

BELL SYSTEM PRACTICES
Teletypewriter and Data Stations

SECTION P35.640
Issue 3, May, 1959
AT&TCo Standard

PERFORATORS

14A, 13B

REQUIREMENTS, PROCEDURES, AND LUBRICATION

1. GENERAL

1.01 This section contains the apparatus requirements and adjusting procedures and lubrication for the main-←
tenance of the 14A (black finish) and 13B (green finish)
perforators.

1.02 This section is being reissued to: ↗

- (a) Add the loop-adjusting screw requirement (3.02)
- (b) Change the release-rod-pawl eccentric requirement (3.06)
- (c) Add the tape-tension lever clearance requirement (3.12)
- (d) Change four requirements and add two figure drawings on perforators equipped with the repeat feature (3.29-3.31)
- (e) Bring up to date the general arrangement of the material

Changes are indicated by marginal arrows. ↘

1.03 These perforators as supplied for Bell System use have punch blocks which provide tape perforations in which the center of the feed holes is in line with the center of the code holes.

1.04 The provisions of Section P30.012 should be observed←
in applying requirements and procedures. ←

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Note: Names of parts as used above and throughout the section are in some cases not the same as those used in the parts bulletin. For ordering parts, the parts bulletin names only should be used. ↵

2. LUBRICATION

- 2.01 The general instructions on lubrication given in BSP←
P30.011 should be followed. ←
- 2.02 The following parts should be adequately lubricated with oil:
- (a) Loops—bearings.
 - (b) Loops—surfaces which engage with keylever combs—oil sparingly.
 - (c) Keylever shaft—if shaft appears dry apply one drop of oil at four equidistant points.
 - (d) Indicator gear—bearing and approximately every tenth tooth.
 - (e) Indicator spring—convolutions.
 - (f) Idler gear—bearing.
 - (g) Release rod—bearings.
 - (h) Release-rod bellcrank—bearings.
 - (i) Release-rod detent—bearing.
 - (j) Lamp-contact lever—bearing.
 - (k) Feed-roll detent-lever—bearing and roller.
 - (l) Back-spacer lever and pawl—bearings—oil sparingly.
 - (m) Spacer-bar loop—bearings.
 - (n) Spacer-bar loop—surface which engages with spacer lever—oil sparingly.
 - (o) Feed roll—bearings—upper and lower—oil sparingly.
 - (p) Feed pawl—pivot.
 - (q) Punches—oil through hole in top of punch block.
 - (r) Punch-hammer bearing—oil through hole in top of punch hammer.
 - (s) Punch bars—where they pass through retaining slots in punch hammer and at pivot bearings.
 - (t) Bellcranks—at bearings and where they engage loop extensions.
 - (u) Plunger rod—where it passes through magnet bracket.
 - (v) Punch-magnet yoke—where it enters solenoid—oil sparingly.
 - (w) Tape-reel bearing—oil sparingly through hole in top of hub.
 - (x) Tape-tension-lever bearing—sparingly.
 - (y) All steel springs, except punch-hammer spring, should have both loops sparingly lubricated with oil.

2.03 Punch-hammer spring should have both loops lubricated with grease.

3. REQUIREMENTS AND PROCEDURES

3.01 **General:** Moving parts should operate smoothly and be free from binding.

Note: Disconnect power to make the following adjustments.

3.02 **Loop-adjusting Screw:** There should be some clearance, not more than 0.015", between the outer surface of the power loop and the end of the adjusting screw at the bellcrank end.

(a) To adjust, turn the adjusting screw to meet the requirement, and position the locknut. When making this adjustment a moderate force should be applied to the loops in the direction to make this clearance a maximum. Avoid bending or forcing the loops which may result in a false adjustment.

3.03 **Loop Springs:** Pressure of power-loop spring should be Min 2-1/2 oz, Max 3 oz, and the pressure of all other loop springs should be Min 1-1/2 oz, Max 2-1/2 oz, measured by pulling on the corresponding loop at a point adjacent to a keylever comb when the keylevers are in a vertical position.

Fig. 1

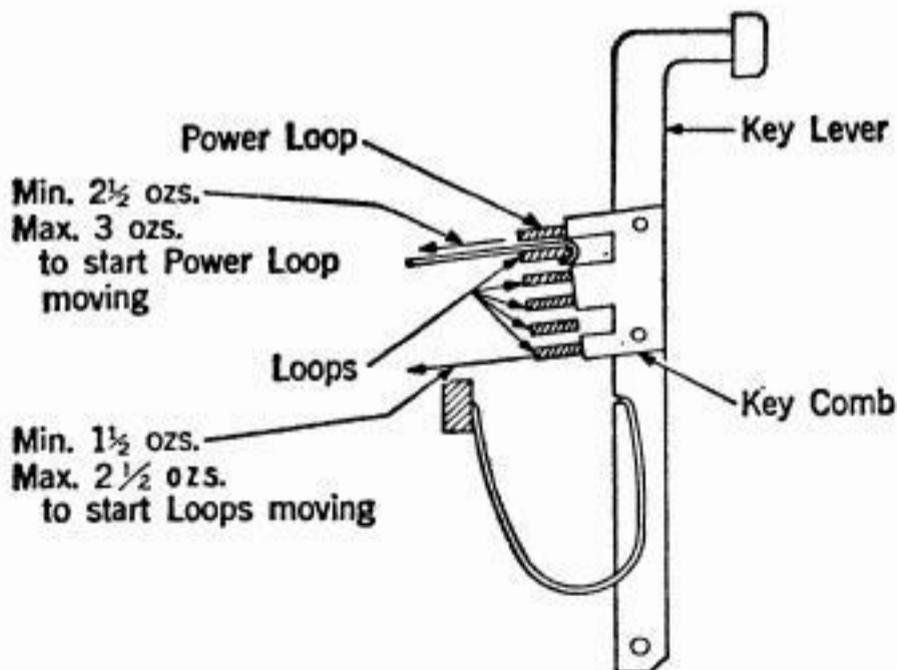


Fig. 1

(a) To adjust, remove loop springs and **spread or compress** the ends to obtain required pressure.

3.04 The opening between ends of all **keylever springs** excepting spacer-keylever spring should measure $1\frac{5}{8}$ ". The **spacer-keylever spring** should measure 2". **Fig. 2**

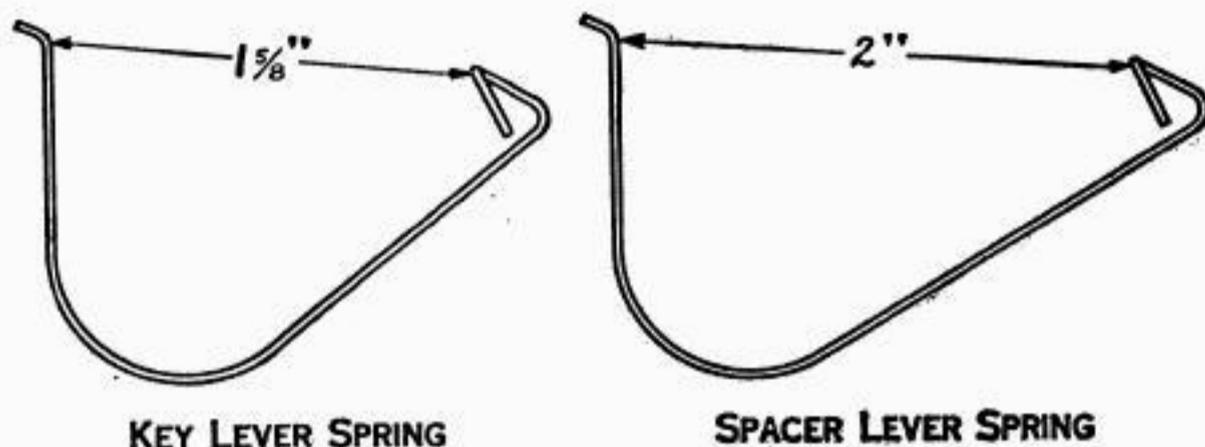


Fig. 2

(a) To adjust, bend springs.

3.05 There should be from 0.002" to 0.030" clearance between the **loops** and the **loop stop** (except in the case of the power loop) when the BLANK keylever is fully depressed.

(a) Gauge minimum clearance by eye, maximum by means of thickness gauge.

(b) To adjust, position the loop stop by means of shims.

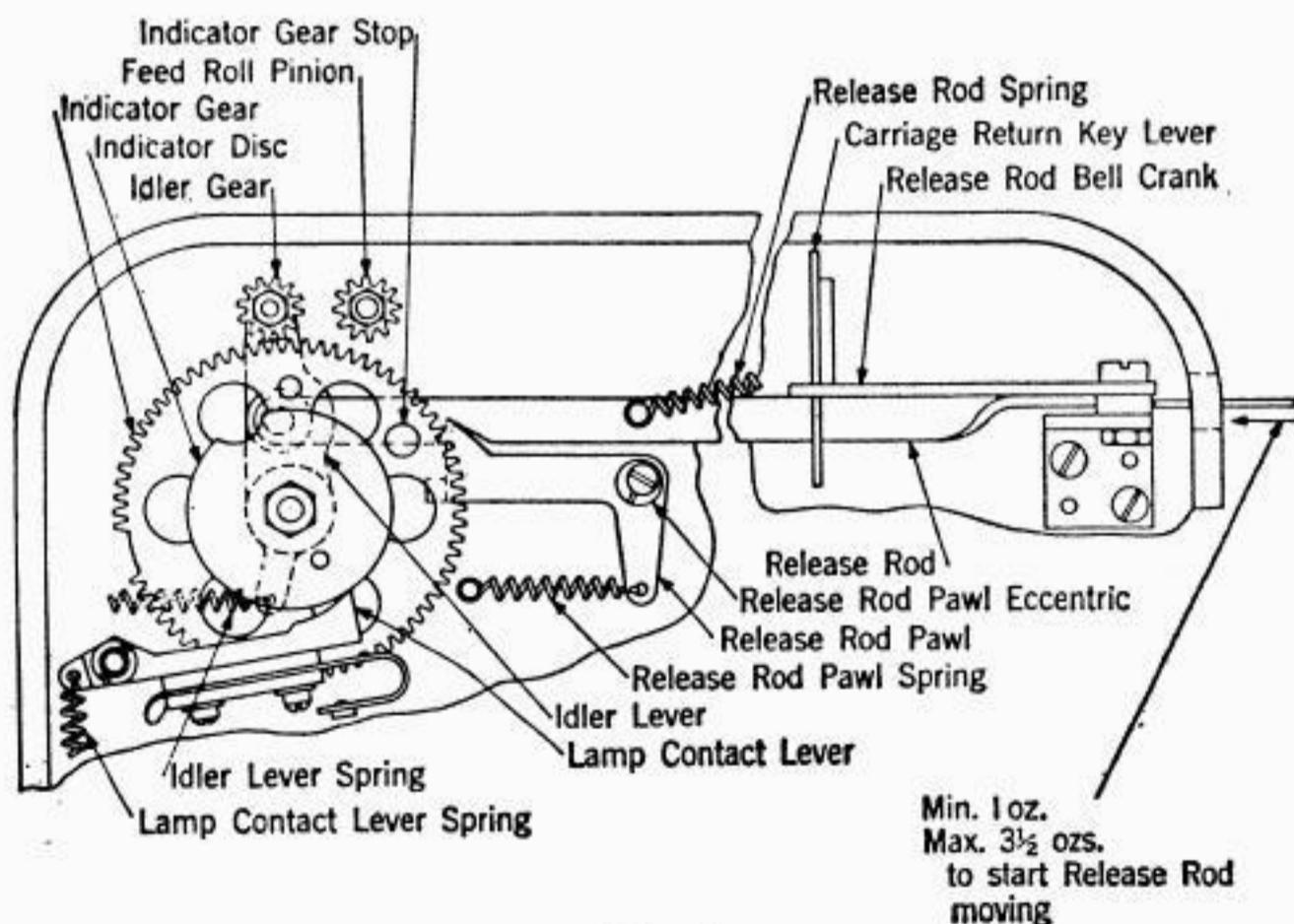


Fig. 3

3.06 **Release-rod-pawl Eccentric**

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(a) With the release rod latched in its operated position by the release-rod pawl, there should be from 0.010" to 0.030" clearance between the tops of the teeth on the idler gear and the tops of the teeth on the feed-roll pinion. Check this clearance throughout a complete revolution of the gear and pinion.

(1) To adjust, position the release-rod-pawl eccentric.

(b) Rotate the indicator gear approximately 1/4 turn and hold it in this position. With the carriage return key-lever fully depressed and the release-rod pawl in the notch in the release rod, there should be at least 0.004" clearance between the release-rod pawl and the holding surface of the notch.

(1) If necessary, readjust the release-rod-pawl eccentric within the limits of its adjustment to obtain this clearance.

Fig. 3

3.07 Tension of **release-rod-pawl spring** should be Min 1-1/4 oz, Max 2-1/2 oz, measured by unhooking spring from spring post and pulling upward vertically until the spring is extended to a length of 1".

3.08 Tension of **idler-lever spring** should be Min 5 oz, Max 8 oz, measured by pulling vertically upward on release-rod bellcrank at a point just to the left of carriage return key-lever, with release-rod spring unhooked, and indicator gear in its zero position (gear stop post against lamp-contact lever).

(a) Replace release-rod spring.

3.09 Tension of **release-rod spring** should be Min 1 oz, Max 3-1/2 oz, measured by pushing on right end of release rod, with idler gear held away from feed-roll pinion just enough to disengage them and with indicator gear in its zero position (gear stop post against lamp-contact lever). **Fig. 3**

(a) Apply push end of gauge through hole in right side of base casting.

Note: Turn perforator upside-down for 3.10.

3.10 Tension of **lamp-contact-lever spring** should be Min 6-1/2 oz, Max 7-1/2 oz, measured by unhooking spring from spring post and pulling vertically upward until the spring is extended to a length of 1-7/8".

(a) Gauge, using care that the spring does **not touch** the casting or the power terminal.

3.11 **Tape-tension lever** should bear against the feed-roll with a pressure of Min 5 oz, Max 5-1/2 oz, measured at the end of the lever and perpendicular to a plane passing

through the center line of the tension-lever stud and the end of the tension lever.

Fig. 4

- (a) To adjust lever with old-style studs it is necessary to remove stud from perforator and wind or unwind the spring on the stud to obtain the desired pressure.
- (b) To adjust lever with new-style studs, loosen nut at upper end of stud and turn stud to the right to increase and to the left to decrease the spring pressure.
- 3.12 **Tape-tension lever** should be centrally located with respect to the feed-roll pins.
- (a) To gauge:
- (1) Take up the feed-roll endplay towards the ratchet, and the tension-lever endplay towards its adjusting nut. The edge of the lever slot may touch the feed-roll pins on the side of the pins nearest the ratchet but there should be clearance on the other side.
- (2) Take up the feed-roll endplay away from the ratchet, and the tension-lever endplay 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 should be clearance on the other side.
- (b) To adjust, add or remove shims between the shoulder on the tape-tension lever stud and its mounting bracket.

Fig. 4

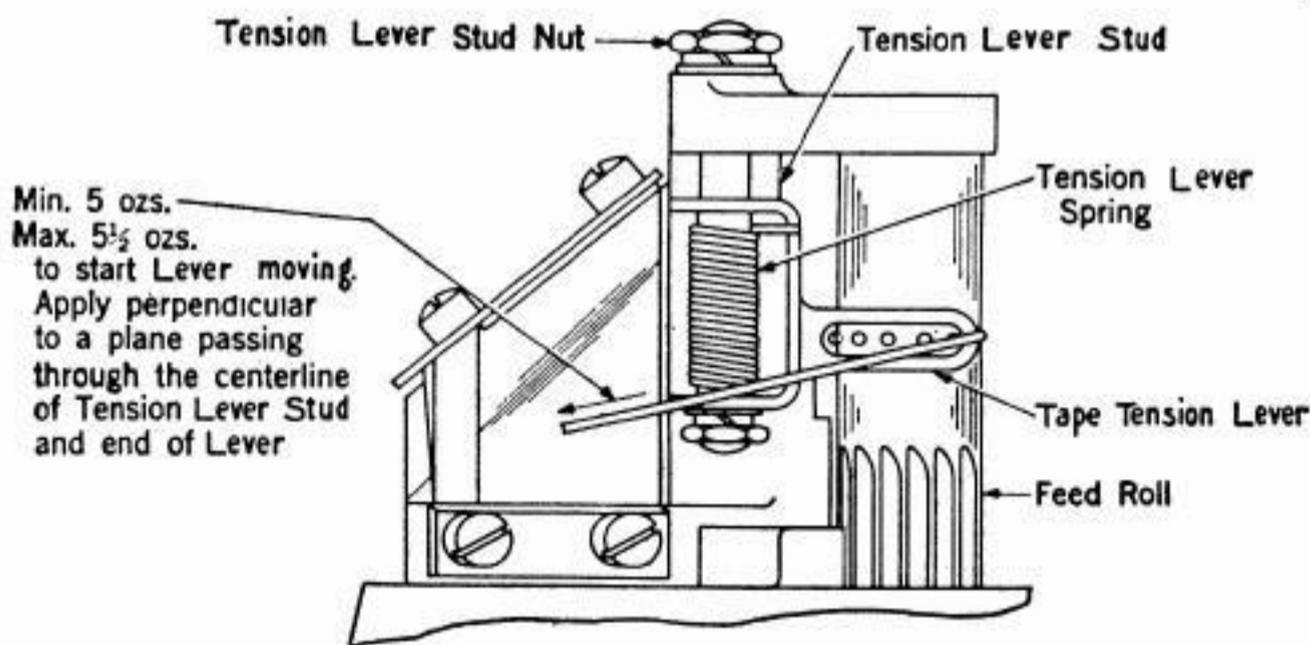


Fig. 4

- 3.13 **Feed-roll detent—preliminary setting** (See also 3.25). The distance from the center of the feed punch to the center of a feed pin on the feed roll should be approximately 0.0600" when the punch hammer is held in the operated position.

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(a) To check this distance, block punch hammer in operated (forward) position, hold tape-tension lever away from feed roll and insert the TP73517 gauge in the punch block so that the projection of the gauge stops against the feed punch. With the gauge in this position a feed pin on the feed roll should line up with the middle hole of the gauge.

Fig. 5

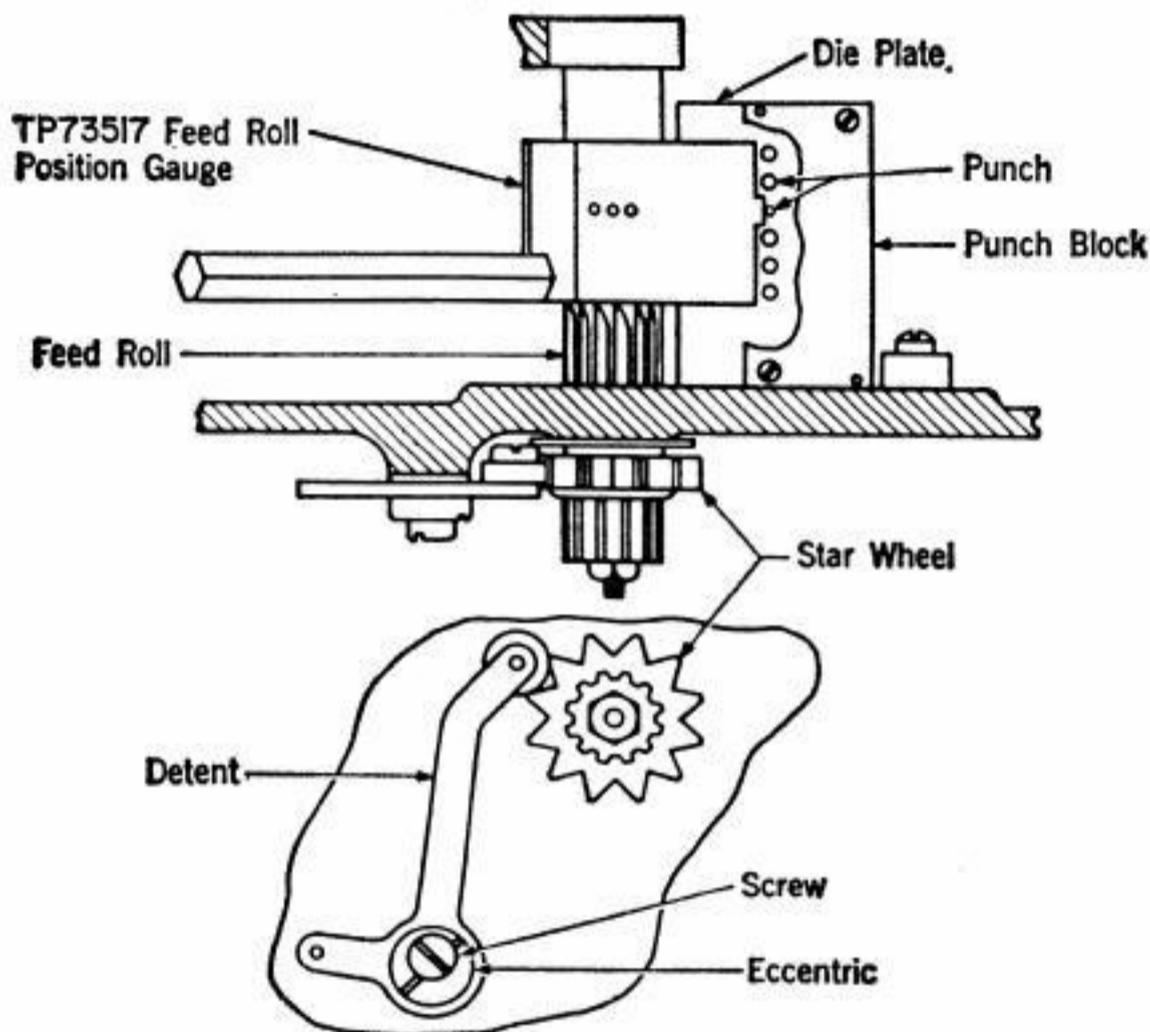


Fig. 5

(b) To adjust turn perforator on its back edge, loosen the feed-roll-detent screw and turn the eccentric bushing until the middle hole of the TP73517 gauge fits freely over a feed pin of the feed roll. Tighten feed-roll-detent screw and restore feed hammer and tape-tension lever to their normal positions.

3.14 Tension of **feed-roll detent-lever spring** should be Min 3-lb, Max 4-lb, measured by pushing on spring end of detent lever.

Fig. 6

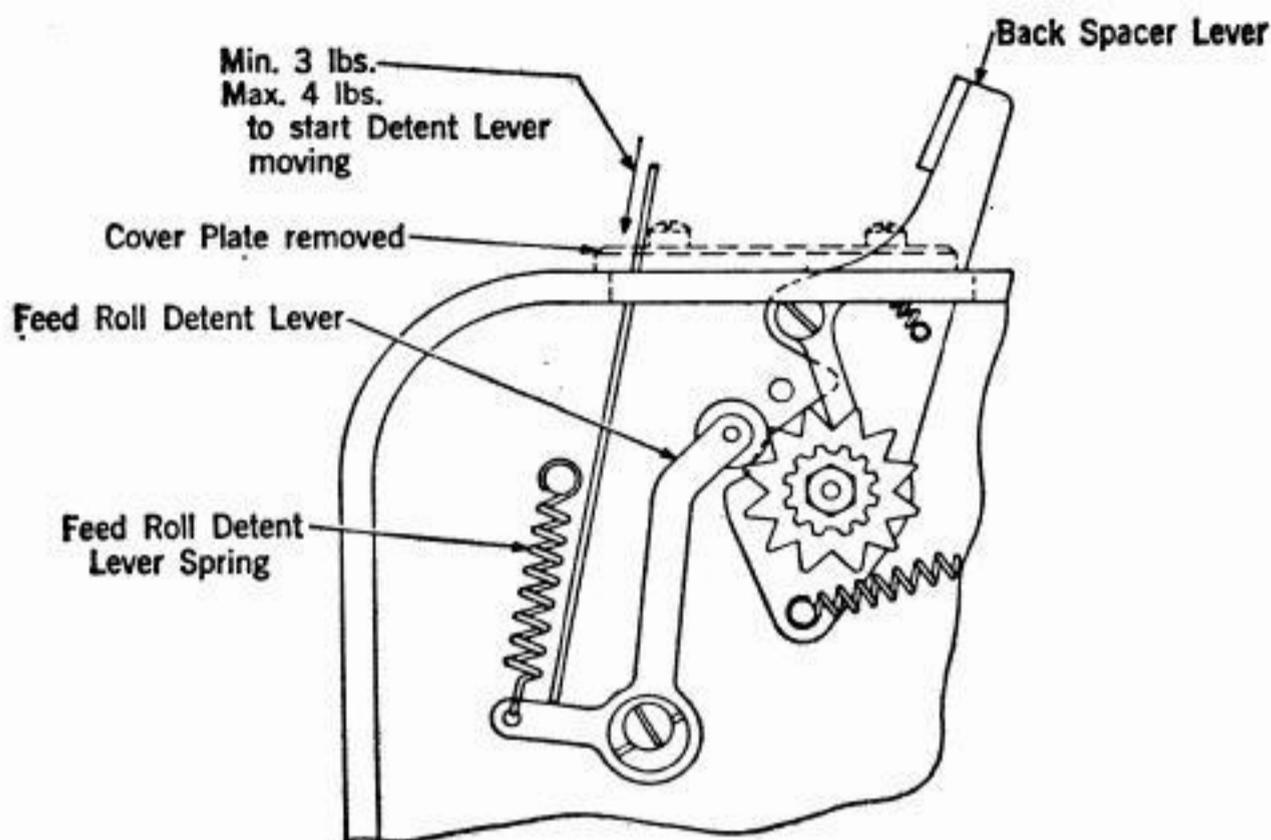


Fig. 6

(a) Remove the cover plate for the back-spacer lever opening and insert gauge through this opening in front of base casting. Hold back-spacer lever in its operated position and apply push end of gauge against detent lever in a direction parallel with spring and as close to the spring as possible.

3.15 Tension of **back-spacer-pawl spring** should be Min 1-1/4 oz, Max 2 oz, measured at end of pawl when back-spacer lever is in its released position. **Fig. 7**

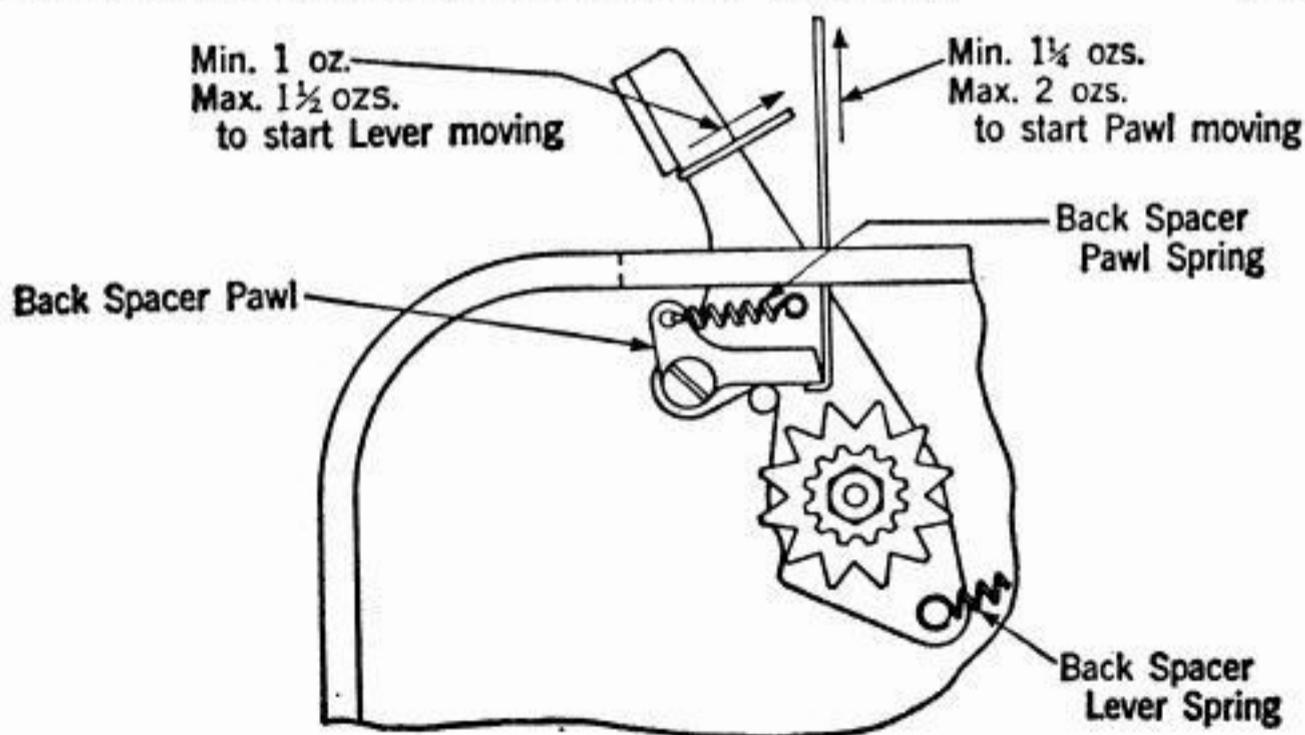


Fig. 7

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(a) Insert gauge through the opening in the base casting and apply at the end of the pawl. Pull upward in a direction perpendicular to pawl.

Note: Replace cover plate.

3.16 Tension of **back-spacer-lever spring** should be Min 1 oz, Max 1-1/2 oz, measured adjacent to cover plate when the lever is in its released position. **Fig. 7**

(a) Gauge by pulling in a direction perpendicular to the handle of lever.

3.17 The **feed pawl** should meet the following requirements:

(a) The feed pawl should advance feed roll one full step (1/12 of a turn) each time the punch hammer is released from the position where the punch bars are just touching the punches in the punch block. **Fig. 8**

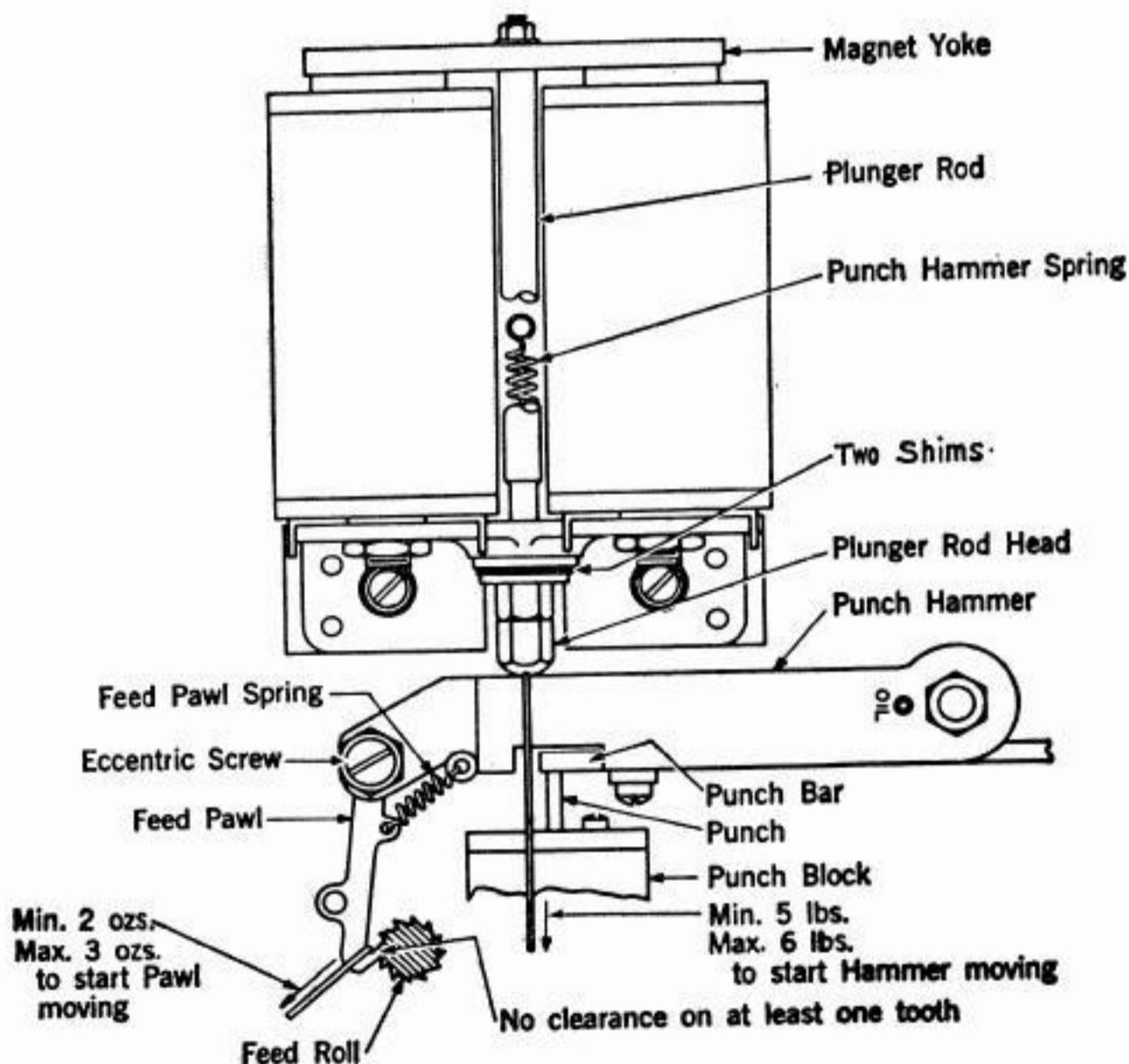


Fig. 8

(b) The feed pawl should engage a tooth on the feed-roll ratchet without over travel when the punch hammer is in the position where the punch bars are just touching the punches.

(1) Gauge by eye.

(2) To adjust, first set feed-pawl-eccentric screw so that the pawl is in its most forward position. Then turn eccentric screw until feed pawl will just meet requirements.

3.18 Tension of **feed-pawl spring** should be Min 2 oz, Max 3 oz, when the feed pawl is resting normally against feed roll, measured at notch of pawl and in a direction parallel with spring. **Fig. 8**

3.19 The following adjustment applies only to perforators equipped with punch-bar bellcranks which have the longer arm cut away to form a neck. **Punch bars** should move without bind in the punch hammer and should overtravel the left edges of the punches by Max 1/32" when all keylevers are in their normal positions (not depressed).

(a) Gauge by eye.

(b) To adjust, bend the neck of the associated bellcranks to either the right or left as required.

3.20 The travel of contact lever from the point where the **punch-magnet contacts** close to the fully operated position should be approximately 0.040" measured at the point where contact lever engages with the power loop. The fully operated position of the lever should be taken as the mean position obtained when the BLANK key and FIGS key are separately depressed.

(a) Gauge by eye.

(b) To adjust, determine the keylever which gives the contact spring the least travel. With this keylever depressed, turn the contact screw just enough to close the contacts, then give the contact screw one additional turn and tighten the locknut.

(c) To adjust for shallower touch than provided by (b) turn in contact screw approximately one additional turn. The limiting position for this adjustment is that at which the punch bars reliably clear the right edge of the punches when the BLANK keylever is depressed until the contacts just close.

(d) When the LTRS keylever is fully depressed, check to see that there is at least 0.002" clearance between the power loop and the loop stop.

Note: Connect power.

3.21 The travel of the **punch-magnet plunger** should be such that the punches are driven through the tape sufficiently to punch all holes cleanly when the LTRS keylever is depressed.

(a) To adjust, insert tape between the die plates of the punch block, loosen the locknut and back off the plunger-rod head until perforations in the tape just fail, then advance until all holes are punched cleanly when the LTRS key is depressed. Advance the plunger-rod head 1/3 turn additional and tighten locknut against head.

Note: If the perforator operation appears sluggish due to slow release of the magnet, inspect the anti-freeze washers in the cavity of the magnet solenoids and replace, if worn.

Note: If the tape does not move freely, the punch- block cleaning tool should be inserted between the guide plate and the die plate of the punch block and moved forward and backward a few times to remove the lint and paper scraps. 

Caution: Do not take apart defective punch blocks. If satisfactory punching cannot be obtained replace entire punch-block assembly.

Note: Disconnect power.

3.22 Tension of **punch-hammer spring** should be Min 5 lb, Max 6 lb, measured with the punch hammer in the released position.

(a) Apply gauge to punch hammer just above the plunger-rod head and in a line parallel with the spring. **Fig. 8**

3.23 **Magnet-yoke Suspension:** With the perforator resting in its normal position and the magnet yoke in its unoperated position the yoke-suspension spring should exert an upward tension, in a vertical line passing through the center line of plunger rod, just sufficient to carry the plungers away from the bottom of the solenoids.

(a) Gauge by eye.

(b) To adjust, position the suspension-spring bracket so that it is perpendicular to magnet yoke. Position the suspension bracket by loosening bracket mounting nut so that the center line of spring is vertical and in line with suspension-spring bracket. Then tighten bracket mounting nut. To increase or decrease spring tension, loosen spring-post nut and move spring post up or down. (It is important that spring post should not be raised any higher than necessary to meet the above requirement.) Tighten spring-post nut. **Fig. 9**

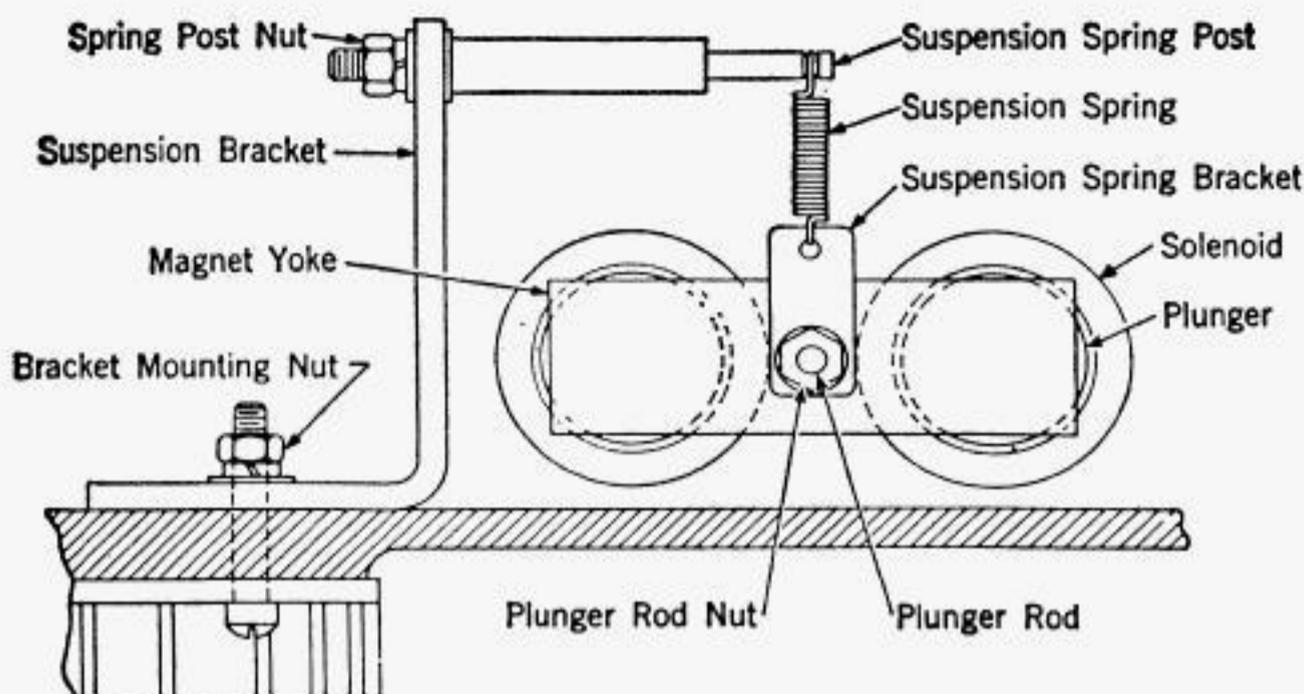


Fig. 9

3.24 The **tape-guide spring** should be positioned so that it holds the tape firmly against the side of the guide block adjacent to the No. 1 punch without buckling the tape.

(a) To check, insert tape between die plates of punch block and press edge of tape against the spring and note that as tape is released the spring moves it securely against the die-block guide.

(b) To adjust, bend tape-guide spring.

Note: Connect power.

3.25 **Feed-roll Detent—Final Setting** (See 3.13). Perforations in tape should be evenly spaced, 10 to the inch, with an allowable variation of ± 0.007 " in a 4" length.

(a) To check, perforate a series of nine BLANK and one LTRS combinations seven or eight times, place the tape on top of a TP95960 gauge, then hold tape and gauge up to a light background and align a No. 3 code hole in the tape with the hole 1-1/2 inches from the left end of the gauge. Gauge holes should be visible through all No. 3 code holes to the right of the point of alignment and the code hole above the large hole at the right end of the gauge should fall entirely within the circumference of the gauge hole.

Note: Disconnect power.

(b) To adjust, turn perforator on its back edge, loosen feed-roll detent screw and turn eccentric bushing upward if holes in tape are too far apart and downward if too close together.

Fig. 5

Note: If adjustment is changed in 3.25 recheck 3.17.

3.26 Tension of **indicator spring** should be such as to reliably restore indicator to its zero position after indicator has been advanced one step and released, and after it has been advanced sixty-five steps and released.

(a) To adjust, turn bottom side of perforator upward, loosen nut on indicator disc and turn disc in a clockwise direction to increase tension and in a counter-clockwise direction to decrease tension. The correct tension can usually be obtained by advancing the indicator gear to its 65th position, winding spring until it is tight and then unwinding it one complete turn of the disc and tightening nut. If spring is wound too tightly it will stick and not restore indicator to its zero position.

Note: Connect power.

3.27 The **indicator lamp** should light on the 64th or 65th character perforated from zero. **Fig. 10**

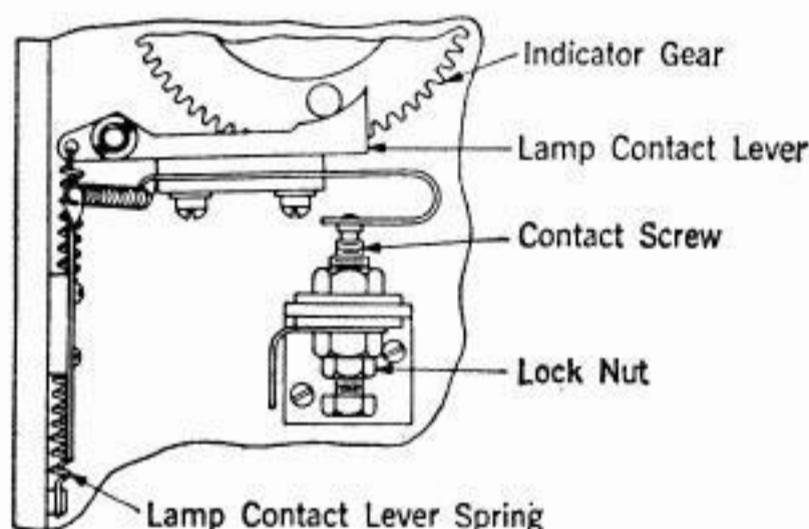


Fig. 10

(a) To adjust, return indicator gear to its starting position (pin on the gear resting against end of the lamp-contact lever) by operating the release rod by hand. Adjust the lamp-contact screw so that when a character keylever is operated 65 times, the lamp lights on the 65th character. Then move screw in 1/4 turn additional. Recheck operation of contact.

Note: In operation, the indicator gear is not always fully returned to its starting position, therefore, it is satisfactory if lamp lights on the 64th or 65th character.

3.28 Tension of **tape-reel-tension spring** should be Min 1-1/2 oz, Max 2-1/4 oz, measured by pulling on the lever at the right-angle bend to the rear of the pivot screw and toward the rear right corner of the base.

(a) Gauge, after loosening the three tape-reel-assembly mounting screws and removing the tape-reel assembly.

Note: Adjustments 3.29 to 3.31 inclusive, apply only to perforators equipped with the TP115841 set of parts to provide the repeat feature. Disconnect power before making these adjustments.

3.29 **Contact and Bracket Assembly:**

(a) The spring hole in the spring arm should be in the plane of the rear surface of the magnet yoke when the yoke is in the middle of its travel.

(1) To adjust, position the contact bracket assembly by means of its mounting screws.

(b) If the perforator is equipped with a magnet-yoke suspension, the suspension spring should appear to be vertical as viewed from the front of the perforator and the tension should be sufficient to just balance the weight of the magnet yoke.

(1) To adjust, position the spring arm by means of its mounting screws. **Fig. 11**

3.30 **Contact Springs:**

(a) With magnet operated, 2 to 3 oz should be required to just open the contact points. Measure by hooking scale over the rear contact spring at the contact point and pulling at right angles to the spring.

(1) To adjust, bend the rear contact spring.

(b) There should be 0.020" to 0.030" clearance between the **contact points** when the magnet yoke is in the unoperated position.

(1) To adjust, bend front contact spring and recheck 3.30(a). **Fig. 11**

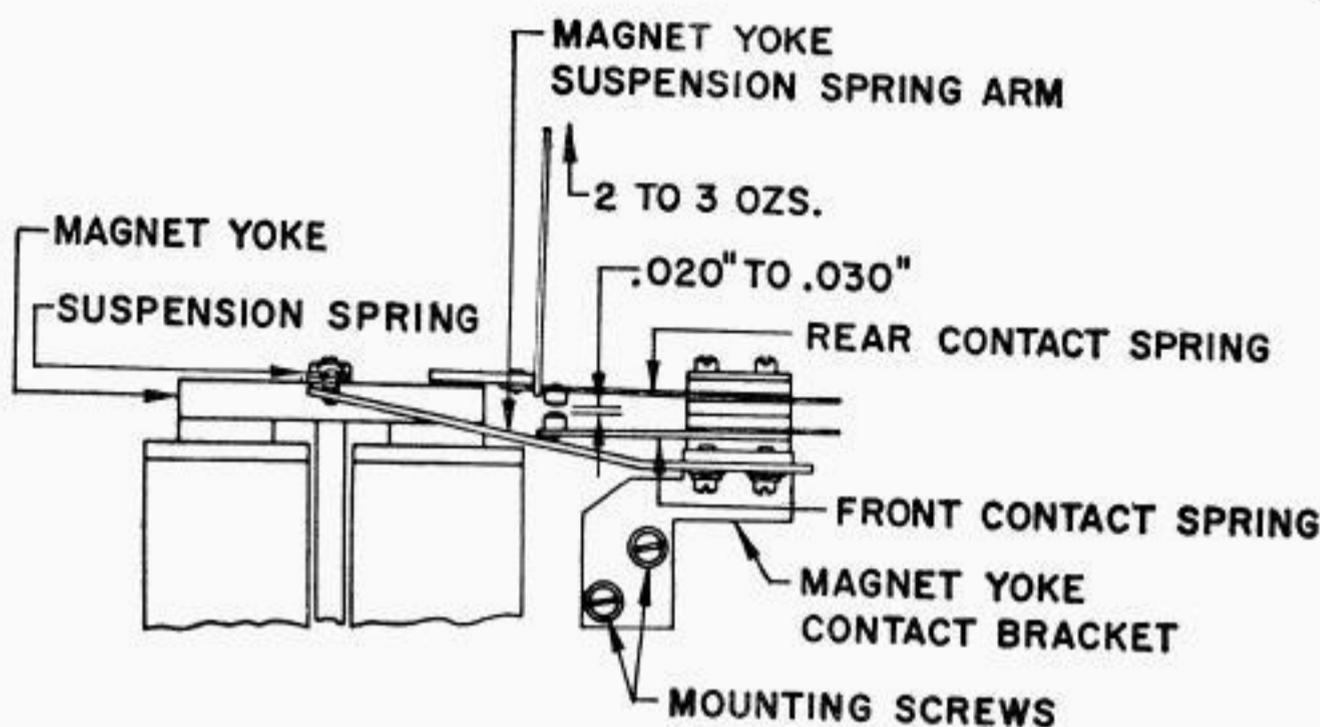


Fig. 11

Note: Remove relay guard to check following adjustments.

3.31 Relay:

(a) There should be 0.002" to 0.010" clearance between the **pole piece** and the **armature** with the armature stopnut backed off and the contact springs held away from the armature. To obtain this clearance it may be necessary to back off the armature stopnut all the way and pull the armature away from the pole piece.

Fig. 12a

(1) To adjust, reposition armature being careful to keep armature parallel to pole piece.

(b) There should be 0.015" to 0.018" clearance between the **armature** and the **stopnut** when the armature is held against the pole piece.

Fig. 12b

(1) To adjust, position the stopnut.

(c) It should require 2-1/4 to 3 oz to start the **contact spring** moving away from the fiber insulator on the **magnet spool** when the armature-contact spring is held off and an 8-oz scale is hooked over the backstop-contact spring at the contact point and pulled at right angles to the contact spring.

Fig. 12c

(1) To adjust, bend backstop-contact spring.

(d) It should require 1-3/4 to 2 oz to start the **contact-spring** moving away from the fiber stud on the **armature** when the armature is held against the pole piece and the push end of an 8-oz scale is applied to the armature-contact spring at the contact point and pushed at right angles to the contact spring. **Fig. 12c**

(1) Adjust by bending armature-contact spring.

(e) There should be some clearance, not more than 0.002" between the **armature-contact spring** and the fiber stud on the armature when the armature is held against the stopnut. **Fig. 12d**

(1) To adjust, bend stop lug on backstop-contact spring. Recheck backstop-contact spring tension.

(f) There should be 0.006" to 0.010" clearance between the contact points when the armature is held against the pole piece. **Fig. 12c**

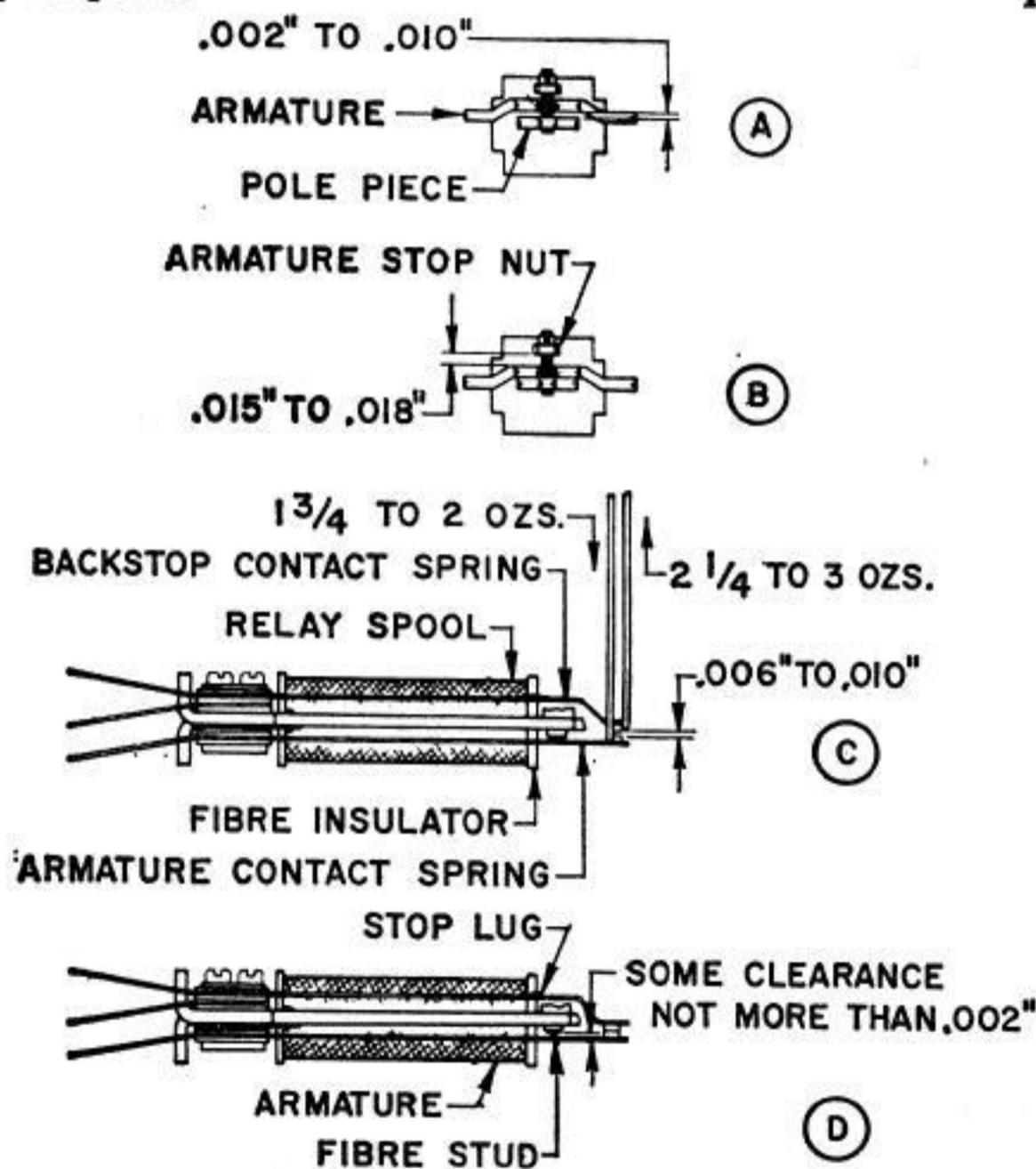


Fig. 12