

BELL SYSTEM PRACTICES
Teletypewriter Stations

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114-TYPE REPERFORATOR TRANSMITTER AND BASE FOR 81D1 SWITCHING SYSTEM

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1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures for the 114-Type Reperforator Transmitter.

1.02 For the adjustments of the selector mechanism as given in BSP Section P32.001, account must be taken of the fact that on the 114-Type Reperforator Transmitter the sword-selector lever pile-up is the reverse of that used in other 5-unit selectors, that is, the No. 1 sword and selector lever are nearest the selector mounting-plate. Therefore, when reference is made in Section P32.001 to the No. 1 element, the No. 5 element should be used.

2. REQUIREMENTS AND PROCEDURES

2.01 **Receiving Shaft Clutch Spring:** With the teeth of the driven clutch member resting against the teeth of the driving clutch member, hook a 32 oz scale over the throwout cam on the driven clutch member and pull as nearly parallel with the shaft as possible. It should require 24 to 30 oz to fully separate the clutch teeth.

Fig. 1

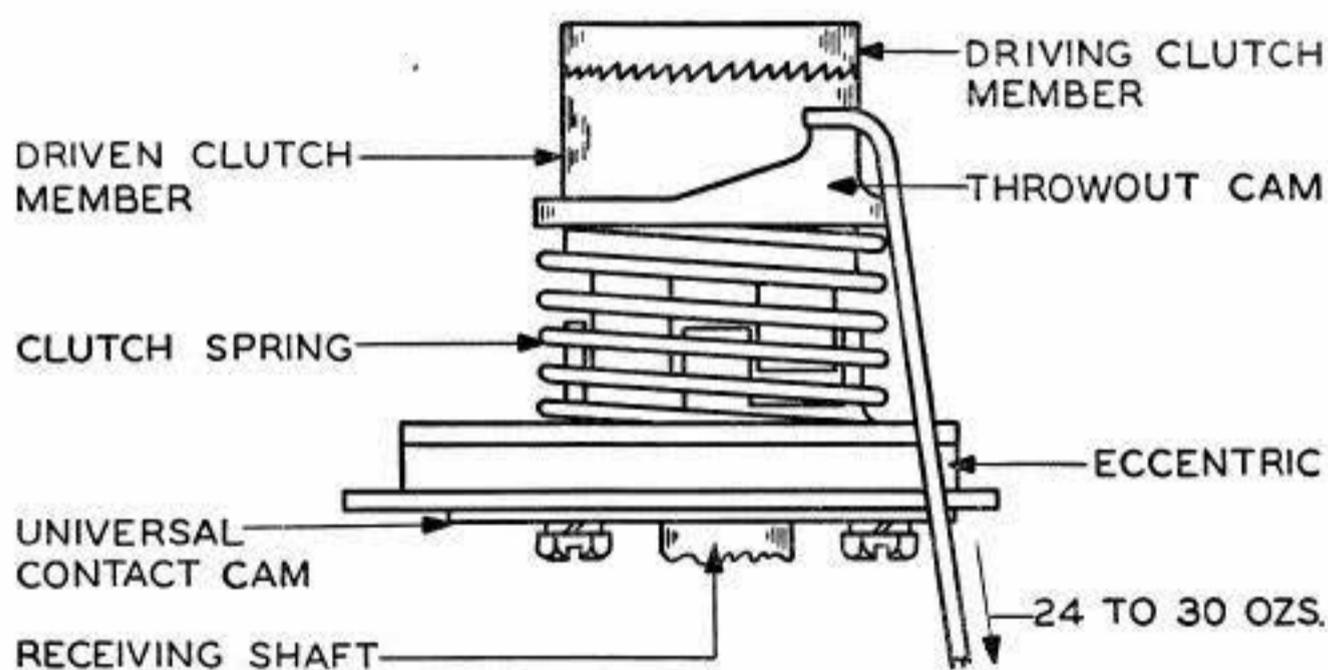


Fig. 1

2.02 **Receiving Shaft:** The selector cams on the selector cam sleeve should line up with their respective selector levers. Check by rotating the receiving shaft. To adjust, loosen the bearing retainer ring nuts and adjust the screws to position the receiving shaft with the lower bearing against the lower

bearing retainer ring. Retighten the bearing retainer nuts so that there is equal clearance, within .005", between the retainer and the casting at all points.

Figs. 2, 3

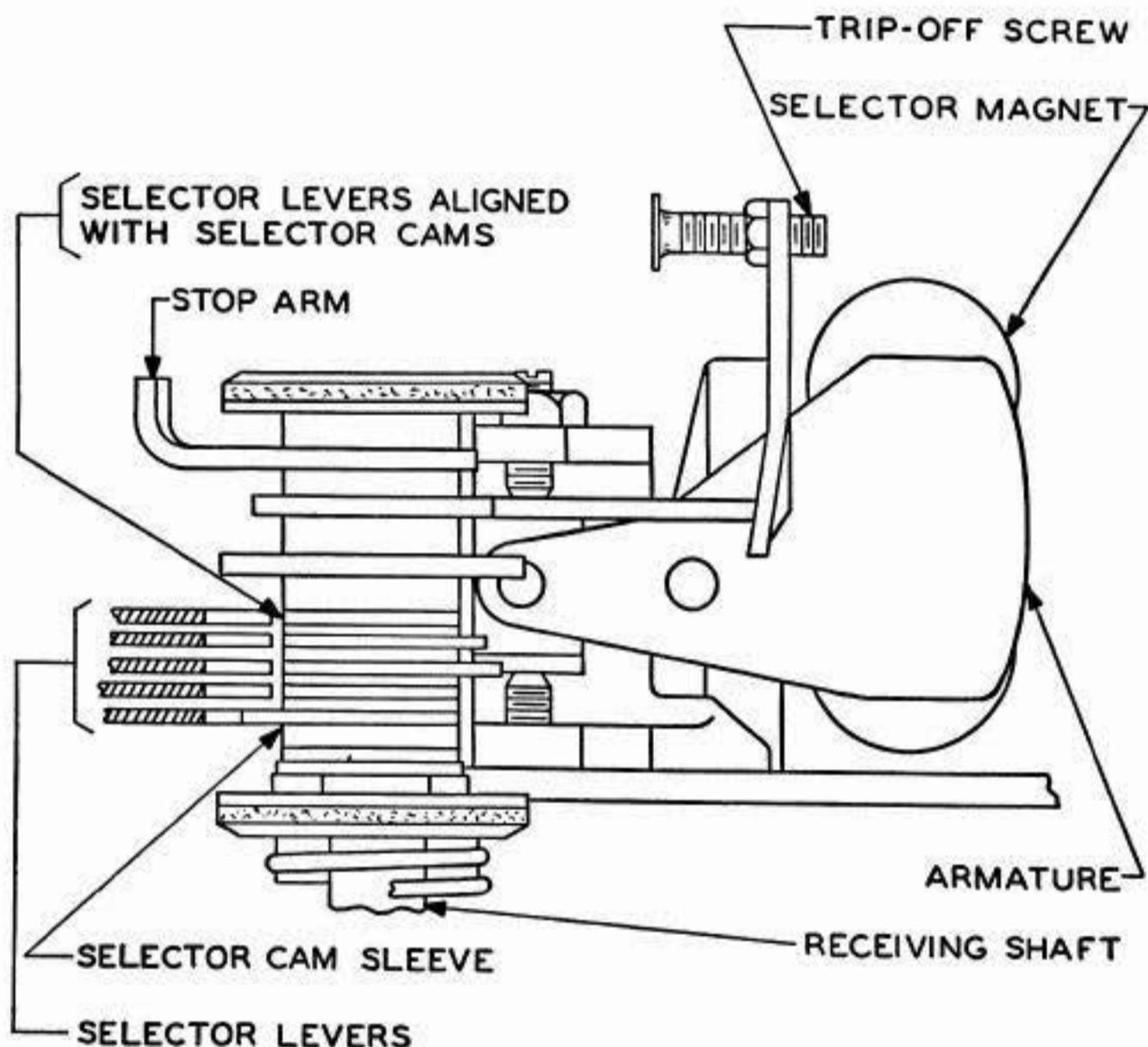


Fig. 2

2.03 **Punch-Lever Shaft:** The punch lever, with the punch arm link, should move freely and the parts on the punch-lever shaft should have some end play, not more than .010". To adjust, loosen the punch lever shaft mounting lock-nut and screw, position the shaft vertically for free movement, add shims for correct end play, then reposition shaft. **Fig. 3**

2.04 Shims are located in the initial assembly to make the adjustment of Paragraph 2.03. If the punch-lever shaft is removed for any reason, or if the receiving shaft is repositioned it will be necessary to position the shims to meet the requirements.

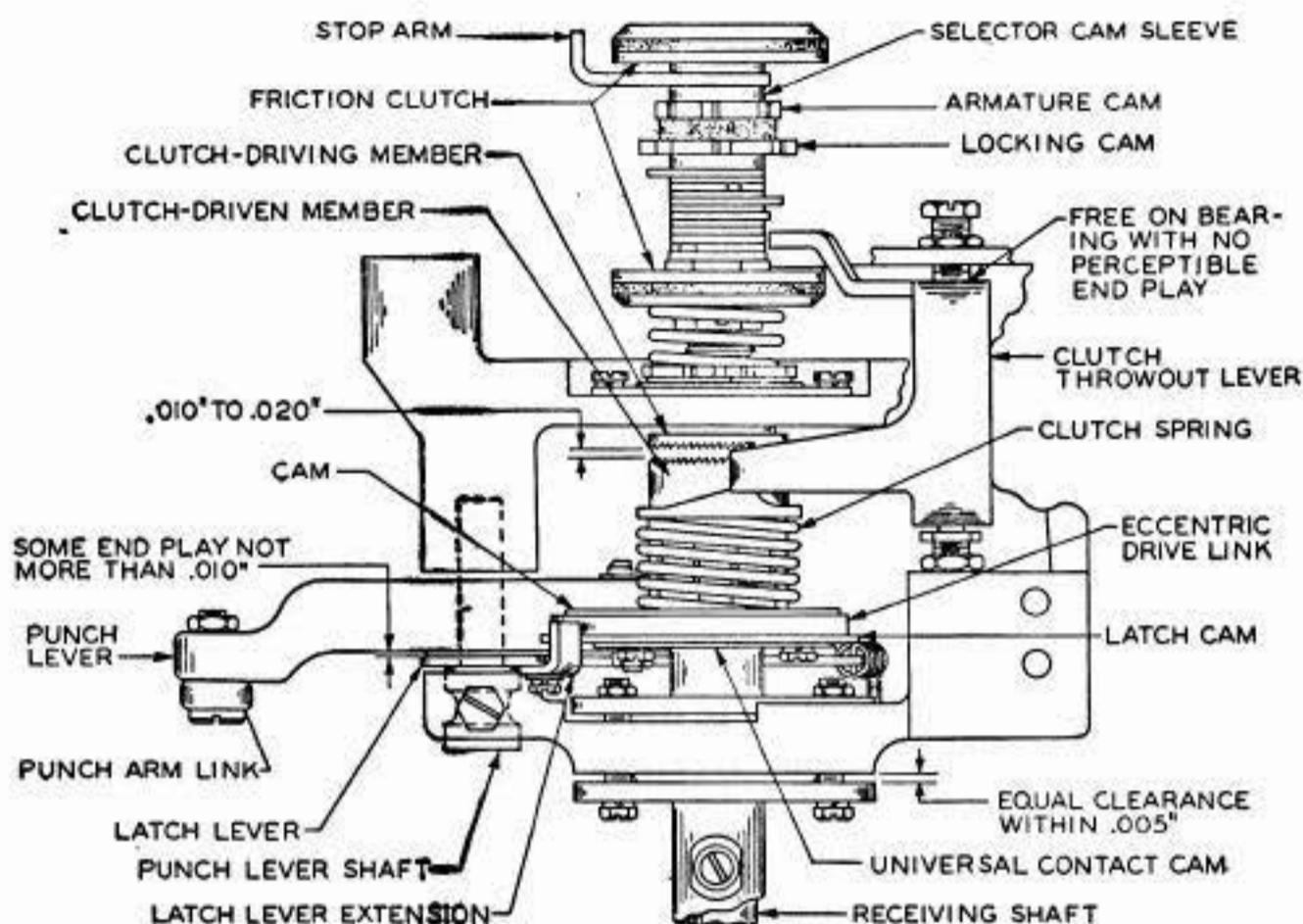


Fig. 3

2.05 **Receiving-Shaft Clutch Throwout Lever (Preliminary Adjustment):** The clutch teeth should be separated by .010" to .020" when the members are fully disengaged (by manually pushing the clutch member to its fully disengaged position). To adjust, position the clutch-throwout lever by means of its pilot-screws. After the clearance is obtained and the pilot-screw lock-nuts tightened, the clutch-throwout lever should be free on its bearings with no perceptible end-play. **Fig. 4**

2.06 **Receiving-Shaft Clutch Throwout-Lever Spring:** With the clutch-throwout lever on the low surface of the driven clutch member, hook an 8 oz scale over the clutch-throwout lever at the spring-hole and pull horizontally at right angles to the clutch-throwout lever. It should require 2-1/2 to 4 oz to start the lever moving. **Fig. 4**

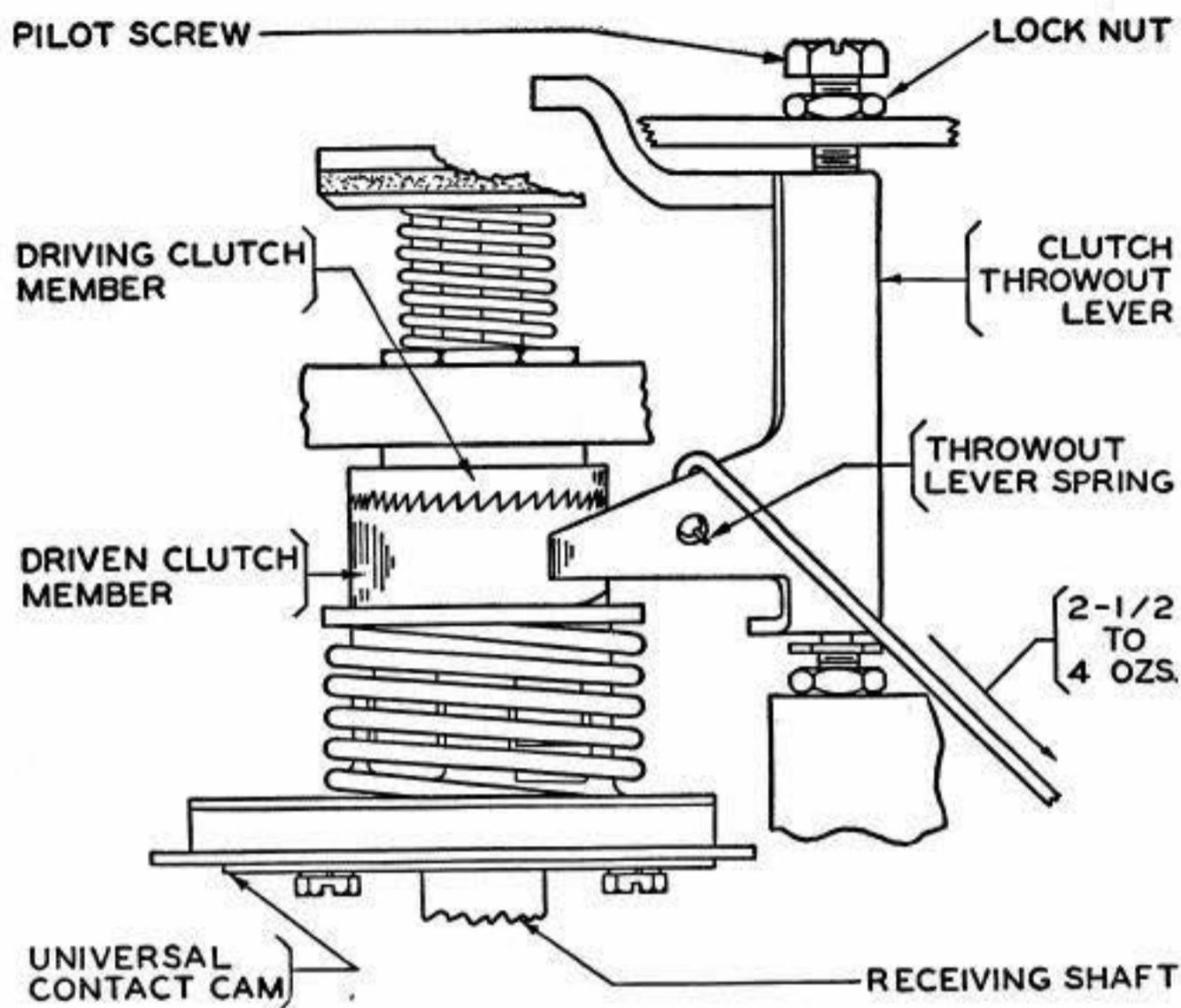


Fig. 4

2.07 **Latch-Lever Spring:** With the latch-lever extension on the low part of the latch cam, hook an 8 oz scale over the end of the latch and pull radially to the receiving shaft. It should require 2 to 4 oz to just move the latch away from its cam.

Fig. 5

2.08 **Latch Cam:** Rotate the receiving shaft to its stop position. With the latch lever on the low part of its cam and the clutch fully disengaged, (by manually pushing the clutch member to its fully disengaged position) there should be .006" to .012" clearance between the latching face of the latch-lever extension and the latching face of the cam when the play is taken up in a direction to make this clearance a minimum. To adjust, position the latch-lever extension with its mounting-screws loosened.

Fig. 5

Note: Under power operation and with the selector cam in the stop position the latch must engage the latching face of the cam.

2.09 **Receiving-Shaft Clutch Throwout Lever (Final Adjustment):** With the clutch fully disengaged (by manually pushing the clutch member to its fully disengaged position) and the latch lever engaging the latching face of its cam, recheck the clearance between the ends of the clutch teeth at the closest point; refine the RECEIVING-SHAFT-CLUTCH THROW-OUT-LEVER PRELIMINARY ADJUSTMENT, if necessary.

Fig. 3

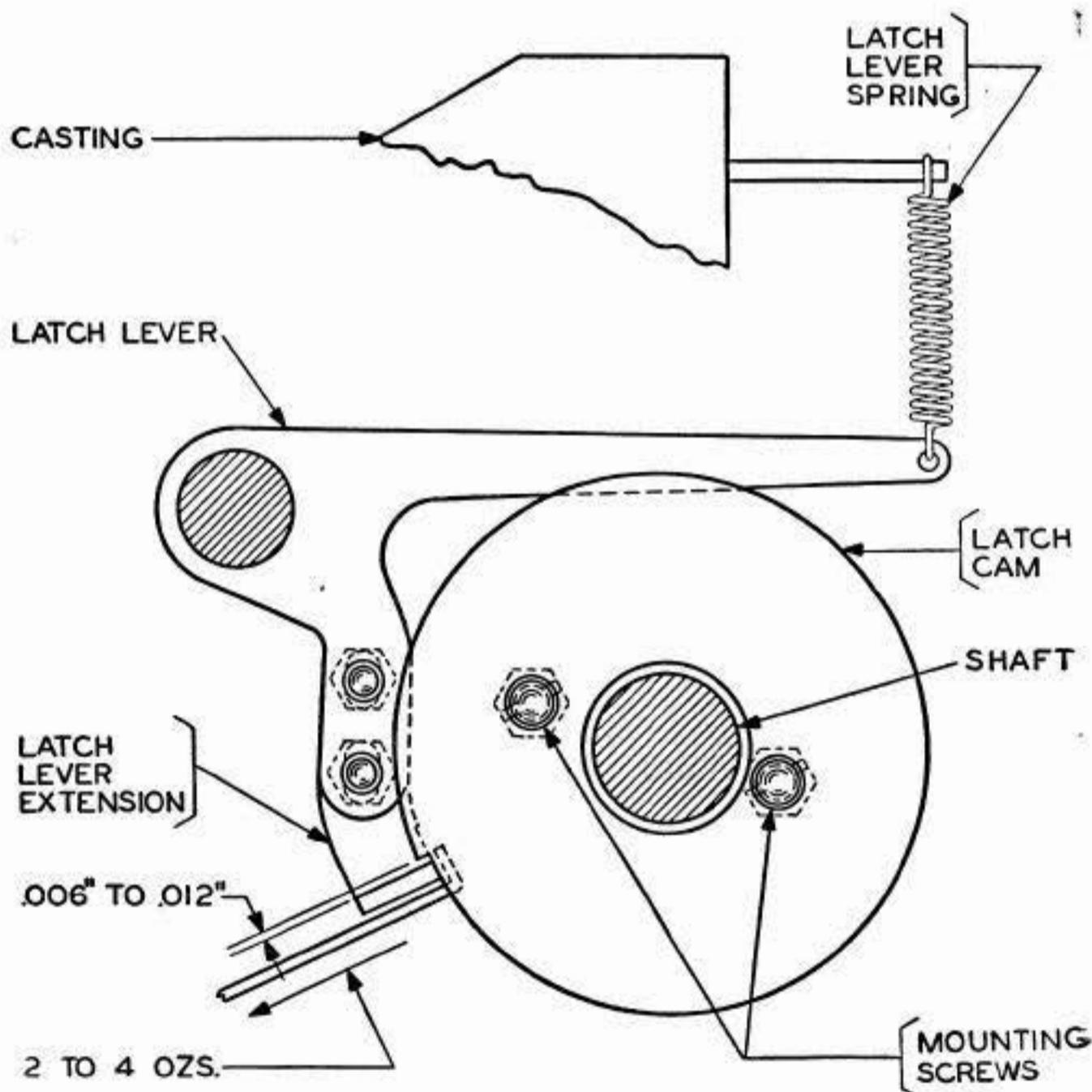


Fig. 5

2.10 **Manual Tape Feed-Out Mechanism:**

(a) The round tip of the tape feed-out lever should be positioned approximately midway between the trip-latch plunger and the bell-crank bracket, and the lever

should not bind or limit the movement of the indicator arm on the range-finder scale. **Fig. 6**

(b) To adjust, loosen the set-screws in the tape feed-out lever set collar and position the lever by means of the set collar. Tighten the set-screws.

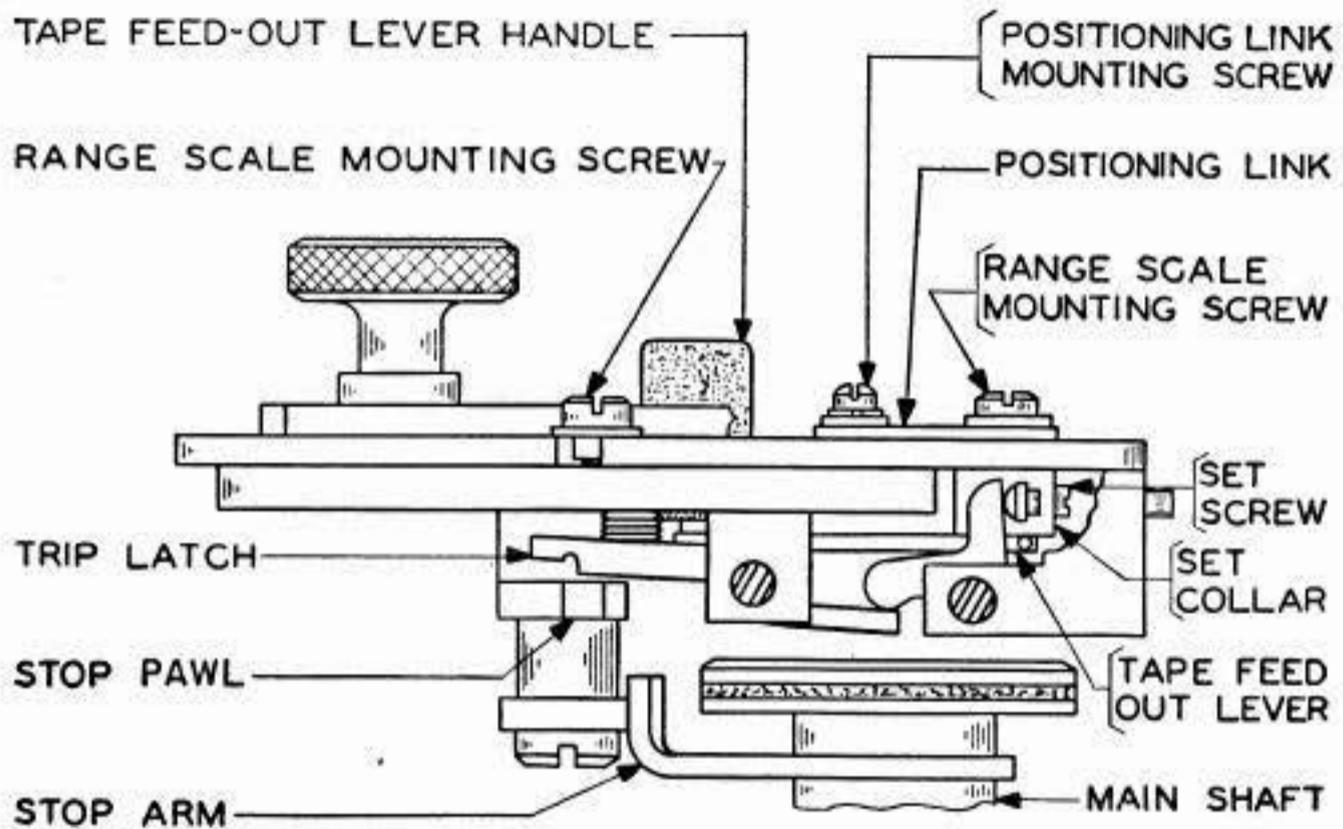


Fig. 6

2.11 In preparation for the adjustments of Paragraphs 2.12 to 2.25, inclusive,

- (1) Remove the punch-lever shoulder-screw and the pre-punch unit mounting-screws.
- (2) Remove the prepunch unit.
- (3) Put back the punch-lever shoulder-screw.

Note: To facilitate the adjustments of Paragraphs 2.12 to 2.42, inclusive, remove the code-punch tape guide and tape-depressing bail (which come off as a unit).

2.12 **Punch-Selector-Finger Retaining Bracket:** The punch-selector fingers should have from .006" to .015" up and down play in the slots. To adjust, position the punch-selector-finger retaining bracket by means of its mounting-screws and clamp plate.

Fig. 7

Note: By means of an off-set screwdriver, loosen the punch-selector-finger retaining-bracket mounting-screws until the bracket is friction tight. Position the bracket and tighten the screws.

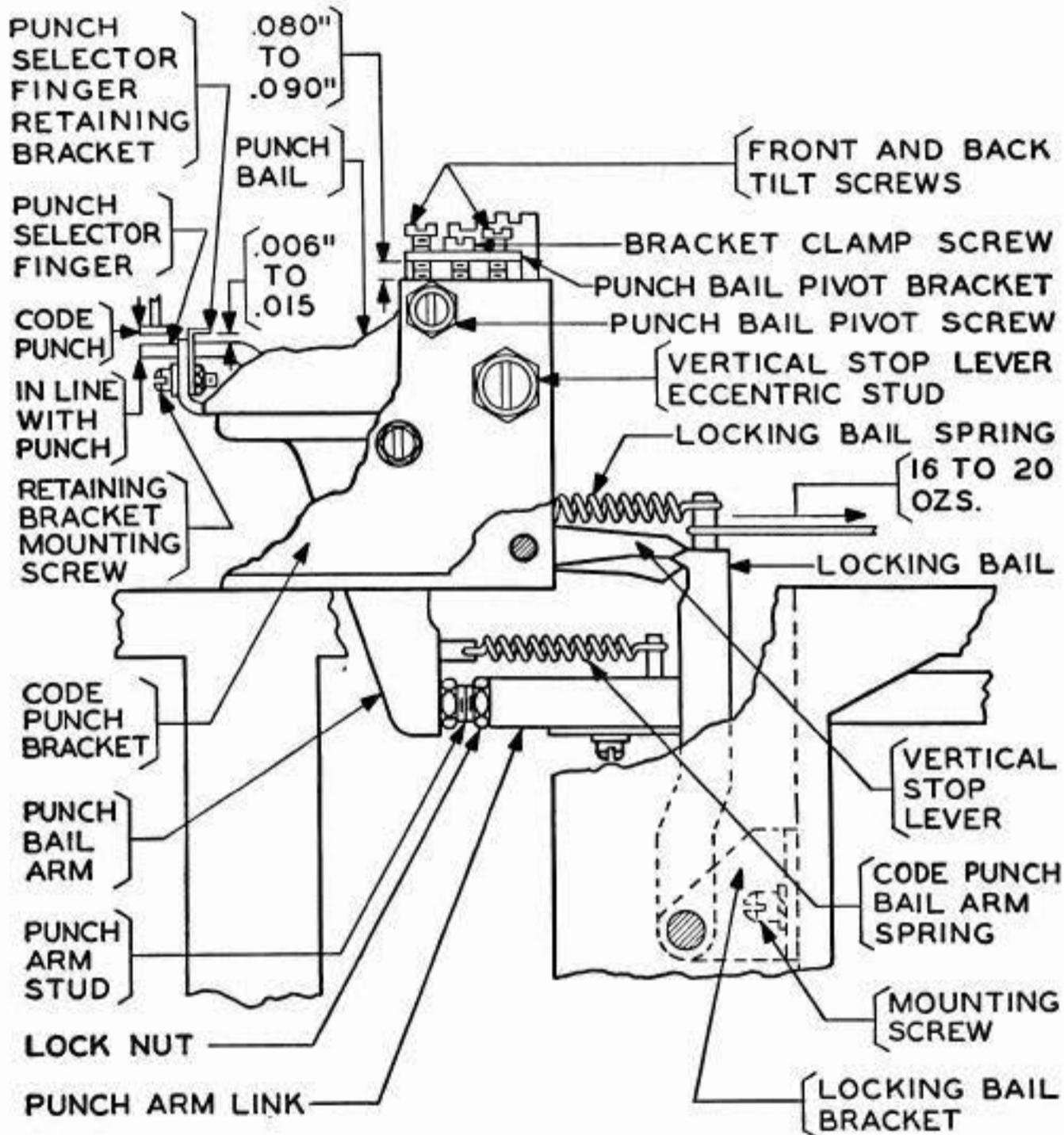


Fig. 7

2.13 **Vertical Stop-Levers Set Collars:** With the selector swords in the spacing position, hold the swords towards the selector magnet coils. This will relieve the spring tension on the T levers. Under these conditions the punch fingers, the stop levers, and the transfer levers can be checked for freeness of operation by rotating the T levers from the spacing to marking positions.

Figs. 8, 9

The vertical stop-levers should have some, not more than .010", total play on the vertical stop-levers shaft. Check this requirement by pushing the vertical stop-levers against the inner set collar and gauge the clearance between the outer set collar and the No. 5 vertical stop-lever. To adjust, position the set collars on each side of the vertical stop-levers.

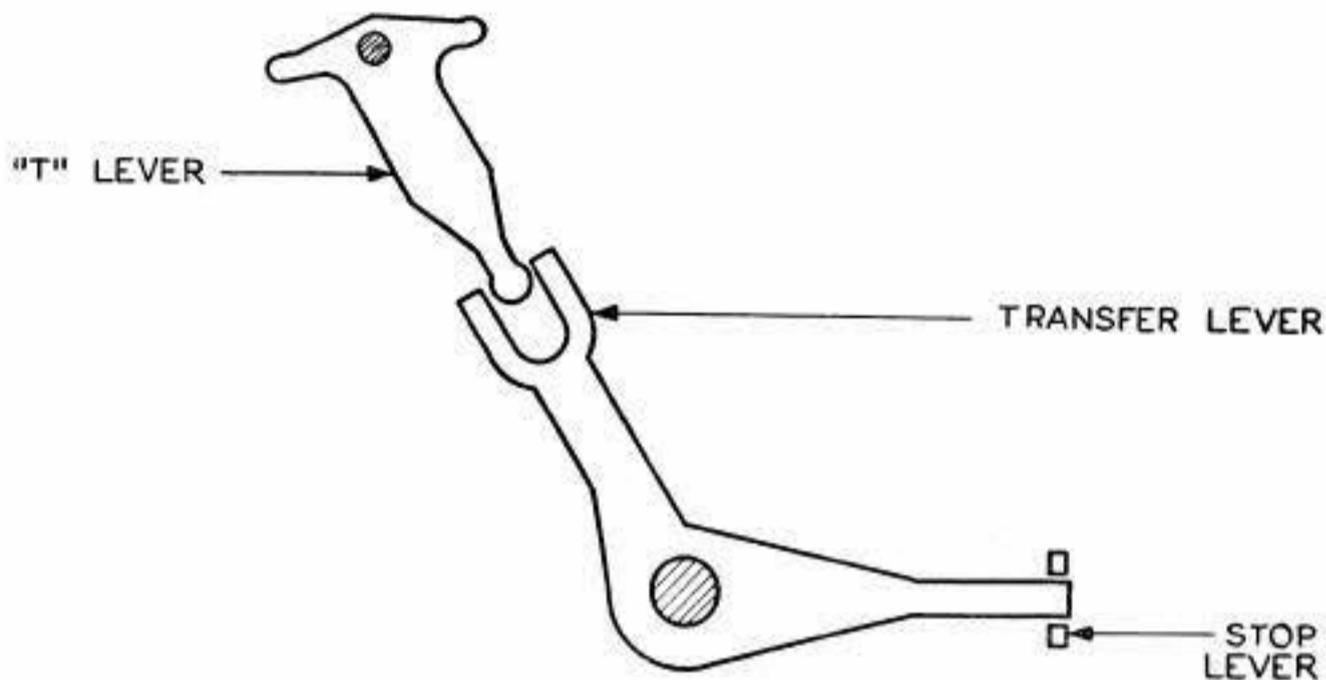


Fig. 8

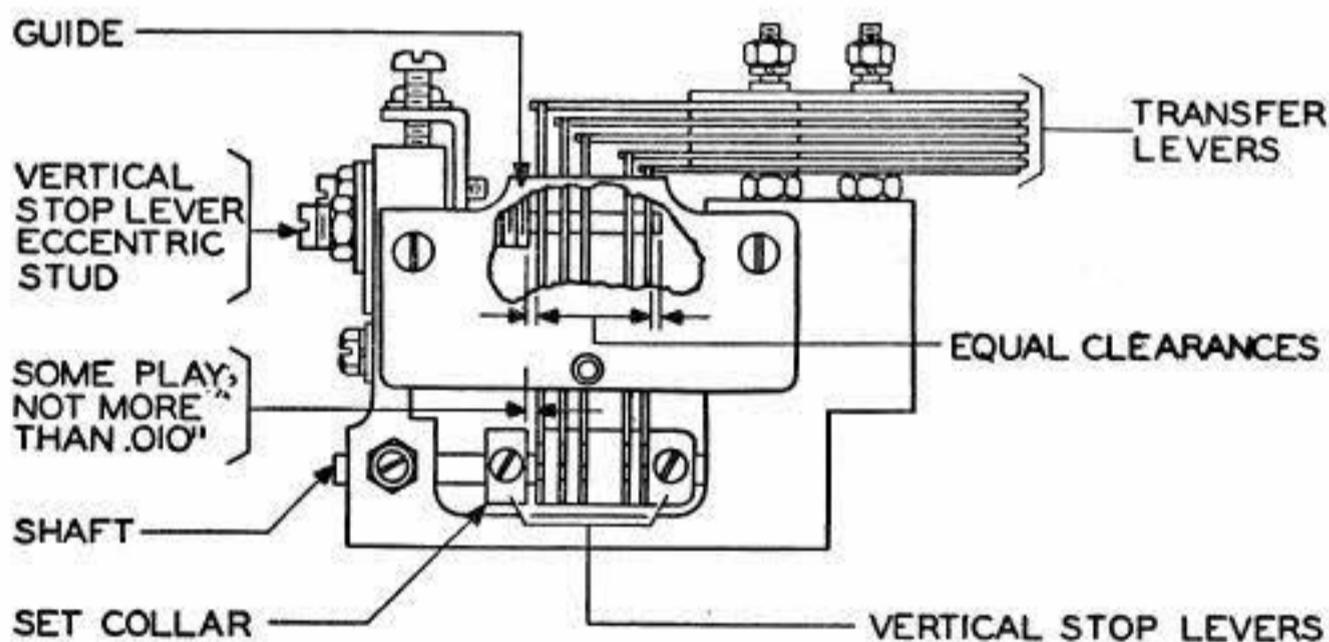


Fig. 9

2.14 Punch-Bail Pivot Bracket (Preliminary Adjustment):

The lower surface of the punch-bail pivot bracket should be .080" to .090" above and parallel to the surface of the code-punch bracket on which it mounts. To adjust, loosen the

right punch-bail pivot screw lock-nut and punch-bail pivot plate clamp screw and position the pivot bracket by means of front and back tilt adjusting screws. Tighten the clamp screw and lock-nut. **Fig. 7**

Note: Removal of Punch-Block Assembly: If at any time it is necessary to remove the punch-block assembly, use the following procedures:

- (a) Remove the locking-bail spring.
- (b) Remove the upper chad chute by means of its two mounting-screws.
- (c) Remove the left mounting-screw of the code-punch-block assembly. Avoid the loss of shims. (This screw holds the code punch block to the bracket.)
- (d) Unhook the punch-bail-arm spring and disengage the punch-arm link from the punch-bail-arm stud.
- (e) Remove the three code-punch-assembly mounting-screws, and lift the assembly out. Avoid the loss of shims. Do not damage or distort the transfer levers or separator plates.

Assemble the code-punch assembly by reversing the procedure outlined above. Care must be taken to avoid damaging the transfer levers or separator plates.

2.15 Code-Punch Bracket: The transfer levers should line up with the selector T levers. The selector T levers should engage the slots in the transfer levers without binds. To adjust, add or remove shims under the code-punch bracket.

Figs. 7, 8, 10

Note: Manually hold the swords away from the T levers and check the T levers, transfer levers, vertical stop levers, and punch fingers for freeness.

2.16 Punch Bail:

- (a) The No. 1 and No. 5 punch-selector fingers should be centered with respect to the No. 1 and No. 5 code punches. **Fig. 10**
- (b) The punch bail should have some end-play, not more than .004". To adjust, position the punch-bail pivot-screws. **Fig. 10**
- (c) With the punch bail adjusted according to the foregoing adjustment and the punch-retractor springs removed, the punch retractor should float freely over the bail. To adjust, bend both legs of the punch retractor near the cross brace and in a line parallel to it. **Fig. 10**

2.17 Punch-Bail Pivot Bracket (Final Adjustment): A line across the top of the punch-selector fingers should be parallel to a line across the bottom of the code punches. To adjust, loosen the punch-bail pivot-bracket clamp screw and position the bracket by means of the right and left tilting screws. Tighten the clamping screw. **Figs. 7, 10**

Note: Turn both adjusting screws the same number of turns to prevent tilting the bracket.

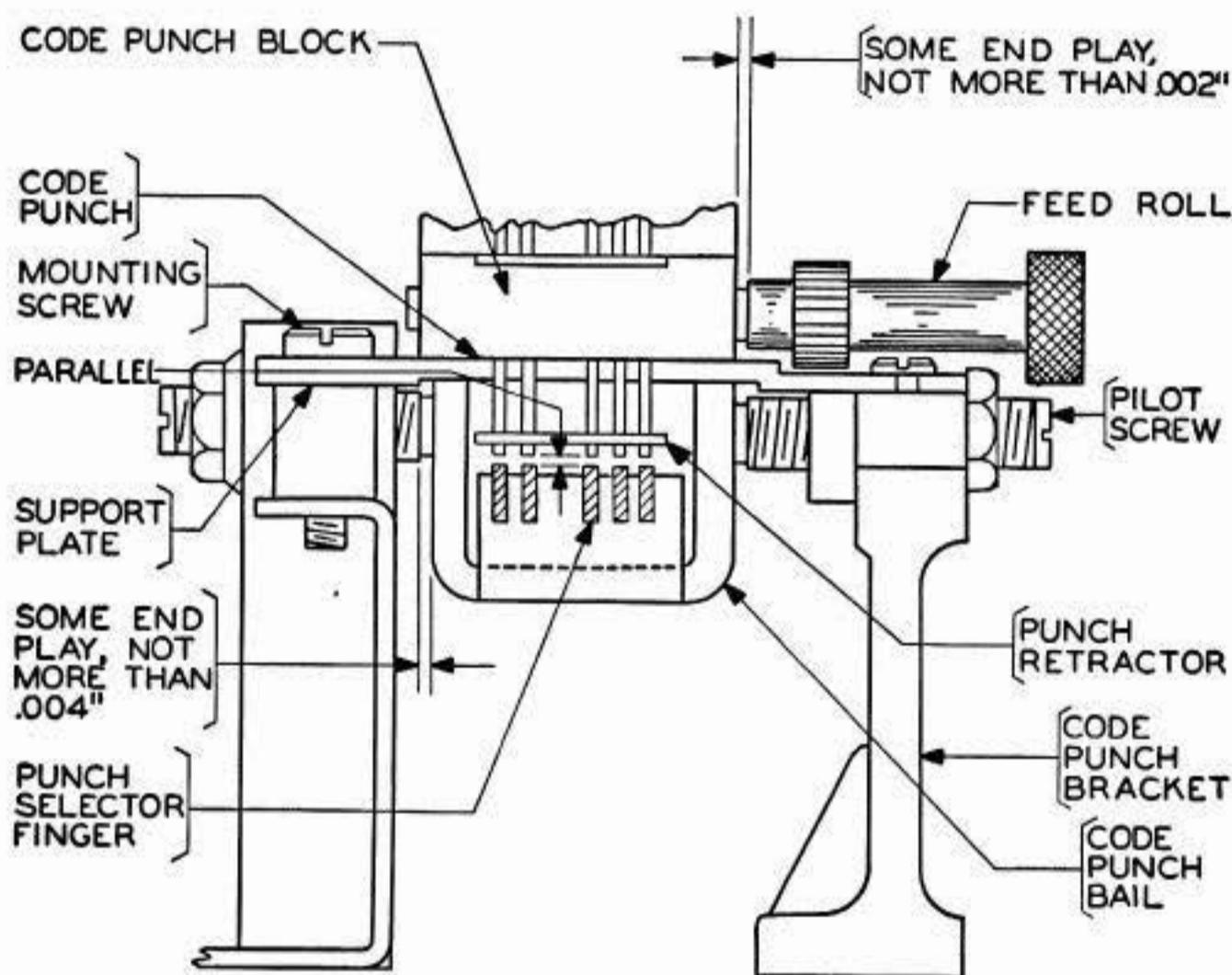


Fig. 10

2.18 Code-Punch-Block Feed-Roll Shims: Place a piece of tape in which the feed holes have been perforated in the die block and engage the feed holes on the pins in the feed wheel. Select the letter I (No. 2 and No. 3 code punches operated) and perforate the tape. Remove the tape from the die block and check to see that the feed hole is centrally located between the code holes, when gauged by eye. The feed roll should be free, with some end-play, not more than .002". **Figs. 10, 11, 12**

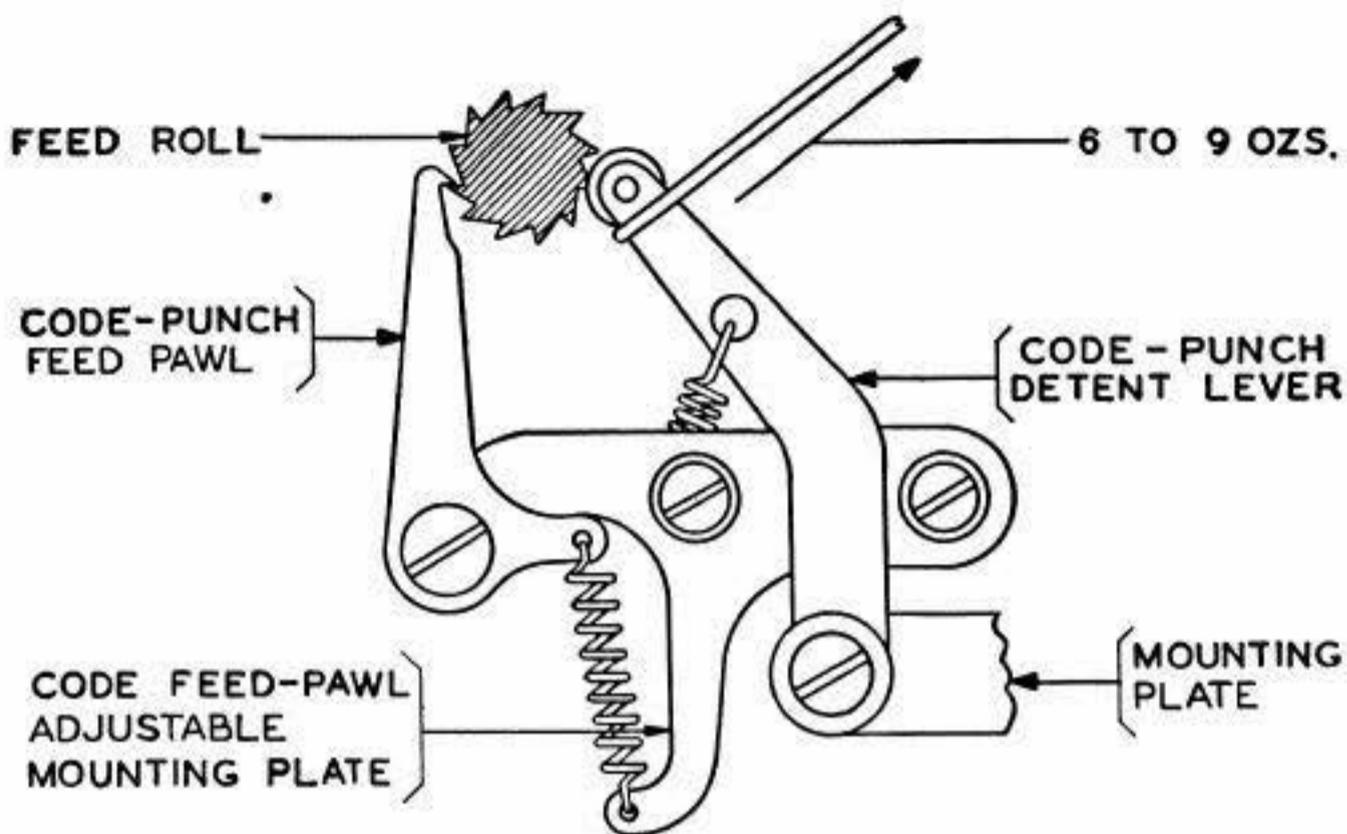


Fig. 11

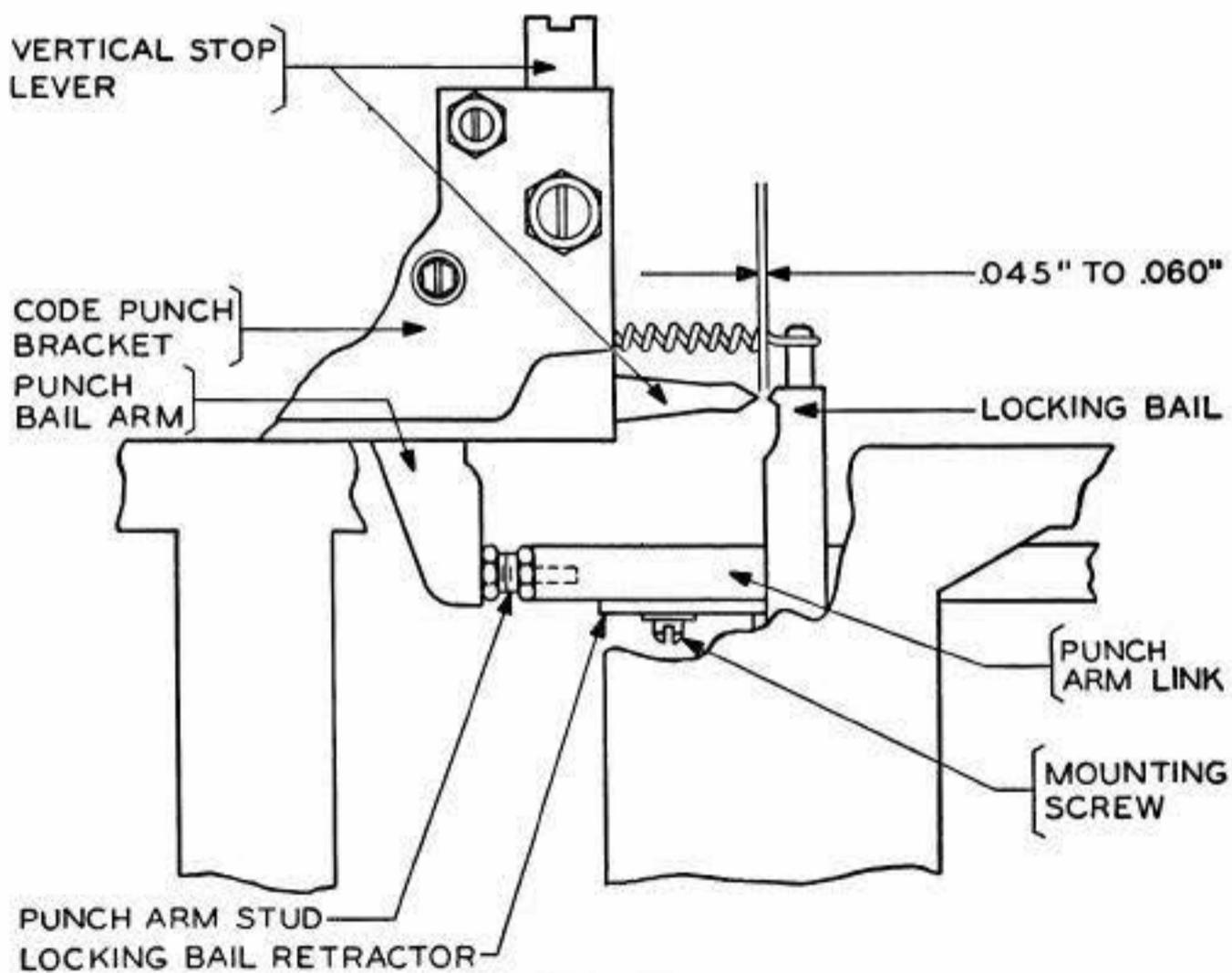


Fig. 12

Note: The above adjustment was made at the factory and should not require re-adjustment unless the shim pile-up has been disturbed or a new feed roll is to be installed. If it is necessary to readjust, the following procedure should be followed:

- (a) Unhook the code-punch detent-lever spring.
- (b) Remove the two code punch-block-assembly mounting-screws.
- (c) With the Blank combination selected and the punch-arm link in its forwardmost position, (punch bail up) hold the feed-pawl (Fig. 22) out of the way and remove the code punch-block assembly from the punch mechanism. Avoid damaging the punch pins when removing them from the punch retractor.
- (d) Hold the code punch-block assembly so that the support plate is upward and remove the two shoulder screws and the two support-plate mounting-screws. Remove the support plate, being careful not to pull out the punch pins.
- (e) Place the proper number of shims on each side of the feed wheel to obtain the proper end-play as per the foregoing adjustment. The shims should be slipped on the shaft by means of the slot. Avoid bending or kinking the shims.
- (f) Place the feed-roll with the shims in the die block with the wide ends toward the die pins and the straight side toward the bottom of the die block.
- (g) Replace the support plate and the two mounting-screws. Tighten the screws and recheck the location of the feed-hole in relation to the code-hole as specified, when the No. 2 and No. 3 code punches are operated manually. If it does not meet this requirement shift one or more shims from one side to the other.
- (h) The tape should be held in the die block so that the edges of the tape are parallel with the sides of the die block. If the feed-roll is rotated so that the front edge of the die plate is midway between two feed-hole perforations, the No. 2 and No. 3 punch pins will perforate their holes in line with the feed holes. This will aid in gauging the position of the feed roll.
- (i) With the Blank combination selected, rotate the shaft until the punch-arm link is in its forwardmost position. Place the punches of the code-punch assembly in the lowermost position, move the detent roller out of the way of the feed-roll ratchet and hold the feed-pawl so that it passes through its slot of the block assembly.

Engage the punches and the guide shoulder screws of the punch-block assembly in the retractor slots and replace the front punch-block mounting-screw friction tight.

Hold the pivoted transmitter against the punch block and locate the block, within the limits of its mounting-holes, parallel to the edge of the pivoted transmitter guide plate. Replace the rear screw and tighten both mounting-screws.

Rehook the feed-roll detent-lever spring. Check following adjustments:

CODE-PUNCH FEED-PAWL (Paragraph 2.22)

CODE-PUNCH FEED-ROLL DETENT (FINAL ADJUSTMENT) (Paragraph 2.97)

CODE-PUNCH TAPE-GUIDE (Paragraph 2.43)

2.19 Vertical Stop-Levers Eccentric Stud: The distance between the end of the threaded portion of the vertical stop-lever eccentric stud and No. 5 vertical stop lever should be approximately equal to the distance between the end of the stud and No. 1 vertical stop-lever; the high part of the eccentric stud should be up. To adjust, loosen the eccentric-stud lock-nut and rotate the stud. **Fig. 9**

(a) With the Y combination set up and with the receiving shaft rotated to its stop position, rotate the eccentric stud clockwise or counterclockwise until the tips of the selector levers are approximately in line. **Fig. 2**

(b) With the Blank combination set up and with the stop-lever locking-bail resting against the stop-levers, the front ends of the punch-selector fingers should not be drawn more than halfway through their guide slots in the punch-bail and there should be at least .020" clearance between the front end of the punch-selector fingers and the rear edges of their respective punches. **Fig. 13**

(c) With the LTRS combination set up and with the stop-lever locking-bail resting against the stop-levers, the front ends of the punch-selector fingers should be in line with or over-travel the front edges of their respective punches. It may be necessary to reposition the code-punch bracket in order to meet this requirement. **Fig. 7**

(d) See that the high part of the eccentric stud is in the upper semicircle of adjustment after the above adjustment is completed.

(e) With the play in the punch-selector fingers and punch-bail taken up sideways, in either direction, see that the punch-selector fingers (in marking position) fully cover their respective punches and that there is some clearance

between the sides of the punch-selector fingers and the adjacent punches when the bail is raised so that the punch fingers touch only their respective punches.

2.20 Punch-Arm Stud (Preliminary Adjustment): The punches should just punch the tape when the punch-arm link is at the extreme forward point of its travel. Rotate the shaft by hand in making this adjustment. To adjust, position the punch-arm stud in or out of the punch-arm link. **Fig. 12**

Note: When the latching face of the latch lever extension lines up with the indicating mark on the under side of the latch cam, the punch-arm link is at the forwardmost point of its travel.

2.21 Code-Punch Feed-Roll Detent (Preliminary Adjustment): When a piece of tape containing ten feed holes to the inch (check with the TP95960 gauge) is placed in the code-punch die block and the code-punch feed-roll detent is resting in an indent between two teeth on the ratchet, the front edge of a feed-hole should be visible at the front edge of the die block when the feed holes in the tape are engaged with the pins on the feed wheel. To adjust, position the detent-lever mounting plate by means of its mounting-screws. **Fig. 11**

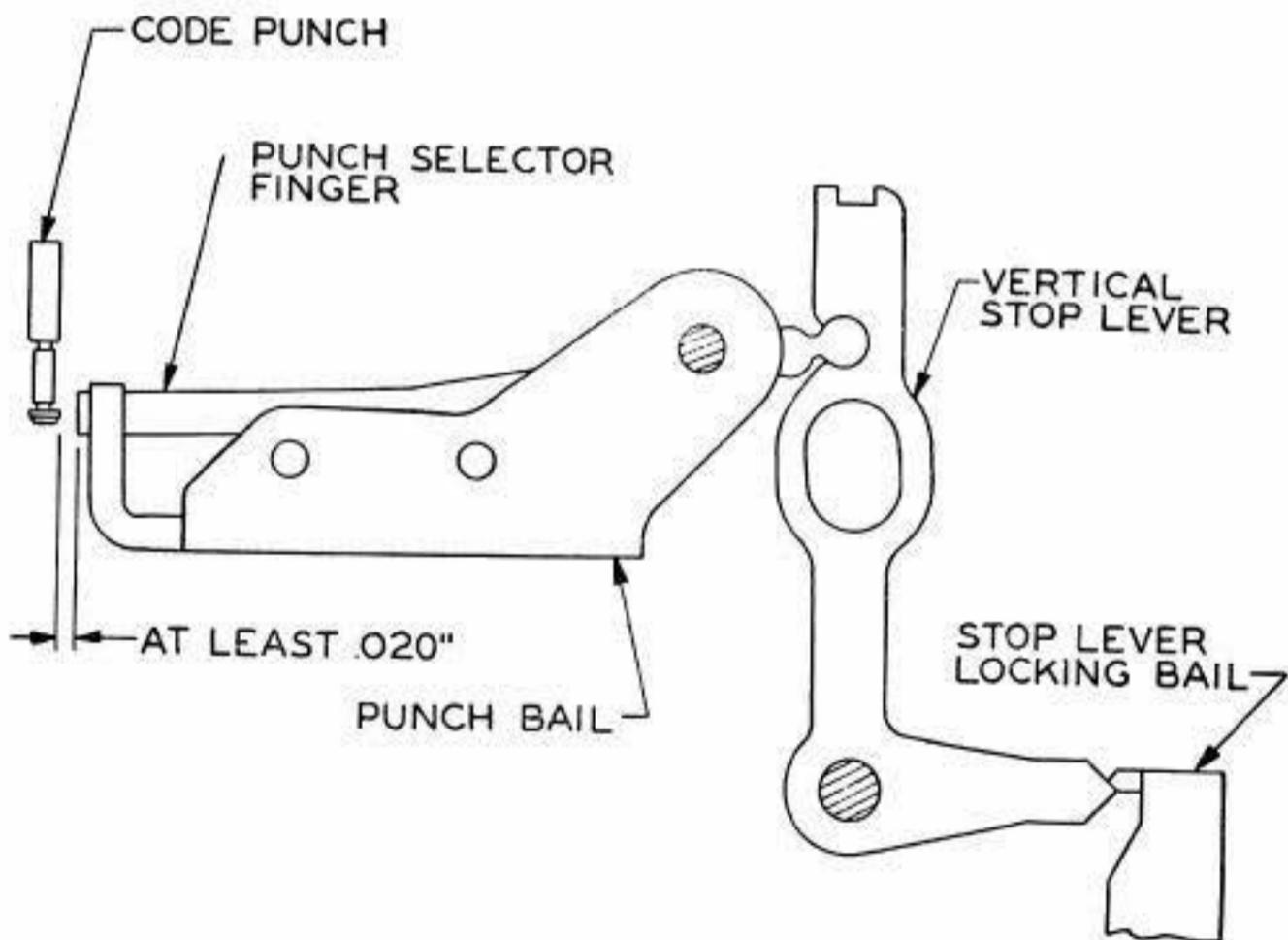


Fig. 13

2.22 Code-Punch Feed-Pawl: With the punch-arm link in its rearmost position, the feed-pawl should rest in the bottom of the first notch below the horizontal center line of the feed-roll. To adjust, position the feed-pawl by means of its adjustable mounting-plate. **Fig. 11**

2.23 Locking-Bail Bracket: Replace the locking-bail spring. With alternate vertical stop levers in the MARKING and SPACING position, the locking edge of the locking bail should engage the stop-levers with approximately an equal bite. To adjust, loosen the locking-bail bracket mounting-screws and push the locking-bail edge toward the stop-levers until it seats firmly between the levers. Tighten the locking-bail bracket mounting-screws. **Fig. 7**

2.24 Locking-Bail Spring: With the locking bail resting against the stop-levers, hook a 32 oz scale on the locking-bail spring post under the spring and pull horizontally to the rear of the unit. It should require 16 to 20 oz to start the bail moving. **Fig. 7**

2.25 Locking-Bail Retractor: When the punch-arm link is in its rearmost position and the vertical stop-levers held so that their knife edges line up with the knife edge of the locking bail, there should be .045" to .060" clearance between the stop-levers and the locking bail. To adjust, position the locking-bail retractor by means of its mounting-screws. Be sure that the retractor engages both sides of the locking bail. **Fig. 12**

Note: REMOVE THE PUNCH-LEVER SHOULDER-SCREW. MOUNT THE PREPUNCH ASSEMBLY AND REPLACE THE SHOULDER-SCREW.

2.26 Prepunch Tape-Guide: The tape guide should be positioned so that the tape enters the pre-punch block without interference. To adjust, position the tape guide by means of its mounting screws.

2.27 Prepunch Tape-Guide Spring: The tape-guide spring should be positioned so that the curved tip is centered on the tape at a point opposite the cutout portion of the tape guide and the tension of the spring should hold the tape firmly toward the left wall of the die-block slot without buckling. To adjust, position the spring by means of its mounting-screw and bend the spring to obtain the pressure required. Tighten mounting-screws.

2.28 Prepunch Retaining Bracket: There should be some clearance, not more than .002", between the top of the prepunch and the prepunch arm, when the prepunch is at its point of highest travel. To adjust, loosen the retaining-bracket

mounting-screws and position the bracket. Tighten the mounting-screws.

Fig. 14

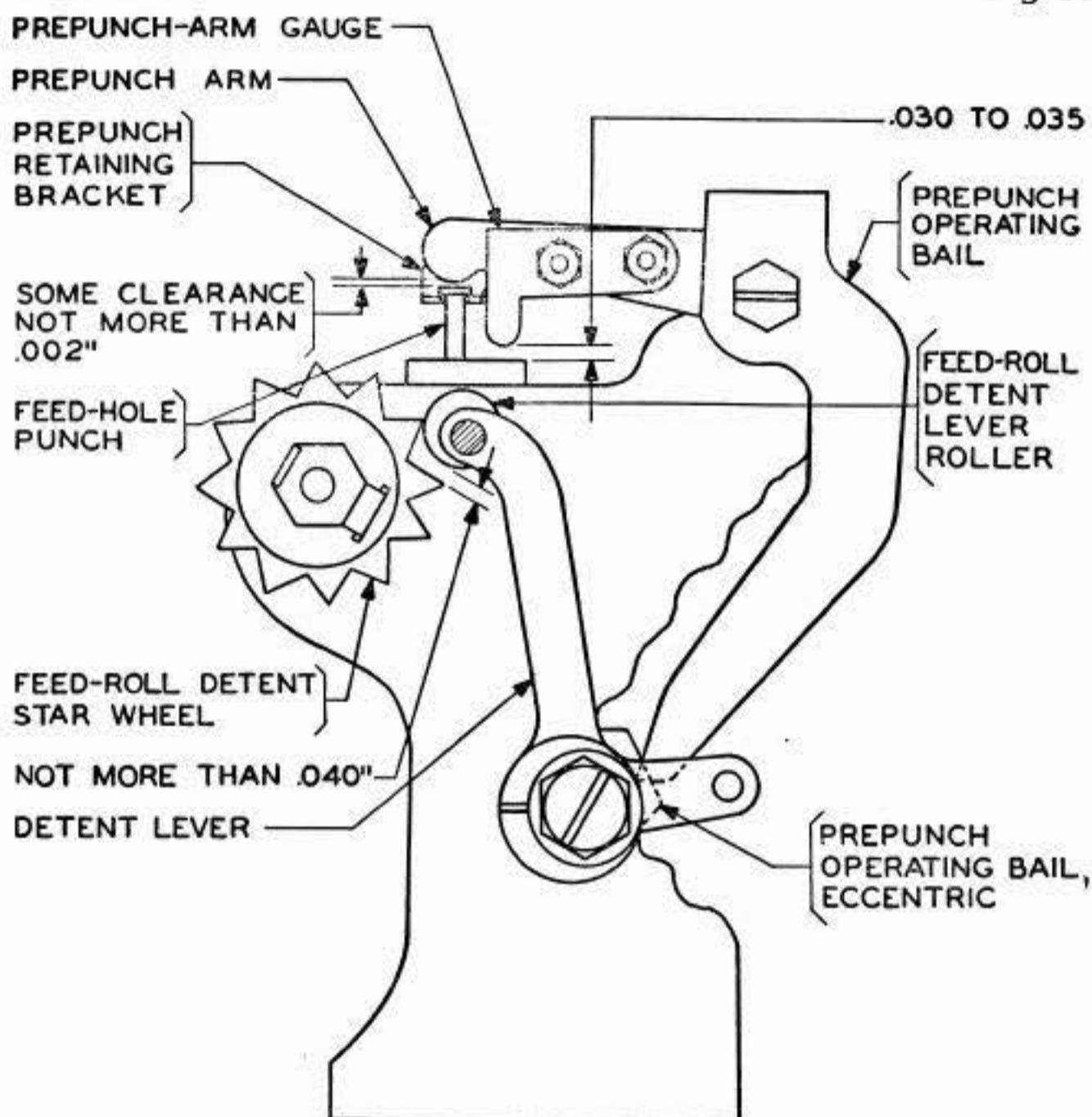


Fig. 14

2.29 **Prepunch Feed-Roll Bearings:** With the feed-roll detent, the feed-pawl, and the tape tension lever held away from the feed-roll, the feed-roll should be free in its bearings with some end-play, not more than .004". To adjust, position the left bearing bracket with its mounting-screws loosened so that the shaft is free in its bearings and position the rear-bearing bushing to obtain the correct end-play. Tighten the mounting-screws and lock-nuts.

Fig. 15

2.30 **Prepunch Tape-Tension-Lever Stud:** The tape-tension-lever stud should be centrally located with respect to the feed-roll pins. This requirement should be measured as follows:

Fig. 15

(a) Take up the feed-roll end-play towards the star wheel and the tension lever end-play towards its tension-adjusting nut. The edge of the tension-lever slot may touch the feed-roll pins on the side of the pins nearest the ratchet but there must be clearance on the other side.

(b) Take up the feed-roll end-play away from the star wheel and the tension-lever end-play away from the tension-adjusting nut. The edge of the lever slot may touch the feed-roll pins on the side farthest away from the ratchet but there must be clearance on the other side. To adjust, add or remove shims between the shoulder on the tape-tension-lever stud and its mounting bracket.

2.31 **Tape-Tension-Lever Spring:** Hook an 8-oz scale over the end of the slotted extension of the tape tension lever and pull at right angles to the lever. It should require a pull of 5 to 5-1/2 oz to start the slotted extension of the lever moving away from the feed-roll. To adjust, loosen the tape-tension-lever stud lock-nut and rotate the stud in either a clockwise or a counterclockwise direction. Tighten the lock-nut.

Figs. 15, 16

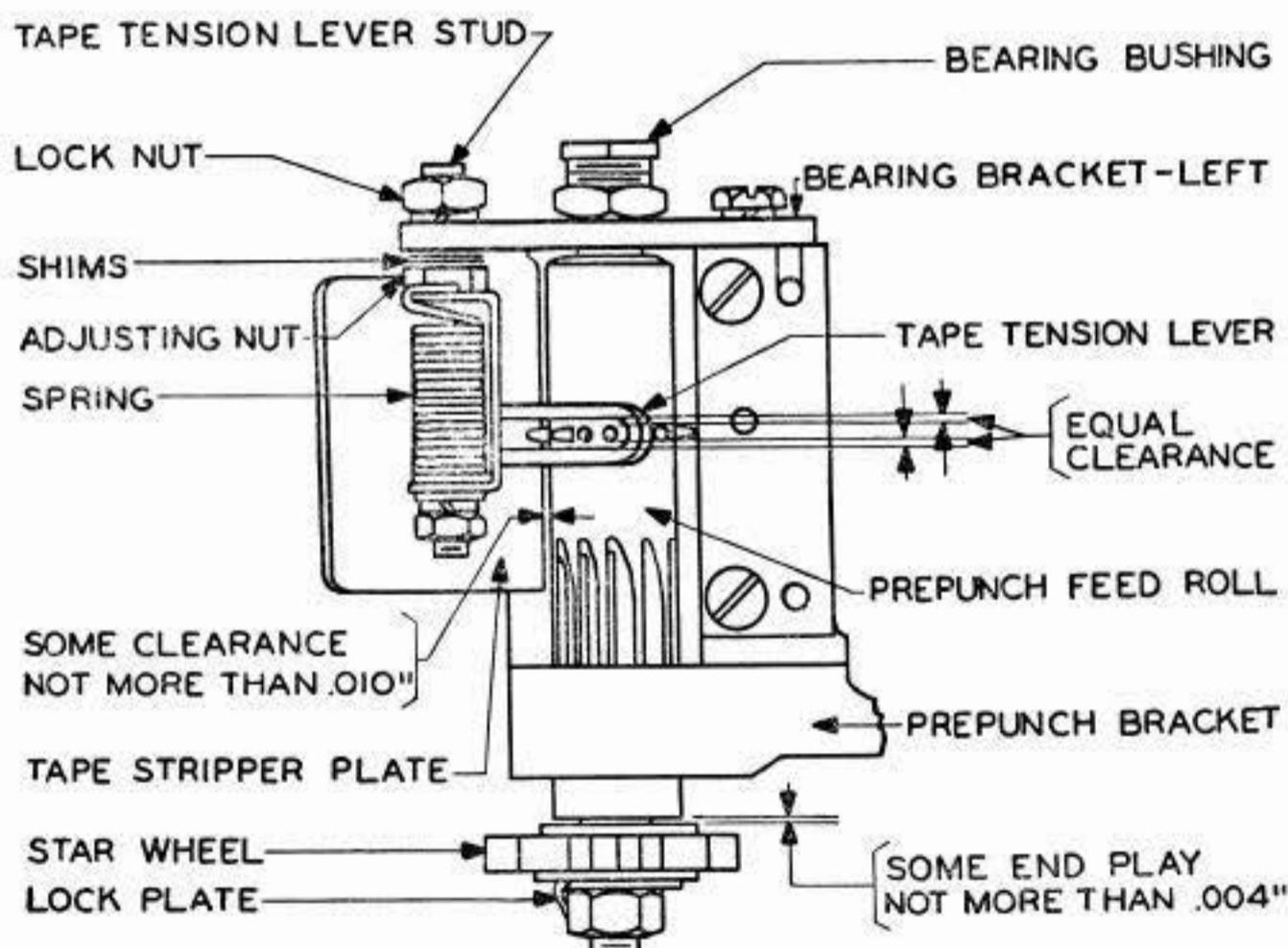


Fig. 15

2.32 Prepunch Feed-Roll Detent (Preliminary Adjustment):

The high part of the detent eccentric should be positioned to the front and the slot should be horizontal. To adjust, rotate the detent eccentric with its locking screw loosened.

Fig. 16

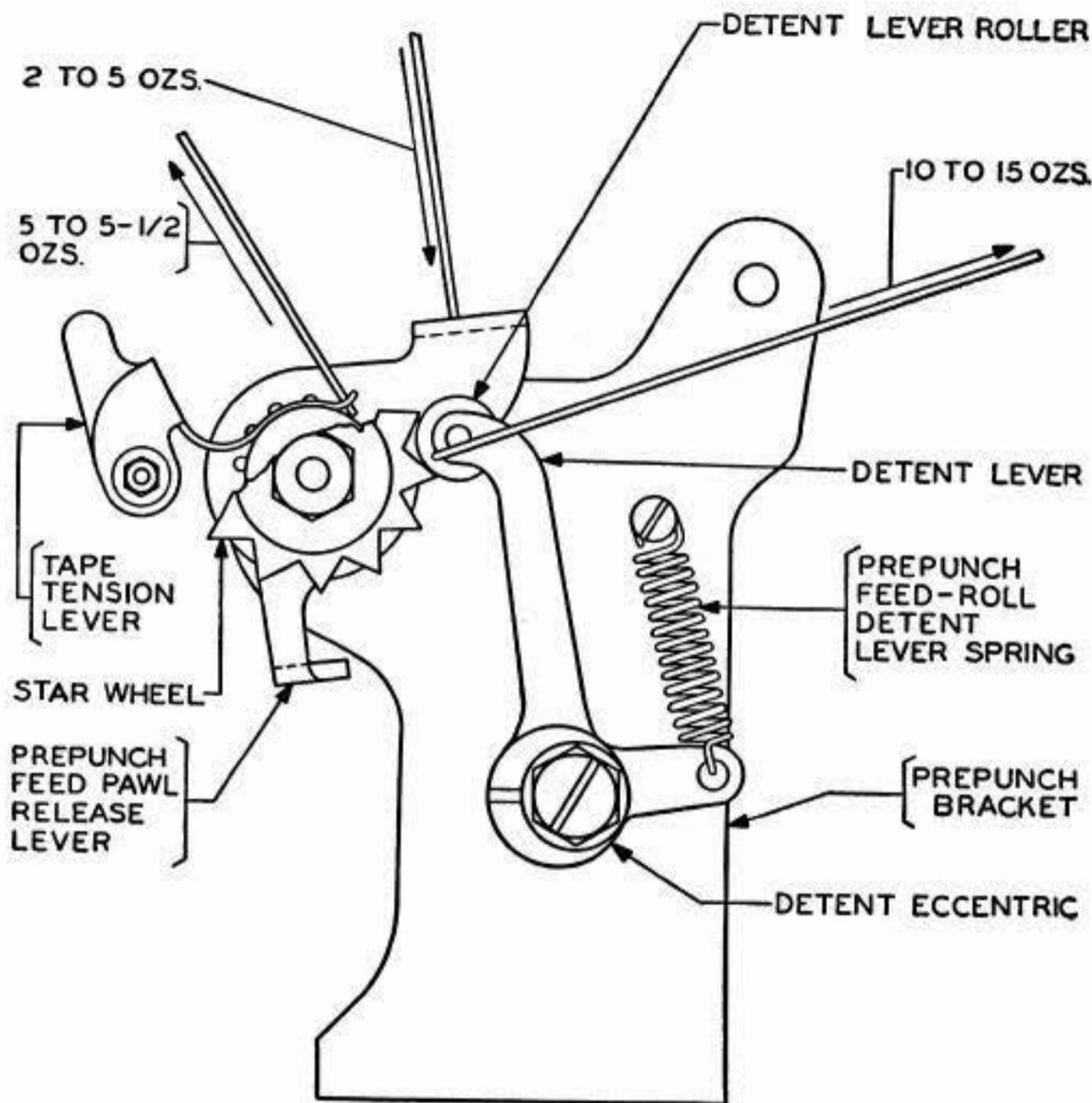


Fig. 16

2.33 Prepunch Feed-Pawl Eccentric (Preliminary Adjustment):

With the shaft rotated until the feed-pawl is in its lowest position, the feed-pawl should rest in the bottom of the notch which is just below the horizontal center line of the feed-roll. Adjust by means of the feed-pawl eccentric. Locate the high part of the eccentric toward the front.

Fig. 17

2.34 Prepunch (Preliminary Adjustment):

(a) A piece of unperforated tape should be held friction tight in the prepunch block by means of the prepunch when the punch-arm link is in its forwardmost position. To adjust, position the eccentric on the prepunch operating bail.

Fig. 14

(b) There should be a clearance of .060" between the end of the punch-arm gauge and the prepunch block. To adjust, loosen the punch-arm-gauge mounting-nuts and position the gauge. Tighten the mounting-nuts. **Figs. 14, 17**

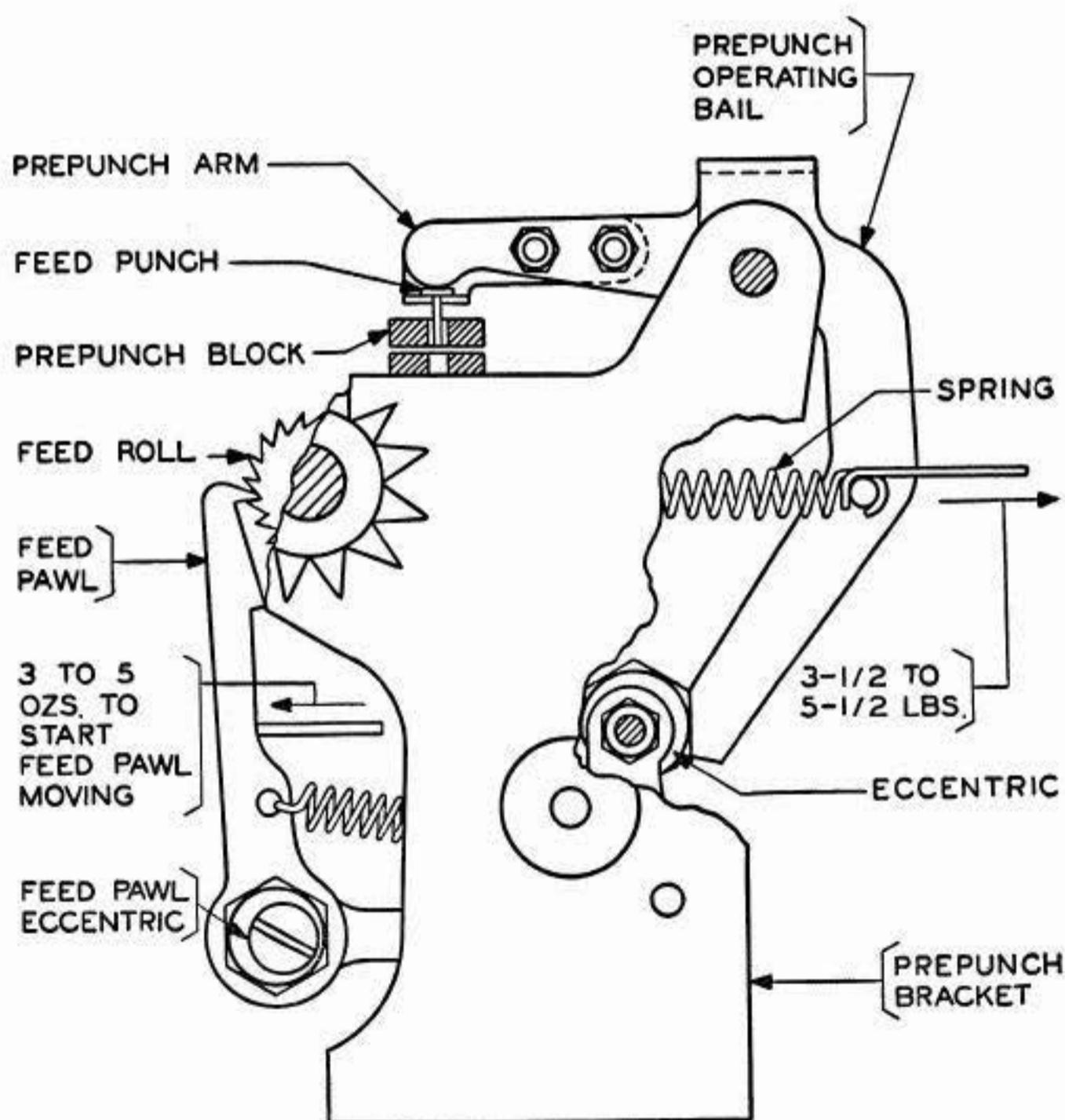


Fig. 17

(c) Remove the tape from the prepunch block and readjust the eccentric on the prepunch operating bail so that there is .030" to .035" between the end of the prepunch-arm gauge and prepunch block. The high part of the eccentric should be positioned above the center of a horizontal line through the eccentric pivot point. **Fig. 14**

2.35 Tape-Stripper Plate: There should be some clearance, not more than .010", between the upper edge of the tape-stripper plate and the feed-roll. Check for one complete revolution of the feed roll. To adjust, position the stripper plate by means of its elongated mounting-holes. **Fig. 15**

2.36 Prepunch Feed-Roll Detent (Final Adjustment): The perforations in the tape should meet the standard spacing of ten feed holes to the inch. This may be checked by perforating a length of tape and checking it against the tape gauge (TP95960). The perforating of tape should be done under power. To adjust, refine the preliminary adjustment of the detent eccentric (Fig. 16, Paragraph 2.32). **Fig. 16**

Note: To operate under power the reperfocator-transmitter unit must be mounted on the base. Check the gear adjustments; then operate under power.

2.37 Prepunch Feed-Pawl Eccentric (Final Adjustment):

Note: During the following adjustment, hold the tape-tension lever away from the feed roller. **Fig. 14**

(1) With the detent roller in engagement with the feed-roll detent star wheel, rotate the receiving shaft until the feed-pawl is in its uppermost position.

(2) Hold the detent roller away from the star wheel and rotate the receiving shaft until the feed-pawl is in its lowermost position. The feed-roll should move one full step.

(3) To gauge, allow the detent roller to come into engagement with the feed-roll detent star wheel and observe that the wheel is not rotated in a clockwise direction. A small amount of counterclockwise rotation is permissible; it should not exceed that represented by a clearance of .015" between the detent-lever roller and the tooth of the detent wheel below it. See Fig. 14, but use a clearance of .015" instead of the .040" there shown. **Fig. 14**

(4) To adjust, move the feed-pawl eccentric.

(5) Check this requirement at 4 points on the detent star wheel 90 degrees apart.

2.37A Prepunch (Final Adjustment): The purpose of the final adjustment of the prepunch is to insure that the punch pin is fully withdrawn from the tape before the feed-roll starts to move the tape forward. Check as follows:

(1) Rotate the receiving shaft until the feed-pawl is at the top of its travel. Insert a .006" gauge in the prepunch tape slot against the prepunch pin. Rotate the receiving shaft until the gauge just slides under the punch pin.

(2) In this position the following should be obtained:

(a) The feed-pawl should not have engaged the feed-roll to cause rotation. Check by lifting the feed-roll detent and observing that there is no counterclockwise motion of the feed-roll. A small amount of **clockwise** rotation of the feed-roll before it contacts the feed-pawl is permissible. See Fig. 17 for identification of parts. **Fig. 17**

(b) Lower the feed-roll detent and rotate the feed-roll counterclockwise by hand. The feed-pawl should drop freely into each feed-roll indent when the detent roller is engaging the detent star wheel. **Figs. 16, 17**

(3) To adjust, position the prepunch operating-bail eccentric. **Fig. 14**

Caution: To avoid damage to the prepunch pin or the gauge, remove the gauge whenever the shaft is turned to cause the prepunch pin to move downward.

2.37B Prepunch Pin Travel (Inspection check): Check the prepunch pin travel as follows:

(1) With the receiving shaft in the stop position, place a piece of unperforated tape in the prepunch block and rotate the receiving shaft until the prepunch pin just touches the tape. This can be detected by sliding the tape back and forth under the pin.

(2) Measure the clearance between the prepunch gauge and the top of the prepunch block.

(3) Rotate the receiving shaft until the prepunch reaches the lowermost point of its travel.

(4) Again measure the clearance between the prepunch gauge and the top of the prepunch block.

(5) The difference between the two gauge readings should not be less than .020". See Fig. 14 for identification of parts. **Fig. 14**

2.38 **Prepunch Operating-Bail Spring:** Rotate the receiving shaft until the punch-arm link (see Fig. 21 for this part) is in its extreme rear position. With the prepunch operating-bail lower extension held against the operating-bail eccentric, hook a 12-lb scale over the spring post in the prepunch operating bail and pull horizontally to the right in line with the spring. It should require 3-1/2 to 5-1/2 lb to start the prepunch arm moving.

Fig. 17, 21

2.39 **Prepunch Feed-Roll Detent-Lever Spring:** With a 32-oz scale hooked over the detent lever at the roller and pulled at right angles to the detent lever, it should require 10 to 15 oz to start the detent-lever roller away from the star wheel.

Fig. 16

2.40 **Prepunch Feed-Pawl Spring:** With the receiving shaft in the stop position, apply the push end of an 8-oz scale to the feed-pawl just above the curved portion at the spring hole and push horizontally to the front of unit. It should require 3 to 5 oz to start moving the feed-pawl away from the feed-roll.

Fig. 17

2.41 **Prepunch Feed-Pawl Release-Lever Spring:** With the push end of an 8-oz scale applied to the upper flat extension of the feed-pawl release lever and pushed vertically downward, it should require 2 to 5 oz to just start to move the feed-pawl release lever.

Fig. 16

2.42 **Code-Punch Tape-Feed Suppressor:** When the tape-feed suppressor is just touching the code-punch feed-pawl, there should be .010" to .030" between the edge of the tape-feed suppressor lever and the feed-roll shaft when the play is taken up to make this clearance a minimum. To adjust, position the tape-feed suppressor lever, or its mounting shaft.

Fig. 18

Note: Put back the code-punch tape-guide, which was removed for the adjustments starting with Para. 2.12.

2.43 **Code-Punch Tape-Guide:** Loosen the tape-guide mounting-screws (friction tight) and position the tape guide so there is some clearance between the guide and the punch block and so the front edge of the tape guide is parallel to the punch block. Tighten the mounting-screws.

2.44 **Tape-Depressing-Bail Mounting-Bracket:** The front end of the tape guide should line up with the code-punch block so that the tape enters the punch block without interference. Loosen the tape-depressing-bail mounting-bracket

2.46 Pivoted-Transmitter Backstop-Screw and Tape-Depressing-Bail Bracket:

(a) With the pivoted transmitter rotated away from the punch mechanism against its backstop screw and the latch on the tape-depressing bail engaged with the transmitter, there should be .020" to .040" clearance between the latch on the tape-depressing bail arm and the adjacent latching edge on the transmitter plate. To adjust, position the transmitter backstop screw in the backstop bracket. Bend the bracket if necessary. **Fig. 19**

(b) There should be .030" to .045" clearance between the projections on the tape-depressing-bail guide bracket and the punch block. There should be at least .008" clearance between the chad-chute mounting-screw and the tape-depressing-bail assembly. To adjust, position the tape-depressing-bail mounting-bracket with its mounting-screws loosened. Recheck subparagraph (a). **Fig. 19**

End of Code-Punch-Tape-Guide and Depressing-Bail Adjustments

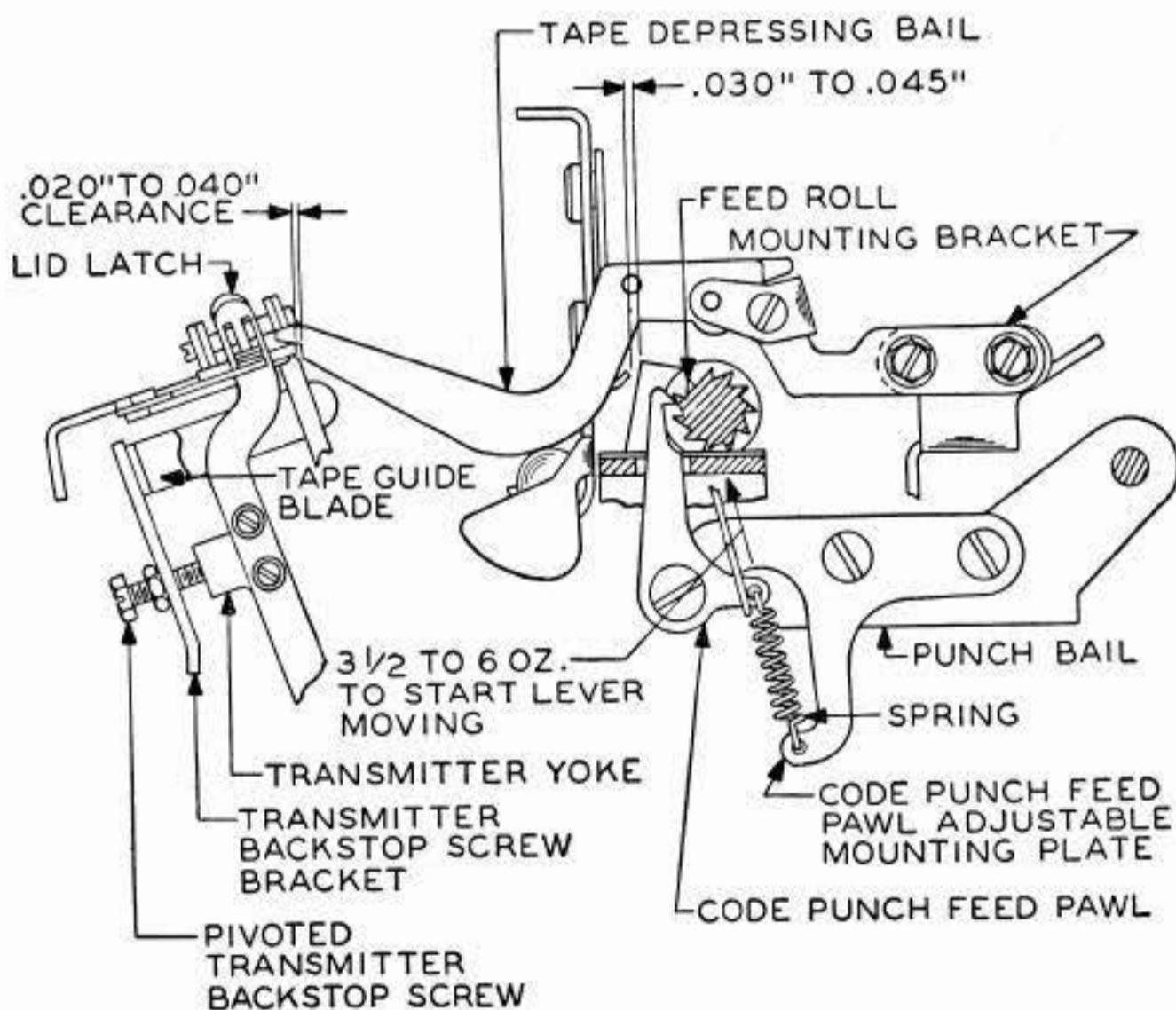


Fig. 19

2.47 **Punch-Retractor Springs:** With the punch-arm link in its rearmost position and with the selector fingers in their spacing position, hook a 12-lb scale under the center of the code-punch retractor—balance the position of the scale until both sides of the retractor leave their stops simultaneously (may require placing the scale under the number 3 punch pin)—and pull vertically upward. It should require $5\frac{1}{2}$ to 8 lb to start the code-punch retractor moving away from the down-stops. **Fig. 20**

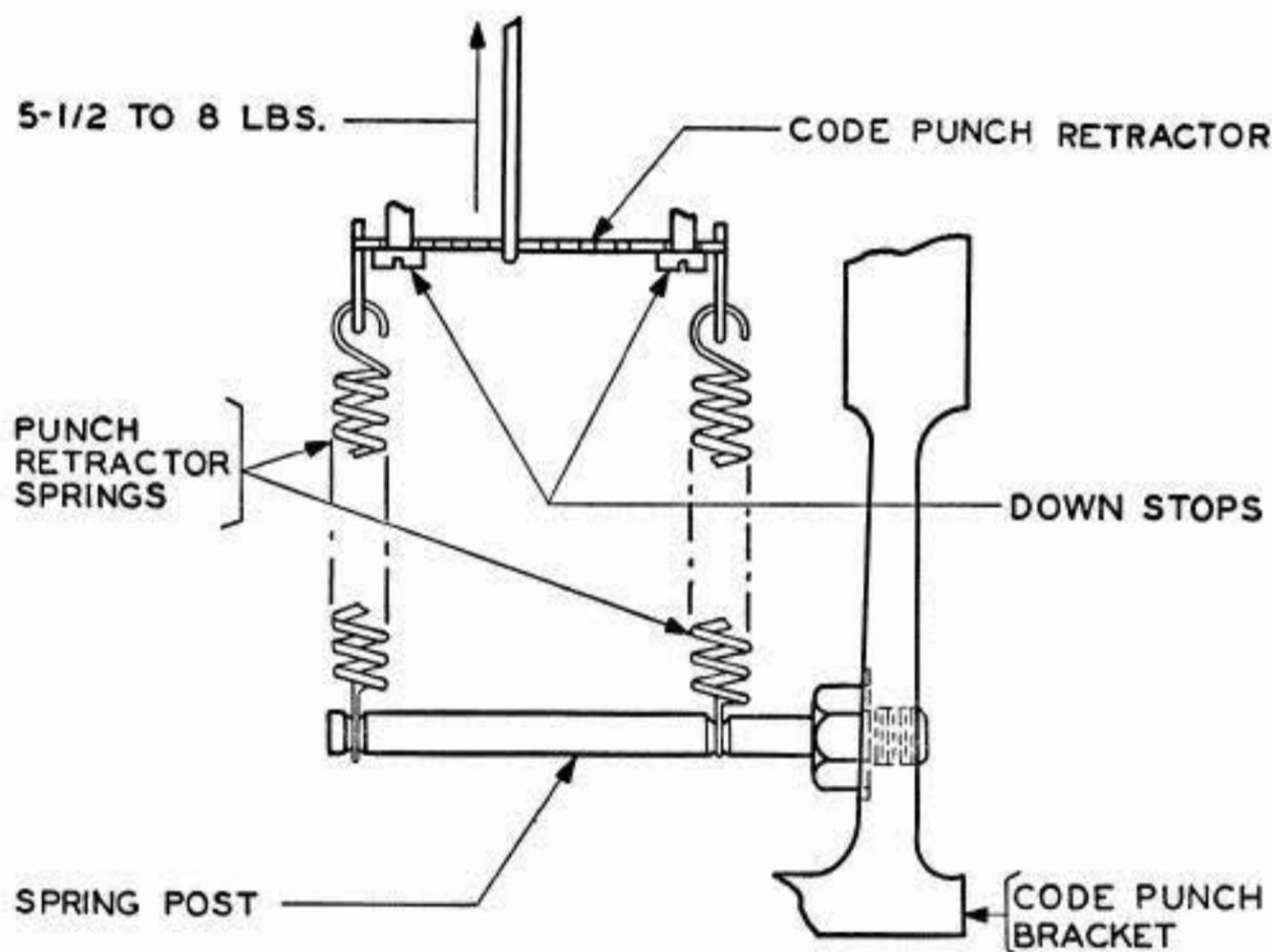


Fig. 20

2.48 **Code-Punch Bail-Arm Spring:** It should require a pull of $8\frac{1}{4}$ to $9\frac{1}{4}$ lbs, with a 12-lb scale, to stretch the spring to an overall length of $1\frac{1}{4}$ inches.

To check this tension, remove the spring from the unit, unhook the prepunch detent-lever spring from its post, and attach the code-punch-bail arm spring to the post. Using a 12-lb scale, pull the spring to length and observe tension reading. Replace the springs. **Fig. 21**

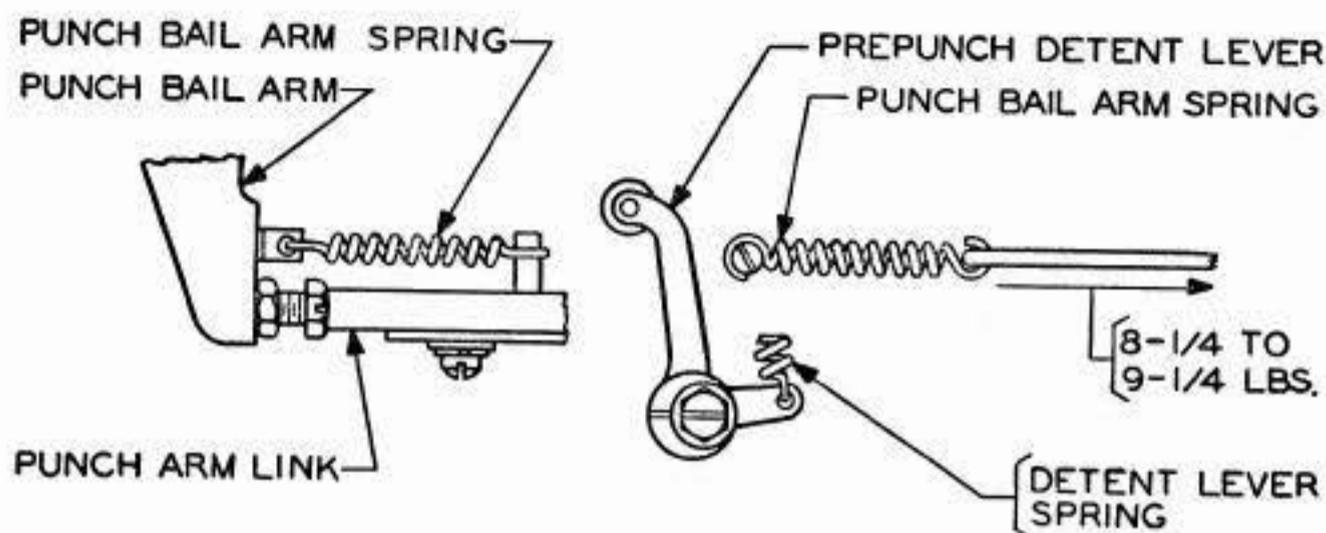


Fig. 21

2.49 **Sensing and Distributor Shafts:** The sensing and distributor shafts should rotate freely without bind. To adjust, remove the sensing and distributing drive-shaft gear guard and gear and position the left bearing bracket to free the sensing shaft, then position the right distributor shaft bracket. Replace the sensing and distributing drive-shaft gear guard.

Fig. 22

2.50 Sensing and Distributor Clutch-Magnet Brackets

Note: Adjustments (a) and (b) below need not be made unless the magnet or shims are disturbed.

(a) The clutch armature levers should have some end-play, not more than .006". To adjust, add or remove shims between the levers and the bracket in which the shaft is mounted.

Fig. 22

(b) The armatures should rest against the magnet cores evenly. Check by holding a light background behind the armature cores. To adjust, add or remove shims between the magnet cores and the magnet yoke.

Fig. 22

(c) The release spring should rest against the top insulators of all four magnet coils; if necessary, adjust by bending the legs of the spring. With the sensing and distributor-clutch throwout-lever springs removed, adjust the two center leaves by bending so that there is from .008" to .012" clearance between the magnet cores and the armatures, at the closest points. The armature to be checked should touch the leaf-extension of the release spring, while the other armature is held in the unoperated position.

Fig. 22

Note: See that the operating edges of the leaf-extensions are parallel to their corresponding armatures. Gauge by eye.

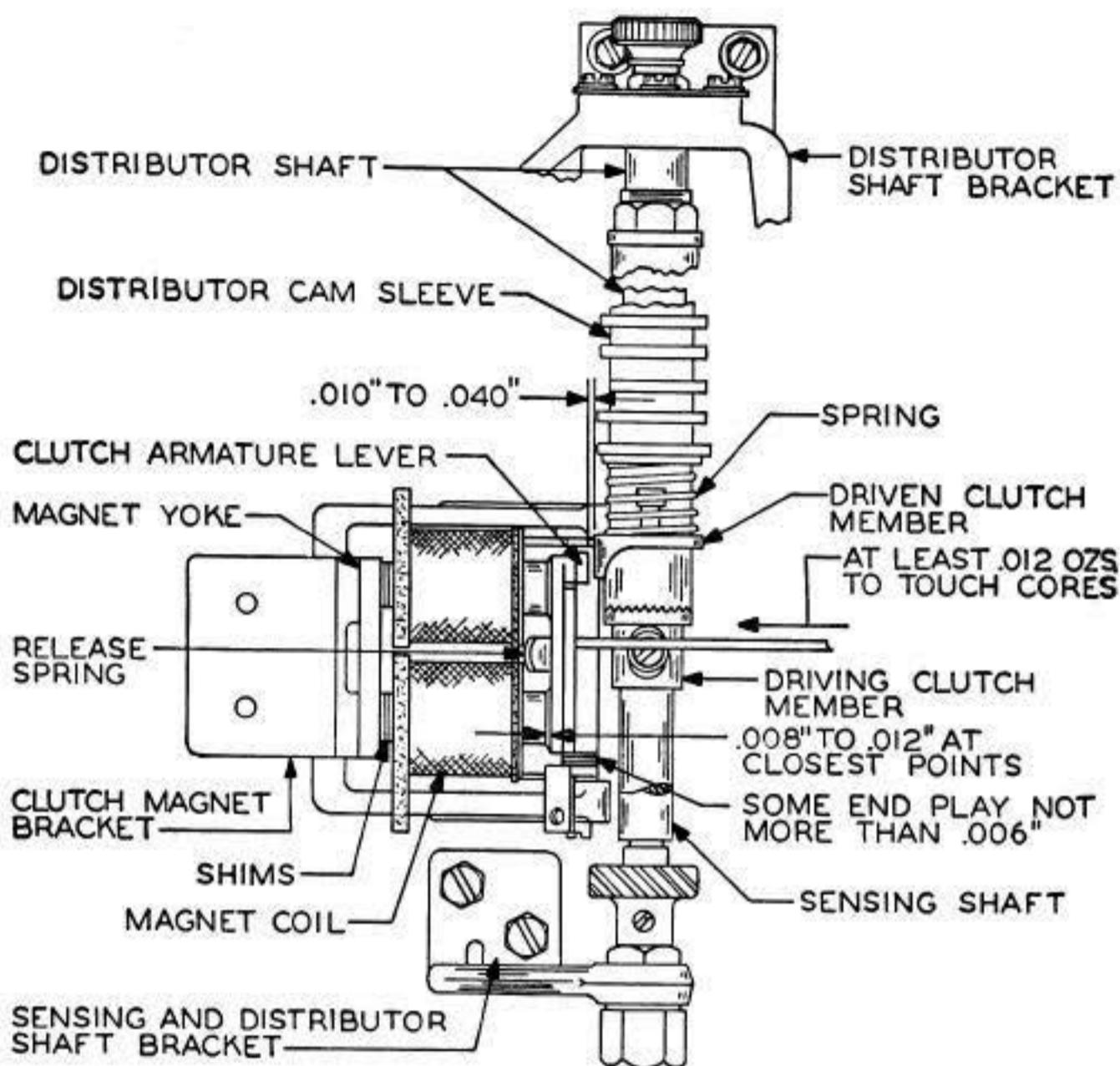


Fig. 22

With the push-end of a 32-oz scale applied horizontally to the outer edge of each armature, approximately in the center, it should require at least 12 oz to push the armatures until they just touch the cores.

Replace the Clutch Throw-Out-Lever Springs

(d) With the driving members positioned in the center of their elongated holes (preliminary) and with the armatures held in the operated position, there should be .010" to .040" clearance between the high part of the driven clutches and their respective clutch-throwout levers. The armatures should be parallel to their associated sensing and distributor shafts, and, with the armatures in the unoperated positions the clutch-throwout levers should disengage both clutches with approximately .005" clearance between the clutch teeth.

To adjust, position the clutch-magnet brackets by means of their mounting-screws. **Fig. 22**

2.51 **Sensing and Distributing Driving Clutches:** With the sensing and distributing shafts in the stop position with their clutch members fully disengaged, there should be .005" to .015" clearance between the teeth of the driving and the driven clutch members. Adjust both driving clutch members with their mounting-screws loosened. **Fig. 23**

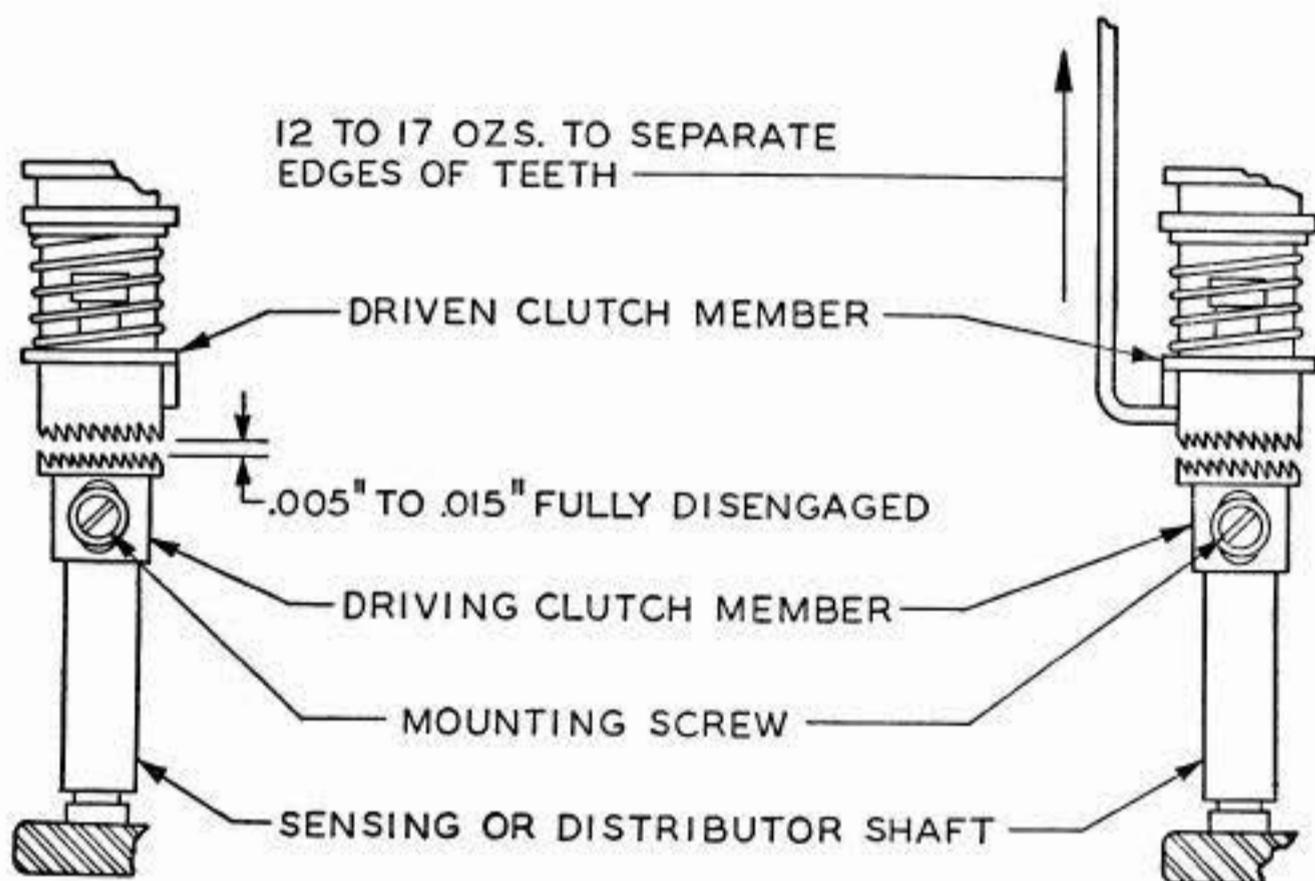


Fig. 23

2.52 **Sensing and Distributing Drive-Shaft Bearing and Gear:** The sensing and distributing drive shaft should rotate freely in its bearings and the backlash between the sensing and distributing drive-shaft gear and the sensing shaft and distributor shaft gears should be approximately equal. To adjust, position the bearing brackets with their mounting-screws loosened for free rotation of the drive shaft, and add or remove shims between front bearing bracket and casting to obtain equal backlash.

2.53 **Sensing and Distributor Clutch Springs:** With the unit resting on its rear supports and the teeth on the driving-clutch member resting on the teeth of the driven-clutch member, but not engaged, hook a 32-oz scale over the driven-clutch

members on the high part of the cam surface and pull in line with the shaft. It should require 12 to 17 oz to just separate the clutch teeth.

Fig. 23

Note: For the adjustments of Paragraphs 2.54 to 2.91, inclusive, remove the tape platform, located at the front right.

2.54 Pivoted-Transmitter Bracket Shims: When the pivoted transmitter is held against the code punch block, the tape channel on the pivoted transmitter should be approximately in the same horizontal plane as the tape channel in the code punch block. To adjust, increase or decrease the number of shims between the pivoted transmitter bracket and the base casting.

2.55 Pivoted-Transmitter Pilot-Screws: The pivoted transmitter should be positioned so that the pins in the feed-pin oscillator are in line with the feed-holes in the tape at the point where the tape emerges from the code punch block. To adjust, position the pivoted transmitter by means of its pilot-screws, adjusting the screws so that the assembly pivots freely, with a minimum amount of end-play and without binds. **Fig. 24**

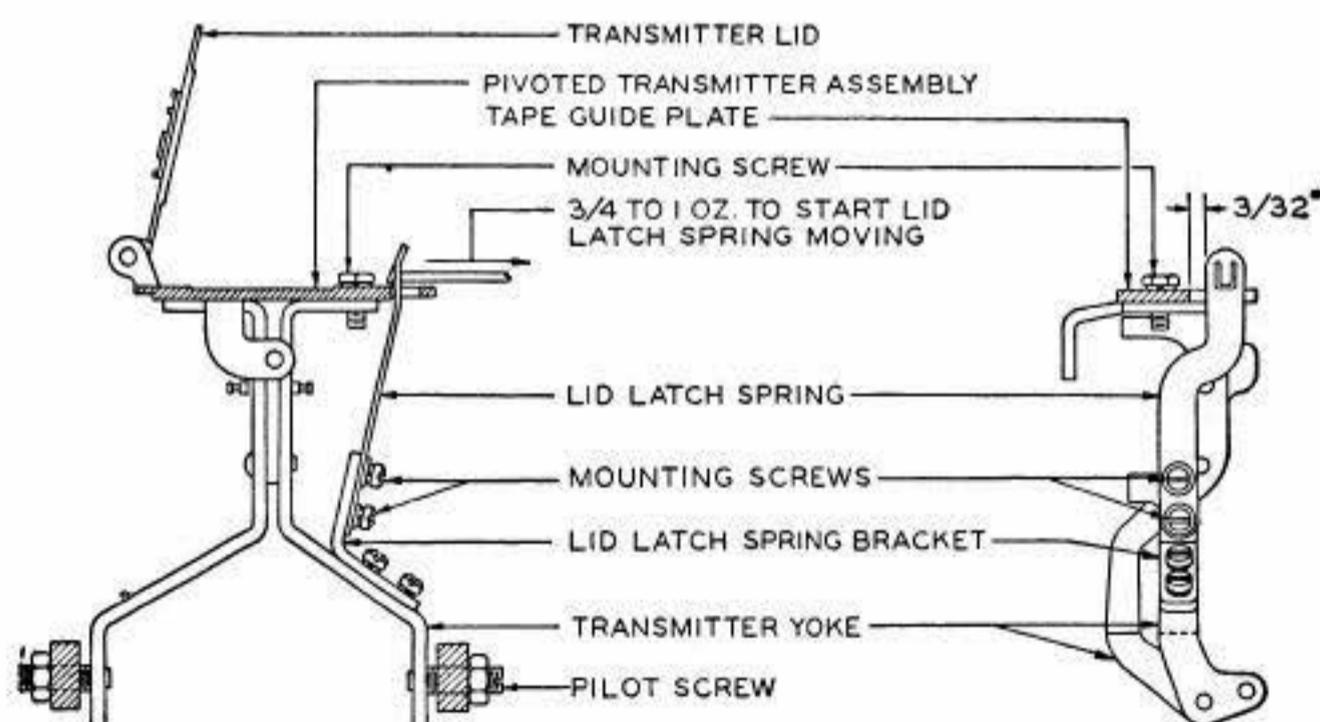


Fig. 24

2.56 Tape-Pin Oscillator Backstop Screw: With the sensing cam sleeve in the stop position and its clutch fully disengaged, place a length of tape which has ten holes to the inch in the pivoted transmitter. Operate the sensing cam sleeve slowly until the tape pins leave and are just about to re-enter

the tape feed-holes. Under this condition the feed-pins should be centered directly beneath the feed-holes in the tape. To adjust, position the tape-pin oscillator backstop-screw. **Fig. 25**

Note: The tape-guide should not buckle the tape to front or rear.

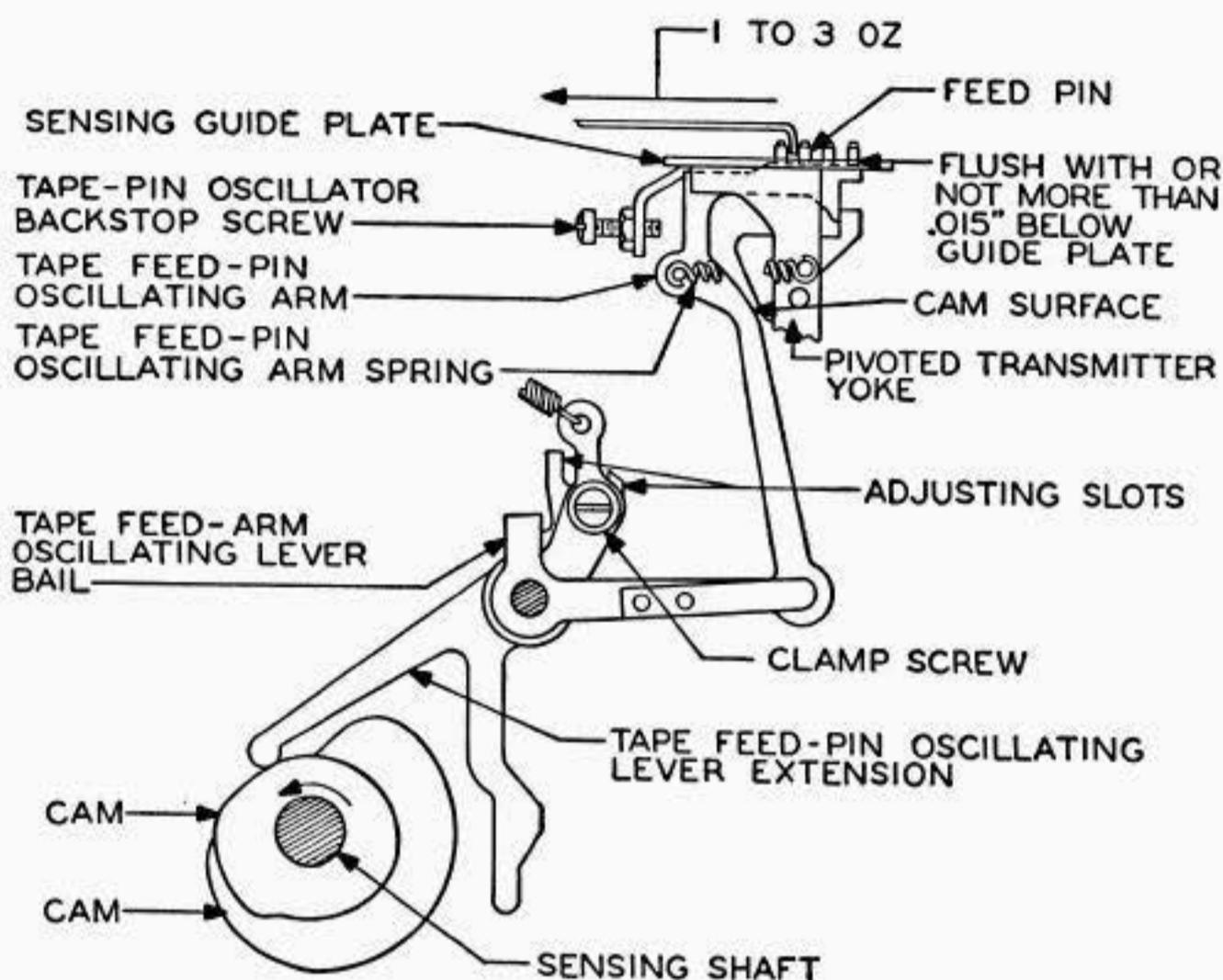


Fig. 25

2.57 Pivoted-Transmitter Tape-Guide Plate:

CAUTION: Do not raise or close transmitter lid unless the sensing shaft is in the stop position.

With a section of tape perforated with the LTRS code combination emerging from the code punch block and the pivoted sensing-unit tape guide touching the punch block, the transmitter tape-guide plate should be adjusted on the pivoted frame by means of its mounting-screws to meet the following requirements:

Fig. 24

- (a) With the sensing cam assembly in the stop position and the tape-feed holes engaged with the tape-feed pins, the tape should not buckle against either the right or left edges of the tape-guide channel. To adjust, position the

tape-guide plate right or left as required to meet the above requirement. **Fig. 24**

(b) With the pivoted transmitter in its midway (between its extreme left and right position) position, release the sensing-shaft clutch lever and rotate the drive shaft until the distributor-clutch-release contact lever drops off the high part of its cam and until the Y levers are about ready to drop off their cams. In this position the sensing pins should be approximately in the center between the leading edge and the trailing edge of the code holes in the perforated tape, and the center line through each pin (parallel to the edges of the tape) should be approximately in line with the center line through its code hole. To adjust, position the tape-guide plate from left to right and from front to rear while rechecking the foregoing adjustment. Check to see that the sensing pins do not touch the edges of their code holes when the pivoted transmitter is: **Fig. 24**

- (1) one space away from the die block
- (2) in its midway position
- (3) in its extreme left-hand position

To make this check, rotate the sensing and distributing drive-shaft slowly and observe the sensing pins when they are rising through the tape holes.

2.58 **Tape-Retaining-Lid Latch:**

(a) With an 8-oz scale hooked to the lid-latch spring, adjacent to and just above the tape guide plate and pulled at right angles to the latch spring, it should require $\frac{3}{4}$ to 1 oz to start moving the flat surface of the lid latch spring away from the tape-guide plate. To adjust, bend the lid latch-spring bracket. **Fig. 24**

Note: Care should be exercised to avoid bending the pivoted frame.

(b) Position the lid latch by means of its enlarged mounting-holes and screws so that the pivoted transmitter lid will be latched by the lid-latch spring with no appreciable play between the lid and the guide plate, and there will be a clearance of approximately $\frac{3}{32}$ " between the edge of the latch spring and the edge of the slot in the tape-guide plate. **Fig. 24**

2.59 **Tape-Holding-Lever Spring:** Unlatch and raise the transmitter lid. Rotate the sensing-shaft cam sleeve until the tape holding lever is in the indent of its cam. Hold the pivoted transmitter in a vertical position and apply the push-end of an 8 oz scale to the pin in the tape holding lever (extreme right sensing-finger pin of the sensing-unit guide plate) and

push vertically downward. It should require 2 to 4 oz to just start the lever moving. Rotate the sensing-shaft cam sleeve to the stop position and close and latch the transmitter lid.

Fig. 26

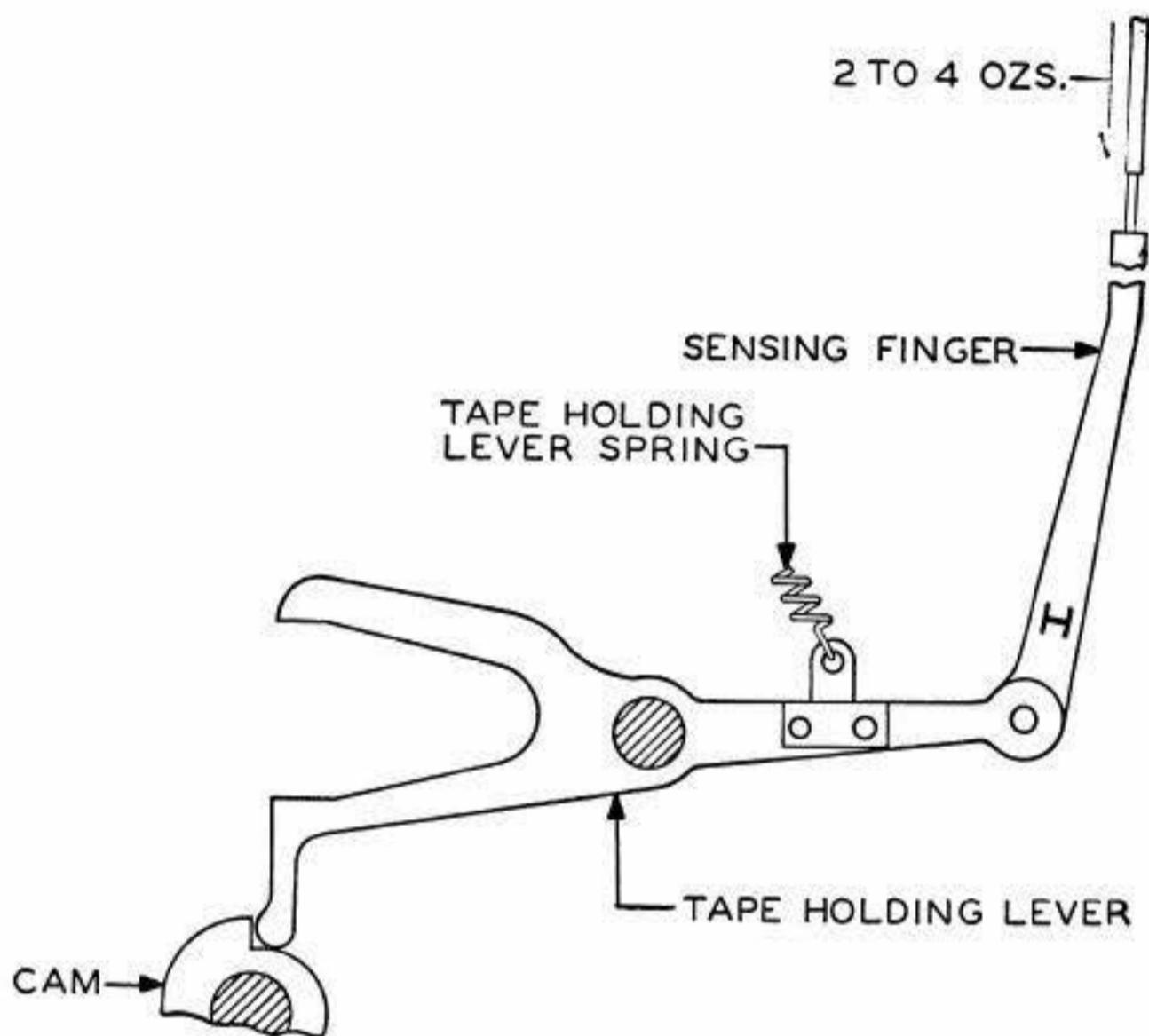


Fig. 26

2.60 Y-Lever Pivot Shaft: With the cam-follower tip on each Y lever resting firmly on the high part of the associated cam, the tip of the sensing finger which is withdrawn the least distance into the sensing guide plate should be just flush with or not more than .005" below the surface of the tape channel in the sensing guide plate. Check by eye. Check with pivoted transmitter in three positions; against die block, in the center, and against the front stop. To adjust, position the Y-lever pivot shaft up or down in the transfer unit base casting by means of the adjusting cams at each end of the pivot shaft.

Fig. 27

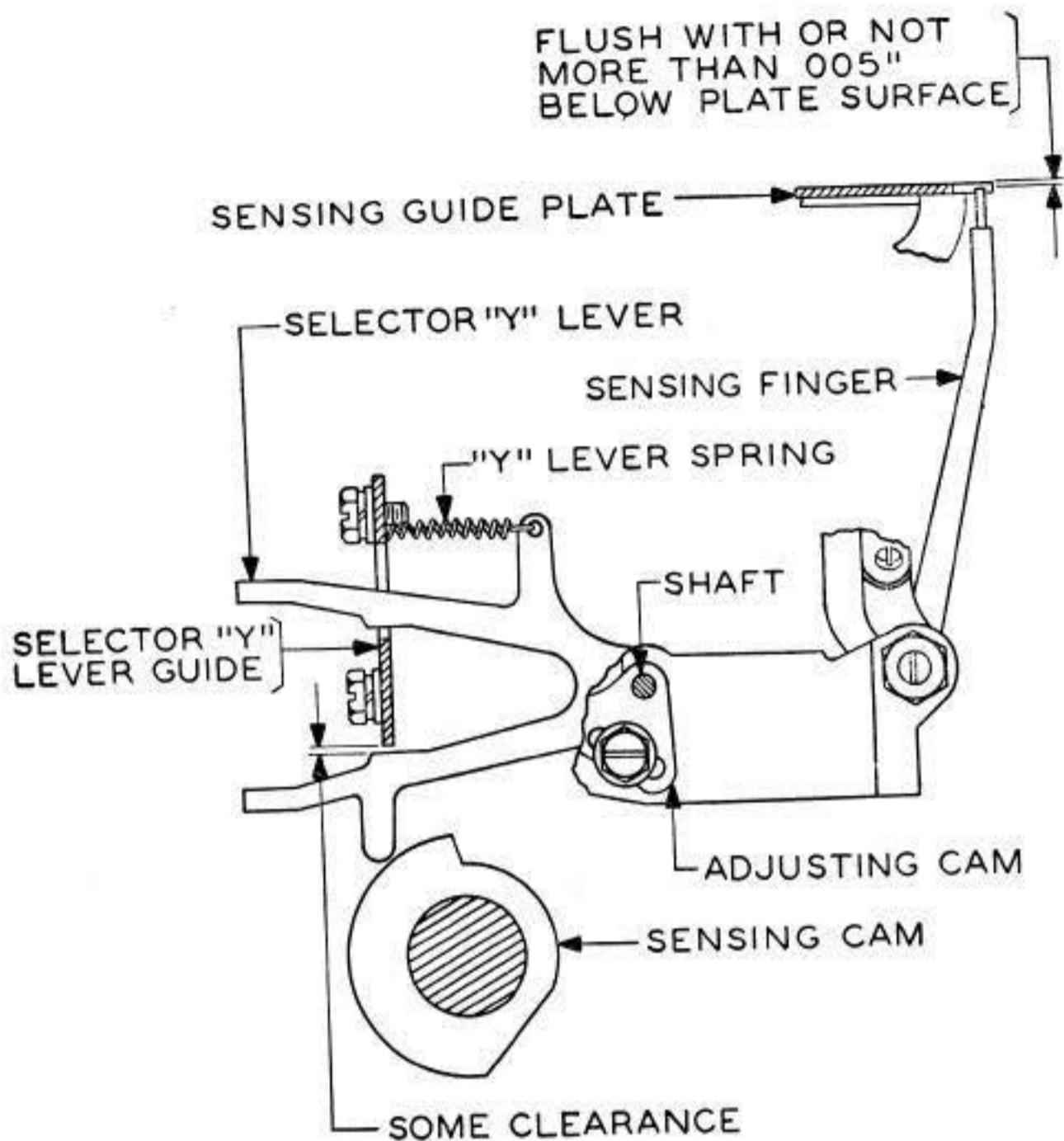


Fig. 27

2.61 **Y-Lever Guide-Plate:**

(a) With the cam-follower tips on the Y levers resting firmly on the high part of their associated cams, there should be some clearance between the top edge of the lower arm of the Y lever and the top of the associated slot. To adjust, position the Y-lever guide on its mounting screws in the transfer assembly casting. **Fig. 28**

(b) The following requirements should be met after the above adjustment has been made:

(1) With the cam-follower tips on the Y levers opposite the low part of the associated cam and the Y-lever springs unhooked, the Y levers and sensing pins should move freely in their guides. Reinstall springs. **Fig. 27**

- (2) With the cam-follower tips on the Y levers opposite the low part of their associated cams, the lower edge of the upper arm of each Y lever should rest firmly on the bottom of its associated guide slot in the guide plate.

Fig. 28

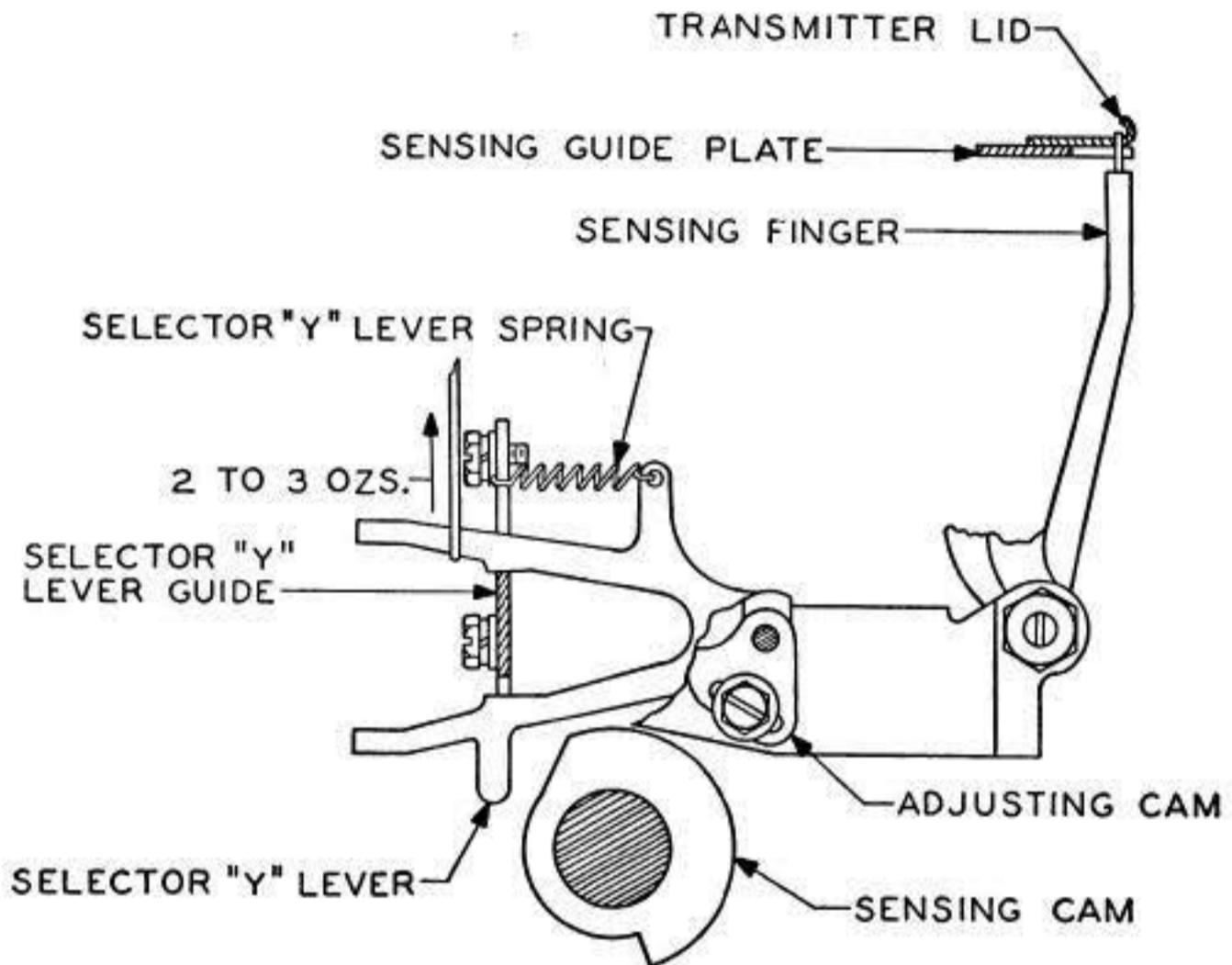


Fig. 28

- (3) When the clearance between the top edge of the lower arm of the Y levers and the top of the associated slot is reduced to zero by hand, the sensing pins should not become disengaged from the sensing-pin guide plate.
- (c) If any of the foregoing requirements are not met, the Y-lever guide-plate adjustment should be refined.

2.62 **Y-Lever Spring:** With the upperarms of the Y levers resting firmly in the bottom of their associated slots, hook an 8-oz scale on the Y lever just adjacent to the left side of the guide and pull upward. It should require 2 to 3 oz to start moving each Y lever. **Fig. 28**

2.63 **Oscillating Lever:** With the cam-follower tip of the oscillating-lever extension riding firmly on the low part of its cam, the surface of the lever in which the feed pins mount should rise to a point flush with or not more than .015" below the lower surface of the tape-guide channel in the sensing pin guide plate at any point during the feeding motion from back to front. To adjust, change the angular relation between the oscillating lever and the oscillating-lever extension by means of the adjusting slot and a clamp screw. **Fig. 25**

Note: Check to see that the tips of the feed pins clear the tape as the lever moves from left to right on the return portion of the tape-feeding cycle when the cam-follower tip on the oscillating-lever extension is on the high part of its cam.

2.64 **Feed-Pin Oscillator Spring:** With the sensing shaft in the stop position hook an 8-oz scale over the front pin in the feed-pin oscillator and pull horizontally to the front. It should require 1 to 3 oz to start the feed-pin oscillator lever moving. **Fig. 25**

2.65 **Tape-Feed Lever:** The feed-pin oscillator should start moving forward immediately after the tape-pin feed-lever extension roller starts to ride to the low part of its cam. To adjust, engage the sensing clutch and turn the subshaft until the tape feed-lever extension just starts to move. Change the angular relation between the tape-feed lever and the tape-feed-lever extension by means of the adjusting slot and clamp screw so that the tape-feed lever just starts to move to the front. Tighten the clamp screw. Recheck the requirements and refine the adjustment if necessary. **Fig. 29**

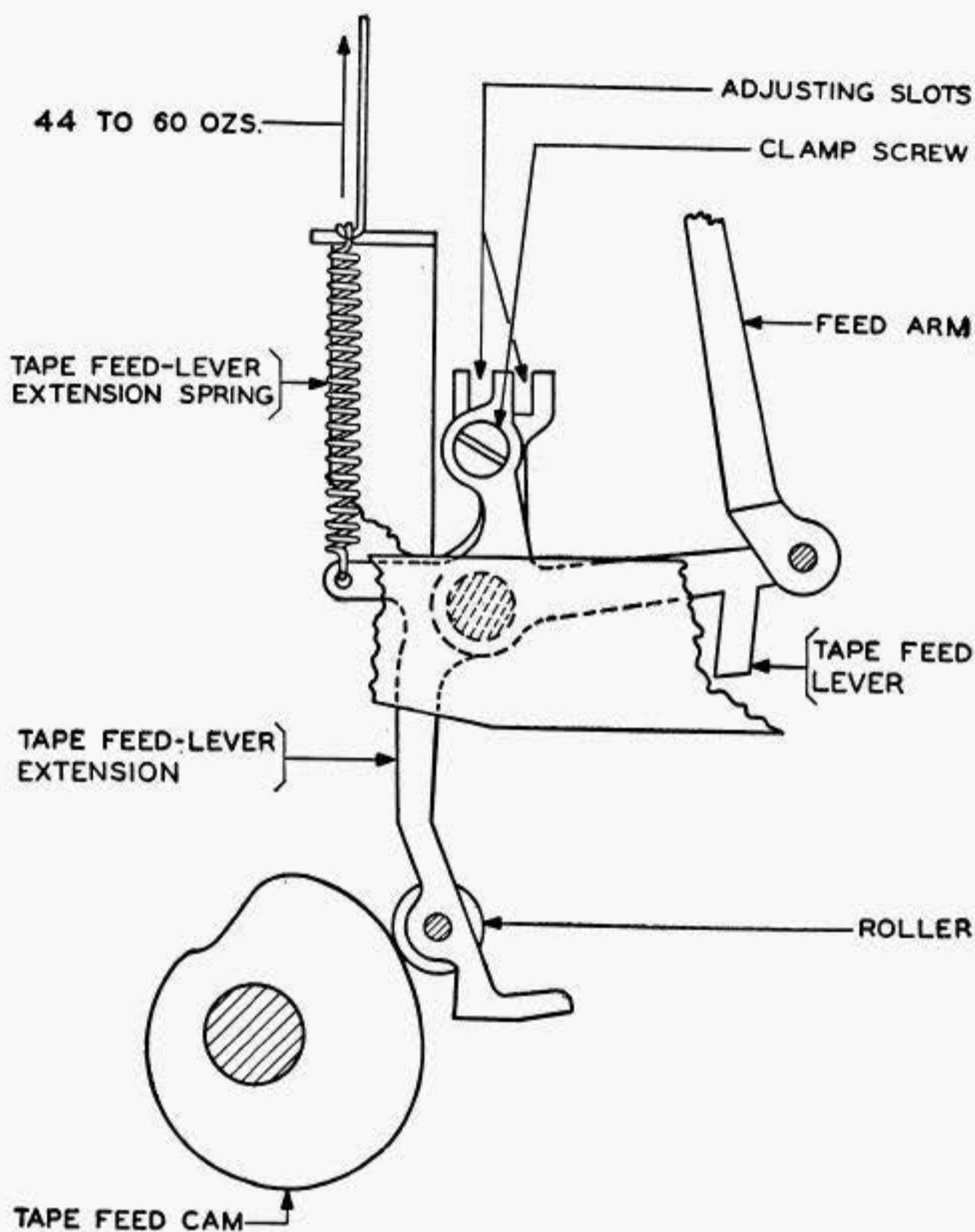


Fig. 29

2.66 **Oscillating-Lever Extension Spring:** With the cam-follower tip of the oscillator-lever extension resting firmly on the high part of its cam, apply the push-end of a 64-oz scale to the oscillator-lever extension at the spring-hole and push to the rear as nearly in line with the spring as possible. It should require 40 to 48 oz to just start the oscillator-lever extension moving.

Fig. 30

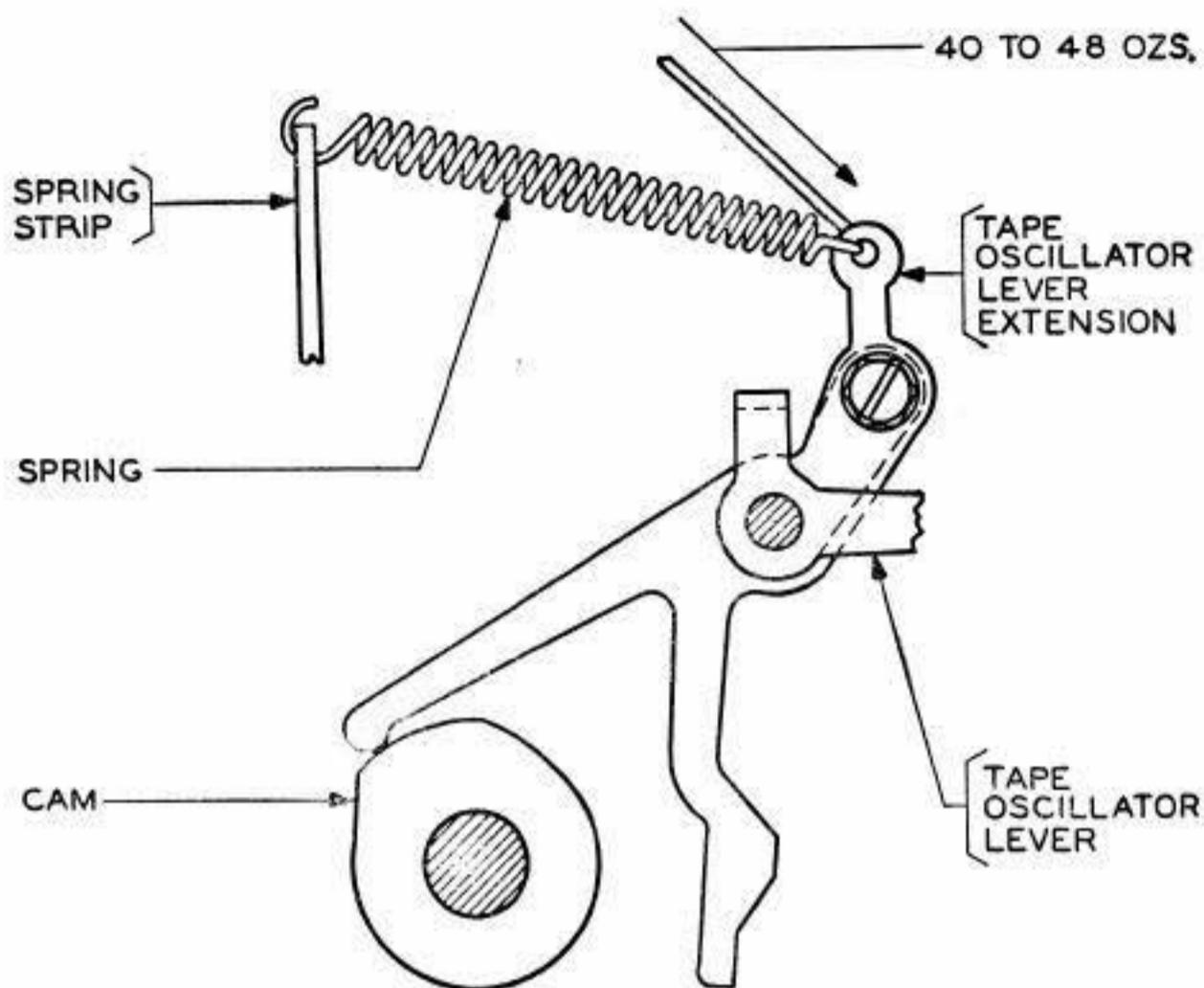


Fig. 30

2.67 **Tape-Feed-Lever Extension Spring:** With the sensing cam sleeve in its stop position and the tape feed-lever cam roller resting on its cam, it should require 44 to 60 oz to stretch the tape feed-lever extension spring to position length. To check, unhook the upper end of the spring from its bracket, hook a 64-oz scale in the spring eye and pull upward in line with the spring mounting-hole in the bracket. **Fig. 29**

2.68 **Tape-Guide Blades:** As the transmitter pivots from right to left, the tape-guide blades should pass between the tape-out and No. 1 and between the No. 4 and No. 5 sensing fingers without touching the sensing fingers or the underside of the transmitter frame. To adjust, position the tape-guide blades on the transmitter backstop bracket by means of the enlarged mounting-holes and screws, and by bending the blades as required. **Fig. 19**

2.69 **Sensing-Contact Operating-Bail:** The switching-control-contact operating bails should be centrally located between the casting supports and the bails should rotate freely on their bearing shaft with some end-play, not more than .005".

To adjust, loosen the set-screws of both set collars and centrally locate the entire assembly along its shaft. Tighten the screws on one set collar. Position the other collar for the specified clearance when the play in the bails is taken up in a direction toward the collar previously adjusted. Tighten the set-screws in the adjusted set collar.

Fig. 31

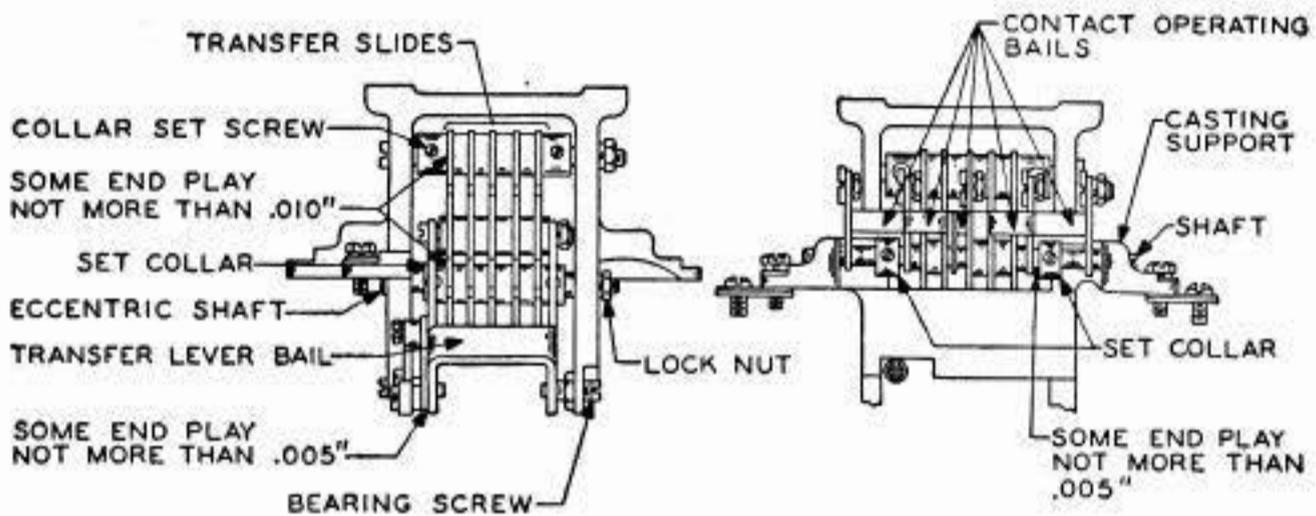


Fig. 31

2.70 Lower Transfer-Slide-Bar Eccentric Shaft:

- (a) Unhook the transfer-bail spring and loosen the set-screws on the lower slide-bar eccentric-shaft collars.

Fig. 31

- (b) The lower transfer-slide-bar eccentric shaft should be positioned so that its high part extends downward. To adjust, position the eccentric shaft in the transfer-slide mounting brackets and lock in place by means of lock-nut on left of shaft.

Fig. 31

2.71 Upper Transfer-Slide-Bar Shaft Collar: The transfer slides should line up with their associated sensing control-contact operating bails and there should be some end-play, not more than .010". To adjust, loosen the collar set-screws of both set collars and position one collar so that the transfer slides each line up with their associated contact-operating bail when all the slides are held towards this collar. Tighten its set-screws. Position the other set collar so that the slide bars move freely and have the specified end play. Tighten its set-screws.

Fig. 31

2.72 Lower Transfer-Slide-Bar Eccentric-Shaft Collar: The transfer slide bars should be perpendicular to their shafts, move freely in their guides, and there should be

some end-play, not more than .010", between the set collar on the lower eccentric shaft and the adjacent slide bar when the play is taken up in a direction away from the collar. To adjust, position the set collar on the lower eccentric shaft and tighten the set-screws.

Fig. 31

2.73 Transfer-Lever Bail: With the transfer-lever bail spring unhooked, the transfer levers should line up centrally with their associated transfer slide bars and the bail should rotate freely on its bearing screws with some end play, not more than .005". To adjust, position the bearing screws in the bracket.

Fig. 31

2.74 Transfer Bail and Slide Assembly (Preliminary Adjustment): Rotate the sensing shaft to its stop position and mount the transfer bail-and-slide assembly on the base casting. Position the assembly so that the transfer T levers line up centrally with the transfer Y levers and that there is approximately equal clearance between each of the front and rear sets of T and Y-levers.

Fig. 32

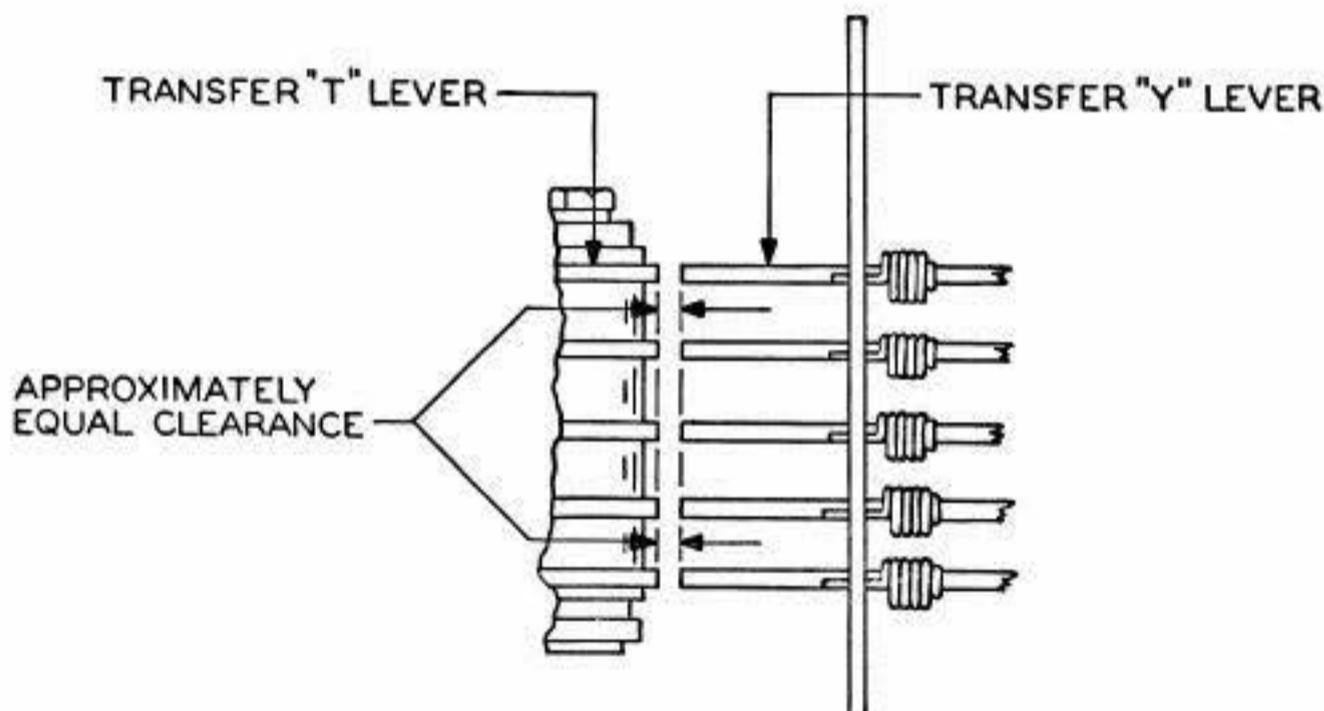


Fig. 32

2.75 Transfer T-Lever-Eccentric Shaft: Loosen the transfer-bail-extension adjusting clamp-screw. With a piece of tape perforated with the Y code combination inserted in the transmitter so that the Y character will be selected, trip the sensing shaft clutch and rotate the drive-shaft gear by hand until the transfer-bail-extension roller is on the high part of its cam. With the transfer-bail-extension roller held against the

cam, press the transfer bail to the rear manually until the transfer slides are moved against their stops. Do not jam. Under this condition, at least one transfer slide should be moved upward against its stop and at least one which is moved downward should also be against its stop. Tighten the transfer-bail-extension adjusting clamp-screw. To adjust, loosen the transfer T lever eccentric-shaft lock-nut and position the shaft, keeping the high part of the eccentric shaft to the right. Tighten the nut.

Fig. 33

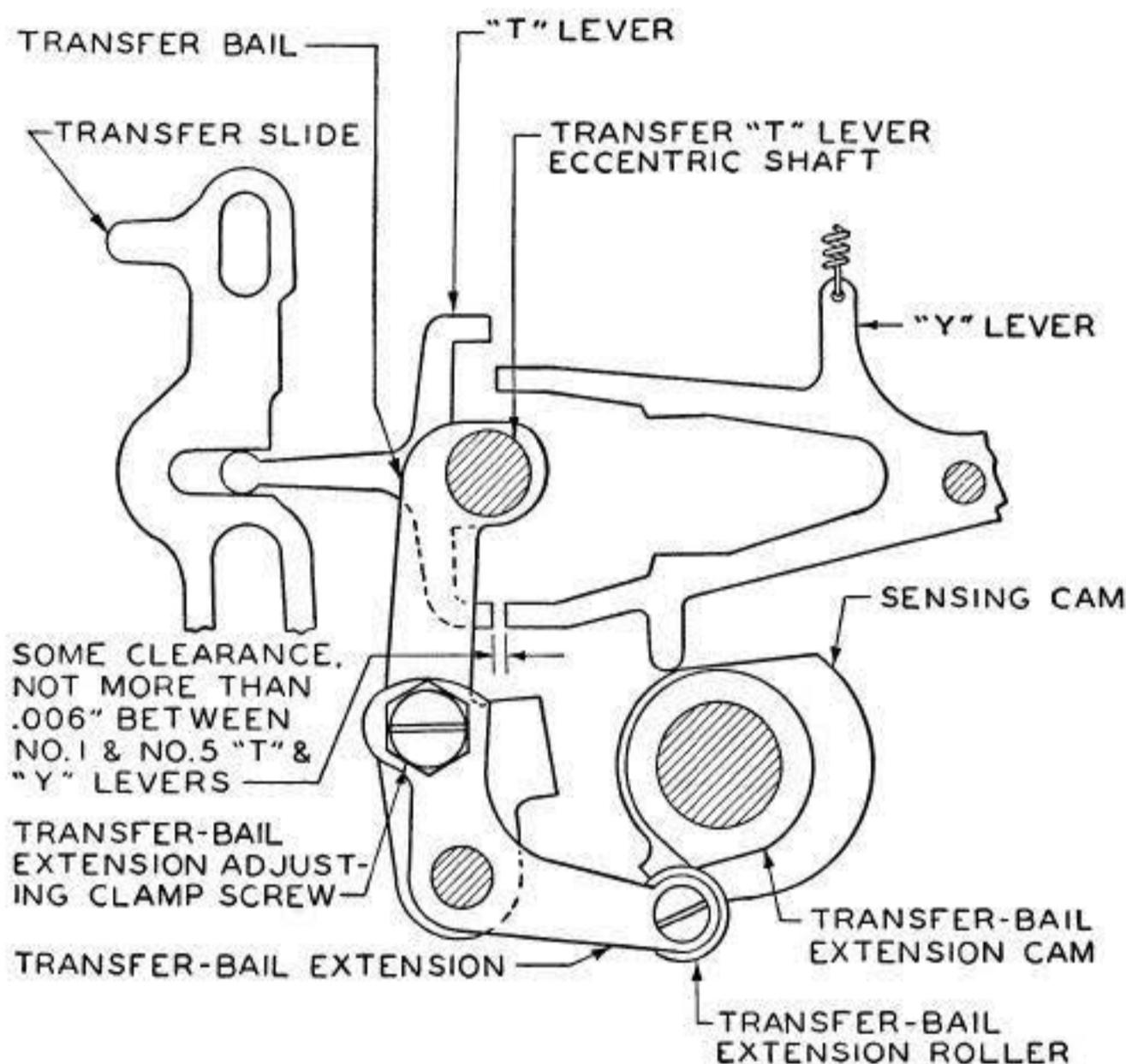


Fig. 33

2.76 Transfer Bail-and-Slide Assembly (Final Adjustment):

- (a) With the Y code combination set up on the Y transfer levers and the transfer-bail extension roller on the high part of its cam, there should be an equal clearance, within .010", between the T levers and the Y levers when measured

between the top prongs of the front set of levers and the bottom prongs of the second set of levers. To adjust, shim equally under the three legs of the transfer-bail assembly bracket.

Figs. 28, 34

(b) There should be an equal clearance, within .004", between the T and Y levers when measured between the bottom prongs of the front and rear sets of levers. To adjust, position the bracket by means of its mounting-screws.

Fig. 35

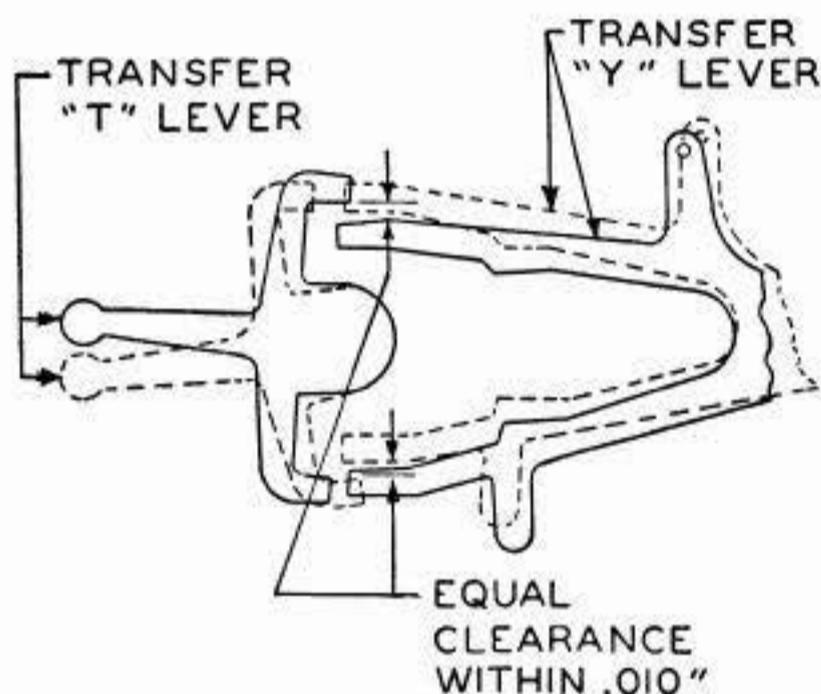


Fig. 34

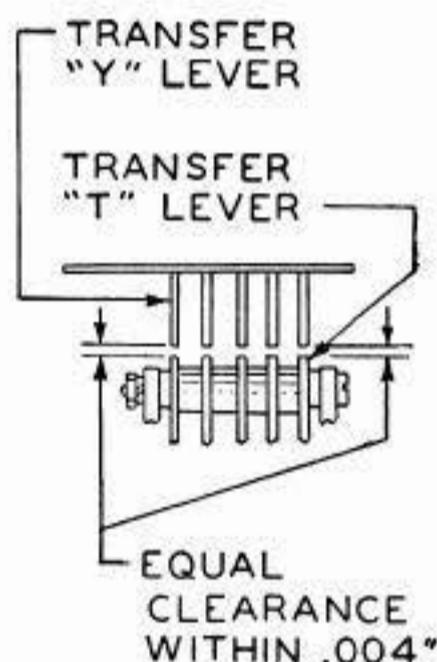


Fig. 35

2.77 Transfer-Bail Extension:

(a) Insert a piece of tape perforated with the Y code combination in the pivoted transmitter and rotate the sensing shaft cam assembly until the transfer-bail-extension roller is on the high part of its cam and the Y code combination is set up on the Y levers. With the play in the transfer slides taken up in a direction to make this clearance a maximum, there should be some clearance, not more than .006", between the lower prongs of the No. 1 and No. 5 T and Y levers. To adjust, loosen the transfer-bail-extension adjusting clamp-screw and position the transfer-bail extension by means of the adjusting hole and tighten the clamp-screw.

Fig. 33

(b) Insert a piece of tape perforated with the Blank code combination in the pivoted transmitter and rotate the sensing shaft cam assembly by hand until the transfer-bail-

extension roller is on the high part of its cam. With the play in the transfer slides taken up in a direction to make this clearance a maximum, there should be some clearance, not more than .010", between the closest set of T and Y levers. If necessary, loosen the lock-nut and refine the transfer-T-lever eccentric-shaft adjustment, keeping the high part of the eccentric to the right. Tighten the lock-nut. Recheck as per subparagraph (a) and readjust if necessary.

Fig. 33

2.78 **Transfer-Bail Spring:** With the sensing shaft in the stop position and the push-end of a 32-oz scale applied to one of the spacers on the transfer-bail T lever eccentric shaft and pushed horizontally to the rear, it should require 9 to 11 oz to just start the transfer bail moving.

Fig. 36

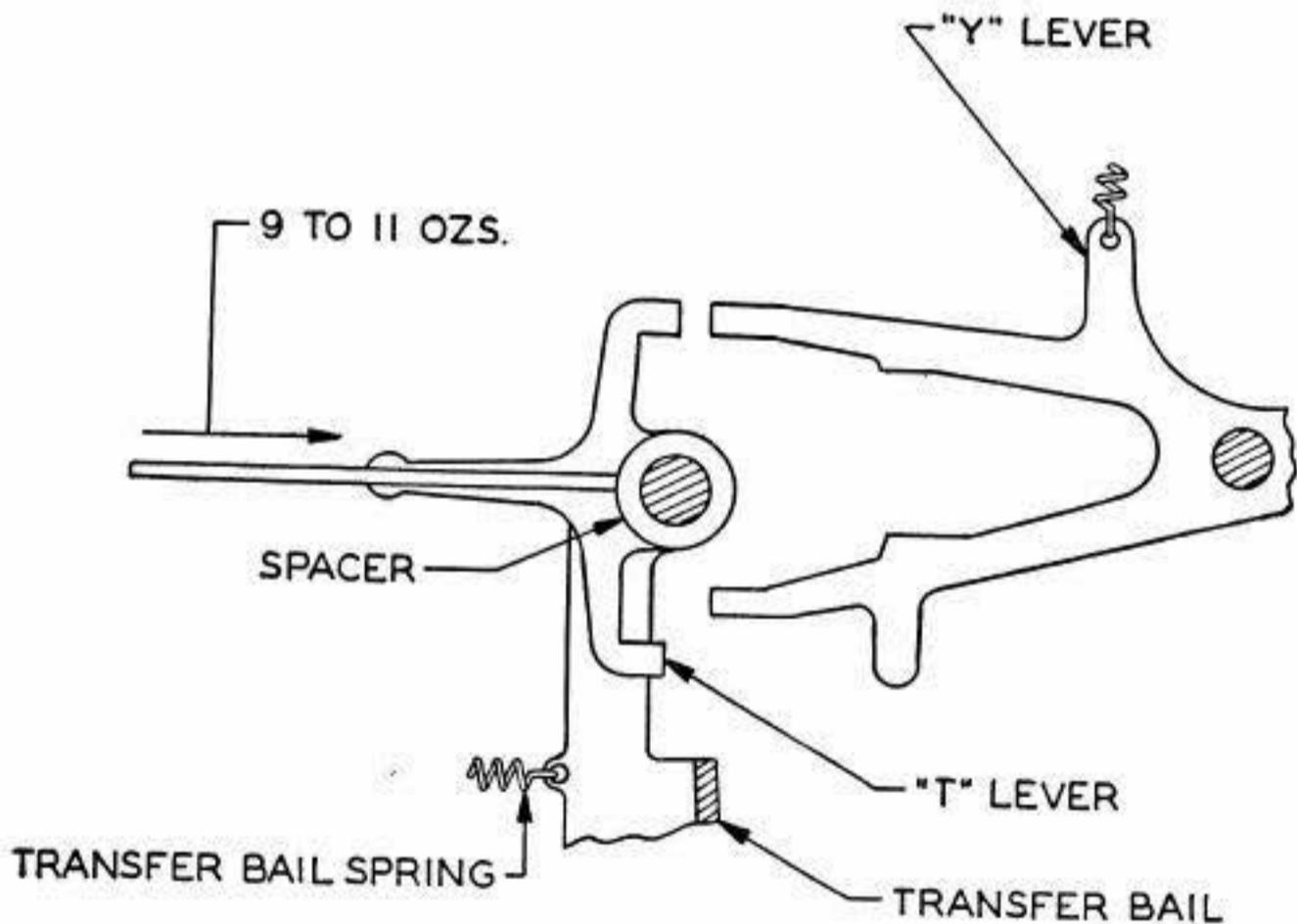


Fig. 36

2.79 Distributing Contacts:

Note: The following adjustments are to be made with the distributor contact levers on the high part of their cams.

(a) With the push-end of an 8-oz scale applied to the ends of the short contact springs and pushed horizontally to the front, it should require $1/2$ to $1-1/2$ oz to start the springs moving away from the contact levers. To adjust, bend the short contact springs. **Fig. 37**

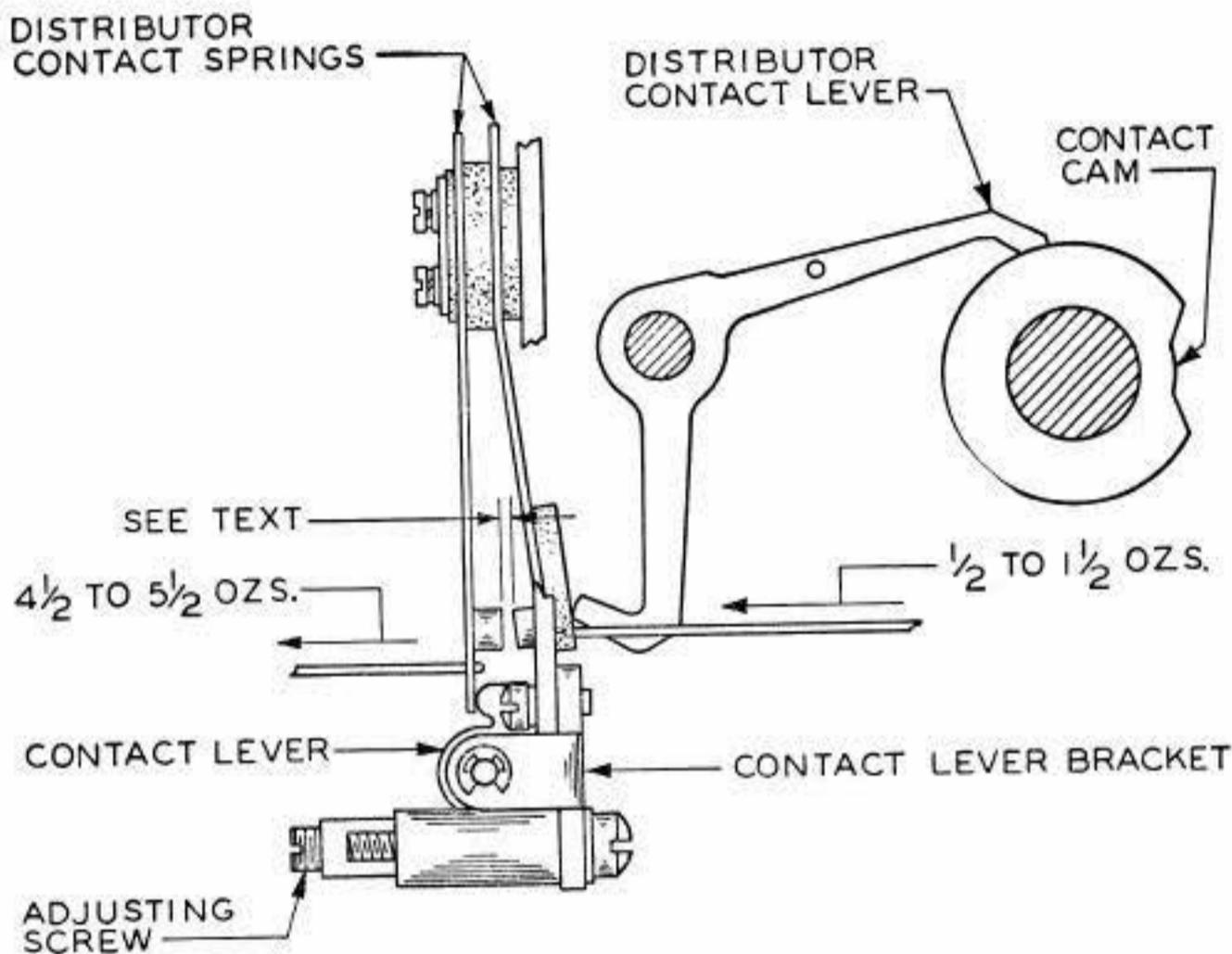


Fig. 37

(b) There should be $.015''$ to $.020''$ gap between the contact points. To adjust, position the adjusting screws. **Fig. 37**

(c) With the pull end of an 8-oz scale hooked over the end of the long contact springs and pulled horizontally to the front, it should require $4-1/2$ to $5-1/2$ oz to start the contact springs moving away from the bakelite adjusting lever. To adjust, bend the long contact springs and recheck item (b) above. **Fig. 37**

(d) With the short contact spring held away, hook the pull-end of a 32-oz scale over the lower end of the contact levers and pull horizontally to the rear. It should require 8 to 10 oz to just start the lever moving. To adjust, loosen the nut holding the spring bracket to the casting and position the bracket. Tighten the nut. **Fig. 38**

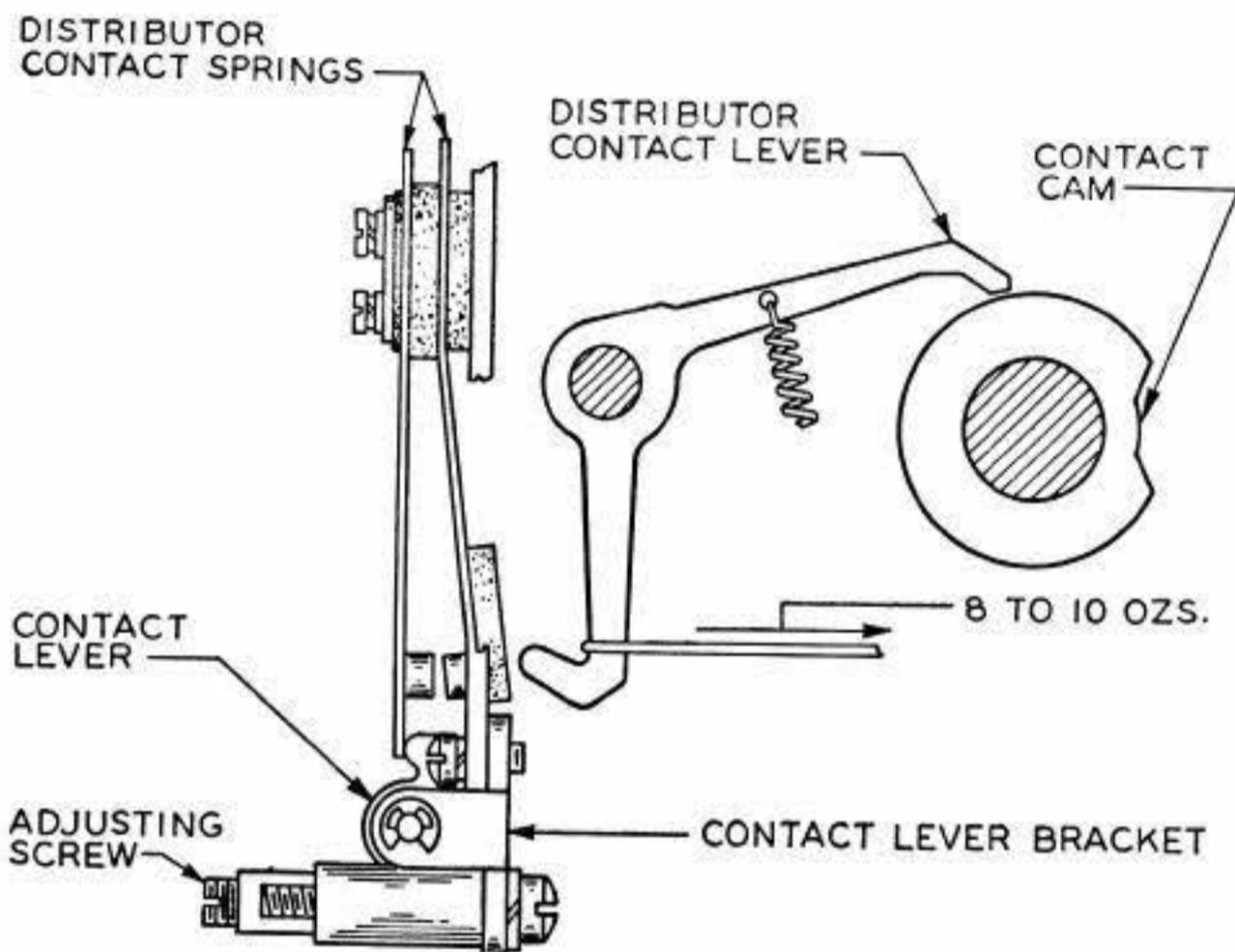


Fig. 38

- (e) If a 1A teletypewriter test set is available, the contact gaps (item (b)) may be adjusted as follows:
- (1) With the space-to-mark transition at the beginning of the STOP element lined up with the zero mark on the stop segment of the test-set scale, adjust the stop-contact gap of the unit by means of its adjusting screw until the end of the stop element is within ± 1 scale division of the 142 mark on the scale.
 - (2) The distortion in any repeated signal should not exceed 5%, i.e., no signal transition, mark-to-space or space-to-mark, should be displaced from its proper position, relative to the start transition, by more than 5% of a perfect signal element.
 - (3) Refine the contact-gap adjustments by means of their respective adjusting screws until this requirement is met.
- Note: If necessary to meet this requirement, the contact gap may be reduced to a minimum of .010", or increased to exceed .020".

2.80 Transmitter Auxiliary-Contact-Lever Spring and Contact:

Note: Before making any of the following contact-assembly adjustments, observe that the bakelite tips on the longer contact springs are centrally aligned with their respective levers and the contact points on opposing contact springs are centrally aligned with each other.

Fig. 39

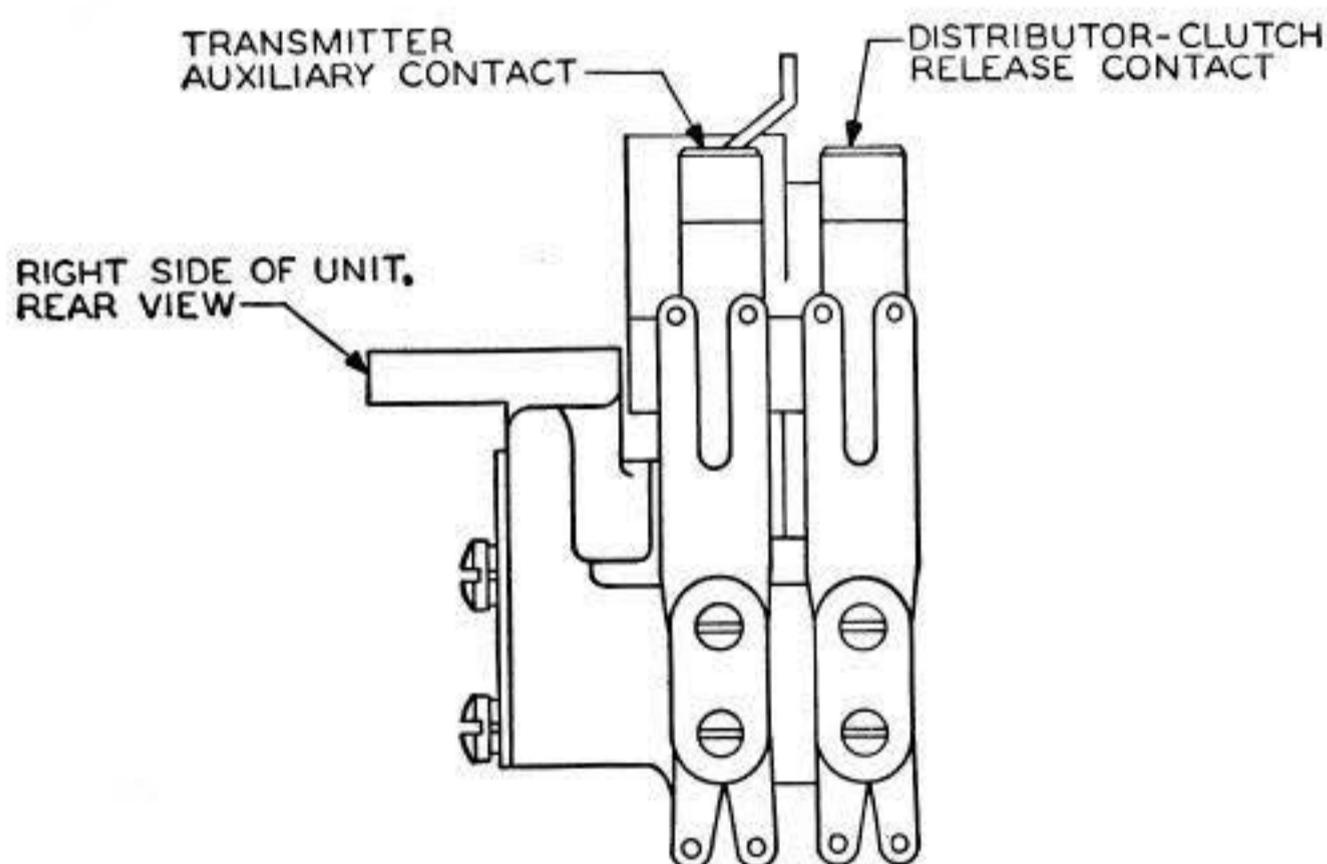


Fig. 39

(a) With the bakelite tip of the longer contact spring (nearest to extreme right end of shaft) resting against the transmitter auxiliary contact lever and the lever resting against the high part of its cam, hook the pull end of an 8-oz scale to the end of the short contact spring and pull at right angles to the spring. It should require $1/2$ to $1-1/2$ oz to just open each contact. To adjust, bend either or both short contact spring legs as required, making sure to maintain a slight clearance between the springs and their stop.

Fig. 40

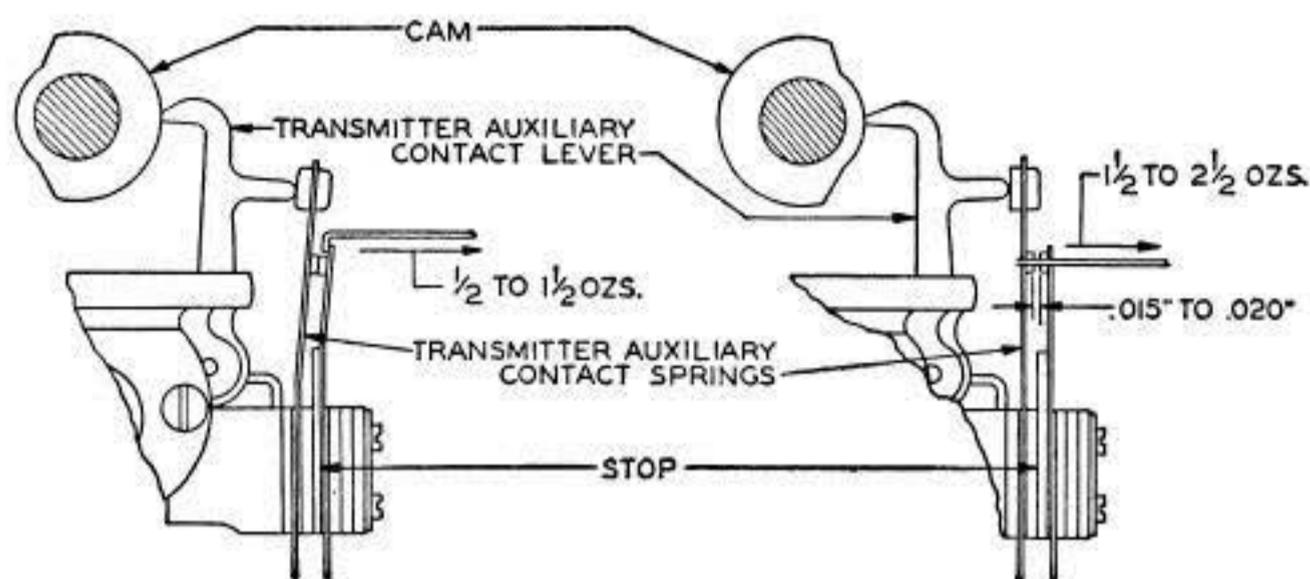


Fig. 40

(b) With the bakelite tip of the longer contact spring resting against the transmitter auxiliary contact lever and the lever resting against the low part of its cam, it should require 1-1/2 to 2-1/2 oz to start moving the bakelite tip away from its lever when the scale is hooked to the long contact spring at the contact point and pulled as nearly at right angles to it as possible. Adjust by bending the longer contact spring.

Fig. 40

(c) With the bakelite tip of the longer contact spring resting against the transmitter auxiliary contact lever and the lever resting against the low part of its cam, there should be a gap of .015" to .020" between each of the two sets of contact points. To adjust, bend the shorter contact-spring stop. Recheck adjustment (a).

Fig. 40

Note: When checking the following two adjustments, the sensing shaft should be in the stop position and the bakelite tip on the long contact spring should rest against its contact lever.

2.81 Distributor-Clutch Release Contact-Lever Spring: With the distributor-clutch-release contact lever resting on the high part of its cam, unhook the distributor-clutch-release contact-lever spring from its mounting bracket and hook a 32-oz scale in the spring eye. It should require 9 to 12 oz to stretch the spring to its position length. Replace the spring.

Fig.41

2.82 Distributor-Clutch Release Contact:

(a) Hook the pull-end of an 8-oz scale on the long contact spring at the contact point and pull approximately at right angles to the contact spring. It should require 1 to 2

oz to start the bakelite tip on the long contact spring moving away from the contact lever. To adjust, bend the long contact spring. **Figs. 39, 41**

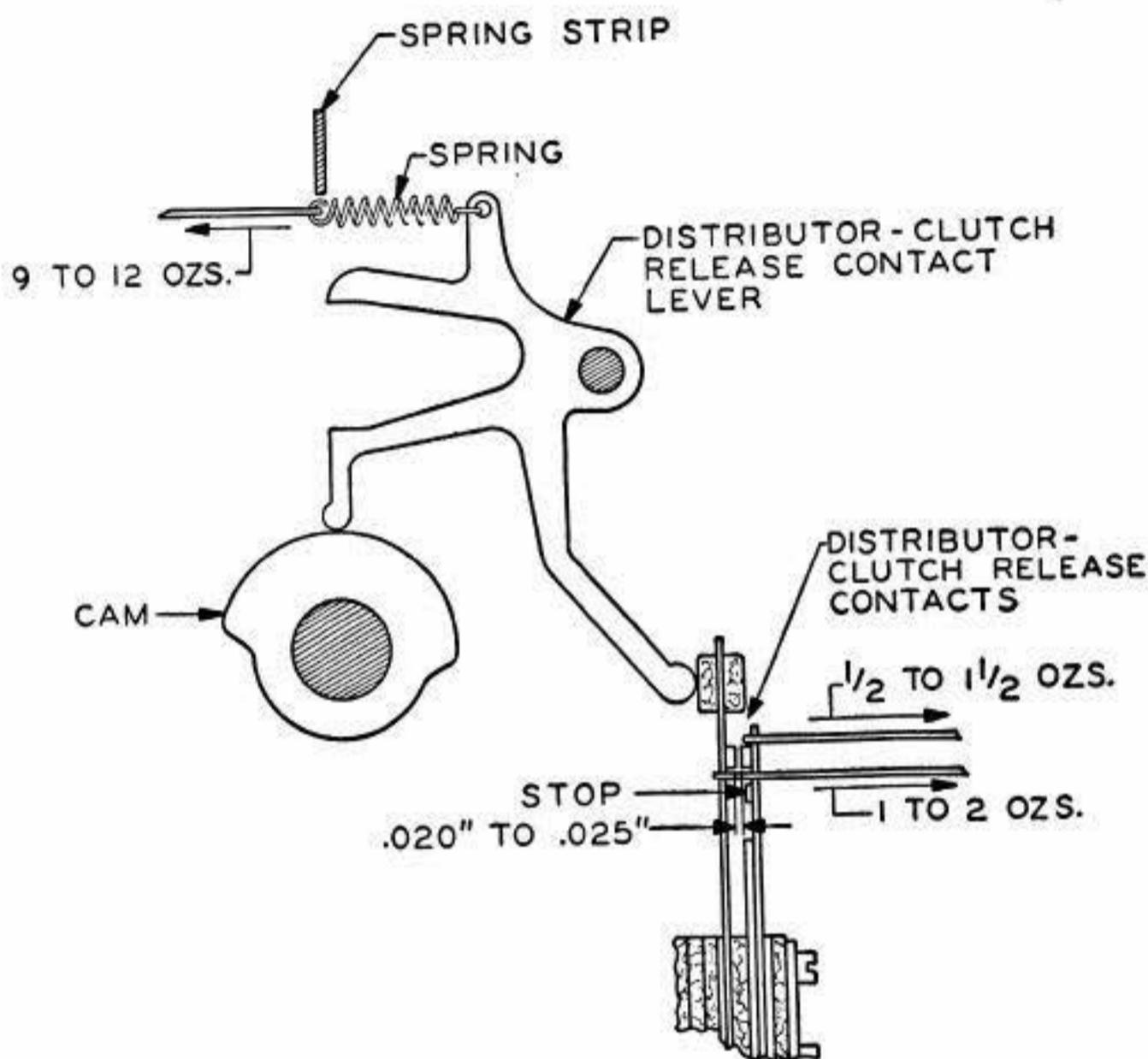


Fig. 41

- (b) There should be $.020''$ to $.025''$ gap between the contact points. To adjust, bend the stop for the short contact spring.
- (c) Hook an 8-oz scale over the end of each short contact spring section and pull approximately at right angles to the spring. It should require $1/2$ to $1-1/2$ oz to just start each short contact spring section moving away from its stop. To adjust, bend the short contact spring sections.
- (d) With the contact lever opposite the indent of its cam and the contacts closed, there should be some clearance between the short contact spring sections and their stop.

If there is no clearance, refine the adjustment in item (b).

2.83 **Tape-Out Sensing-Lever Spring:** With the tape-out sensing lever held on the high part of its cam, it should require 7 to 8 oz to stretch the tape-out sensing lever spring to position length **Fig. 42**

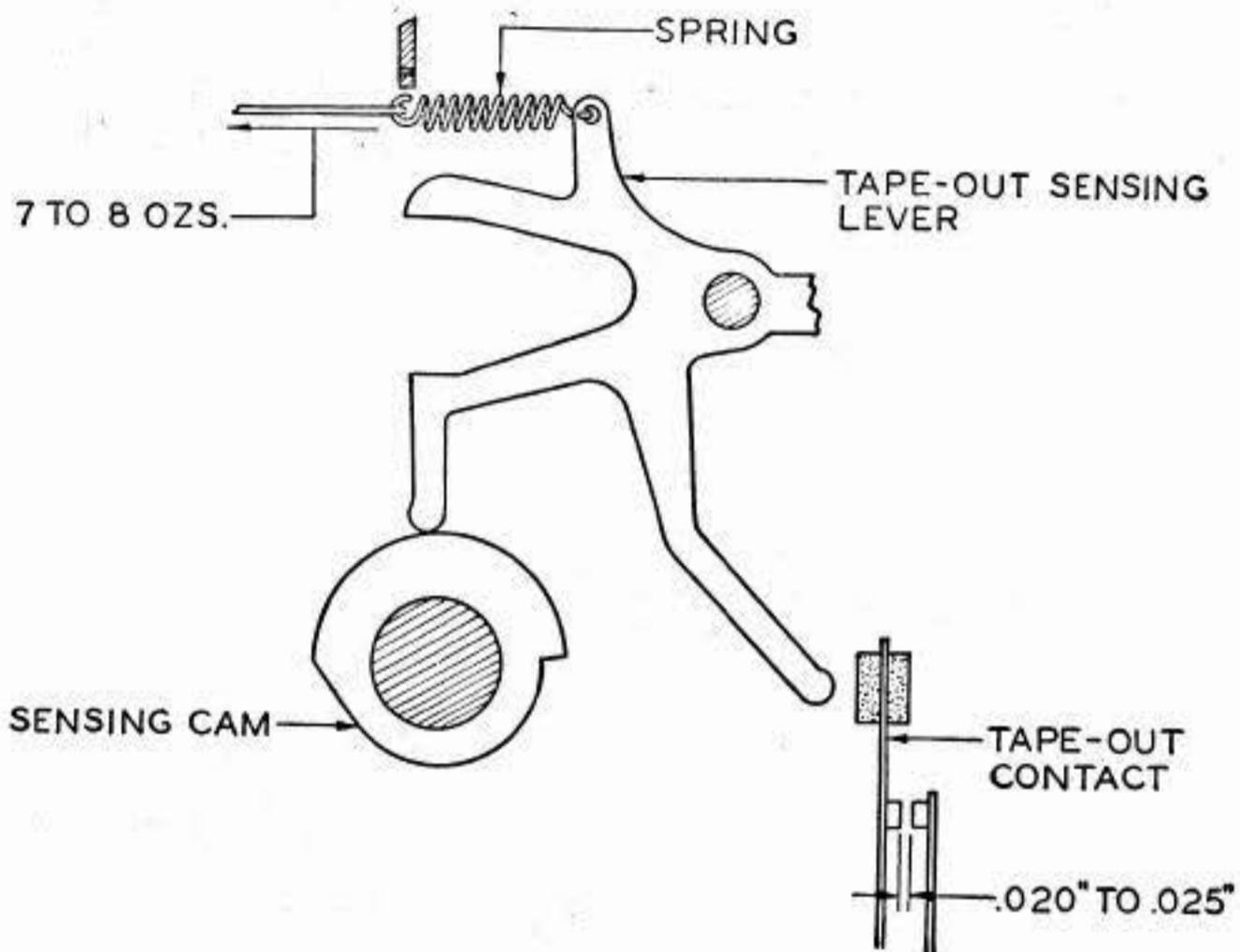


Fig. 42

REMOVE THE TAPE CHUTE

2.84 **Tape-Out Contacts:**

Note: The tape-out contact assembly with its mounting bracket may be removed to make the adjustment in subparagraph (a) below.

(a) With the long and short contact springs parallel with each other and aligned so that they are at right angles to their mounting bracket, there should be .020" to .025" gap between the contact points on the opposing springs. The shorter contact spring sections should be tensioned lightly against their stop. To adjust, bend the springs or short spring stop.

Fig. 42

(b) With a piece of tape, perforated with the LTRS code combination, inserted into the pivoted transmitter, and the sensing shaft rotated until the tape-out sensing lever is opposite the low part of the cam, there should be a clearance of .010" to .030" between the bakelite tip of the long contact spring and the tape-out sensing lever. Adjust by means of the enlarged mounting-holes with the mounting-screws loosened.

Note: With the tape removed from the transmitter, make certain that the contacts are closed and that each short contact spring is forced away from its stop.

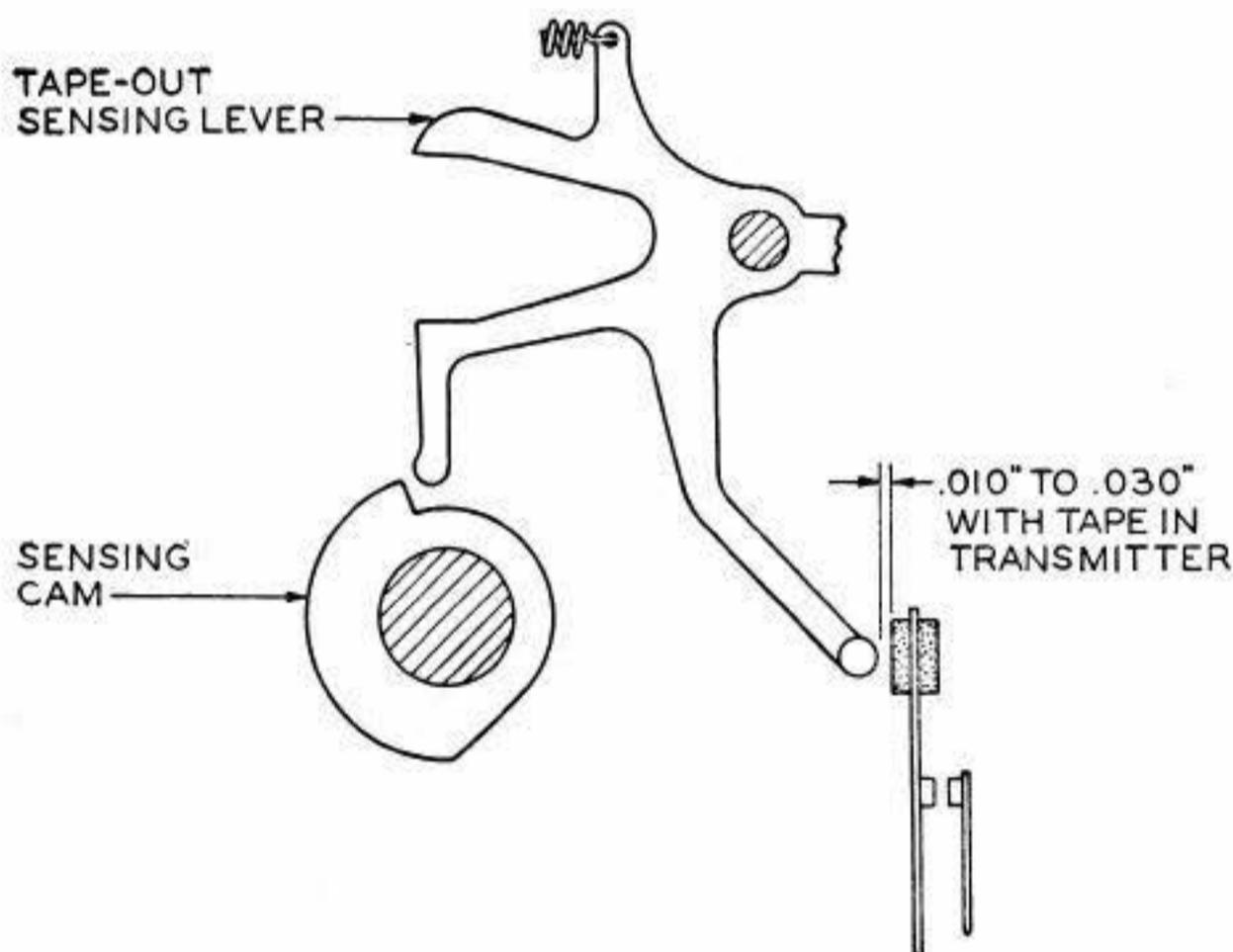


Fig. 43

2.85 Transmitter Stop Contact:

Note: The transmitter stop-contact assembly and its mounting bracket may be removed to make the adjustment in subparagraph (a) below.

(a) With the short contact springs tensioned against their stop and aligned so that they are parallel to their mounting bracket, it should require 1/4 to 1/2 oz to just open the contacts when the scale is hooked over the end of the insulator tip of the long contact spring and pulled at right angles to the spring. To adjust, bend the long contact spring.

Fig. 44

(b) With a piece of perforated tape emerging from the punch mechanism and engaged in the pivoted transmitter, (1) the transmitter stop contacts should be open with a minimum gap of .010" when the last character on the tape is being sensed, and (2) the contact should be closed with some clearance between the transmitter yoke and the upper end of the contact pin when the second to the last character on the tape is being sensed by the selector pins. To adjust, position the contact assembly by means of the two contact tilting screws and the clamp screw.

Fig. 44

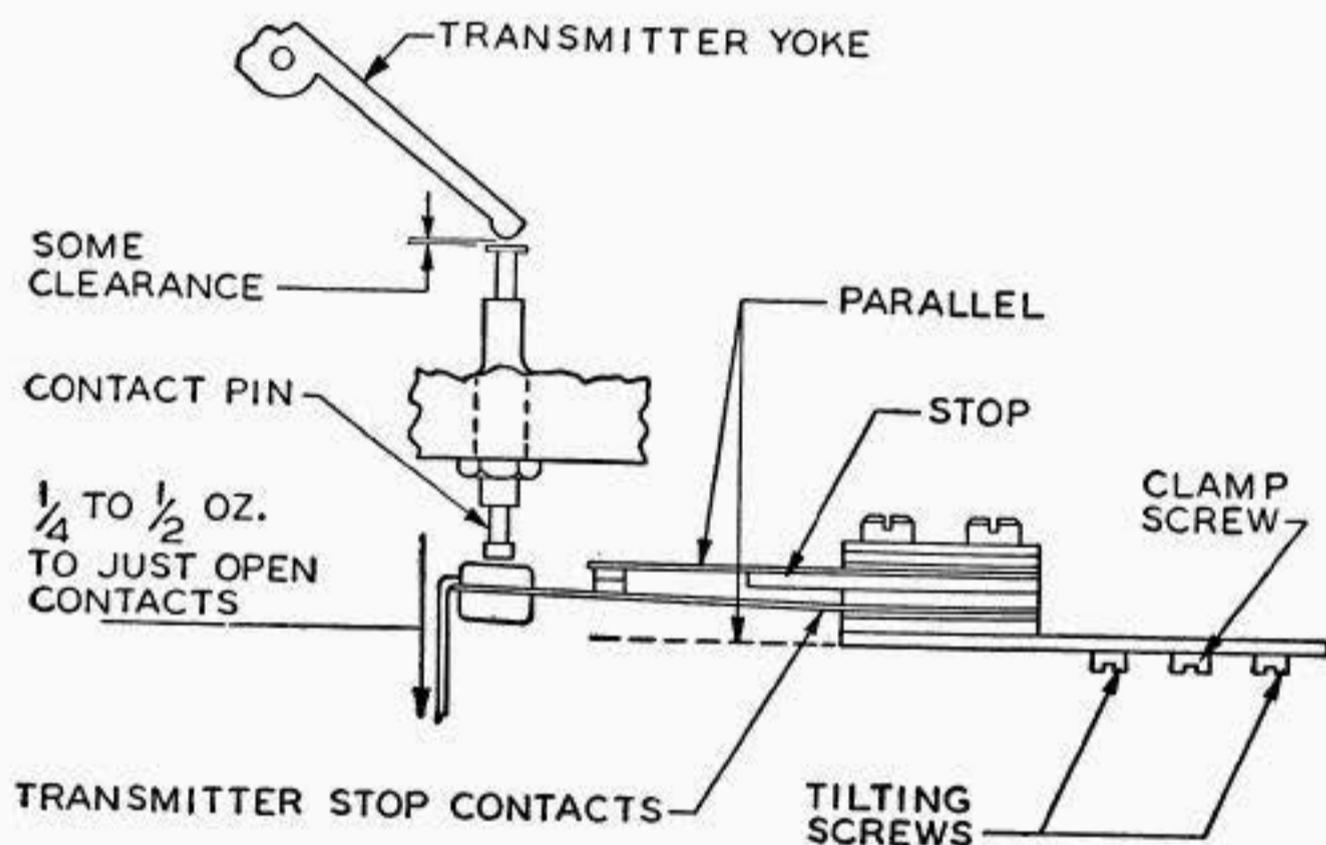


Fig. 44

REPLACE THE TAPE CHUTE

2.85A Tape Chute: With the punch bail in its lowest position, there should be some clearance, not more than .020", between the tape chute and the punch bail. To adjust, position the tape chute with its mounting-screws loosened.

2.86 Universal Contacts: In measuring the tensions specified in the following adjustments the spring scale should be applied horizontally to the contact springs at the outer edge of the contact point.

Fig. 45

Note: The following adjustments may be made with the universal contact assembly and its bracket removed from the base casting.

(a) With the No. 4 contact-spring stop aligned parallel to the contact mounting surface on the bracket and the No. 5 spring contacts held away from the No. 4 spring contacts, it should require 1-1/2 to 2-1/2 oz to just start pulling each section of the No. 4 contact spring away from the stop. To adjust, bend the No. 4 contact spring sections against their stop.

(b) With the insulator tip of the No. 2 contact spring held away from the insulator tip of the No. 5 contact spring, it should require 2 to 3 oz to just separate the contacts on the No. 5 contact spring from the opposing No. 4 contact points. To adjust, bend the No. 5 contact spring.

(c) With the No. 1 contact-spring stop aligned parallel to the contact mounting surface on the bracket and the No. 2 spring contacts held away from the No. 1 spring contacts, it should require 1-1/2 to 2-1/2 oz to just start pulling each section of the No. 1 contact spring away from their stop. To adjust, bend the No. 1 contact spring-sections against their stop.

(d) With the No. 3 spring contacts held away from the No. 2 spring contacts, it should require 2 to 3 oz to just separate the contacts on the No. 2 contact spring from the opposing No. 1 contact points, and there should be a clearance of .010" to .015" between the insulator tips on the No. 2 and No. 5 contact springs. To adjust, bend the No. 2 contact spring between its contacts and bakelite tip.

(e) It should require 1 to 2 oz to just start pulling each section of the No. 3 contact spring away from the stop, and there should be a clearance of .020" to .025" between each set of the opposing contact points on the No. 3 and No. 2 contact springs when the No. 2 spring contacts are against the contacts of the No. 1 spring. To adjust, bend the No. 3 contact spring sections and their stop.

Note: The following adjustments should be made with the universal-contact assembly and bracket assembled in position on the unit.

(f) The universal-contact lever should be aligned with its cam. To adjust, position the universal-contact mounting bracket with its mounting-screws loosened.

(g) With the universal-contact lever on the high part of the universal-contact cam, there should be a clearance of .020" to .025" between the No. 4 and No. 5 spring contact points. To adjust, position the universal-contact-lever adjusting screw with its lock-nut loosened.

2.87 Universal Contact-Lever Spring: With the universal-contact lever on the high camming part of the universal contact cam, it should require 2-1/2 to 3-1/2 oz to stretch the spring to position length. **Fig. 45**

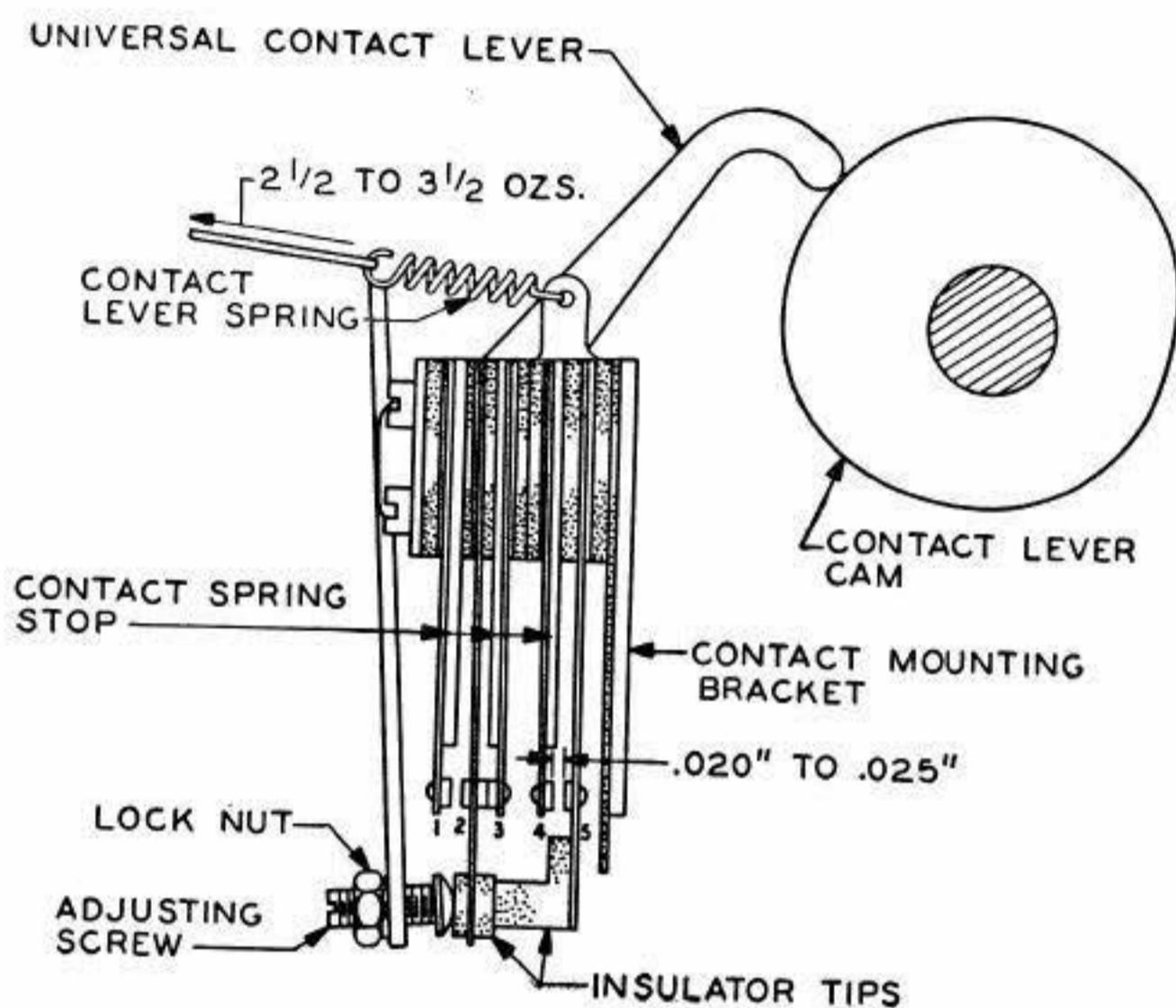


Fig. 45

2.88 Distributing and Sensing-Clutch Throwout-Lever Spring:

(a) With both throwout levers on the low part of their respective clutch cams and the clutch teeth engaged, place the push-end of an 8-oz scale on the bottom edge of the lower armature and push as nearly horizontal as possible. It should require 3 to 5 oz to start the lever moving.

Fig. 46

(b) With the levers and clutch members in this same position, hook an 8-oz scale over the upper-lever spring arm near the spring and pull as nearly horizontal as possible. It should require 5 to 7 oz to start the lever moving.

Fig. 46

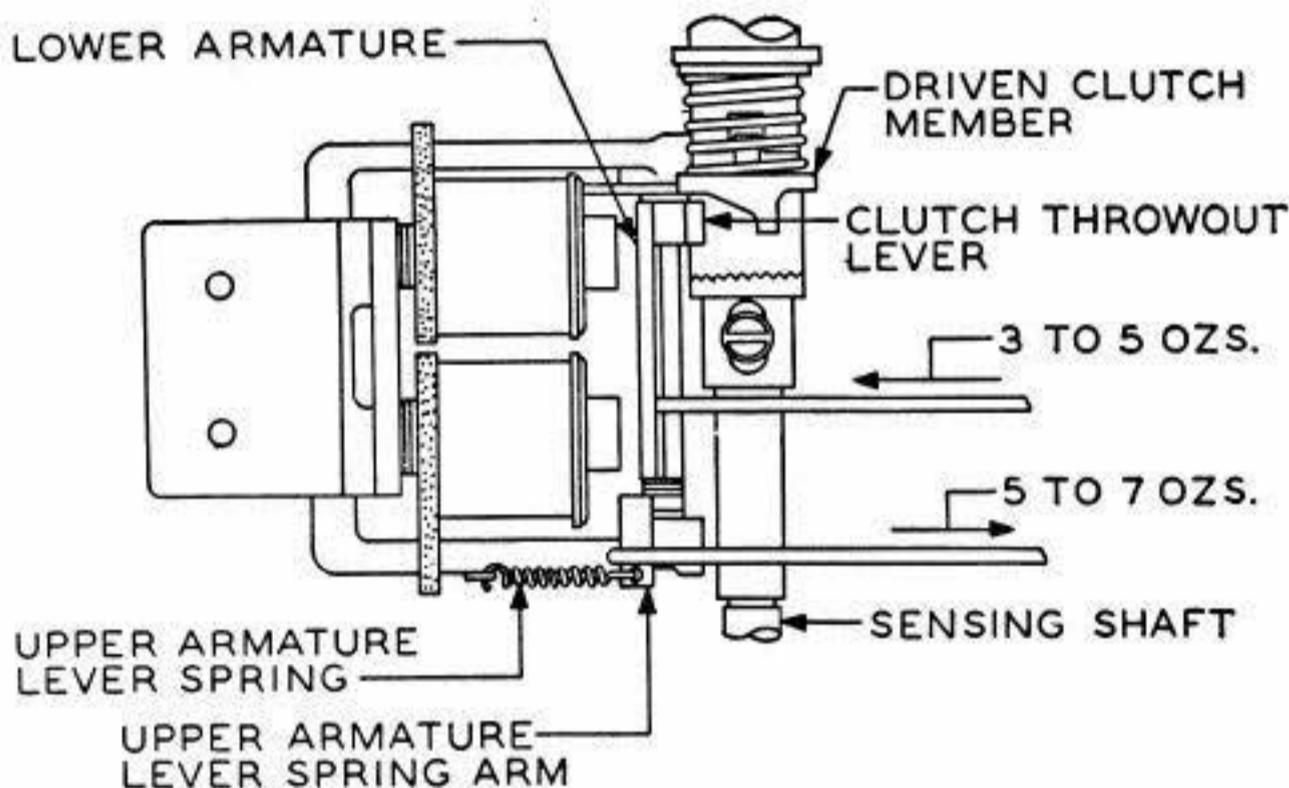


Fig. 46

2.89 Sensing and Distributor Cam-Sleeve Detent:

(a) The detent levers must engaged their respective cams by at least $\frac{2}{3}$ the width of the cams when the play in the detent lever is taken up in a direction to make this engagement a minimum. Position the detent bracket to meet the above requirement.

(b) Adjust the detent-lever mounting-plate on its bracket by means of the elongated mounting-holes so that, with both clutches in their fully disengaged positions, there is a maximum and approximately equal amount of engagement (for both levers) between the detent levers and their respective cams. Make certain that both spring tensions are approximately equal by extending the springs an equal amount. Gauge by eye. If the detent bracket has been repositioned for alignment of the detent levers with their cams, the tape-out contact adjustment must be rechecked, and if necessary, remade.

Fig. 47

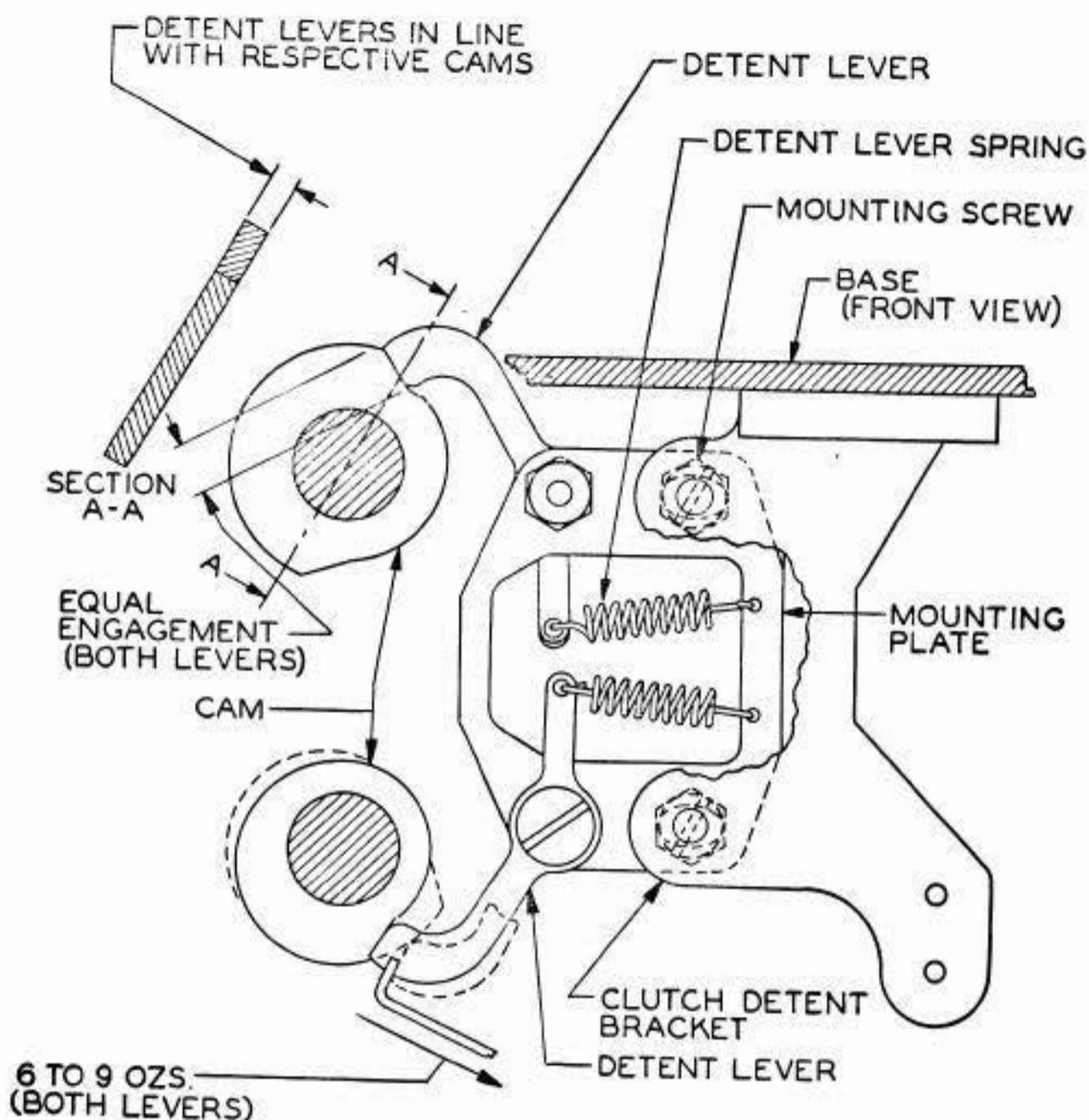


Fig. 47

2.90 Detent-Lever Spring:

- (a) With both detent levers resting on the high part of their respective cams, apply a 32-oz scale to the cam end of each lever and pull at right angles (as nearly as possible) to the levers. It should require from 6 to 9 oz to start each lever moving away from its cam. **Fig. 47**

2.91 Sensing-Contact Assembly:

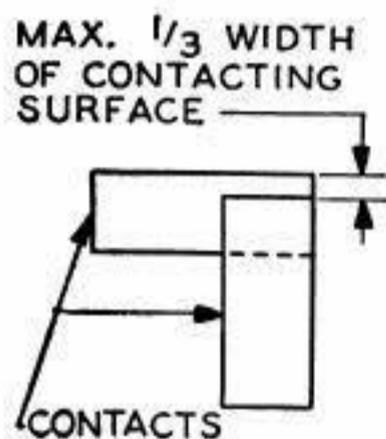
Note: Slack in the cable to the sending-control contacts permits the entire contact assembly to be removed a short distance from the casting of the unit.

(a) CONTACT AND SPRING-TANG ALIGNMENT:

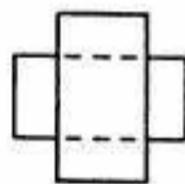
Figs. 48, 49, 50

(1) CONTACT ALIGNMENT—The alignment of the contacts should be such that the full width of one contact overlaps the full width of the associated contact somewhere along the entire length of either contact. Gauge by eye.

Fig. 48



MAX. PERMISSIBLE MISALIGNMENT



WIDTH OF ONE CONTACT MUST BE WHOLLY WITHIN LENGTH OF MATING CONTACT

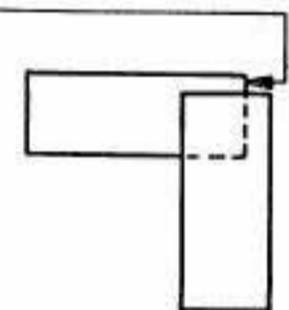


Fig. 48

- (2) The width of each spring tang should lie entirely within the slots in the comb. Gauge by eye. **Fig. 49**
- (3) The spring studs should clear the springs through which they pass in all positions of travel. **Fig. 49**
- (4) To adjust, loosen the contact-spring mounting-screws so that they are friction tight and align the contact springs. Tighten the mounting-screws.

Note: The contact pile-ups are preheated in the factory and the clamping screws are tightened with the pile-ups under pressure; therefore, these screws should be loosened only when absolutely necessary and tightened in such a manner that the contact springs do not shift after clamping.

(b) COMB ALIGNMENT:

The spring tangs should rest in the slots of the comb so that there is approximately equal clearance from the free end of the tang to the bottom of the slot, gauged on the two end springs with tangs. Adjust by means of the mounting-screws and enlarged holes in the comb. **Fig. 49**

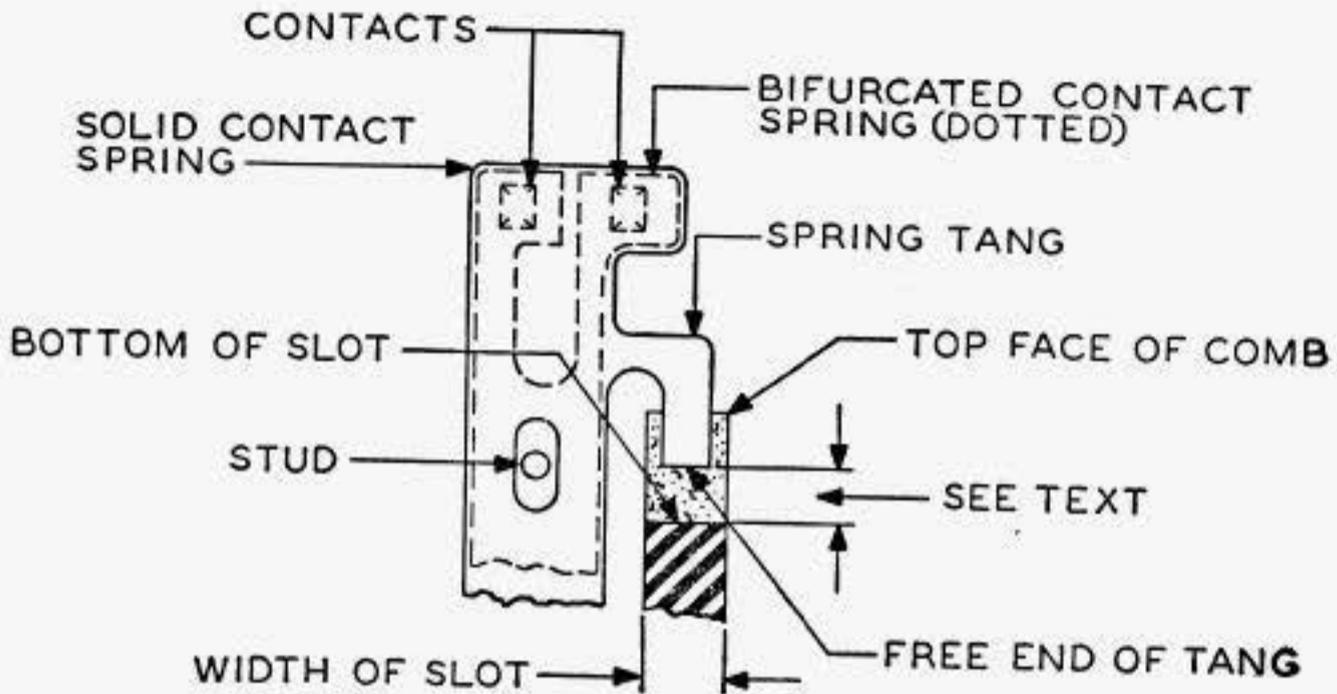


Fig. 49

(c) SPRINGS:

- (1) Before applying any of the following spring-tension adjustments, all the springs should be tensioned toward the narrow end of the comb so that they exert some tension against the adjacent contact spring comb.
- (2) Unless otherwise specified, the tension should be measured with the springs in the normal unoperated position.
- (3) Both sections of bifurcated (split) springs should be in alignment with each other so that the contacts on the bifurcated springs break or make with the contacts on associated springs approximately at the same time.
- (4) A spring whose contacts are tensioned against the comb or an opposing spring, or a stud, should register the required tension just as the tang leaves the comb, or just as the contacts break, or just as it leaves the stud.
- (5) When gauging tensions on solid springs the tip of the gauge should be applied near the end of the spring just in front of the contacts. When checking tensions of swingers, the tip of the gauge should be applied to both parts of the bifurcated springs, just above the contact points.
- (6) There should be a clearance, not less than .008", between adjacent springs, whether in the operated or unoperated position. Gauge by eye.

(7) For the following adjustments the contacts in each pile up are numbered, 1 to 13 inclusive, from the contact pile bracket. **Fig. 50**

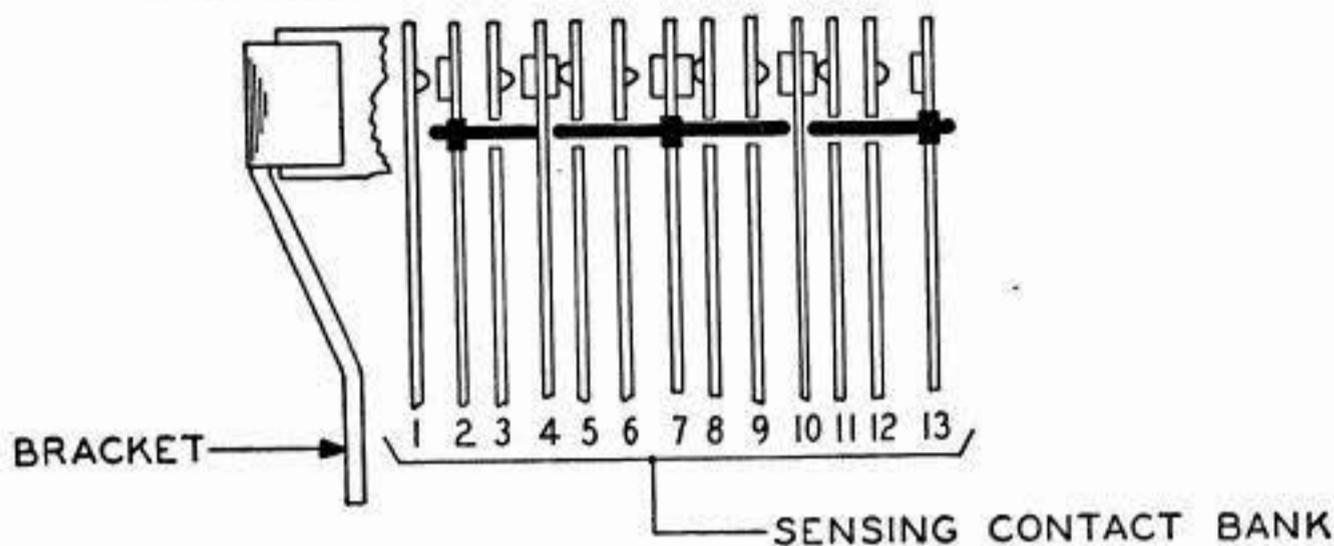


Fig. 50

(a) The heavy contact springs with tangs are Nos. 1, 3, 5, 6, 8, 9, 11 and 12. The tangs of these springs should be in alignment with the main body of the spring before starting adjustments.

(b) These springs should register 30 to 50 gm just as the tang of the spring leaves the comb.

Note: In tensioning springs Nos. 5, 8 and 11, the load of the opposing springs should be removed by pressing the right-hand stud to the left.

(c) Spring No. 2 should be tensioned toward the right so that its stud is in contact with the No. 4 spring. The No. 2 spring should register 6 to 12 gm just as its stud leaves the No. 4 spring.

(d) Spring No. 4 should register 18 to 25 gm just as it breaks contact with the opposing spring.

Note: The No. 2 spring stud should be resting against the No. 4 spring when measuring tension.

(e) Spring No. 7 should register 18 to 25 gm just as it breaks contact with the No. 8 spring, and there should be some clearance, not more than .003", between the stud of the No. 7 spring and the No. 4 spring. To adjust, bend and bow No. 7 spring. If further refinements are necessary, the tang on No. 8 spring may be bent slightly.

Note: In making this adjustment, some clearance should be maintained between the No. 10 spring and the stud on No. 7 spring. Hold No. 10 spring away by hand.

(f) Spring No. 10 should register 18 to 25 gm just as it breaks contact with the No. 11 spring, and there should be some clearance, not more than .003", between the stud of the No. 7 spring and the No. 10 spring. To adjust, bend and bow No. 10 spring. If further refinements are necessary, the tang on No. 11 spring may be bent slightly.

(d) CONTACT PILE-UP ALIGNMENT:

(1) Preliminary. With the transfer slides in the spacing (lower) position and the slots in all the contact-operating bail eccentrics in a vertical position (high side up or down according to the position that gives the fullest engagement between the end of the plunger and the curvature of the eccentric) the gap between the stud, on No. 13 spring and the No. 10 spring should be .010" to .015" on the Number 1 and the Number 5 contact pile-up assemblies. To adjust, loosen the two eccentric-stop mounting-screws and rotate the eccentrics away from the brackets. Loosen the contact-bracket mounting-screws and position the bracket. Tighten the mounting-screws. Rotate the eccentrics so they make contact with the bracket and tighten the eccentric mounting-screws.

(2) The stud on each pile-up should be centrally aligned with its associated contact-bail eccentric. Align each contact pile-up by means of its mounting-screws and the enlarged holes in the mounting-plate.

(3) The clearance between the stud of No. 13 spring and No. 10 contact spring of each pile-up should be .005" to .015". To adjust, position the contact-bail eccentrics.

(4) With the transfer slides in their lower SPACING position, spring No. 13 in each pile-up should register 18 to 25 gm just as the stud leaves the slide-lever eccentric. To adjust, bend and bow the No. 13 spring.

(5) With the slide levers in their SPACING (lower) position, adjacent contact springs Nos. 1 and 2, 3 and 4, 6 and 7, 9 and 10, 12 and 13, should "make" with a .035" gauge, and "not make" with a .025" gauge placed between the transfer-slide eccentrics and their respective studs. To adjust, bend the tangs on springs Nos. 1, 3, 6, 9 and 12 and recheck tension requirements in subparagraph 2.91 (c) (7), under "SPRINGS."

(6) Recheck contact spring tensions as outlined in subparagraphs (7)(b), (c), (d), (e), and (f) above.

(7) With the slide levers in their SPACING (lower) position, there should be at least .008" clearance between the contact points of the light contact springs and those of the associated left-hand (front) heavy springs; with the slides in the MARKING (upper) position, check for at least .008" clearance between the contact points of the light springs and those of the associated right-hand (rear) heavy springs.

(8) With the slides in the MARKING position, move the heavy (front) left-hand contact springs away from their backstops (or from the light springs) and see that there is some "follow" of the light contact springs. REPLACE THE TAPE PLATFORM, which was removed for the adjustments starting with Paragraph 2.54.

2.92 Tight-Tape-Feed Indicator Contact Assembly:

(a) CONTACT-BRACKET POSITION (Preliminary Lever Position)

The tape-contact lever should be centrally located on the tape guide and should conform to the contour of the tape guide at the rear of the code punch block. To adjust, position the bracket by means of its mounting-screws.

Fig. 51

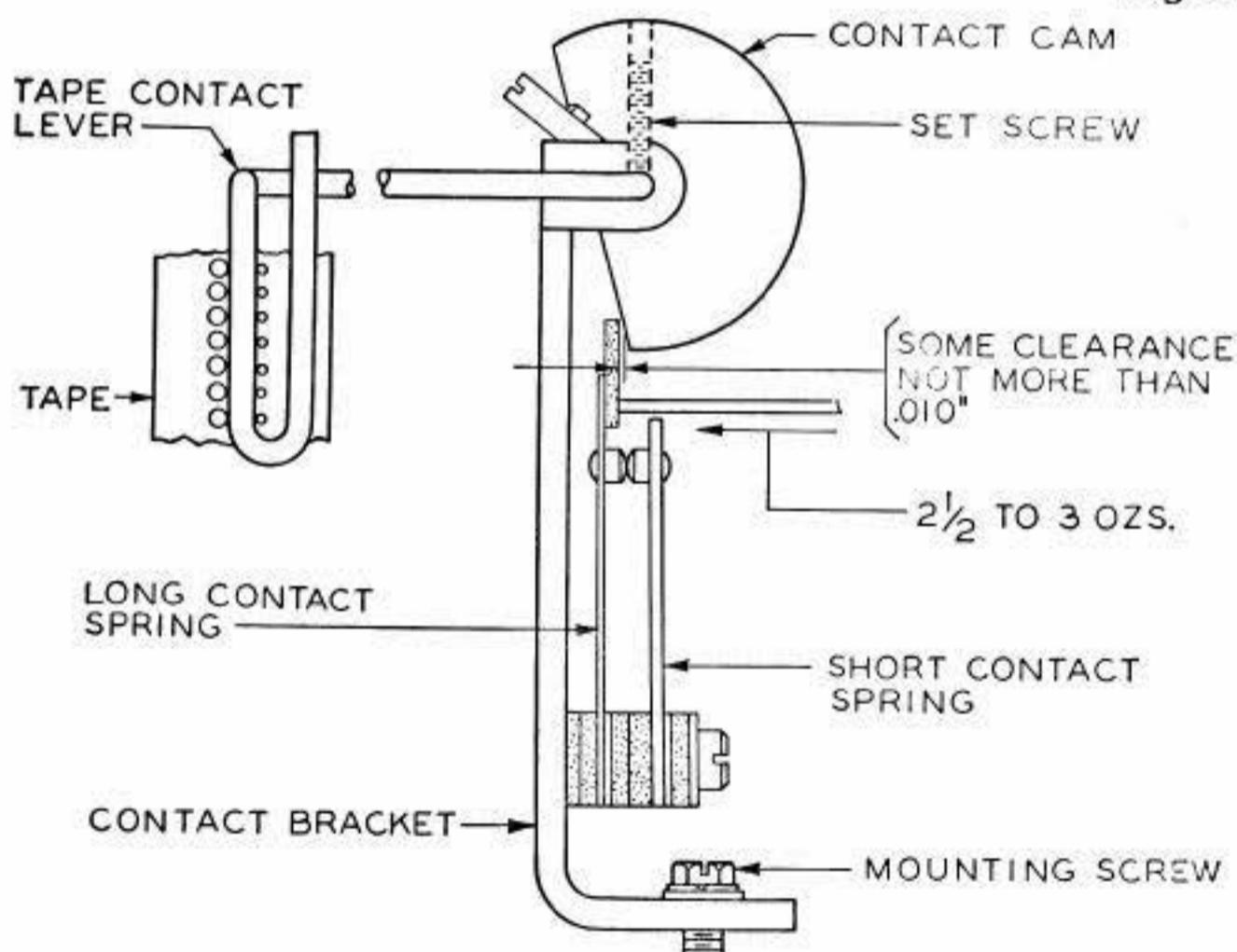


Fig. 51

(b) **TIGHT-TAPE CONTACT-LEVER:**

(1) **HORIZONTAL POSITION**

The contacting section of the formed portion of the lever above the tape loop should be over the tape between the feed-holes and the code-punch holes directly in front of the feed-holes.

(2) **VERTICAL POSITION**

There should be some clearance between the lever and the tape (when the tape is pressed flat against guides) and not more than .070" when measured at the bottom of the loop and at straight section nearest the code punch block. **Fig. 52**

(3) Position the rear collar against the ear at the rear of the bracket and adjust the position of the lever in the collar and bracket by means of its post (or bend lever if necessary) so that the two above requirements (1) and (2) are met.

(4) There should be some, not more than .004", end-play between the collars and the ears of the bracket. To adjust, position the left collar.

2.93 **Tight-Tape-Feed Indicator Contact-Cam:** The contact cam should be in line with the long contact insulator, and there should be some, not more than .010", clearance between the flat part of cam and the insulator. To adjust, loosen the set-screw in the cam and position cam; tighten the set-screw. **Figs. 51, 52**

2.94 **Tight-Tape-Feed Indicator Long Contact Spring:** With the lever in its normal unoperated position, and the contacts closed, apply the push end of an 8-oz scale horizontally to the insulator between the rivets. It should require 2-1/2 to 3 oz to open the contacts. To adjust, bend the long contact spring. **Fig. 51**

2.95 **Chad Chute:** With the unit resting on its three supporting posts, loosen the chad-chute mounting-screws and position the chute so that the ends of the chad-chute legs are on a line parallel to the bottom of the support feet.

Note: The following four adjustments should be made with the unit on the base.

2.96 **Punch-Arm Stud (Final Adjustment):** With the selector magnet energized and the machine operating under power, feed out a length of tape by operating the tape feed-out lever intermittently. The code punches should punch a clean hole. Refer to Paragraph 2.20. If necessary to readjust, loosen

the punch-arm stud lock-nut and position the punch-arm so that the punch pins just punch through the tape. Add an additional 1/3 turn and tighten the lock-nut. **Fig. 7**

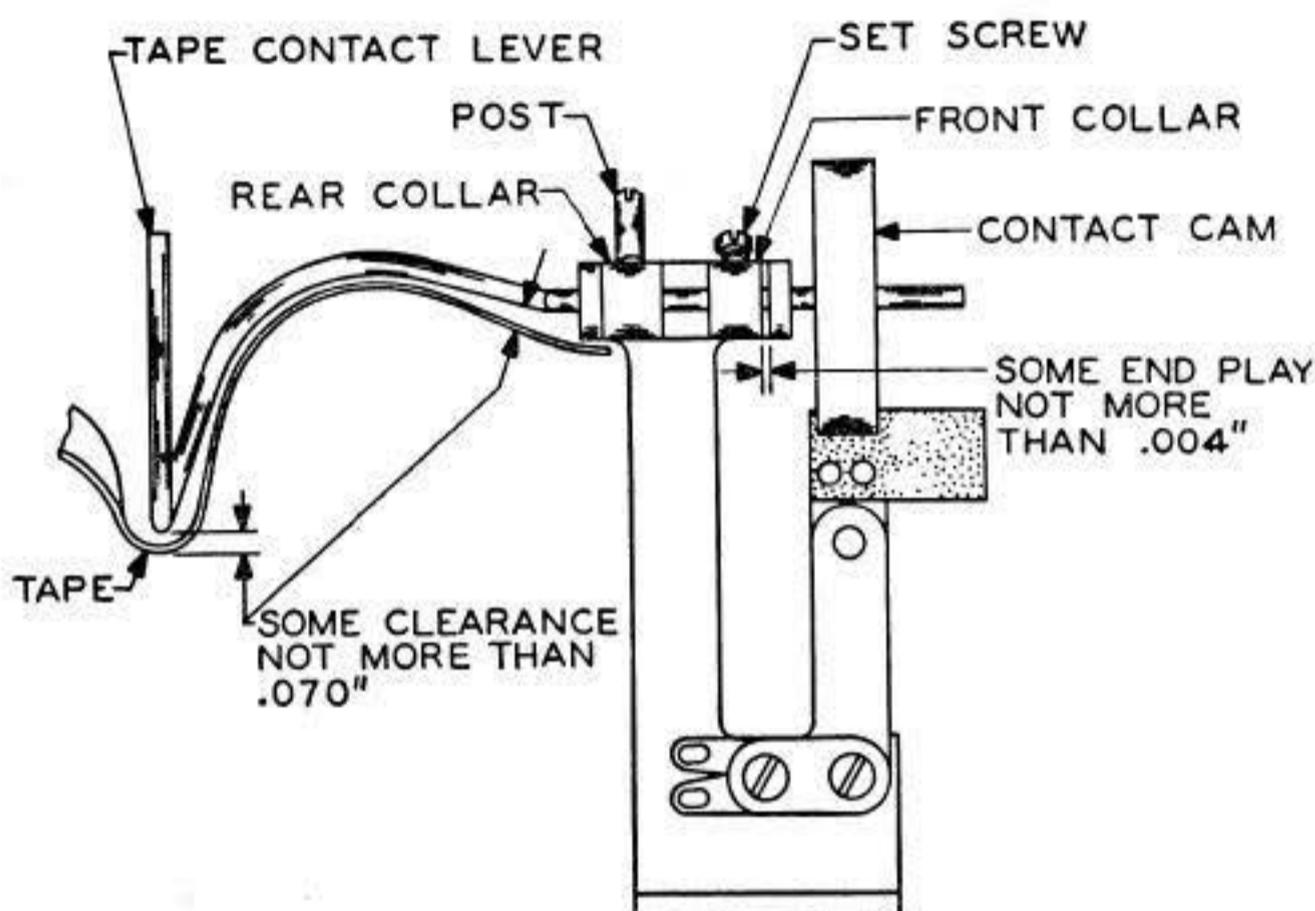


Fig. 52

2.97 Code-Punch Feed-Roll Detent (Final Adjustment):

With the selector magnet energized and the machine operating under power, press the tape feed-out key intermittently until a code combination, with holes punched on both sides and adjacent to a feed hole, appears in the tape. (Code combinations LTRS, C, I, K, P, Q, U, or V should be used for checking.) The centers of the punch holes and the center of the feed-hole should lie in a straight line. To adjust, position the feed-roll detent-lever mounting-plate. Check the CODE-PUNCH FEED-PAWL adjustment and readjust to meet requirements. **Fig. 11**

2.98 Code-Punch Feed-Roll Detent Spring: With the feed-roll-detent roller resting between two teeth, hook a 32-oz scale under the detent lever at the roller and pull at right angles to the detent lever. It should require from 6 to 9 oz to start the roller moving away from the feed-roll teeth. **Fig. 11**

2.99 **Code-Punch Feed-Pawl Spring:** With the unit in its stop position and the feed-roll detent lever held away, hook an 8-oz scale to the feed-pawl at the spring hole and pull in line with the spring. It should require 3-1/2 to 6 oz to start the pawl moving away from the ratchet wheel. **Fig. 19**

Note: If the selector dust shield and selector-magnet oil shield have been removed, put them back at this point.

BASE ADJUSTMENTS (2.100-2.107, inclusive)

2.100 **Motor-Unit Gear:** There should be a perceptible amount of backlash, not more than .004", between the motor pinion and the main-shaft gear.

To adjust, loosen the two rear pivot-screws until they are friction tight, and loosen the lock-nut of the adjusting screw and the clamp screw at the front. Turn the adjusting screw clockwise or counterclockwise to increase or decrease the backlash to meet the above requirement. Tighten the lock-nut, clamp-screw and pivot-screws and recheck the backlash.

2.101 **Tape-Out Switch:** The tape-out switch should operate when there is 1/8 to 3/16 inch of (radial measurement) tape remaining on the tape core.

To check, place a tape roll with 1/8" tape remaining on the core in the container. Raise the tape lever at the switch, until the switch is in its unoperated position. Then slowly lower the tape lever and stop at the position where the switch is operated. Note the clearance between the tape lever and the tape roll. (Not more than 1/16".)

2.102 **Tape-Lever Spring:** With the tape removed from the tape container, and the switch lever held away from the tape lever, apply an 8-oz scale at the switch end of the lever and pull in a vertical direction. It should require 1/2 to 2 oz to start the tape lever moving. **Fig. 53**

2.103 **Chad Drawer:** The fastener strike on the rear of the chad drawer and the catch on the base should be in alignment as gauged by eye. To adjust, position the strike and catch in their respective mounting-holes.

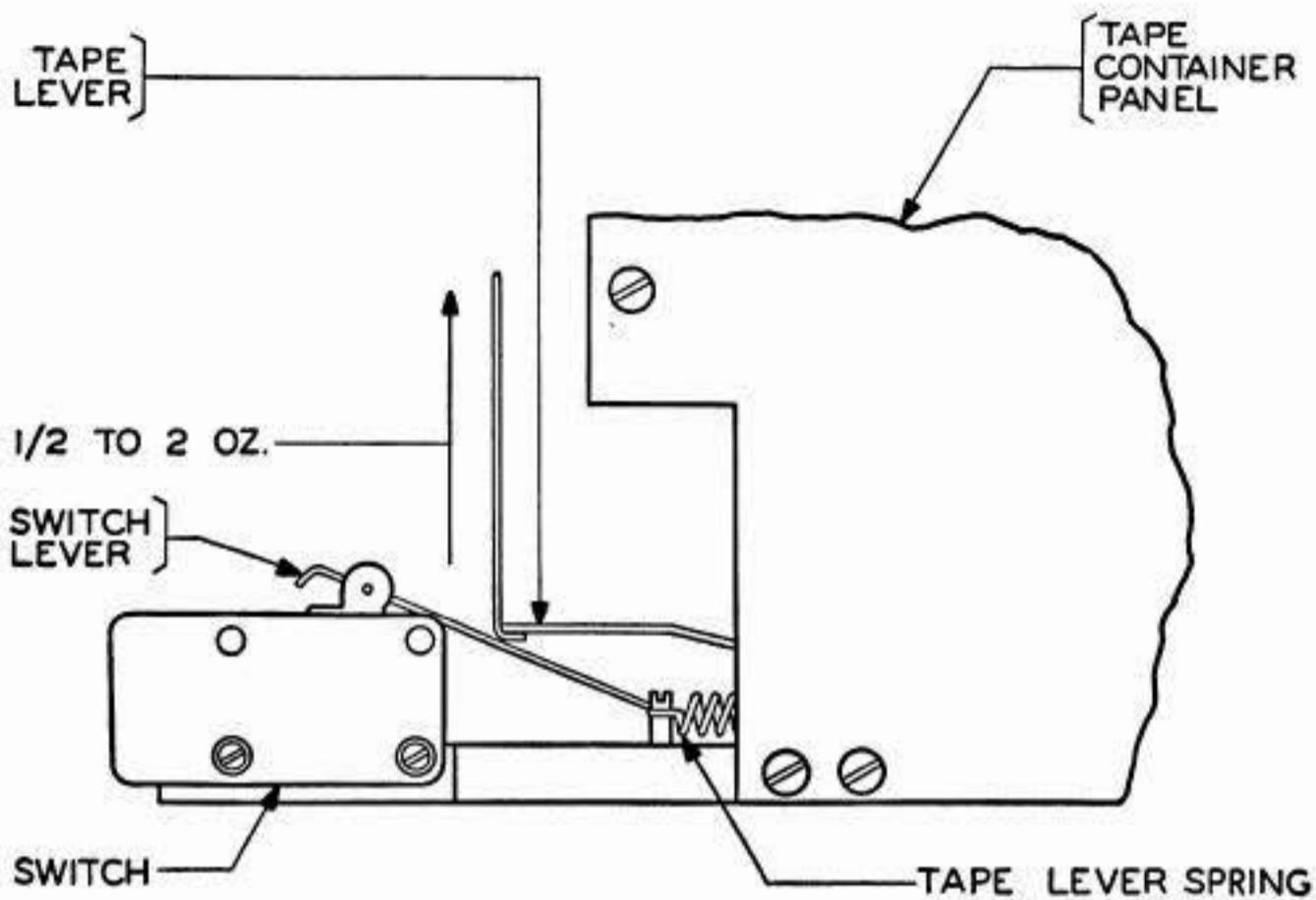


Fig. 53

2.104 **Gear Adjustments (Preliminary):** The receiving-shaft-gear adjustment plate on the base should be rotated in its mounting-holes, so that the pin is in its most forward position. The sensing and distributing drive-shaft gear-play-adjusting bushing should be in a high position with at least 3 threads engaged.

Fig. 54

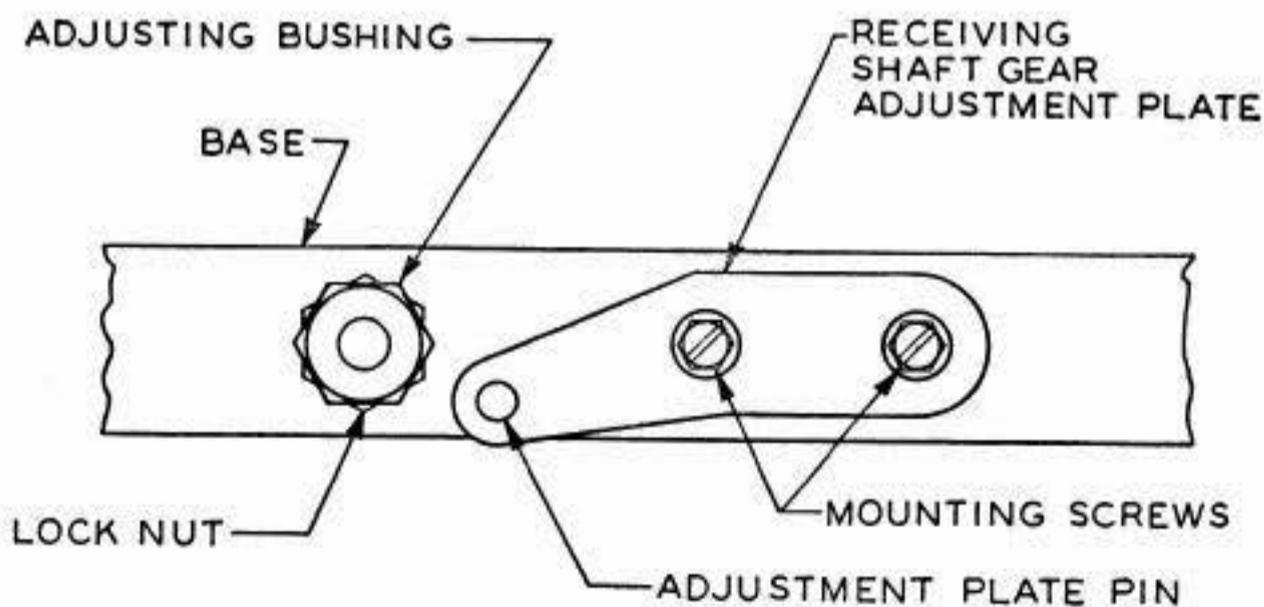


Fig. 54

To adjust, loosen the mounting-screws and position the plate to meet the above requirements, and loosen the adjusting-bushing lock-nut and position the adjusting bushing. Tighten the mounting-screws and lock-nut.

Note: For the following adjustment place the (reperforator-transmitter) unit in place on the base with the two front mounting-screws friction tight and the rear mounting-screw loose.

2.105 Receiving-Shaft-Gear (Final Adjustment): There should be a perceptible amount of backlash, not more than .004", between the main-shaft gear and the receiving-shaft gear. To adjust, loosen the gear-adjustment plate and move the unit from front to rear. Retighten the gear-adjustment plate clamp screws. After tightening, check gear clearance for one (1) full revolution of the larger gear.

2.106 Sensing and Distributing Drive-Shaft Gear (Final Adjustment): There should be a perceptible amount of backlash, not more than .004", between the sensing and distributing drive-shaft gear and the main shaft gear. To adjust, loosen the lock-nut of the vertical adjusting bushing, and position the bushing to meet the above requirement. While holding the adjusting bushing in position, tighten the unit mounting-screw, and then tighten the adjusting-bushing lock-nut.

After tightening, recheck gear clearance for one (1) full revolution of the larger gear. Recheck RECEIVING SHAFT-GEAR (FINAL ADJUSTMENT) above.

2.107 Tape-Guide Rollers: With tape threaded through the tape-guide rollers and the units, the tape should feed from the container without touching its sides, and should feed into the prepunch tape guide in a straight path. To adjust, position the tape-guide assemblies in their mounting holes.