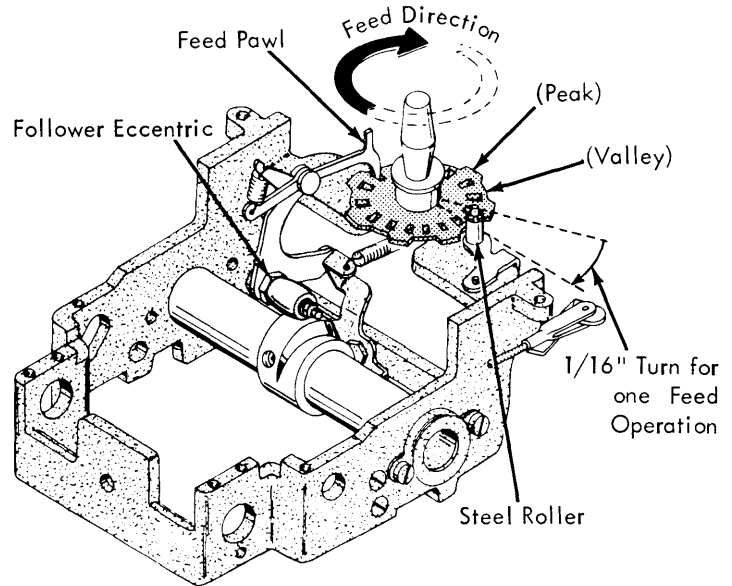


FIGURE 191. Feed Cam Follower Eccentric

This adjustment may be checked in the following manner: With the machine at rest manually position the feed and lift wheel so that the steel roller on the lift control lever rests approximately in the center of a valley (high lift lobe) on the feed and lift wheel (Fig. 191). Now, perform a ribbon feed operation by hand-cycling any character through its complete cycle. Make certain that the cycle shaft returns to its latched position. If the follower eccentric is properly adjusted the feed pawl should rotate the feed and lift wheel 1/16 of a turn causing the steel roller on the lift control lever to come to rest in the center of a peak (low lift lobe) on the feed and lift wheel (Fig. 191).

NOTE: Be sure to keep the high point of the eccentric up and toward the front when making this adjustment.

Improper adjustment of the follower eccentric will generally cause either under or over feeding of the ribbon plus variations in the ribbon lift pattern. The ribbon lift operation will only be affected if the feed and lift wheel fails to rotate the proper amount causing the steel roller on the lift control lever to fail to reach or remain on the proper cam lobe of the wheel. This type of failure usually occurs during a low lift operation where the steel roller must come to rest on a peak (low lift lobe) of the feed and lift wheel.

3. Detent Spring - Adjust the feed and lift wheel detent spring in its slot so that during a ribbon feed operation the detent spring will drop into the next feed window .008" to .012" before the feed and lift wheel completes its travel (Fig. 192).

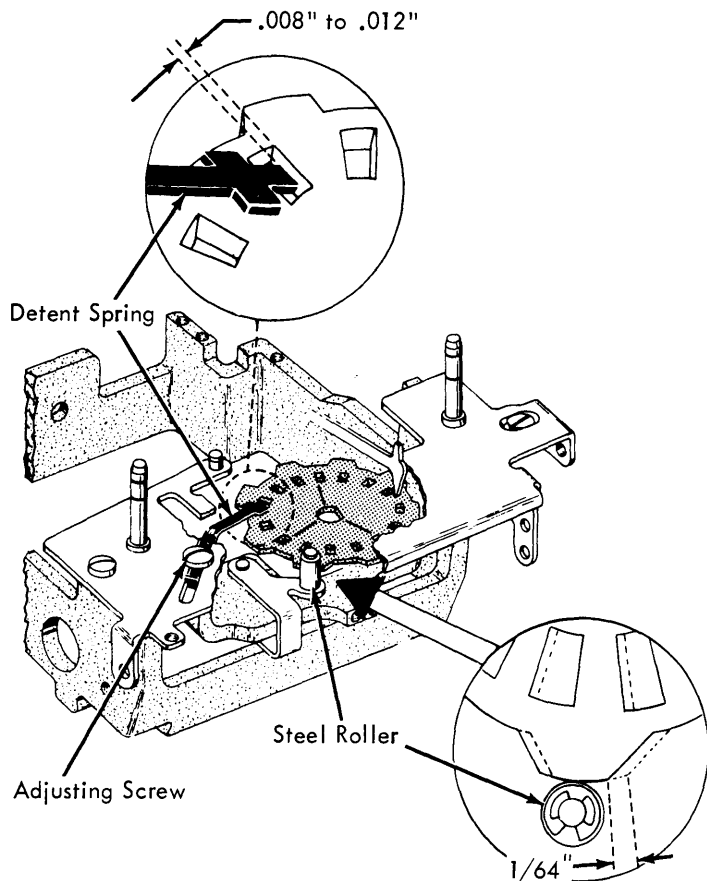


FIGURE 192. Feed & Lift Wheel Detent Spring

NOTE: Observing the .008" to .012" clearance at the detent spring is extremely difficult. Therefore, the clearance may be easily gauged by observing the amount of backlash that the detent spring allows the feed and lift wheel when the wheel is manually rotated backwards from its rest position. This backlash can be observed by using the following procedure: Perform several ribbon operations under power. Allow the machine to come to rest with the steel roller on the lift control lever resting against any peak (low lift lobe) of the feed and lift wheel. Then, slowly hand-cycle the machine (using any character) until the feed pawl is operated far enough toward the rear to be fully disengaged from its feed window in the feed and lift wheel. Now, gauge the backlash by manually rotating the feed and lift wheel counter-clockwise while observing the movement of the wheel at the steel roller. This movement should be approximately 1/64" if the detent spring is adjusted correctly.

A detent spring that is improperly adjusted may cause intermittent ribbon feed and lift failures. This will only occur if the spring fails to detent and hold the feed and lift wheel in position at the completion of each ribbon feed operation. If there is either insufficient or excessive backlash of the feed and lift wheel the wheel will tend to rotate backwards with the feed pawl when the

pawl begins to cam itself out of the feed window as it is operated toward the rear during the early portion of a print cycle. This backward rotation of the wheel (if excessive) may prevent the feed pawl from dropping into the next feed window as the pawl reaches its rearmost position. Thus, the wheel will receive no rotation from the feed pawl when the pawl is powered forward causing a feed and lift failure to result.

SERVICE HINT: A good method for checking both the cam follower eccentric and detent spring adjustments is to hold the take-up pulley as shown in Figure 193 while operating a repeat underscore. A feed failure can be easily recognized while observing the rapid rotation of the feed and lift wheel. A definite pause in the wheel rotation can be seen when a feed failure occurs.

CAUTION: When operating a repeat underscore while holding the carrier stationary be sure to remove the type-head first to prevent damaging the platen.

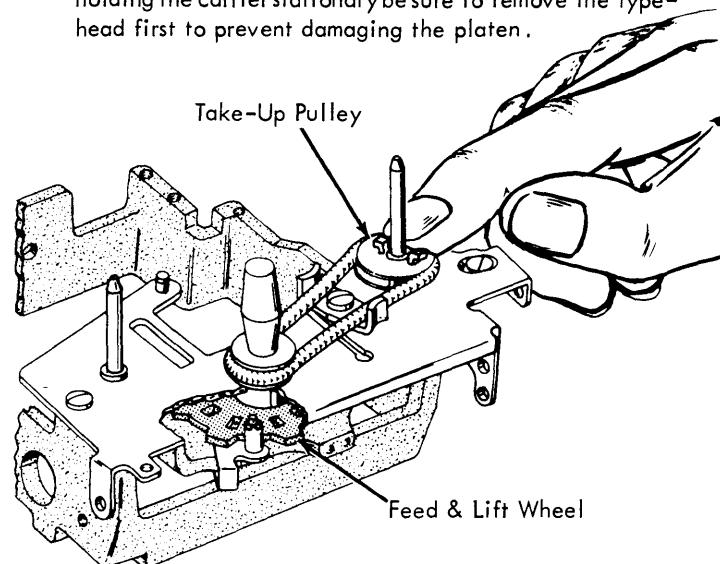


FIGURE 193. Ribbon Feed Check

4. Brake Actuating Lever - Form the lug on the brake actuating lever so that the supply spool brake is allowed to just bottom in the ratchet teeth of the supply spool when the machine is at rest (Fig. 194).

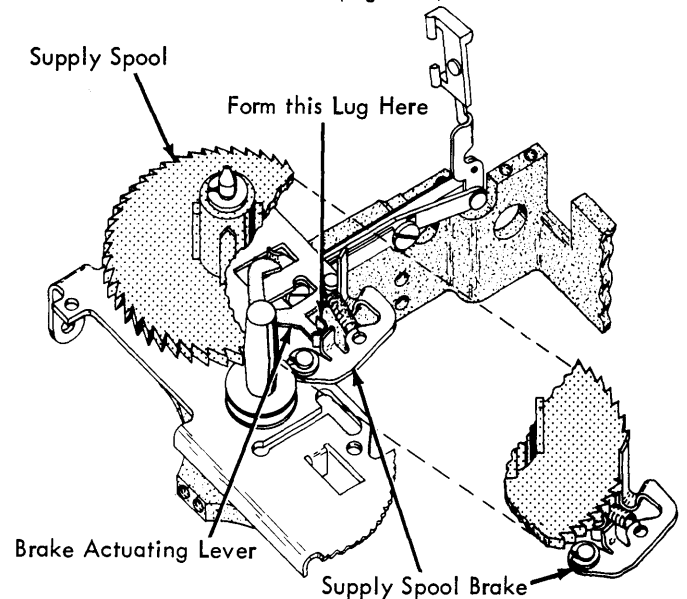


FIGURE 194. Brake Actuating Lever

NOTE: This adjustment permits the brake to engage the ratchet teeth of the supply spool as late as possible during a ribbon feed operation. If the brake is allowed to engage the supply spool too early the amount of tension in the ribbon circuit will become inconsistent from one feed operation to the next. That is, as the brake is permitted to engage the supply spool too early during each ribbon feed operation, the ribbon becomes tighter and tighter in the ribbon circuit until finally the excessive tension causes a spooling off effect to the supply spool. The ribbon then remains slack in the ribbon circuit for several feed operations until the brake can build up the tension again. This inconsistent tension in the ribbon circuit will contribute or may even create a poor ribbon tracking characteristic at the feed and pressure rollers. Also, character overlap on the ribbon may be present each time the ribbon becomes slack.

Insufficient engagement of the brake with the supply spool will allow the ribbon to become slack in the ribbon circuit (especially during a repeat spacebar or backspace operation when the carrier is under excessive vibrations). This will also lead to sensitive tracking and intermittent overlapping characters on the ribbon.

CAUTION: Be sure that the stencil lever is not in the stencil position when making this adjustment; otherwise, an erroneous adjustment may result.

SERVICE HINT: To form the lug on the brake actuating lever place a screwdriver as shown in Figure 195 and then slowly twist the flat portion of the lug with duckbill pliers. Do not attempt to form the curved portion of the lug as it is brittle and breaks easily.

The purpose of the screwdriver as shown in Figure 195 is to eliminate any pressure that might be placed on the vertical lug of the lift guide plate while making this forming adjustment.

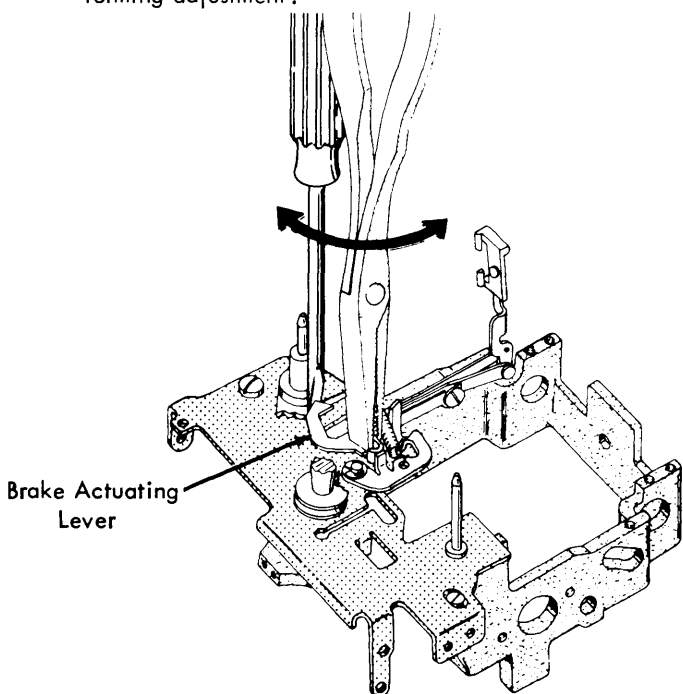


FIGURE 195. Forming Technique

RIBBON LIFT

1. Lift Guide Plate - With the ribbon lift cam follower on the low point of the lift cam, position the lift guide plate on the arm of the lift guide assembly to satisfy two conditions (Fig. 196).
 - a. Position the lift guide plate vertically so that the rear of the lift guide assembly rests $1/32''$ above the carrier casting when the stencil lever is not in the stencil position (Fig. 196).
 - b. Position the lift guide plate so that its bottom surface (where the control link operates) is parallel to the slot in the cam follower.

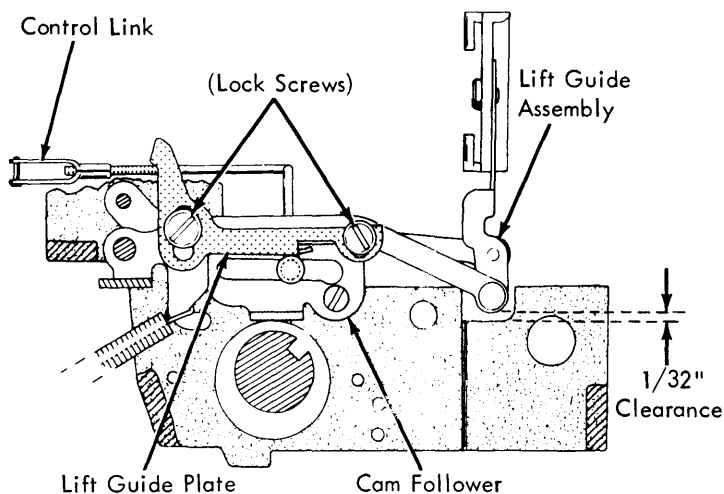


FIGURE 196. Ribbon Lift Guide Plate

Adjusting the plate up or down so that the lift guide assembly is resting $1/32''$ above the carrier insures that there will be no lost motion from the ribbon lift cam through to the lift guide assembly. Keeping the bottom surface of the lift guide plate parallel to the slot in the cam follower insures that the lift guide assembly will receive the proper amount of lift motion for each one of the four different lift positions.

SERVICE HINT: The vertical position of the lift guide plate may be checked by observing the lift guide assembly while manually pushing the control link all the way to the rear into its stencil position. The guide assembly should drop $1/32''$ at the rear if the adjustment is correct.

Parallelness of the lift guide plate with the slot in the cam follower may be checked in the following manner: With the cam follower resting on the low point of the lift cam, disconnect the control link and manually slide the link back and forth through the four lift positions (Do not slide the link into the stencil position). If the plate is parallel, no movement will be produced to the ribbon lift guide assembly while sliding the link back and forth.

Figure 197 illustrates how a maladjusted lift guide plate will affect each one of the four ribbon lift positions. A series of H's are used for simplicity to show the position of the typed characters on the film ribbon.



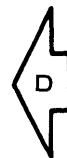
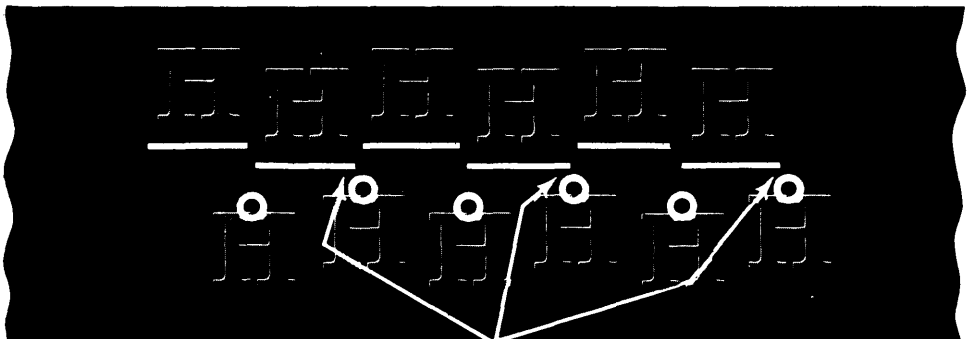
LIFT GUIDE PLATE
PARALLEL TO SLOT
IN CAM FOLLOWER



LIFT GUIDE PLATE
OUT OF PARALLEL
TOO HIGH AT THE
REAR



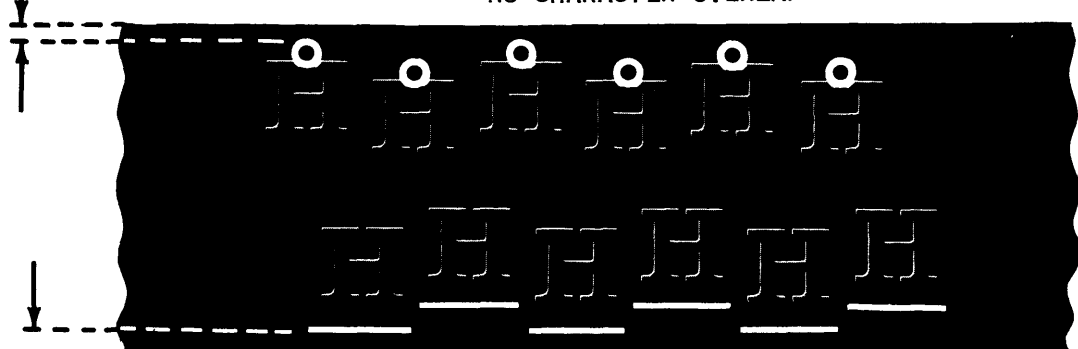
LIFT GUIDE PLATE
OUT OF PARALLEL
TOO HIGH AT THE
FRONT



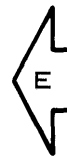
LIFT GUIDE PLATE
PARALLEL TO SLOT
IN CAM FOLLOWER

APPROX. .030''

NO CHARACTER OVERLAP



APPROX. .050''



LIFT GUIDE PLATE
PARALLEL TO SLOT
IN CAM FOLLOWER

FIGURE 197. Lift Guide Plate Check

Figure 197-a is a sample of how the lift pattern will look when the lift guide plate is adjusted parallel to the slot in the cam follower.

In Figure 197-b the lift guide plate is adjusted too high at the rear with respect to the slot in the cam follower. This condition causes the lift guide assembly to drop down a slight amount whenever the control link is moved toward the rear into a low lift position. This causes both of the low lift positions (those nearest the top of the ribbon) to be affected because some of the lift motion produced by the ribbon lift cam must be wasted in order to overcome this slight amount of drop that occurs to the lift guide assembly each time the control link is moved toward the rear. Notice that the overall result of this maladjustment is a spreading effect to the lift pattern between the high and low lift positions (Fig. 197-b).

In Figure 197-c the lift guide plate is adjusted too high at the rear with respect to the slot in the cam follower. This condition causes just the opposite of that of Figure 197-b. Whenever the control link is moved forward into either one of the high lift positions, the lift guide assembly drops down slightly and the high lift positions (those nearest the bottom of the ribbon) are affected. The overall result is a crowding effect to the lift pattern between the high and low lift positions (Fig. 197-c).

A good check for the crowding effect illustrated by Figure 197-c is to alternately type the degree and underscore instead of H's. These two characters are used because they are usually the highest and lowest printing characters on the typing element. If the degree is typed in phase with a low ribbon lift operation, when beginning to alternately type the degree and underscore, the lift pattern embossed onto the ribbon will look similar to Figure 197-d. If there is no character overlap on the ribbon between the degree and underscore, then the crowding condition illustrated by Figure 197-c does not exist. (Some styles of typeheads may have characters that print higher or lower than the degree and underscore. If so, use them for this check.)

A good check for the spreading effect illustrated by Figure 197-b is to alternately type the degree and underscore beginning with the underscore in phase with a high ribbon life operation. The lift pattern illustrated by Figure 196-e should occur. If the lowest underscore strikes the ribbon approximately .050" from the bottom edge of the ribbon and the highest degree strikes the ribbon approximately .030" from the top edge, then the spreading condition illustrated by Figure 197-b does not exist. (The control link adjustment which controls the position of the entire lift pattern on the ribbon must be considered when using this check.)

NOTE: It will be necessary to recheck the supply spool brake adjustment if the lift guide plate position is changed because the brake actuating lever receives its motion from an upright extension of the guide plate.

2. Lift Control Link - Adjust the clevis on the control link so that the lowest underscore prints approximately .050" from the bottom of the ribbon (Fig. 197-e).

The adjustment of the control link positions the previously adjusted lift pattern on the ribbon. It does not have any effect on the distance or spread between each one of the four lift positions in the pattern.

NOTE: Make certain that the lift control lever does not strike the vertical lug on the left hand corner of the feed plate when the lever is in its highest lift position.

RIBBON LOAD

1. Load Lever Link - The load lever link should be adjusted to raise the ribbon lift guide assembly as high as possible without binding off on either the feed plate or the take-up spool when the load bail is in the load position (Fig. 198).

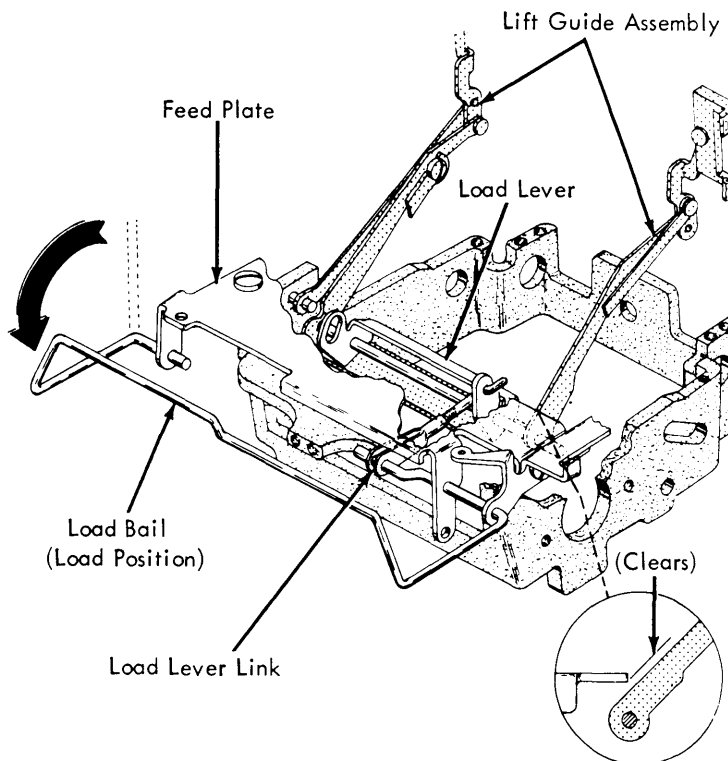


FIGURE 198. Load Lever Link

NOTE: Make sure that the load bail does not contact the flanges of the take-up spool when the bail is in its closed position as this could affect the take-up tension.

2. Pressure Roller Release Arm - When the load bail is pulled forward into its load position the supply drag lever should be pushed forward, by the pressure roller, sufficiently to just clear or be tangent to the front edge of the supply spool. Adjust the pressure roller release arm (located on the left end of the load lever) by its lock screw to obtain this condition (Fig. 199). Do not form the supply drag lever to obtain this adjustment.

CAUTION: When the load bail is in its closed position a clearance must exist between the pressure roller release arm and the pressure roller lever. This clearance insures that the pressure roller will be fully engaged with the feed roller whenever the load bail is in its closed position.

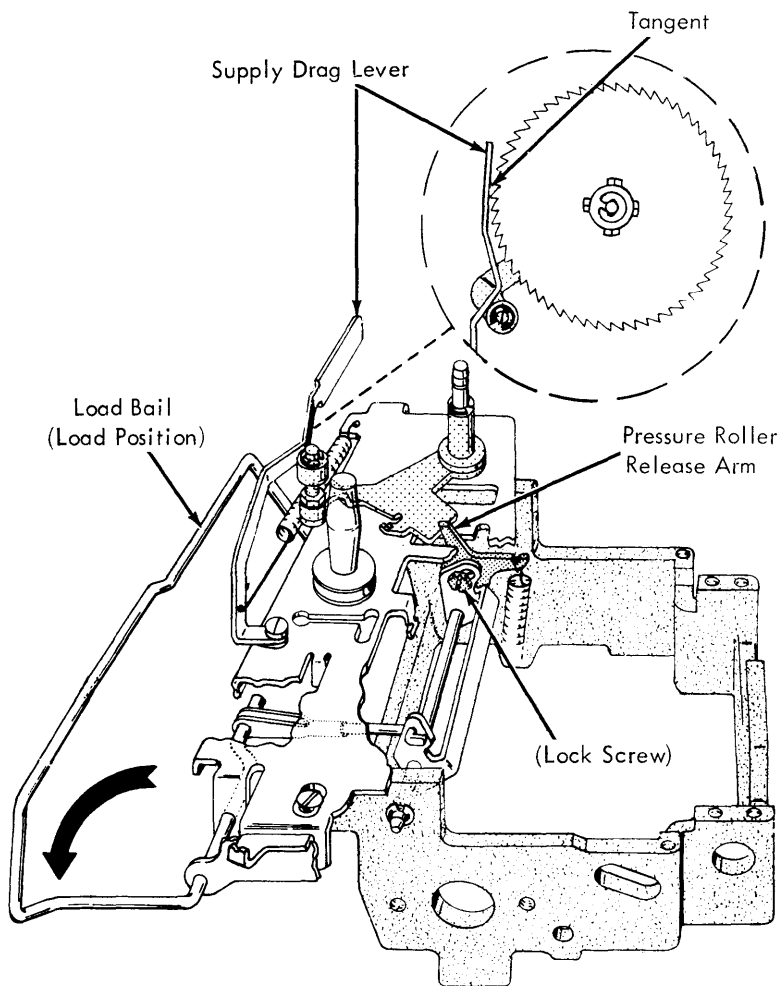


FIGURE 199. Pressure Roller Release Arm

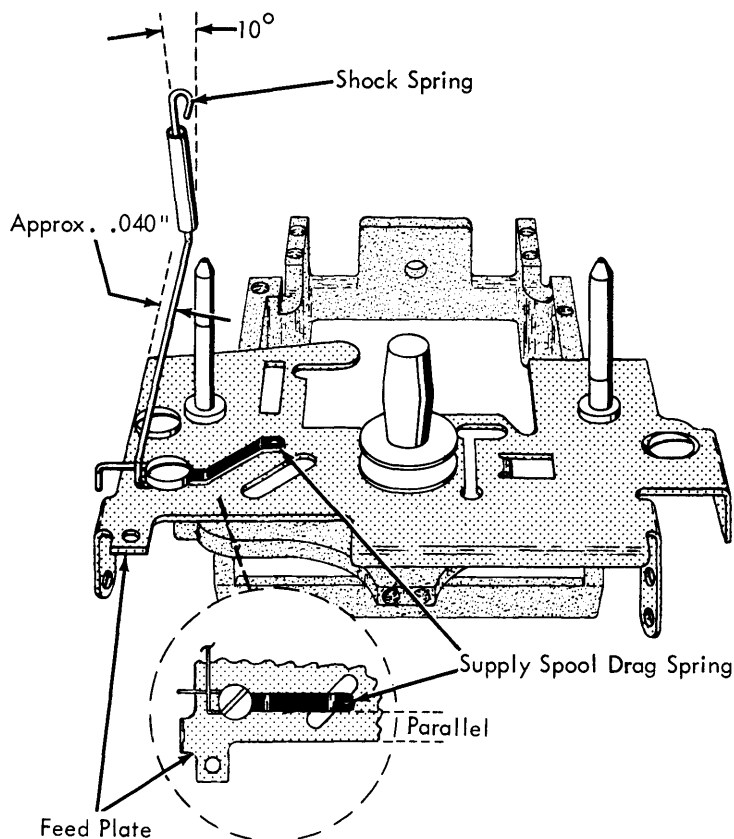


FIGURE 200. Shock and Drag Spring Adjustments

RIBBON TRACKING ADJUSTMENTS

The term "tracking" is used in this mechanism to describe the path or course that the ribbon assumes as it progresses from the supply spool through the guides and onto the take-up spool. The mechanism contains a series of guides and springs which are designed to establish and maintain a constant ribbon tracking characteristic throughout the ribbon circuit. Since the entire mechanism is subject to vibrations, the purpose for some of the adjustments is to over-ride the effects that these vibrations incur on the ribbon feed operation. The tracking adjustments are inter-related and must be considered together in order to obtain reliable ribbon tracking.

1. Supply Spool Drag Spring - Position the drag spring parallel to the front edge of the feed plate (Fig. 200). Moving the spring further away from the center of the supply spool increases the amount of drag, while bringing it closer will decrease the amount of drag.

NOTE: Use the following technique to check and adjust the tension of the drag spring: Remove the C-clip which retains the supply spool on its pivot stud. Then, raise the spool slightly and allow it to settle down onto the drag spring by its own weight. If the drag spring's tension is properly adjusted it will hold the supply spool elevated so that 1/2 of the angled surface (chamfer) on the top of the pivot stud is protruding above the top face of the spool (Fig. 201). Form the drag spring up or down to obtain this condition.

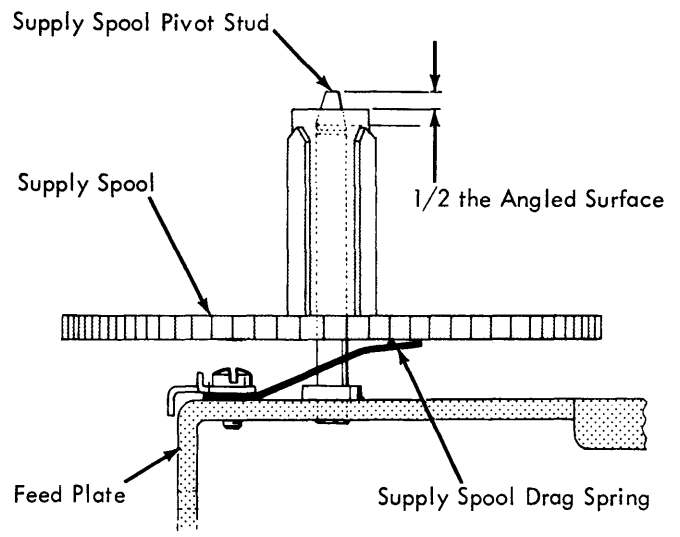


FIGURE 201. Supply Spool Drag Spring Check

CAUTION: The drag that is supplied to the core of the ribbon supply by this drag spring during a ribbon feed operation is necessary in order to maintain a tightly wrapped spool of ribbon on the supply spool. If a condition exists where the outer wraps of ribbon on the supply spool have become loose check the supply spool brake adjustment first before suspecting the drag spring.

Excessive drag on the supply spool may cause ribbon slippage at the feed and pressure rollers which could result in characters overlapping on the ribbon. Character overlap from excessive drag is most apparent when nearing the end of a spool of ribbon on the supply spool. This is

caused by the fact that the effect of the drag spring felt at the feed and pressure rollers increases as the amount of ribbon on the supply spool diminishes. And, in addition, the effect of the take-up spool tension felt at the feed and pressure rollers decreases as the diameter of the used ribbon on the take-up spool increases.

If the ribbon should become slack in the ribbon circuit by improper operation of either the supply spool brake, supply drag lever, or the supply spool drag spring an overly sensitive ribbon tracking condition will exist.

2. **Shock Spring** - Position the shock spring so it is approximately .040" to the right and parallel to the edge of the ribbon feed plate (Fig. 200). The shock spring should be formed at the front making the roller on the spring lean approximately 10° to the left.
3. **Supply Drag Lever** - The supply drag lever must contact the outer wrap of ribbon on the supply spool at the center or slightly above (Fig. 202). Form the lever up or down to obtain this condition. Do not form it front to rear.

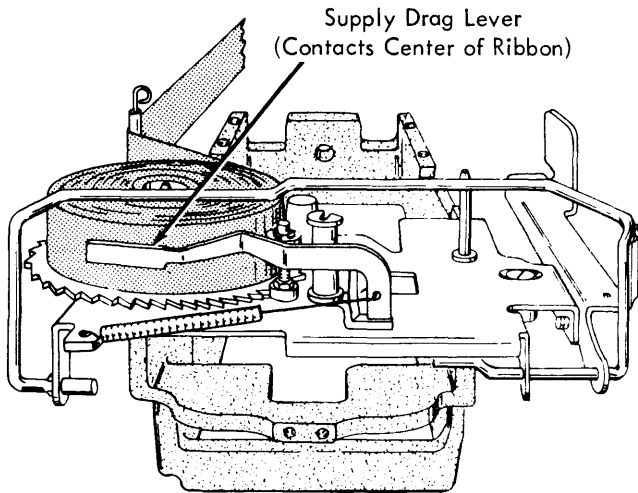


FIGURE 202. Supply Drag Lever

NOTE: After forming the lever make sure that it does not bind on its pivot screw.

CAUTION: If the supply drag lever contacts the ribbon below center, the outer wraps of ribbon on the spool will tend to creep up which may cause ribbon spillage.

4. **Corner Guide** - The corner guide is aligned parallel to the feed roller at the factory and should not require adjustment unless damaged or replacement is necessary. If an adjustment is required the corner guide should be formed at the bottom so that it is vertical to the feed plate and clears both flanges of the take-up spool (Fig. 203).
5. **Tracking Post** - The tracking post is positioned and aligned parallel to the feed roller at the factory with gauges and should not require adjustment unless damaged or replacement is necessary. If an adjustment is necessary the following procedure should be used:

- a. Position the tracking post under its mounting screw so that it clears the flanges of the transparent take-up spool by approximately 1/32" (Fig. 203).

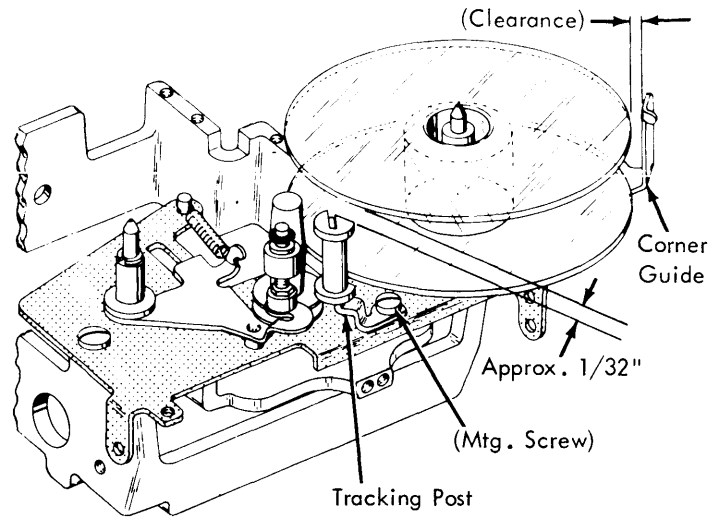


FIGURE 203. Corner Guide & Tracking Post

- b. Form the tracking post at the bottom to achieve verticalness with the feed plate:

The following technique may be used to check verticalness: First, remove the typehead and then hold the load bail open just far enough to disengage the pressure roller from the feed roller (Do not open the load bail so far that the supply drag lever is held away from the spool of ribbon on the supply spool). Now, operate the repeat underscore and observe how the ribbon tracks from the corner guide to the feed roller. If the tracking post is vertical the ribbon will be centered as it passes between the two flanges of the transparent take-up spool (Fig. 204). It should also track on the center of the feed roller and evenly between the two flanges of the tracking post without touching either flange.

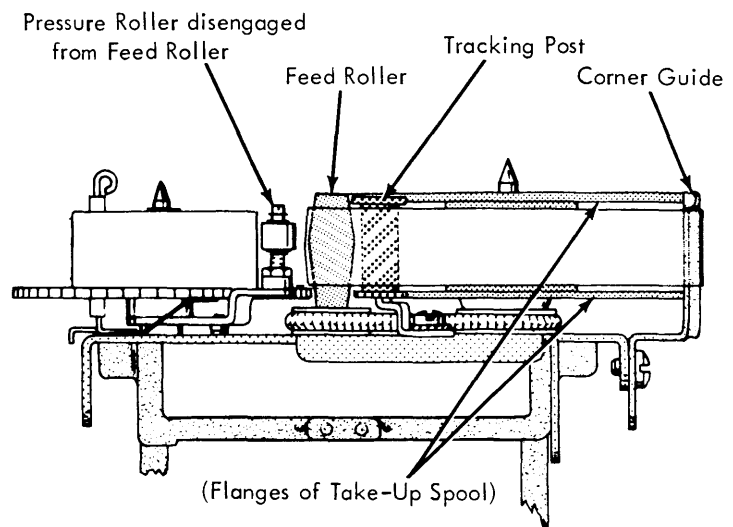


FIGURE 204. Track Post Verticalness

If the ribbon is not centered on the feed roller or tends to drift steadily in one direction (either up or down) on the feed roller or tracking post, the tracking post is out of vertical and must be formed front or rear to correct this condition. Forming the post top toward the rear will cause the ribbon to drift up; toward the front causes the ribbon to drift down.

The flanges on the tracking post will not stop or alter drifting of the ribbon if a definite ribbon drift condition exists. The function of the flanges is only to confine the slight up and down drift of the ribbon which is inherent in the mechanism (caused by the feed and pressure rollers reaction to the varying vertical position of the embossed characters on the ribbon).

- c. Loosen the set screw in the flanged portion of the tracking post and adjust it up or down so it just spans the ribbon (Fig. 204). Check the adjustment by observing how the ribbon tracks between the flanges when operating the repeat underscore while holding the pressure roller disengaged from the feed roller.

NOTE: Adjustments "b" and "c" must be considered together.

- 6. Pressure Roller - Adjust the pressure roller up or down by its mounting stud so that it engages the center of the crown on the feed roller as shown in Figure 205.

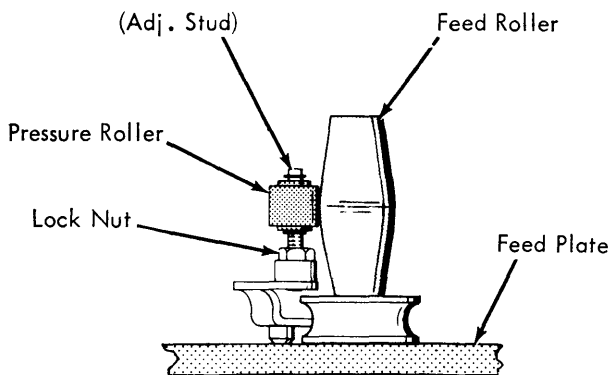


FIGURE 205. Pressure Roller Adjustment

The adjustment of the pressure roller may be checked by observing how the ribbon tracks between the flanges of the tracking post while under a typing operation. Since the position, size, and shape of the embossed characters on the ribbon have a definite effect on the ribbon tracking at the feed and pressure rollers, the following procedure should be used to check the pressure roller adjustment: Type a series of upper case straight line characters (such as H's, I's, L's, and T's) and observe how the ribbon tracks between the flanges of the tracking post as these characters embossed on the ribbon are passing between the feed and pressure rollers. If the pressure roller adjustment is correct these upper case characters will cause the ribbon to slowly drift up against the upper flange of the tracking post without curling or climbing over. Now, type a repeat underscore and observe how the ribbon tracks between the flanges of the tracking post as the embossed "underscores" are passing between the feed and

pressure rollers. If the pressure roller adjustment is correct the ribbon will slowly drift down against the lower flange without curling or climbing over. If the ribbon has a definite tendency to drift either up or down, regardless of what characters are typed, the pressure roller must be adjusted in the direction of the drift to correct for the drift.

Since the pressure roller adjustment has good response, it is suggested that the mounting screw be turned only 1/4 of a turn at a time when correcting for drift. Also, after each adjustment it is necessary to re-tighten the lock nut before observing the tracking.

CAUTION: Be sure that the small stabilizing pin riveted to the underside of the pressure roller lever is always in contact with the top surface of the feed plate (Fig. 206). If the stabilizing pin fails to stay in contact with the feed plate, the engaged position of the pressure roller will vary vertically each time the load bail is opened and closed. This will cause extreme difficulty in obtaining and holding the correct pressure roller adjustment.

NOTE: The pressure roller mounting stud should be approximately parallel to the previously aligned tracking post. Check by partially disengaging the pressure roller from the feed roller and sighting past the tracking post as shown in Figure 206. If the mounting stud is noticeably out of parallel the pressure roller lever should be twisted carefully with duckbill pliers at the point shown in Figure 206. After forming make sure that the stabilizing pin is still resting against the top surface of the feed plate.

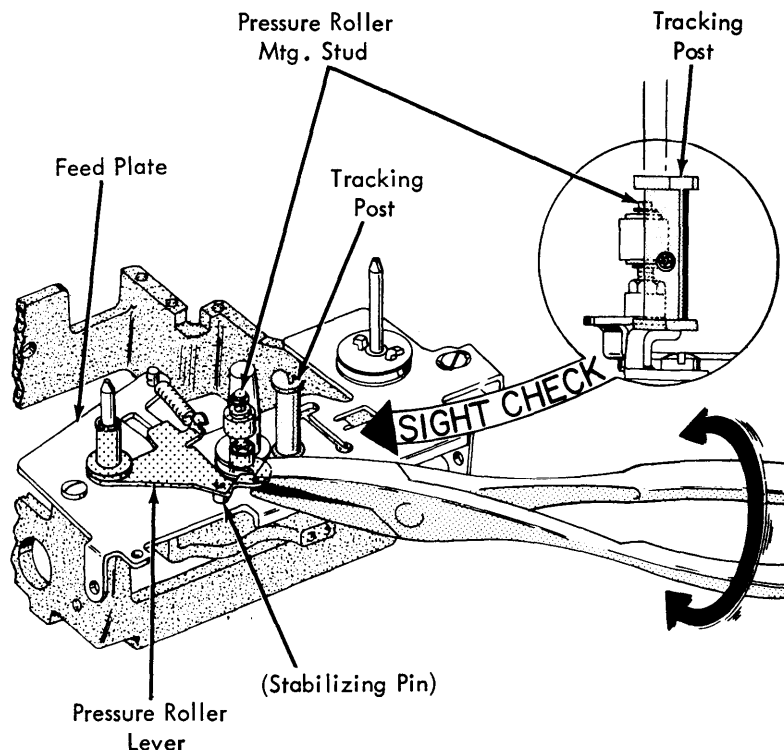


FIGURE 206. Pressure Roller Mtg. Stud Alignment

7. Take-Up Tension - The recommended method of controlling the amount of take-up tension to the take-up spool is by the installation of either a light, medium, or heavy drive spring. These springs are color coded as follows:

- Light red
- Medium no color
- Heavy blue

CAUTION: Do not attempt to control the amount of take-up tension by either stretching the drive spring or cutting loops off one end of the spring. This method is not effective and will only lead to erratic take-up tension.

SERVICE HINT: A lack of sufficient take-up tension can usually be recognized by the fact that the take-up spool either fails to hold an entire spool of ribbon causing spillage; or, upon reaching the end of a spool of ribbon the take-up spool is filled beyond its safe capacity which is approximately 1/32" within the outer edge of the flanges. If this condition exists, before a decision is made to replace the drive spring both the spring and its pulleys should be thoroughly cleaned with cleaning fluid and then lubricated lightly with ET oil. If cleaning and oiling does not bring about the desired results a new drive spring of the same category should be tried first before going to a heavier drive spring.

Excessive take-up tension will generally cause the ribbon to be pulled through the feed and pressure rollers resulting in over feeding of the ribbon. This condition is most apparent at the beginning of a new supply of ribbon when the take-up tension felt at the feed and pressure rollers is the greatest. If there is enough ribbon slippage a noticeable reduction in character yield per spool of ribbon will be present. In addition, excessive take-up tension can be a contributing factor to an overly sensitive tracking condition.

Erratic take-up tension is generally caused by either a dirty or damaged drive spring. It can usually be detected by examining the feeding pattern on the ribbon. If there are signs of both over-feeding and character overlap together on the ribbon this is a good indication that erratic take-up tension is present. The drive and take-up pulleys should be cleaned and a new drive spring installed (lubricated lightly with ET oil). Erratic take-up may also contribute to unreliable tracking.

NOTE: If at some time it becomes necessary to check the amount of take-up tension, it may be measured with a gram gauge (listed under Tools and Supplies) using the following procedure:

- a. Thread a small machine screw, approximately 1/2" long, up through the hole in the bottom flange of the transparent take-up spool. (This hole, provided for this purpose, is located exactly one inch from the center of the spool.)
- b. With the take-up spool installed, remove the ribbon from between the feed and pressure rollers and let it hang slack.
- c. Remove the type head, disconnect the escapement trip link, and position the carrier at the left hand margin.
- d. Place the gram gauge (using a times one spring blade) as shown in Figure 207 and operate the repeat underscore. For the most accurate reading try to keep the end of the spring blade in line with the center of the spool. Also, keep the small hole in the end of the blade against the machine screw as shown by the insert in Figure 207. If the measurement obtained falls within a range of 45 to 55 grams the take-up tension is correct.

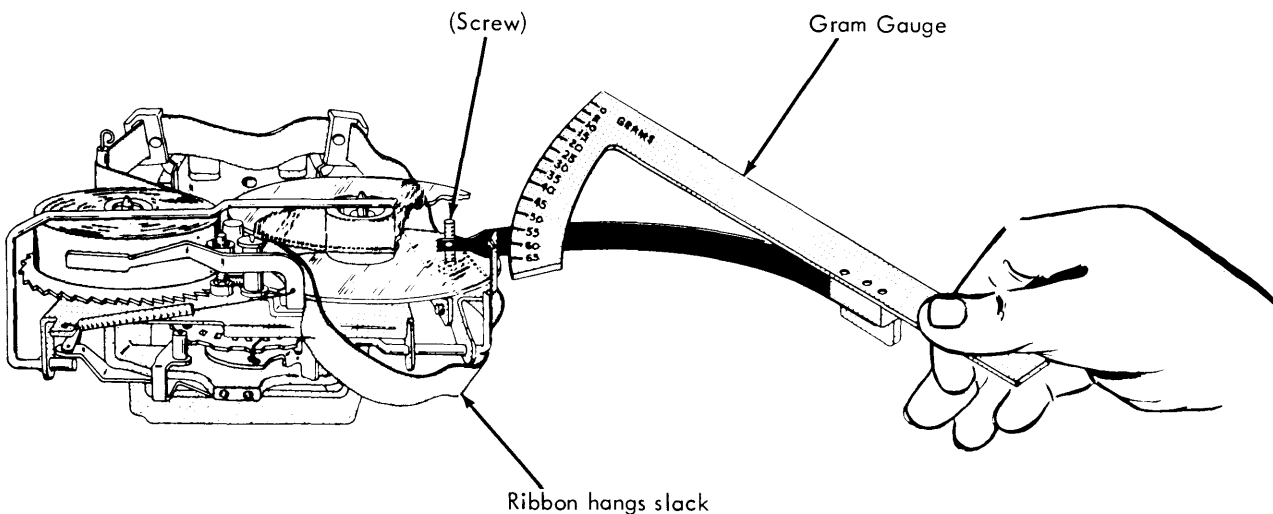


FIGURE 207. Take-Up Tension Check

COVERS AND MOUNTS

1. TOP COVER HINGE - The hinge should be adjusted so that the contour of the top cover matches the contour of the center cover (Fig. 208).

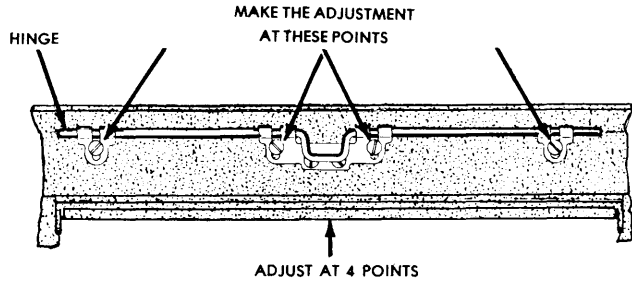


FIGURE 208. TOP COVER HINGE ADJUSTMENT

2. TOP COVER LATCHES - Adjust the latches front to rear so that the top cover is latched securely in the closed position.
3. HINGE SPRING - The spring should be positioned front to rear so that the top cover hinge is detented and held in the open position.
4. CENTER COVER MOUNTS - Adjust the center cover mounts so that with the machine suspended in the covers the following four requirements are met:
 - a. All of the openings for keybuttons will have equal clearance on each side.
 - b. The platen will clear the covers in the extreme front or rear position.
 - c. The clearance between the paper guide and the deflector will be .020" to .040" (Fig. 209).
 - d. The top of the spacebar will be 1-3/8" above the bottom of the center cover section.

The shock mount brackets are adjustable front to rear as well as up and down. The cover brackets are adjustable left and right on the shock mounts.

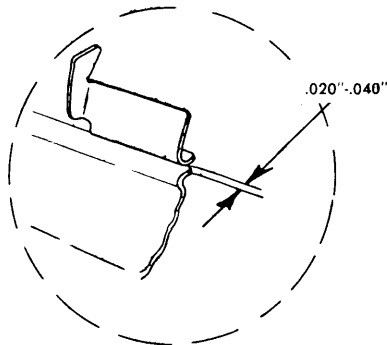


FIGURE 209. DEFLECTOR PAPER GUIDE CLEARANCE

5. TOP COVER INTERLOCK - The top cover interlock lever should be formed so that when the top cover is closed the following conditions exist:
 - a. The top cover hinge contacts the interlock squarely in the center.
 - b. A clearance of 1/16" to 3/32" exists between the lower lug of the cover interlock and the carrier return/tab interlock lever (Fig. 210).

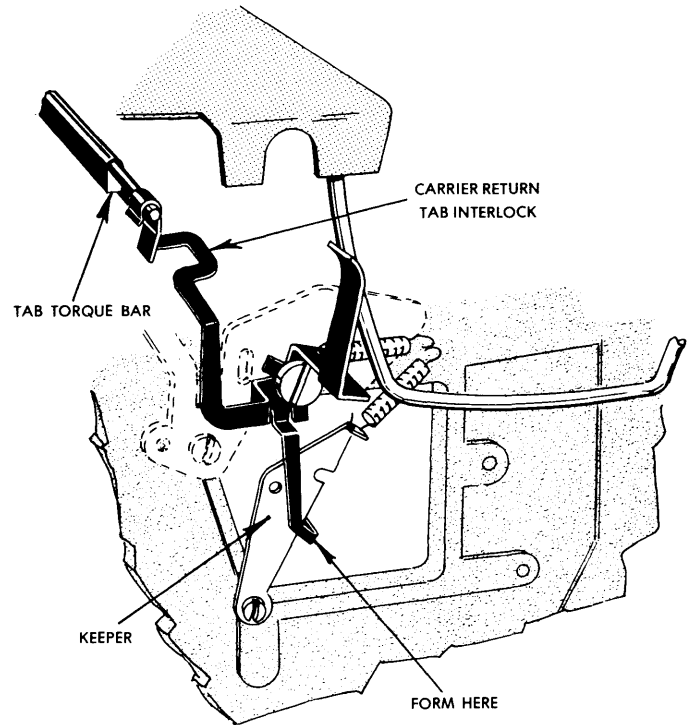


FIGURE 210. TOP COVER INTERLOCK

FABRIC RIBBON MECHANISM (NEW STYLE)

1. CARTRIDGE GUIDE LUGS: Form the cartridge guide lugs so that the cartridge spools will be centered over the ratchets. Side play of the cartridge must be limited within .005"-.010".
2. CARTRIDGE RETAINING SPRINGS: The cartridge retaining springs should be positioned laterally so they are FLUSH against the feed plate; then adjusted front to rear so that the cartridge retaining fingers are centered in the holes of the cartridge guide lugs. (Fig. 211). The ratchet brake portion of the spring should exert a small drag on the feed ratchet. Form only as necessary.

NOTE: Excessive or insufficient tension could result in reverse failure.

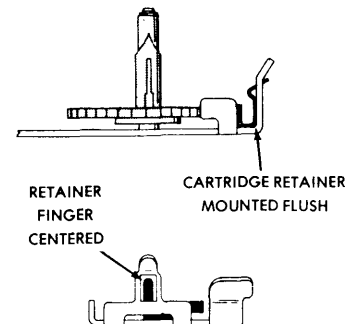


FIGURE 211. CARRIAGE RETAINING SPRINGS

3. RIBBON LIFT LEVER: Three conditions must be met as follows:
 - a. Form the lift lever finger tab left or right (Fig. 212A), so that the ribbon feed pawl will center between the two feed ratchets when the lift lever is placed in stencil position.
 - b. Form the rear lug so that a clearance of .010"-.040" exists between the lug and the feed plate positioning lug when the LEFT HAND RATCHET IS FEEDING (Fig. 212B).

- c. Form the front lug so that a clearance of $.010''-.040''$ exists between the lug and the feed plate positioning lug when the RIGHT HAND RATCHET IS FEEDING (Fig. 212C).

NOTE: Avoid forming the ribbon feed plate positioning lug, since breakage would require replacement of the entire feed plate.

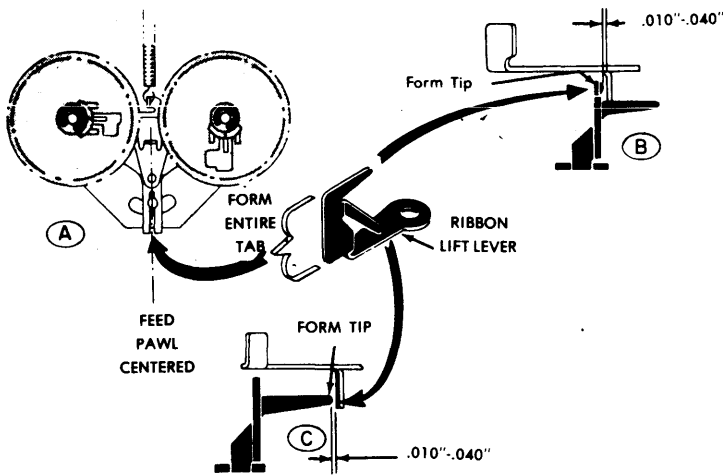


FIGURE 212. FEED PAWL

4. RATCHET DETENT LEVER LUGS:
These should be formed as follows:

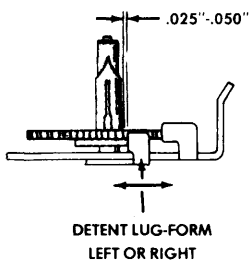


FIGURE 213. DETENT LUG
(LEFT TO RIGHT)

- a. Left or right, so that the ribbon feed ratchet tooth overthrows past the edge of the detented lug by $.020''-.050''$ when hand cycling to the high point of the ribbon feed cam (Fig. 213).
- b. Form the detent lugs front to rear so that the ribbon feed pawl engages a ratchet tooth by approximately $1/2$ the depth of the ratchet tooth (Fig. 214).

Note: The feed pawl spring lug should clear the teeth of the opposite ratchet by at least $.015''$ when the feed pawl is being withdrawn to the rest position at the end of an operation. Failure to clear the teeth of the opposite ratchet under power may result in a lockup and consequent failure of the ribbon feed operation.

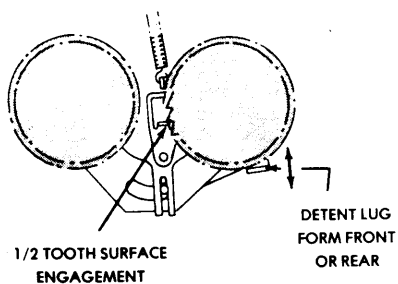


FIGURE 214. DETENT LUG (FRONT TO REAR)