

**BELL SYSTEM PRACTICES**  
**Teletypewriter and Manual**  
**Telegraph Station and P.B.X.**  
**Installation and Maintenance**

**SECTION P40.610**  
**Issue 4, August, 1940**  
**AT&T Co. Standard**

# **TELETYPEWRITER—TYPING UNIT**

## **26 TYPE**

### **REQUIREMENTS AND PROCEDURES**

#### **1. GENERAL**

1.01 This section contains the apparatus requirements and adjusting procedures for the maintenance of typing units of 26 type teletypewriters. It is reissued to add or revise the requirements and procedures marked with an asterisk (\*) in the Table of Contents, 1.03.

1.02 The following shall be observed in applying requirements and procedures:

(a) Use appropriate gauges and Teletype scales, unless otherwise specified, as spring tensions (including gram equivalents) are values indicated by these scales when used as shown:

<b>Use Teletype Scale</b>	<b>When Max. Tension Shown Is</b>
138-55M	Up to 8 ozs.
138-58M	Above 8 ozs. up to 32 ozs.
82711M	Above 32 ozs. up to 64 ozs.
4841M	Above 4 lbs. up to 12 lbs.
2727M	Above 12 lbs. up to 25 lbs.

(b) Before readjusting a part, loosen locking device (clamping screw, lock nut, etc.). Reset locking device after adjustment is completed.

(c) After readjusting a part, check adjustment of related parts which may have been disturbed.

(d) Parts dismantled to facilitate checking or readjustment shall be reassembled after operation is completed, reassembling any dismantled locating shims in original position.

(e) Springs which are outside tension limits shown and for which no adjustment is provided shall be replaced.

(f) Refer to Ordering Information for part names and numbers as designations used are in some cases abbreviated to save space.

(g) Contact points shall fall wholly within the circumference of the opposing contact except contacts having same diameter whose centers shall not be out of alignment more than 25% of their diameter.

(h) Fixed pivot points are noted in figures by solid black circles.

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## 2. CLEANING

2.01 If necessary, typing units shall be cleaned in accordance with general Section P30.010 covering Cleaning Teletypewriter Apparatus.

## 3. LUBRICATION

3.01 Typing units shall be lubricated in accordance with Section P40.601 covering Lubrication of 26 Type Teletypewriters.

#### 4. REQUIREMENTS AND PROCEDURES

**Note:** Remove ribbon feed unit, range finder assembly and selector armature guard from typing unit after placing type wheel in lowest position, pressing on front end of ribbon feed unit and pulling printing bail toward front until printing hammer disengages its guide.

4.01 **Sword separator plate leaf springs**, except those of top and bottom plates, shall press lightly against their respective swords.

**Note:** If necessary to check, remove separator plates and check to see that leaf spring end is Min. .045", Max. .055" away from plane of plate as gauged by eye.

(a) To adjust, bend leaf spring at narrow portion.

4.02 **Armature lever** shall have minimum end play without bind, gauged by eye and feel, when the armature lever and selector arm springs are unhooked. See Fig. 1.

(a) To adjust, reposition top armature lever pivot screw.

4.03 **Selector armature** when in operated position shall touch both magnet cores at approximately the centers of their pole-faces; and the cores shall be centrally located with respect to the armature as gauged by eye when holding a light background behind the magnet and armature assembly.

**Caution:** Make sure armature and pole-faces are free of oil and dirt.

(a) To adjust, remove selector magnet bracket from typing unit and reposition magnet core assembly while holding the assembly so that the cores are vertical and the armature rests against the pole-faces by its own weight.

**Note:** With proper adjustment, at least 3-1/2 lbs., applied at right angles to armature edge midway between cores, should be required to pull armature away from cores when .020 ampere is flowing to magnet coils. (Coils in series shunted by 5,000 ohm resistance.)

4.04 **Selector arm** shall have minimum end play without bind as gauged by eye and feel and shall clear armature lever by Min. .008", Max. .016" when armature lever, selector arm and selector arm stop detent springs are unhooked. See Fig. 1.

(a) To adjust, reposition bottom selector arm pivot screw for clearance then top screw for end play.

**Note:** It may be necessary to remove the selector arm and magnet brackets in order to readjust the bottom pivot screw.

4.05 **Selector swords** shall clear both front and rear stop posts by approximately equal amounts, not more than .040" as in Fig. 1, when (1) locking lever and selector arm springs are removed, (2) associated selector lever is on peak of its cam, (3) selector arm has been moved slowly from its unoperated or operated position to a point where the extension lug which has been against the sword arm just clears that arm. When checking clearance to front stop post unhook armature lever spring from spring arm.

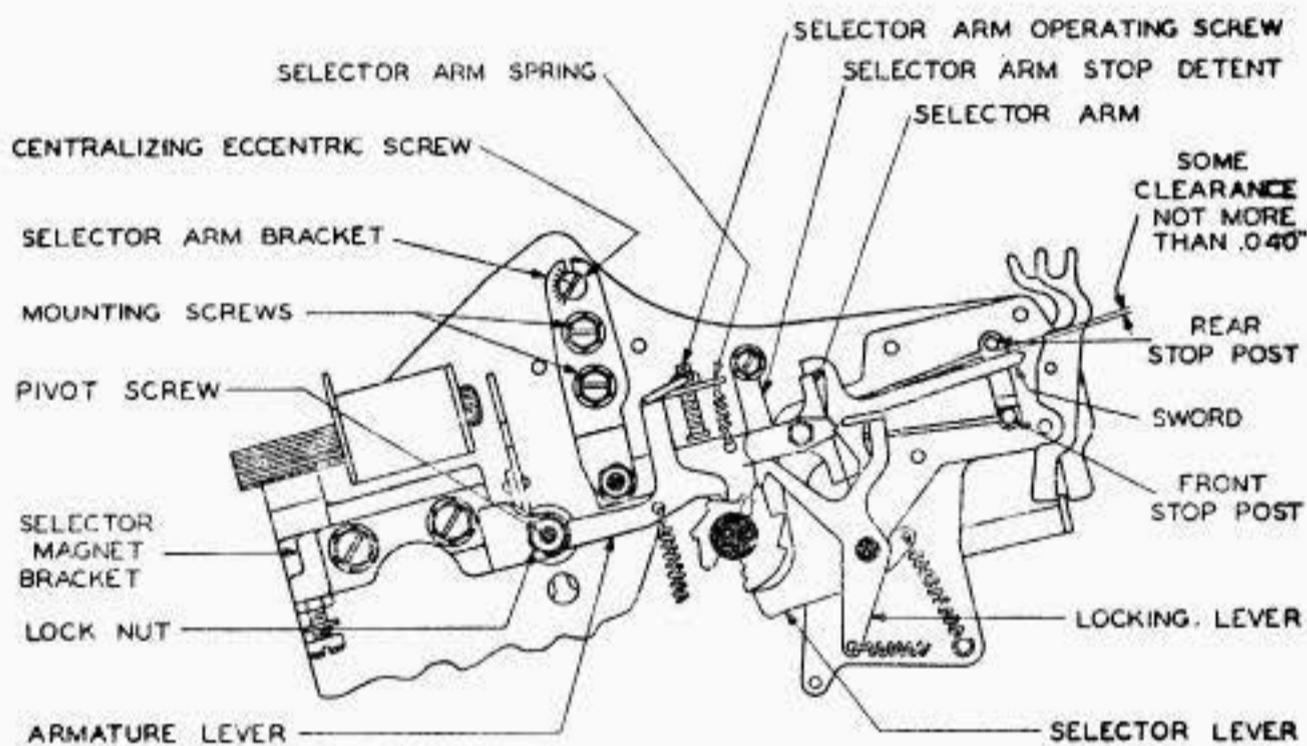


Fig. 1

Note: Use No. 1 sword in gauging and adjusting then check remaining swords.

(a) To adjust; loosen selector arm bracket until held friction tight; equalize clearance between swords and stop posts by turning centralizing eccentric, making sure that the selector arm stop detent does not interfere and the eccentric indicating line is adjacent to scale on bracket; then move bracket closer or farther away from swords by inserting and turning the 90783M wrench in one of two holes provided.

4.06 **Locking wedge** shall clear locking lever by Min. .006", Max. .010" as in Fig. 2 when lever is resting on a high part of its cam and end of wedge is held in line with lever.

(a) To adjust, reposition locking wedge.

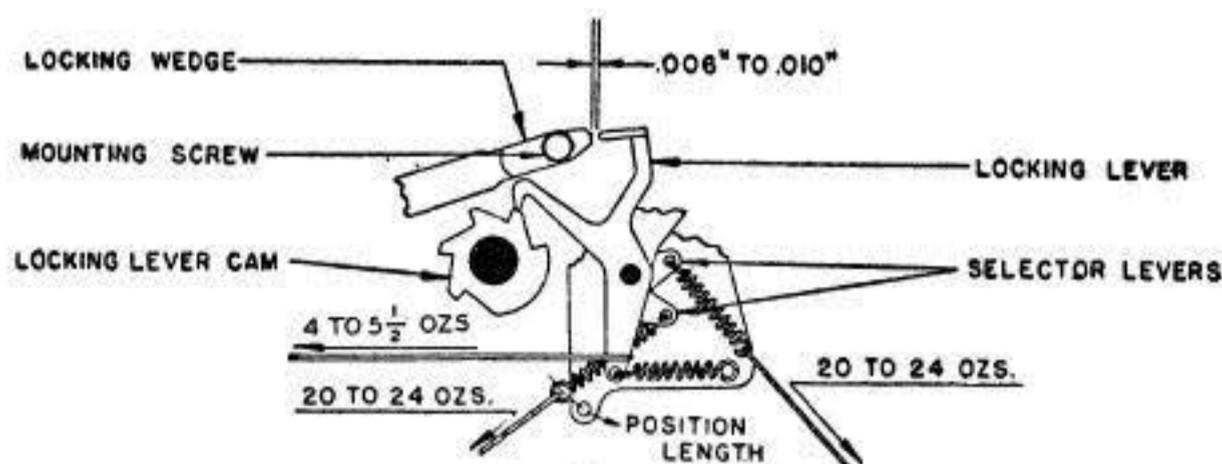


Fig. 2

4.07 **Locking lever spring** shall have a tension of Min. 4 ozs. (115 gms.), Max. 5-1/2 ozs. (155 gms.) measured as in Fig. 2 when lever starts to move from high part of cam.

4.08 **Locking lever** shall clear sides of locking wedge by equal amounts within .003" as in Fig. 3 gauged by eye, when selector arm is in its operated (rear) and unoperated positions.

Note: Make sure that selector arm operating screw does not interfere with selector arm.

(a) To adjust, reposition selector arm stop detent eccentric post.

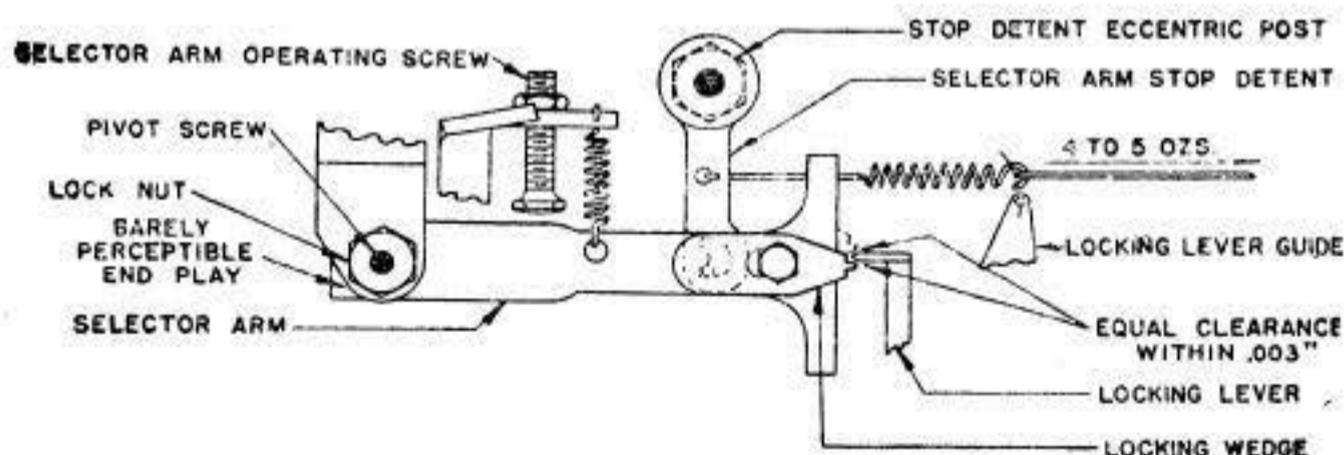


Fig. 3

4.09 **Selector arm stop detent spring** shall have a tension of Min. 4 ozs. (115 gms.), Max. 5 ozs. (140 gms) measured as in Fig. 3 when stretched to position length.

4.10 **Selector lever springs** shall have a tension of Min. 20 ozs. (565 gms.), Max. 24 ozs. (680 gms.) measured as in Fig. 2 when selector levers are in unoperated position.

4.11 **Armature lever** shall clear its cam by Min. .060", Max. .065" when locking lever has just dropped off high part of cam, the cam is held back against the locking lever as in Fig. 4 and the selector arm is held in its operated (rear) position.

(a) To adjust, loosen selector magnet bracket and selector magnet bracket adjusting arm until held friction tight, then reposition selector magnet bracket by inserting and turning 90783M wrench in hole above adjusting arm end.

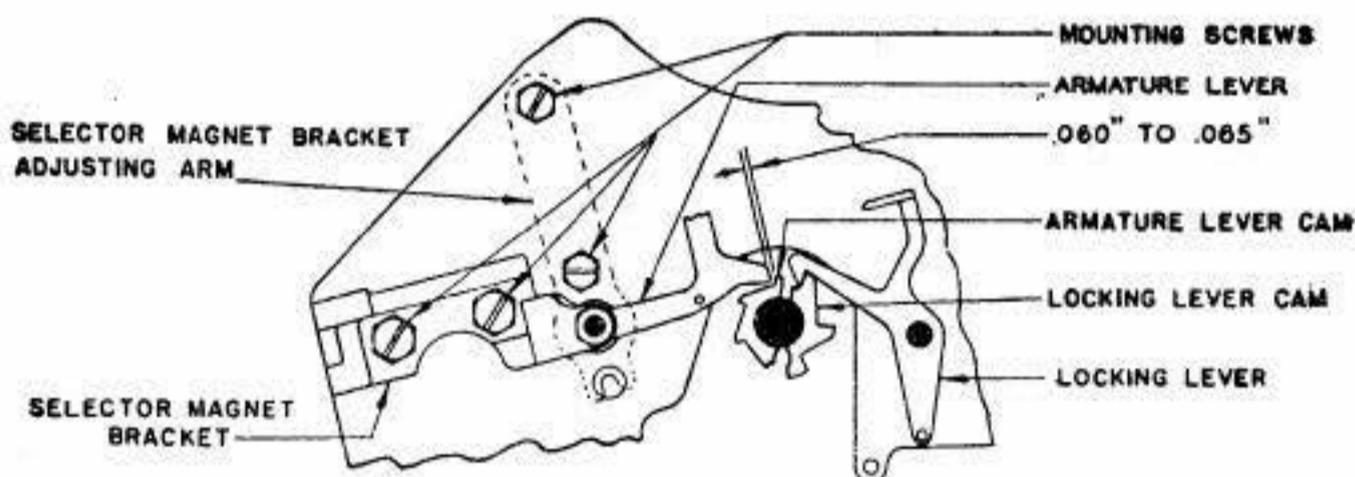
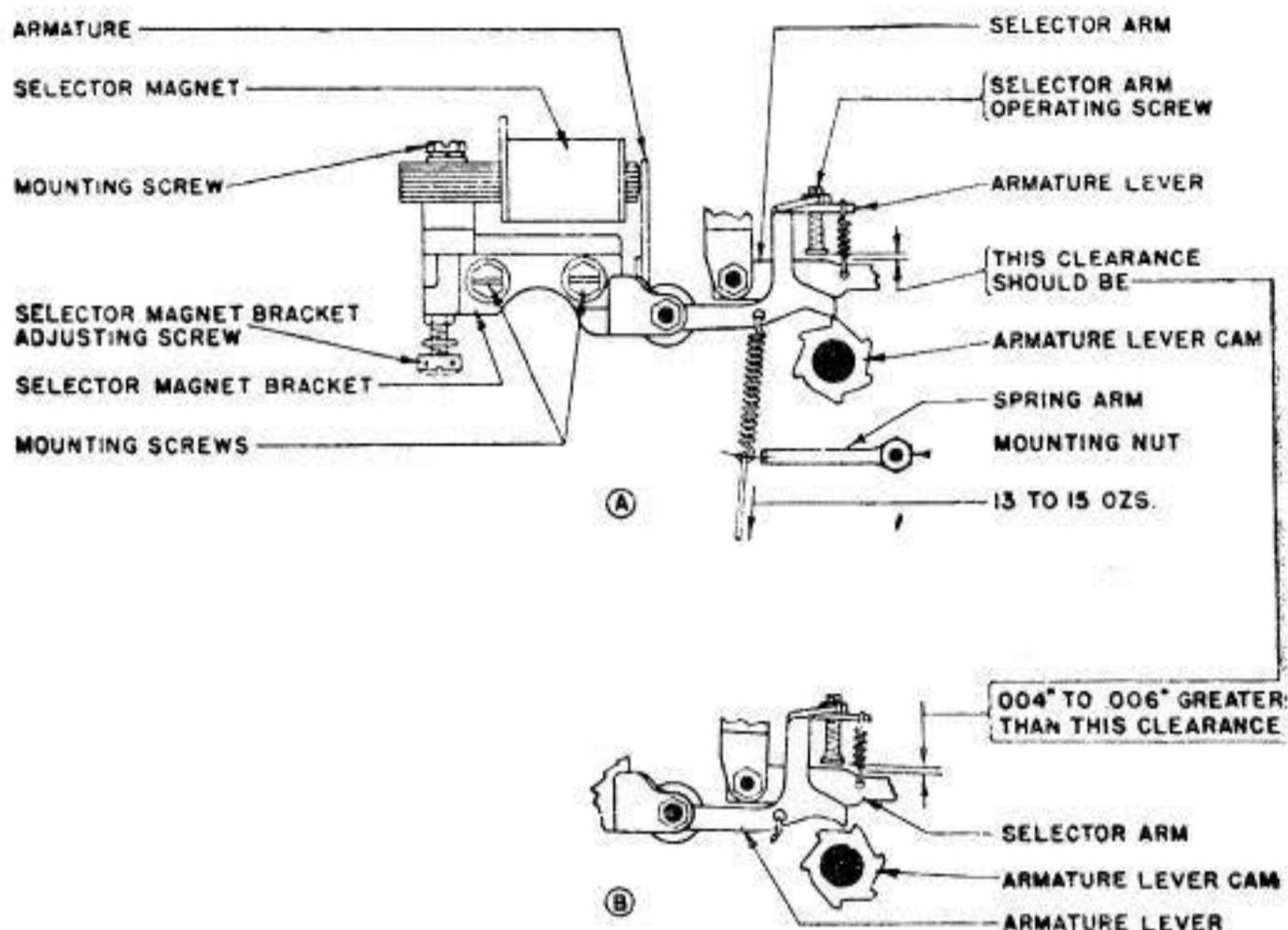


Fig. 4

4.12 **Selector Magnet Bracket:** With the magnet energized, the clearance between the selector arm and its operating screw shall be .004" to .006" greater when armature lever is on the peak of its cam which gives the greatest throw to the armature lever as in Fig. 5(A) than when opposite an indent as in Fig. 5(B).

(a) To adjust, energize magnets, hold cam sleeve so armature lever is on a peak of its cam, turn main shaft to position where it gives greatest throw to armature lever, loosen selector magnet bracket and reposition latter by means of its adjusting screw until armature lever just touches the peak of its cam then give screw an additional 1/10 turn counterclockwise; if selector arm does not clear its operating screw, back off operating screw to provide at least .006" clearance and recheck requirement; if difference in clearances exceeds .006" turn magnet bracket adjusting screw clockwise, if less than .004" turn screw counterclockwise.

Note: Avoid lost motion due to loose fitting screw threads.



**Fig. 5**

4.13 **Armature lever spring** shall have a tension of Min. 13 ozs. (370 gms.), Max. 15 ozs. (425 gms.) measured as in Fig. 5A when the armature lever is on a high part of cam.

(a) To adjust, reposition spring arm.

**Note: Reassemble selector armature guard.**

4.14 **Selector arm** shall clear its operating screw by Min. .003", Max. .006" as in Fig. 6 when magnet is energized, selector arm is in its operated (rear) position and armature lever is between peaks of its cam.

(a) To adjust, reposition selector arm operating screw.

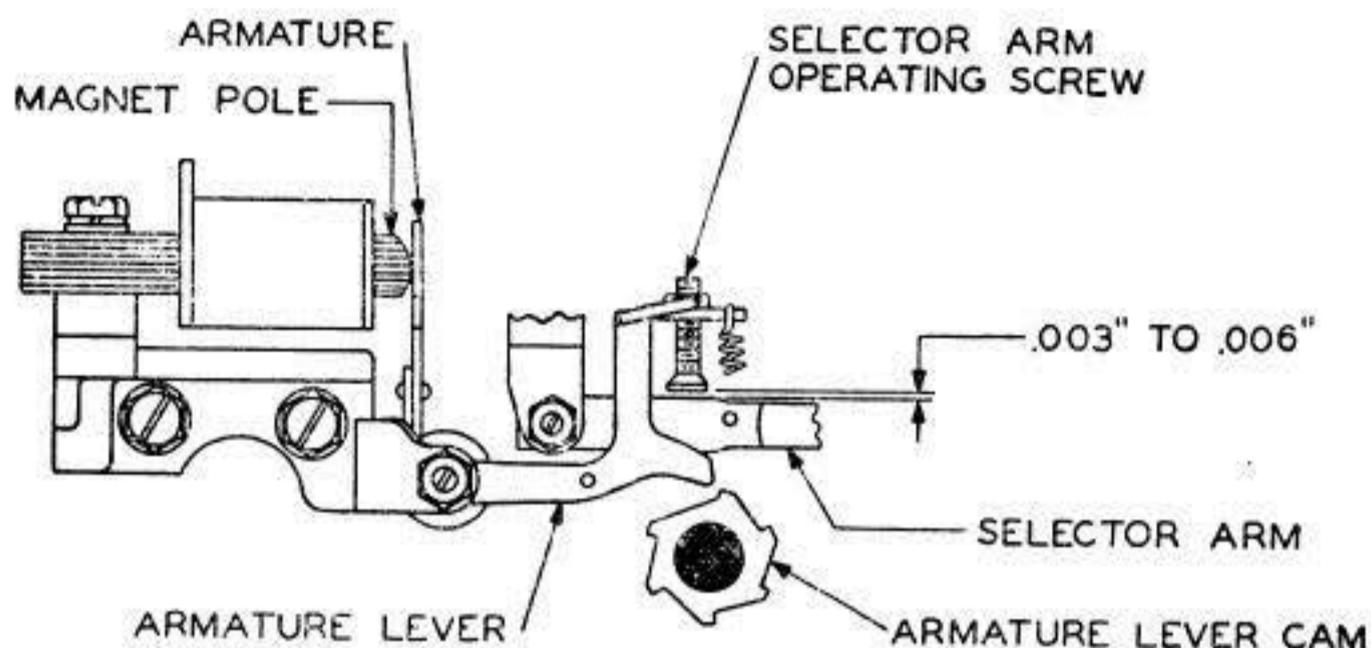


Fig. 6

4.15 **Selector arm spring** shall have a tension of Min. 1-1/4 ozs. (35 gms.), Max. 1-3/4 ozs. (50 gms.) measured as in Fig. 7 when armature lever is on a high part of its cam and selector arm stop detent spring is unhooked.

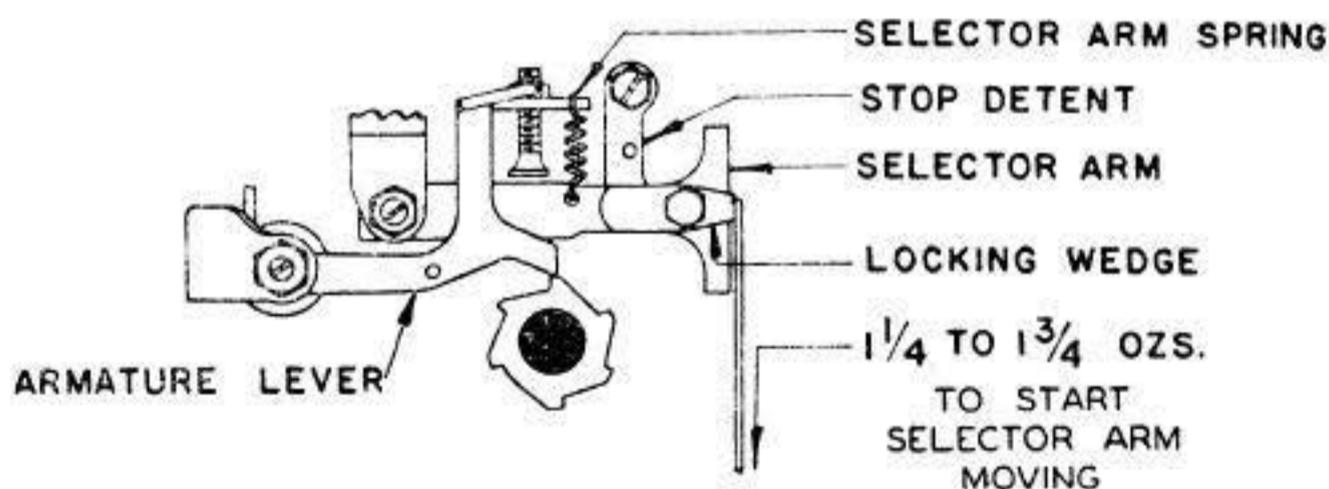
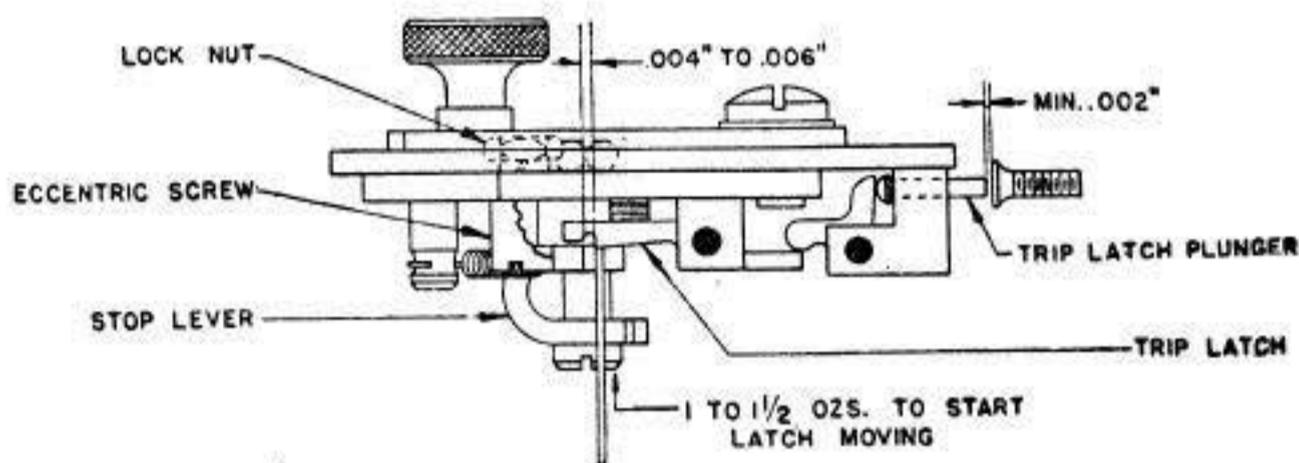


Fig. 7

4.16 **Stop lever** shall overtravel trip latch by .004" to .006" as in Fig. 8.

(a) To adjust, reposition stop lever eccentric screw.

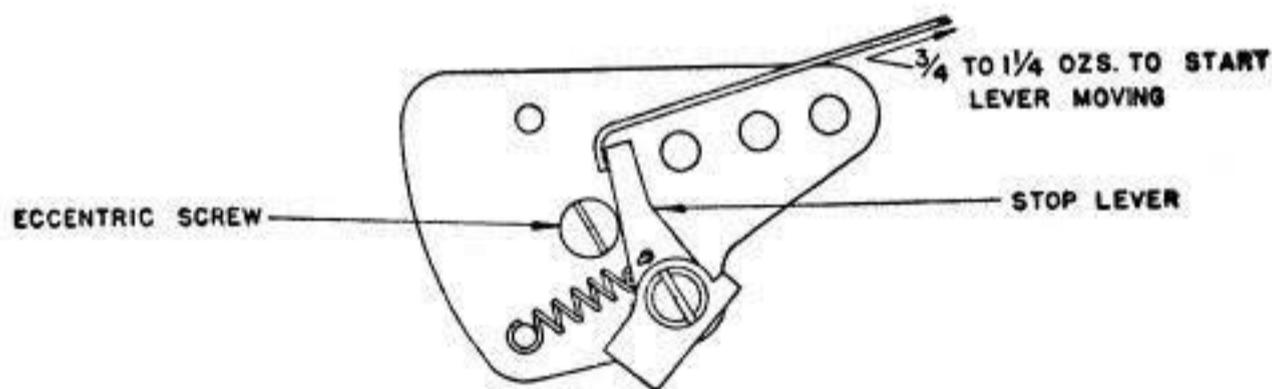
4.17 **Trip latch spring** pressure measured as in Fig. 8 shall be Min. 1 oz. (28 gms.), Max. 1-1/2 ozs. (40 gms.) when ranger finder assembly is held horizontally.



**Fig. 8**

4.18 **Stop lever spring** shall have a tension of Min. 3/4 oz. (21 gms.), Max. 1-1/4 ozs. (35 gms.) measured as in Fig. 9.

Note: Check 4.17 before gauging this requirement.



**Fig. 9**

**Note: Reassemble the range finder assembly.**

4.19 **Trip-Off Screw:** Stop lever shall clear trip latch by not more than .002", as in Fig. 10, when armature is unoperated and stopping edge of the lever is directly opposite the trip latch latching surface; and trip latch plunger shall have at least .002" end play as in Fig. 8 when armature is held operated and stop lever is clear of trip latch latching surface.

(a) To adjust, reposition trip-off screw.

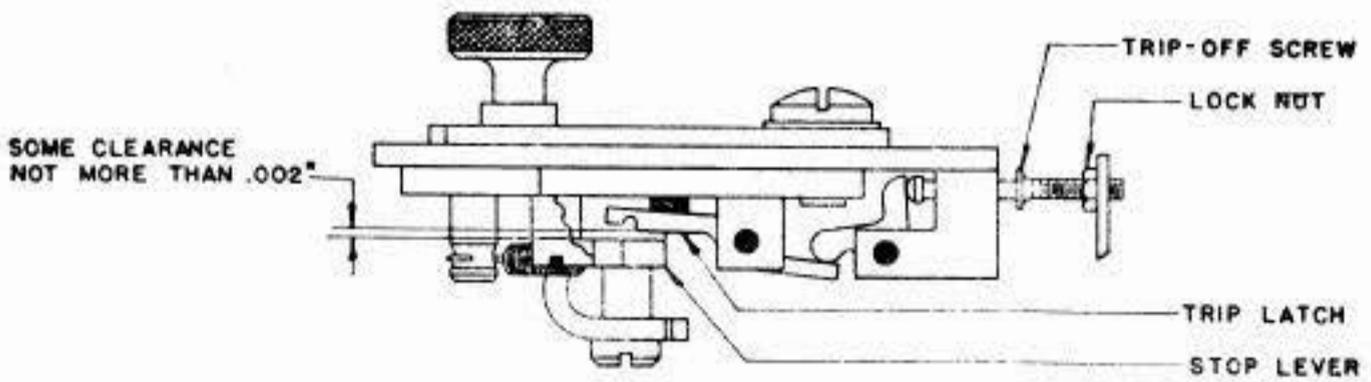


Fig. 10

4.20 **Type wheel stop pin springs** shall have a tension of not more than 6 oz. (170 gms.) when in unselected position and not less than 2 ozs. (56 gms.) when in selected position, measured as in Fig. 11.

**Note:** Tension on pins which are not accessible to scale may be checked by feel.

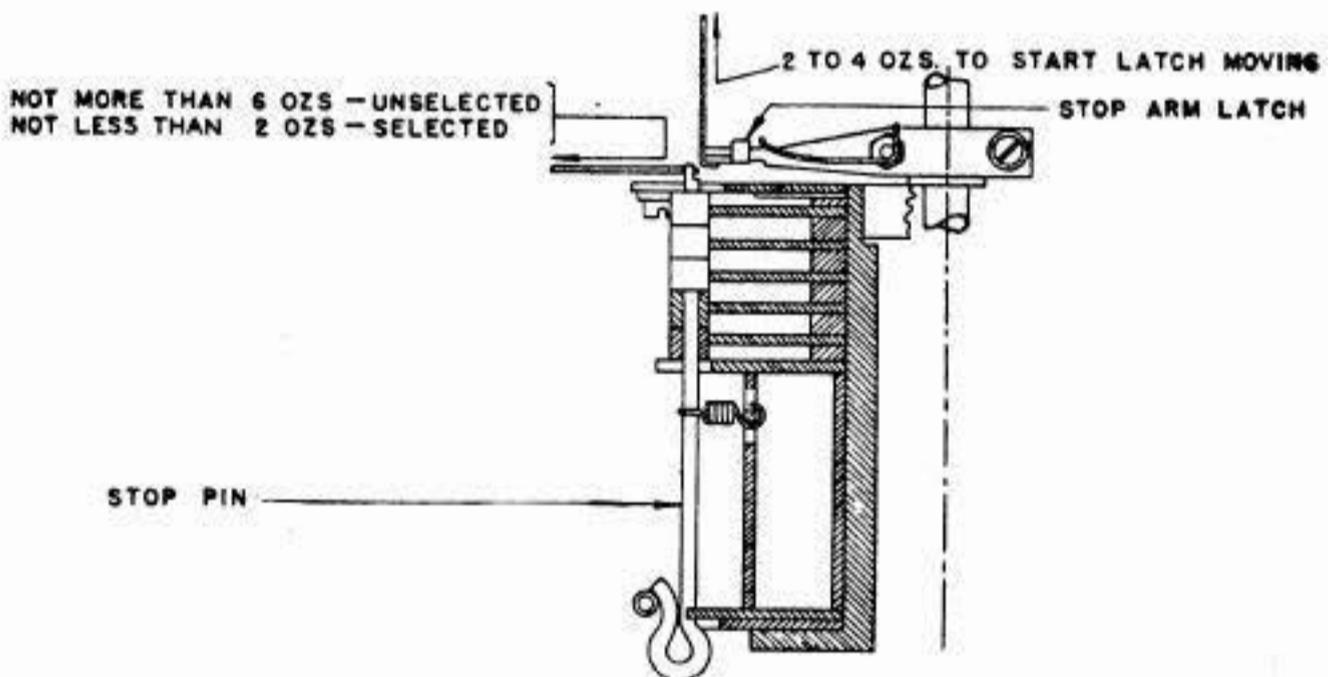


Fig. 11

4.21 **Type wheel stop arm latch spring** shall have a tension of Min. 2 ozs. (56 gms.), Max. 4 ozs. (115 gms.) measured as in Fig. 11.

**Note:** Remove type wheel lifting bail yield spring, printing arm spring, front shaft assembly and lifting bail taking care not to lose roller and wick of lifting bail lower arm. Removal of the lifting bail may be facilitated by removing its return spring and shaft. See Figs. 31 and 35.

4.22 **Operating bail shaft** shall have end play not to exceed .006". See Fig. 12.

- (a) To adjust, loosen function bail shaft wedge and lock nut, and turn shaft to right or left.

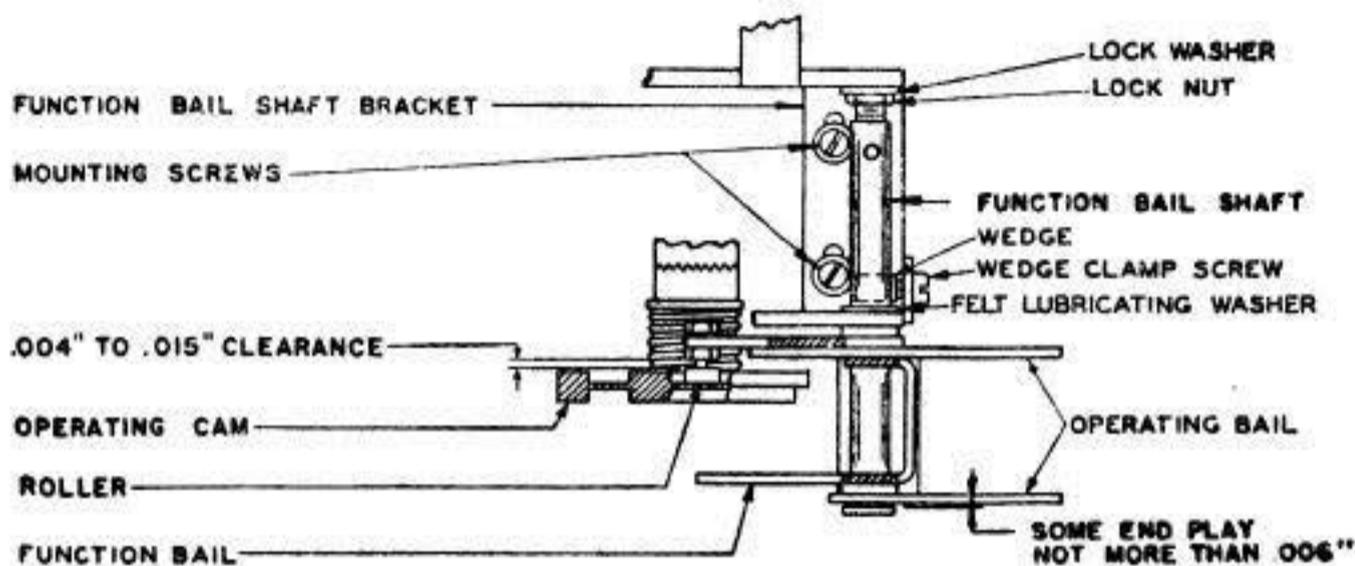


Fig. 12

4.23 **Selector cams** shall line up with their respective selector levers when main shaft is rotated. See Fig. 13.

- (a) To adjust, add or remove shims between the lower bearing bushing and main shaft shoulder.

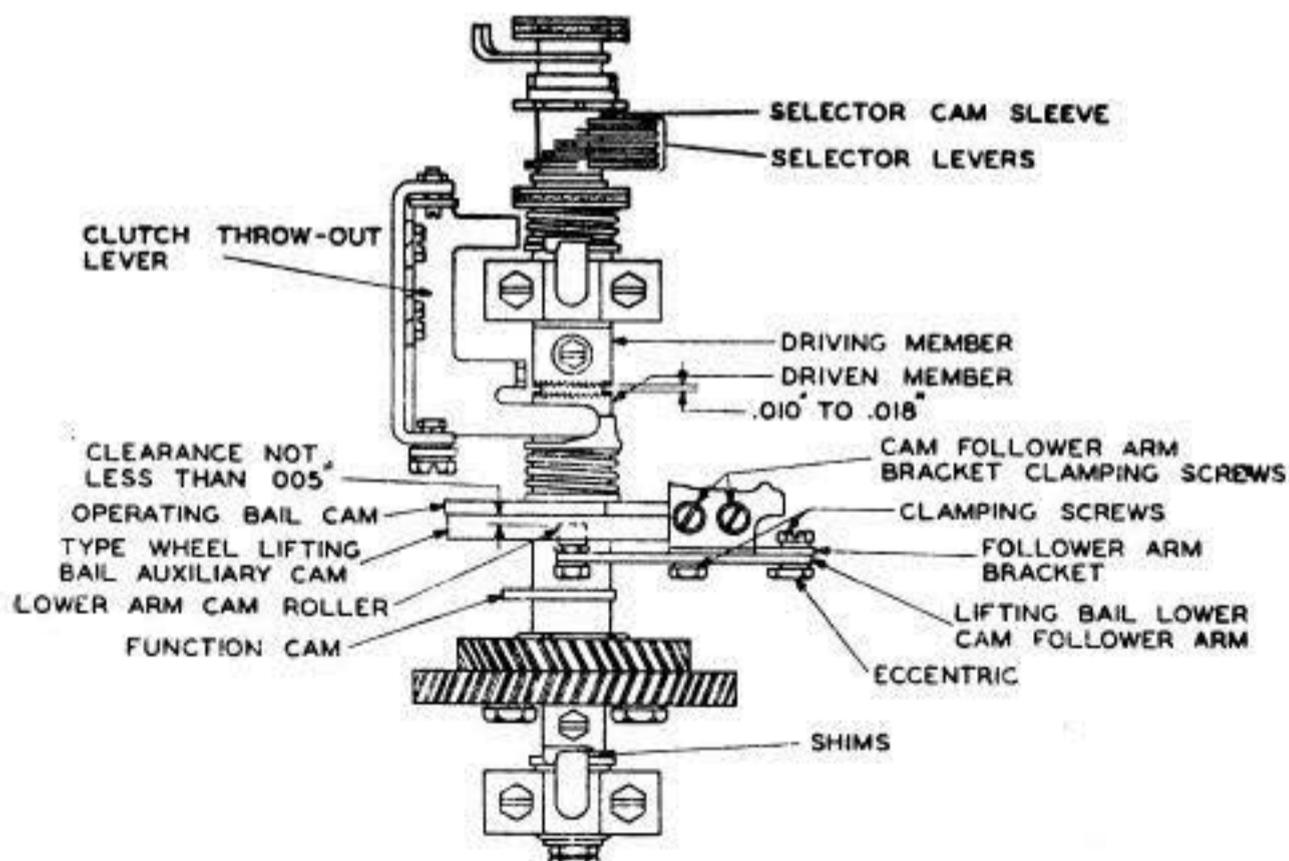


Fig. 13

4.24 **Operating bail cam roller** shall clear the shoulder of its stud by Min. .004", Max. .015" as in Fig. 12, when the cam assembly is in its stop position, the roller is resting on the bottom of the channel in its cam and the play in the main-shaft is taken up so as to make the clearance minimum.

- (a) To adjust, reposition function bail shaft bracket and check clearance for one complete revolution of cam.  
Note: When tightening mounting screws hold bracket toward front so as to take up all clearance between screws and bracket.

4.25 **Type wheel shaft** shall have end play not to exceed .010" and its function arms shall line up in the same horizontal plane as their function levers, as gauged by eye and feel.

Note: Make sure type wheel stop arm clears the upper shaft bearing when checking end play.

- (a) To adjust, reposition function index arm assembly on lower end of type wheel shaft using 91941M shims between the assembly and the lower shaft bearing. Check 4.67 before readjusting.

4.26 **Motor shaft centerline** shall intersect the centerline of type wheel shaft gear and lower main shaft gear and the clearance between the gears and motor pinion shall be equal, as gauged by eye. See Fig. 14.

- (a) To adjust, reposition motor.

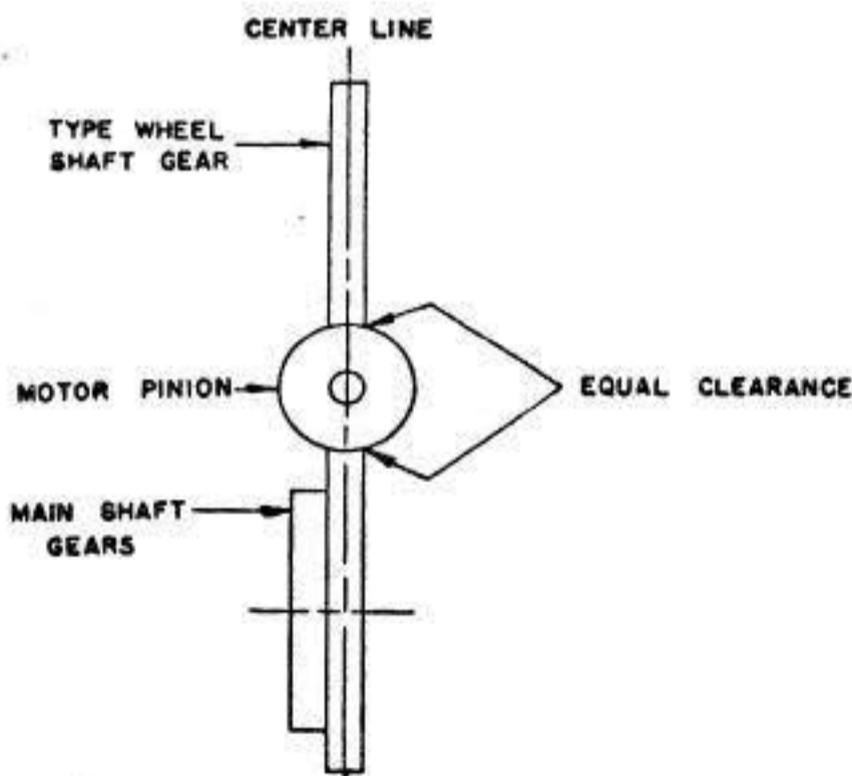


Fig. 14

4.27 **Main shaft clutch teeth** shall clear each other by Min. .010", Max. .018", as in Fig. 13 when clutch is fully disengaged manually.

(a) To adjust, reposition clutch throw-out lever bracket.

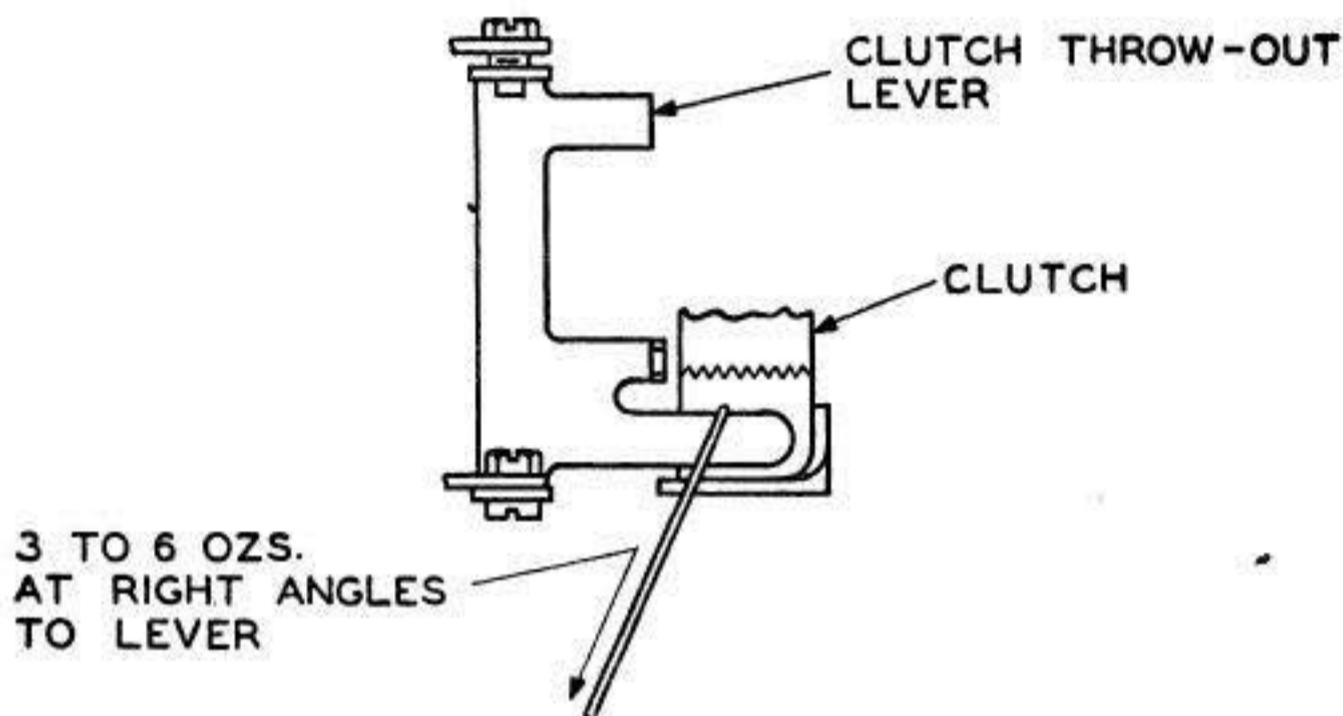


Fig. 15

4.28 **Main shaft clutch throw-out lever spring** shall have a tension of Min. 3 ozs. (85 gms.), Max. 6 ozs. (170 gms.) measured as in Fig. 15 when throw-out lever is on low part of its cam.

4.29 **Front and Main shaft clutch springs** when removed, shall require a force of Min. 1-1/4 lbs., Max. 1-1/2 lbs. to compress them to 3/8" length.

Note: This requirement need be checked only when there is reason to believe clutches are not functioning properly as springs hold their adjustment over long periods.

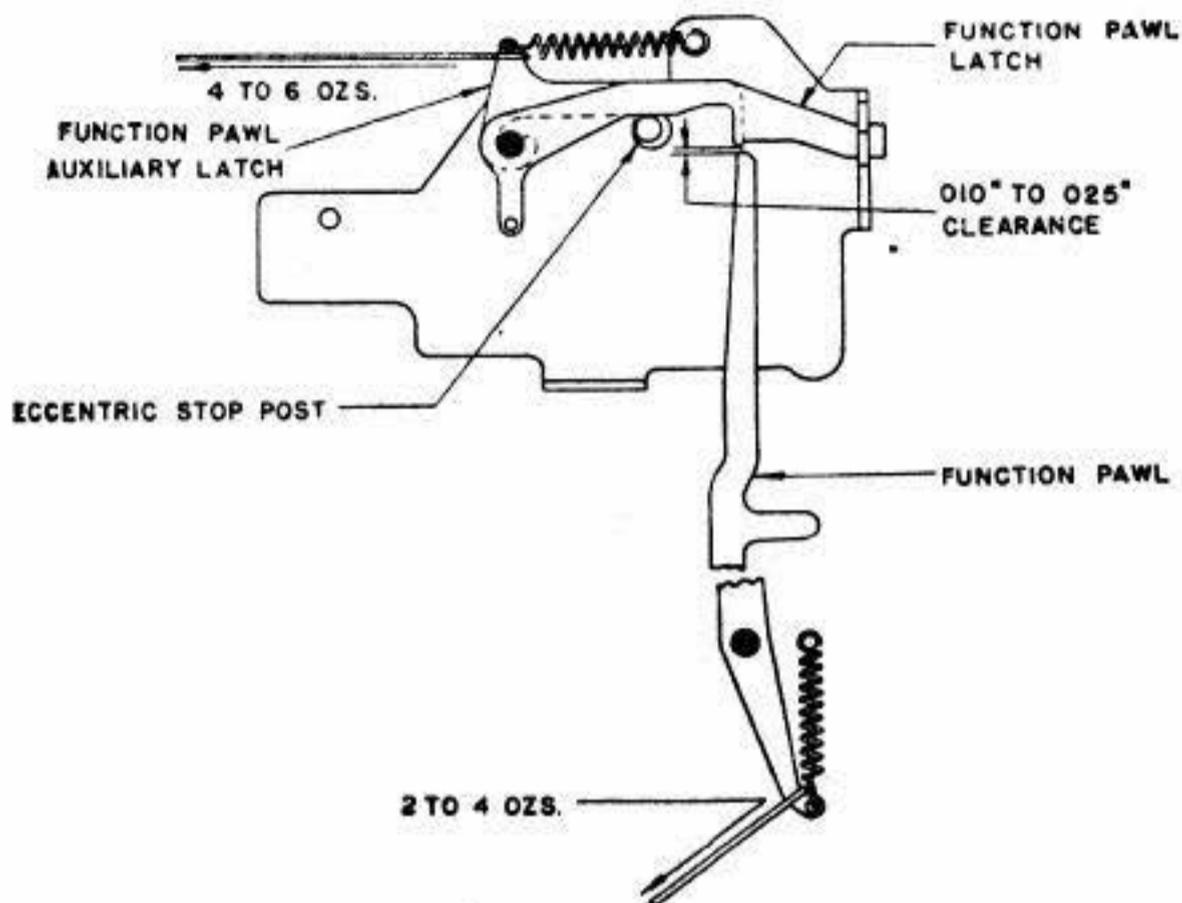


Fig. 16

4.30 **Function pawl latches** shall clear their pawls by Min. .010", Max. .025" as in Fig. 16 when latching surfaces of the pawls and latches are held in line and the main shaft has been rotated until clearance is a maximum.

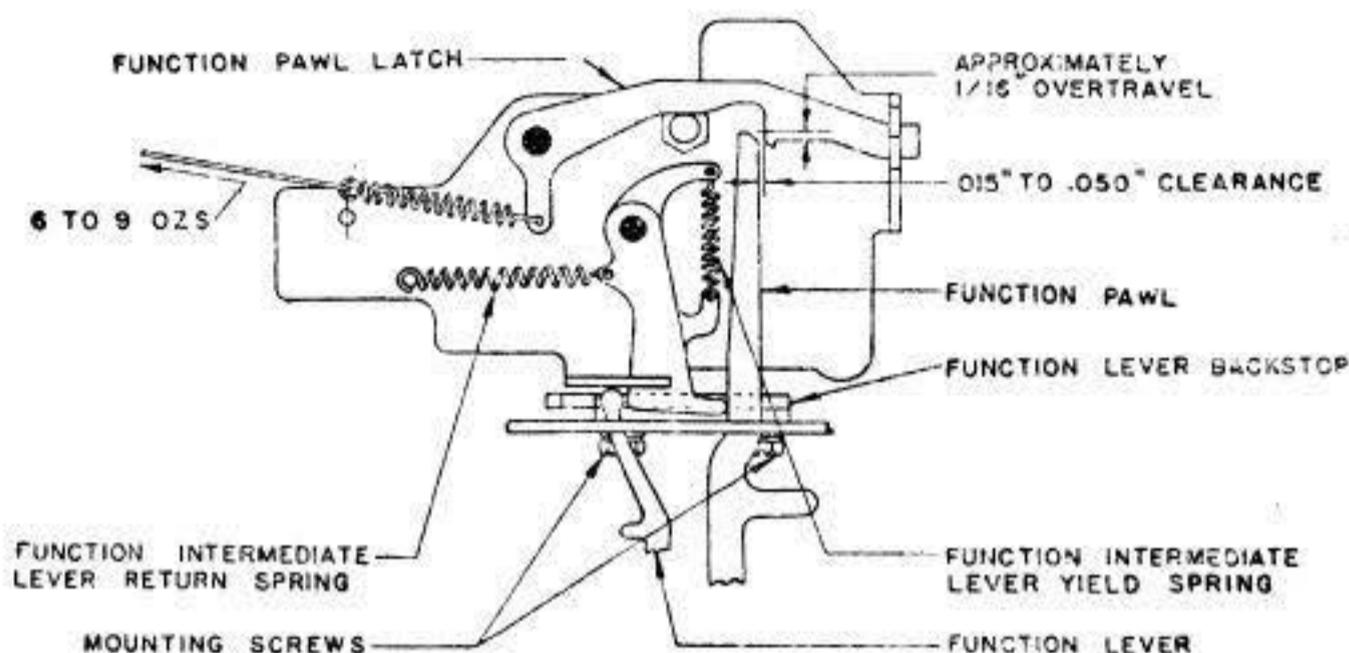
(a) To adjust, reposition function pawl latch eccentric stop post.

4.31 **Function Pawl Guide Plate:** Function pawls shall line up vertically with their latches and not bind on the guide, gauge by eye and feel.

(a) To adjust, reposition guide plate.

4.32 **Function pawls** shall clear their latches by Min. .015" Max. .050" as in Fig. 17 when main shaft has been rotated, until unselected pawls overtravel their latches by approximately 1/16".

(a) To adjust, reposition function lever backstop.



**Fig. 17**

4.33 **Function pawl latch springs**, except those of signal bell hammer and spacing pawls, shall have a tension of Min. 6 ozs. (170 gms.), Max. 9 ozs. (255 gms.) measured as in Fig. 17, when stretched to position length. Signal bell hammer function pawl latch spring tension shall be Min. 24 ozs., Max. 36 ozs. See 4.40 for spacing pawl latch spring.

4.34 **Function pawl auxiliary latch springs** shall have a tension of Min. 4 ozs. (115 gms.), Max. 6 ozs. (170 gms.) measured as in Fig. 16 when main shaft cam sleeve is in stop position.

4.35 **Function pawl springs** shall have a tension of Min. 2 ozs. (56 gms.), Max. 4 ozs. (115 gms.) measured as in Fig. 16 when main shaft cam sleeve is in stop position.

4.36 **Spacing pawl** shall clear its latch by Min. .010", Max. .030" as in Fig. 18 when main shaft is in position which makes clearance maximum and latching surfaces of pawl and latch are held in line.

(a) To adjust, reposition spacing pawl latch stop.

4.37 **Spacing pawl spring** shall have a tension of Min. 3 ozs. (85 gms.), Max. 5 ozs. (140 gms.) measured as in Fig. 18 when main shaft cam sleeve is in stop position.

4.38 **Spacing pawl yield spring** shall have a tension of Min. 48 ozs., Max. 60 ozs. measured as in Fig. 18 when main shaft cam sleeve is in stop position.

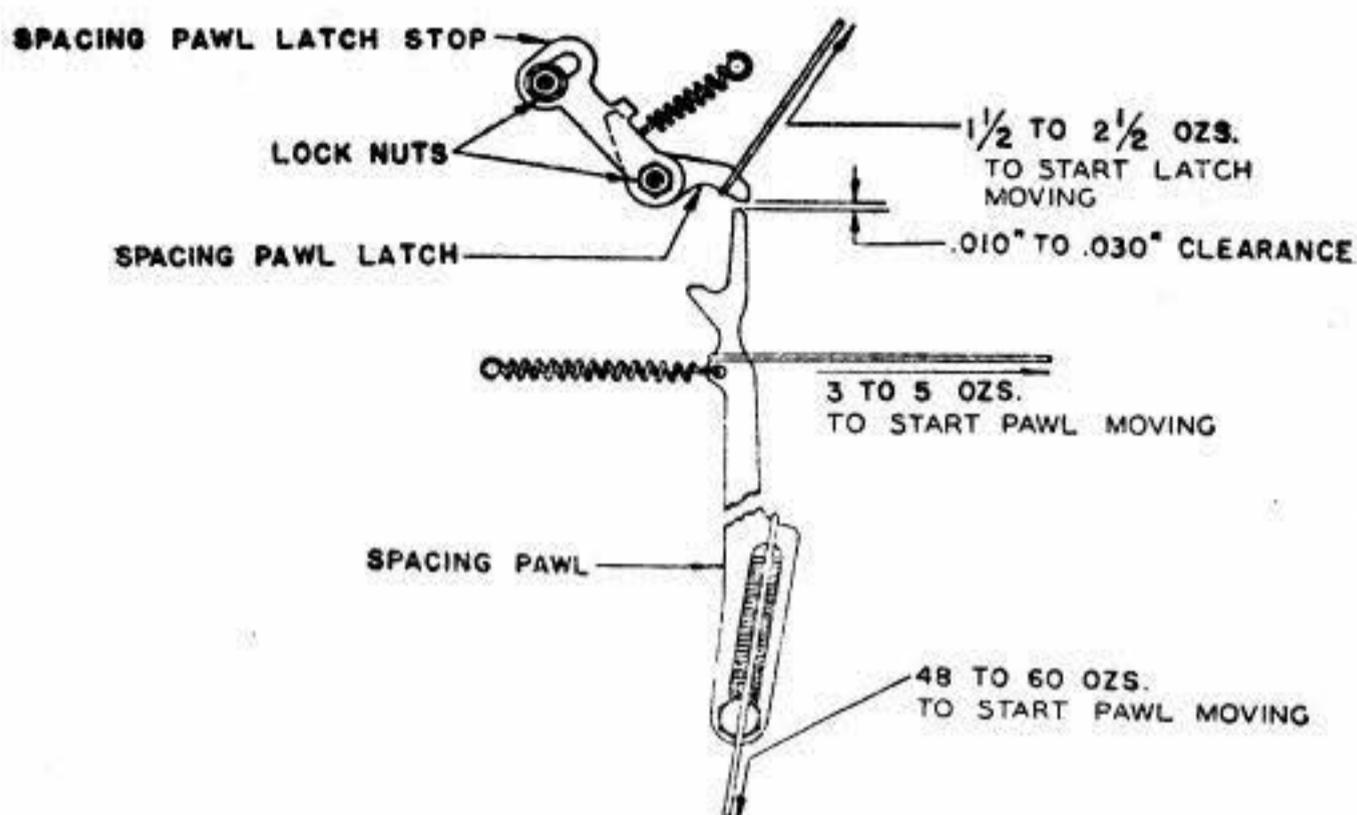


Fig. 18

4.39 **Spacing pawl** shall clear spacing ratchet teeth by Min. .010", Max. .020" as in Fig. 19 when (1) carriage return lever is latched (2) carriage return release lever is held out of its link's path, (3) any character other than a function is selected and (4) main shaft is rotated until clearance between space pawl and teeth is minimum.

(a) To adjust, reposition carriage return lever latch mounting post.

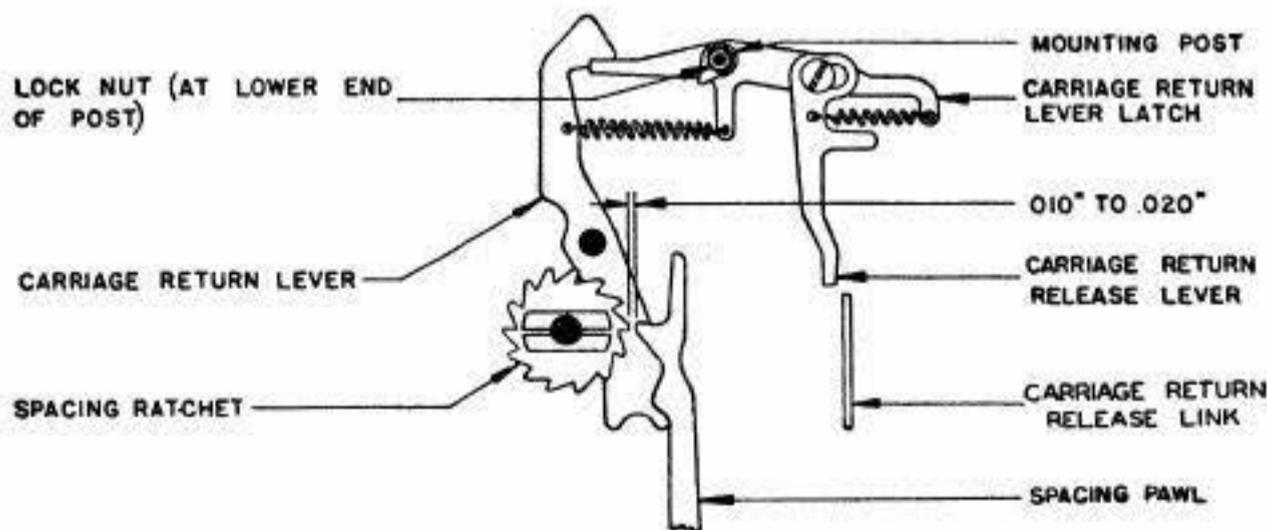


Fig. 19

4.40 **Spacing pawl latch spring** shall have a tension of Min. 1-1/2 ozs. (40 gms.), Max. 2-1/2 ozs. (70 gms.) measured as in Fig. 18 when main and front shafts are in their stop positions and carriage return lever is latched.

4.41 **Function levers** shall clear their associated function arms by Min. .010", Max. .025" as in Fig. 20 when the operating bail cam roller is on the low part of cam and play in parts is taken up to make clearance maximum. Check one arm with each lever.

(a) To adjust, reposition roller arm on operating bail.

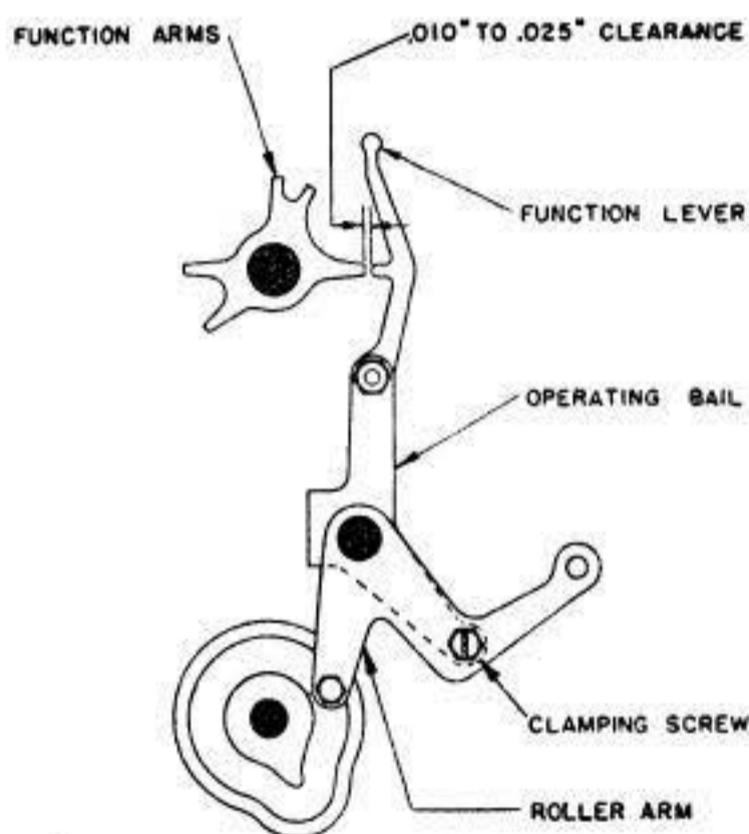


Fig. 20

4.42 **Spacing retaining pawl** shall (1) clear radial face of spacing ratchet teeth by Min. .010", Max. .025" as in Fig. 21(A) when any character other than a function is selected and main shaft is rotated until function bail arm roller is on high part of cam; and (2) clear tips of all spacing ratchet teeth by Min. .020", Max. .030" as in Fig. 21(B) when typing unit is set up as above, carriage return lever is latched and spacing shaft rotated by moving the platen.

Note: Check 4.68 and 4.89 before readjusting.

(a) To adjust, reposition spacing retaining pawl.

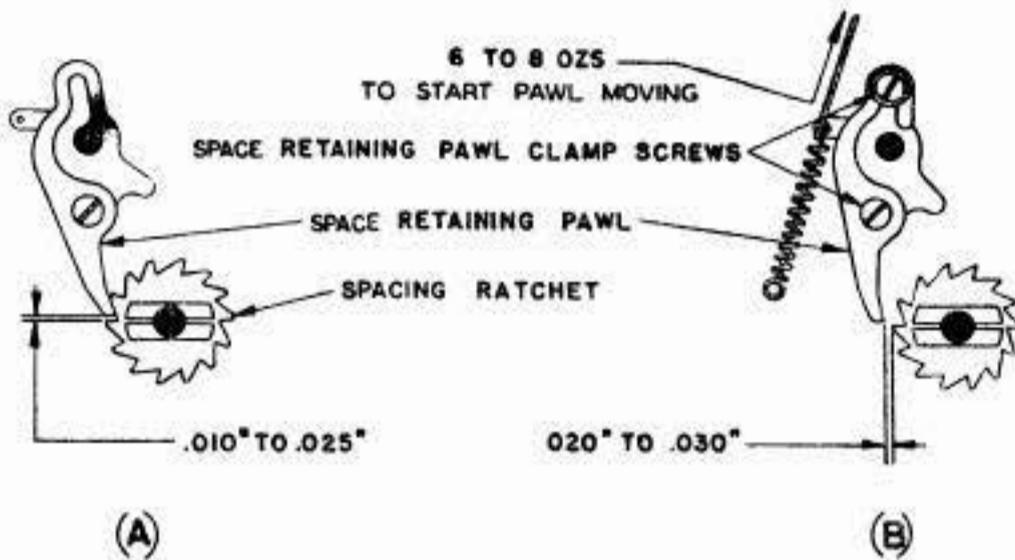


Fig. 21

4.43 **Spacing retaining pawl spring** shall have a tension of Min. 6 ozs. (170 gms.), Max. 8 ozs. (225 gms.) measured as in Fig. 21-B when carriage return lever is latched.

4.44 **Carriage return lever spring** shall have a tension of Min. 1 oz. (28 gms.), Max. 3 ozs. (85 gms.) measured as in Fig. 22 when main shaft cam sleeve is in stop position, and spacing pawl, spacing retaining pawl and carriage return lever latch are held out of engagement with carriage return lever.

4.45 **Carriage return release lever spring** shall have a tension of Min.  $\frac{3}{4}$  oz. (21 gms.), Max. 2 ozs. (56 gms.) measured as in Fig. 22.

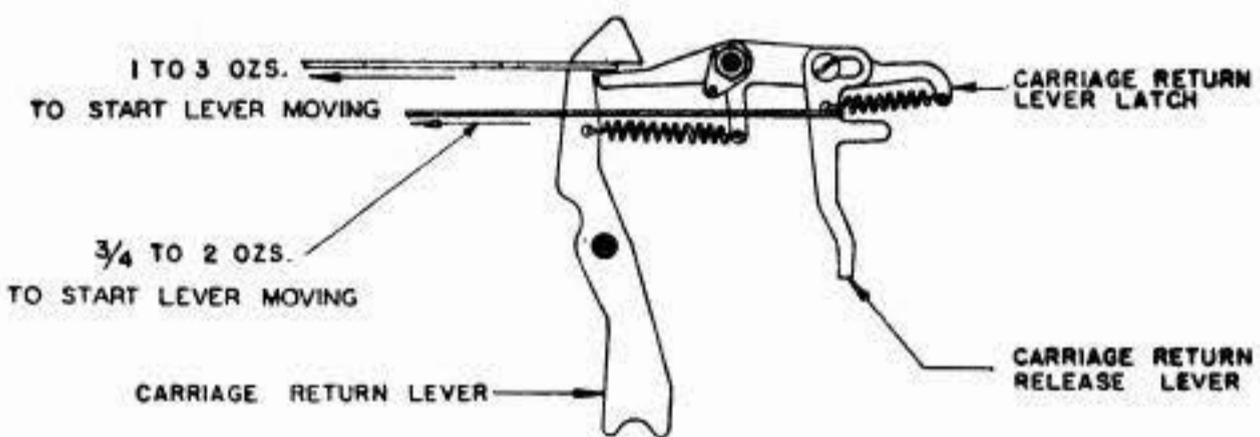


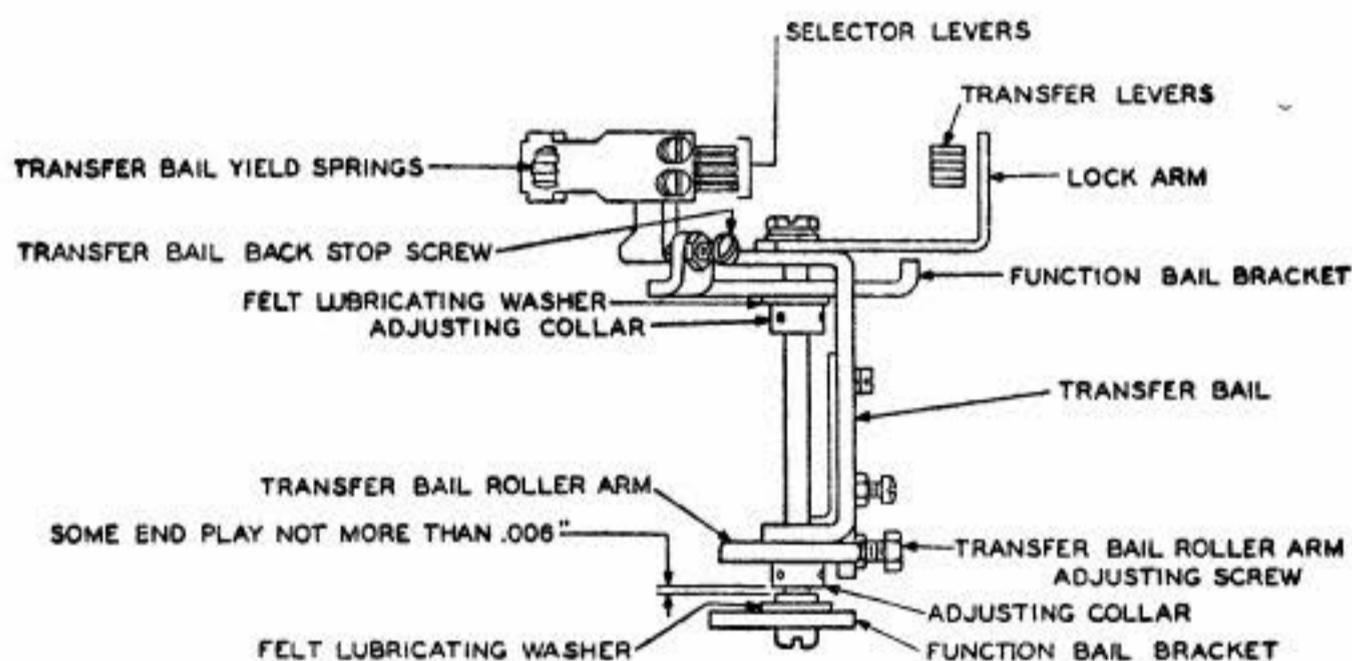
Fig. 22

4.46 **Function intermediate lever return springs** shall have a tension of Min. 6 ozs. (170 gms.), Max. 8 ozs. (225 gms.) when stretched to a length of  $1\frac{1}{2}''$ . (See Fig. 17)

4.47 **Function intermediate lever yield springs** shall have a tension of Min. 13 ozs. (370 gms.), Max. 15 ozs. (425 gms.) when stretched to a length of  $5/8$ ". (See Fig. 17)

4.48 **Transfer bail** shall have end play not to exceed  $.006$ " as in Fig. 23 and each transfer bail yield spring shall line up with its respective selector lever, gauged by eye and feel.

(a) To adjust, loosen shaft clamping bracket and reposition collars in transfer bail shaft; (1) lower collar for alignment, (2) upper collar for end play.



**Fig. 23**

4.49 **Code Disc Lever Plate:** At least two code discs shall be against their stops, one in each direction as in Fig. 24 when letter "R" combination is set up in swords, transfer operation is performed manually and transfer bail is held firmly in operated position (do not jam).

Note: Check by observing play in transfer levers, being careful not to spring linkages between transfer levers and code discs. When a code disc is against its stop, there should be no play (additional travel) in the corresponding transfer lever.

(a) To adjust, reposition code disc lever stud mounting plate.

4.50 **Transfer yield springs** shall have a tension of Min. 4 lbs., Max. 7 lbs. when shorter end of each spring is pressed to within  $1/4$ " of the longer end of the springs as in Fig. 24.

Note: These springs hold their tension for long periods of time and since it is necessary to remove them to measure their tension, they need be checked only when there is reason to believe they are outside their limits.

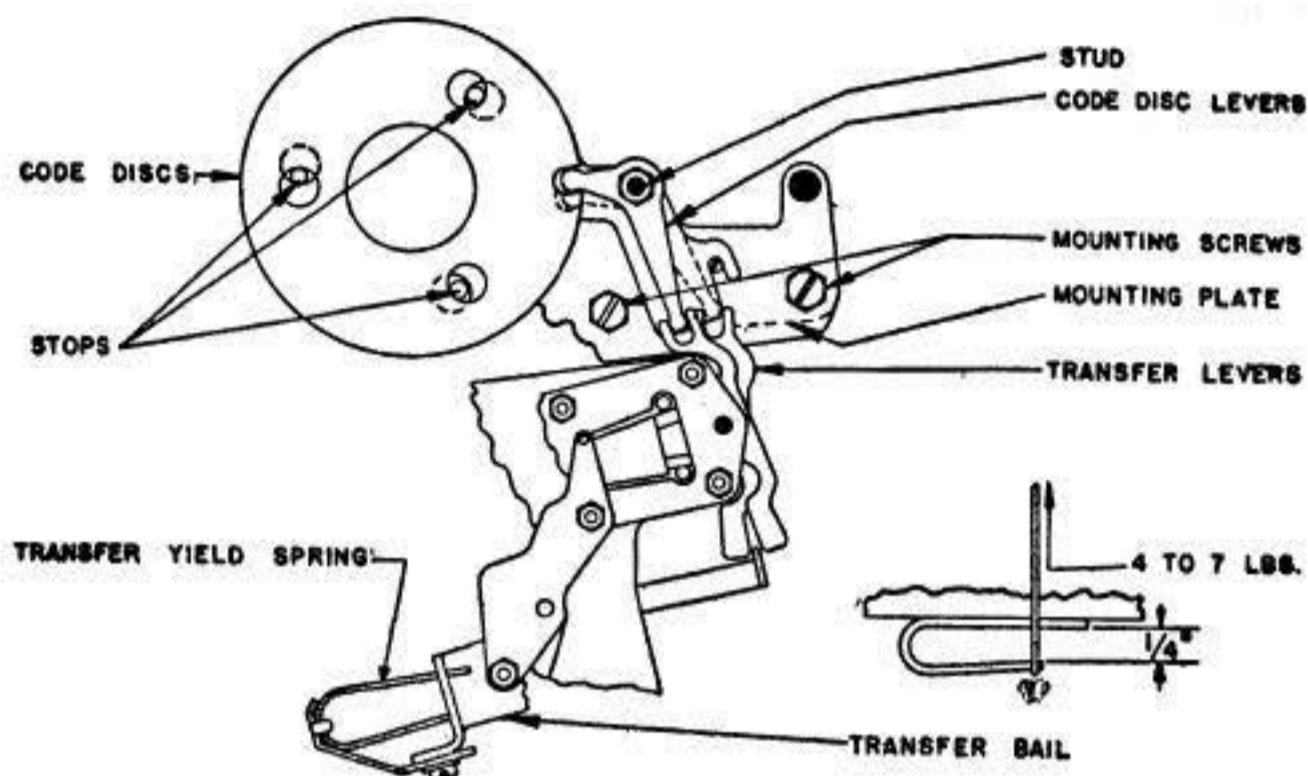


Fig. 24

4.51 **Front shaft clutch throw-out lever shall have end play not to exceed .004".**

- (a) To adjust, use shims, 96874M, under head of lower shoulder screw.

**Note:** Reassemble lifting bail, front shaft, lifting bail yield and return springs and printing arm spring after making sure that oil wick slot in lower lifting bail cam follower arm stud is in line with the oil wick retaining hole in the arm, the oil wick extends into the slot from the retaining hole in the arm and the roller is on the stud.

4.52 **Front shaft shall have end play not to exceed .006" and its gear shall (1) clear the lower main shaft gear throughout a complete revolution and (2) line up and rotate with the upper main shaft gear with minimum backlash without bind.**

- (a) To align gears use shims, 92612M, under lower bearing of front shaft; to adjust backlash, use shims, 92811M, between front shaft bracket and casting; and to adjust end play reposition upper bearing bushing.

4.53 **Main shaft clutch throw-out lever** shall clear high part of main shaft clutch driven member by Min. .025", Max. .040" as in Fig. 25 when lever's forward extension is resting on high part of its cam on the front shaft.

(a) To adjust, bend forward extension of lever.

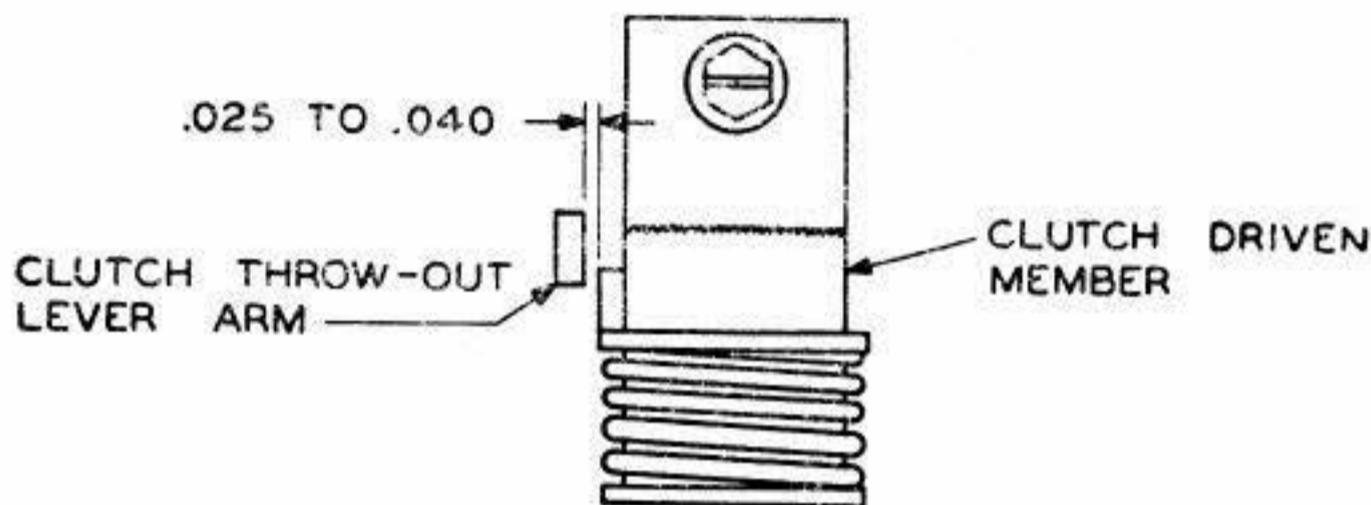


Fig. 25

4.54 **Transfer yield springs** shall press against their associated selector levers so as to be slightly deflected when transfer bail cam roller is on high part of its cam. Gauge by eye.

(a) To adjust, set up "blank" combination on swords, rotate front shaft until transfer bail roller is on high part of its cam, move front end of transfer levers to right, loosen transfer bail cam follower arm hexagonal head clamping screw (see Fig. 26(A)) back off the adjusting screw a few turns and then reposition the adjusting screw until all transfer levers snap over to left; then back off adjusting screw 1/4 turn. Check to see that transfer levers snap over to right when "letters" combination is set up and transfer bail roller is on high part of its cam.

4.55 **Transfer bail** shall clear its backstop screw by not more than .010" as in Fig. 26(B) when motor has been rotated until both cam sleeves are in their stop positions.

(a) To adjust, reposition transfer bail backstop screw.

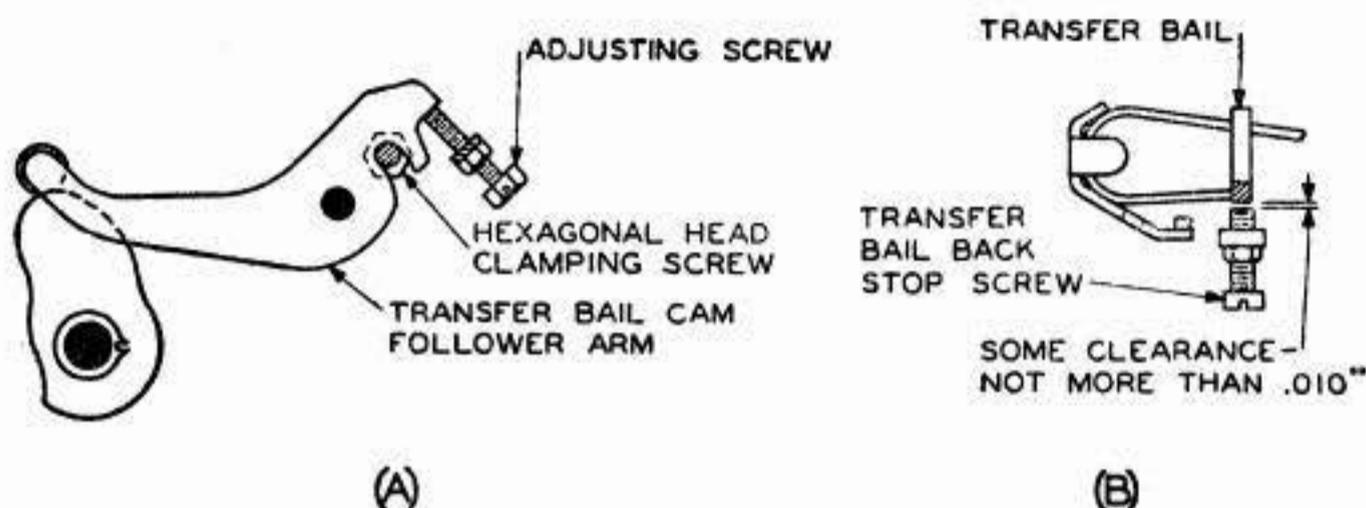


Fig. 26

4.56 **Transfer lever lock arm** shall (1) clear the transfer levers to its right and left by approximately equal amounts and (2) overtravel the lever sides by Min. .030", Max. .045" as in Fig. 27 when main shaft cam sleeve is in its stop position and "R" combination is set up on swords and transfer levers.

(a) To adjust, reposition transfer lever lock arm.

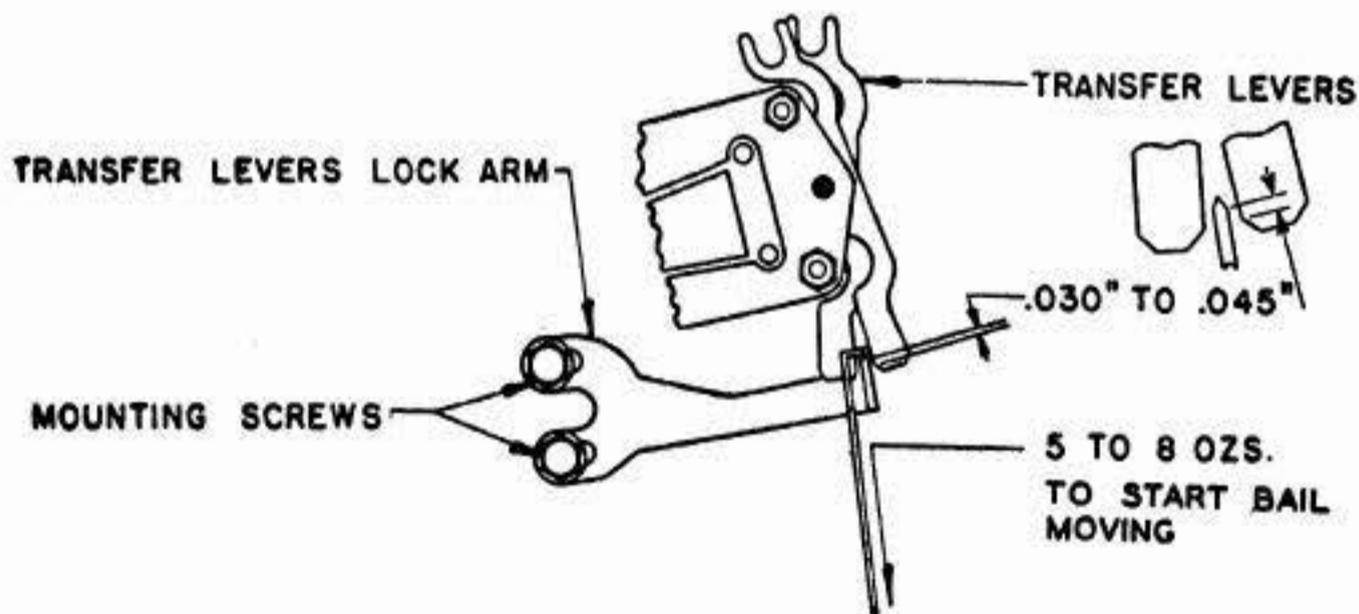


Fig. 27

4.57 **Transfer bail spring** shall have a tension of Min. 13 ozs. (370 gms.), Max. 16 ozs. (455 gms.) measured as in Fig. 27 when main shaft cam sleeve is in stop position.

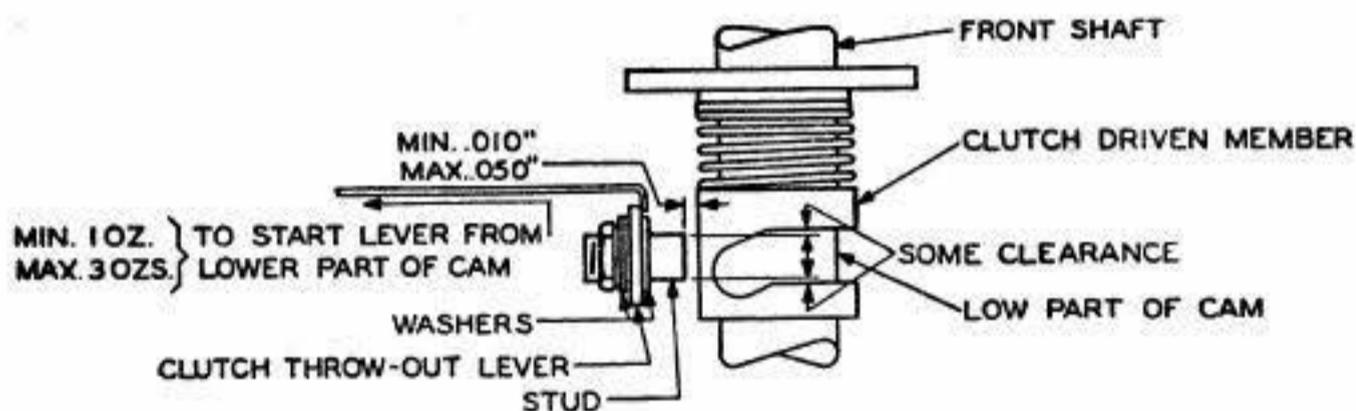
**Note:** Old style springs had a tension of Min. 3-1/2 ozs. (100 gms.), Max. 8 ozs. (225 gms.). New style springs, 34464M, shall be used when old springs require replacement.

4.58 **Front shaft clutch throw-out lever arm** shall ride fully on its cam and clear the transfer bail by at least .005", judged by eye, when bail is operated manually.

(a) To adjust, reposition throw-out lever bracket.

4.59 **Front shaft clutch throw-out lever stud** shall clear high part (outer surface) of driven clutch member by Min. .010", Max. .050" as in Fig. 28 when throw-out lever extension is on high point of its cam on the main shaft.

(a) To adjust, reposition stud by moving spacing washers from under stud to back of lever or vice versa.



**Fig. 28**

4.60 **Front shaft clutch teeth** shall clear each other by Min. .010", Max. .020" when disengaged by motor power and the throw-out lever stud shall clear the sides of its channel in the clutch driven member (see Fig. 28) when power is disconnected, the clutch teeth are fully engaged and the play in the lever is taken up to make the clearances a minimum.

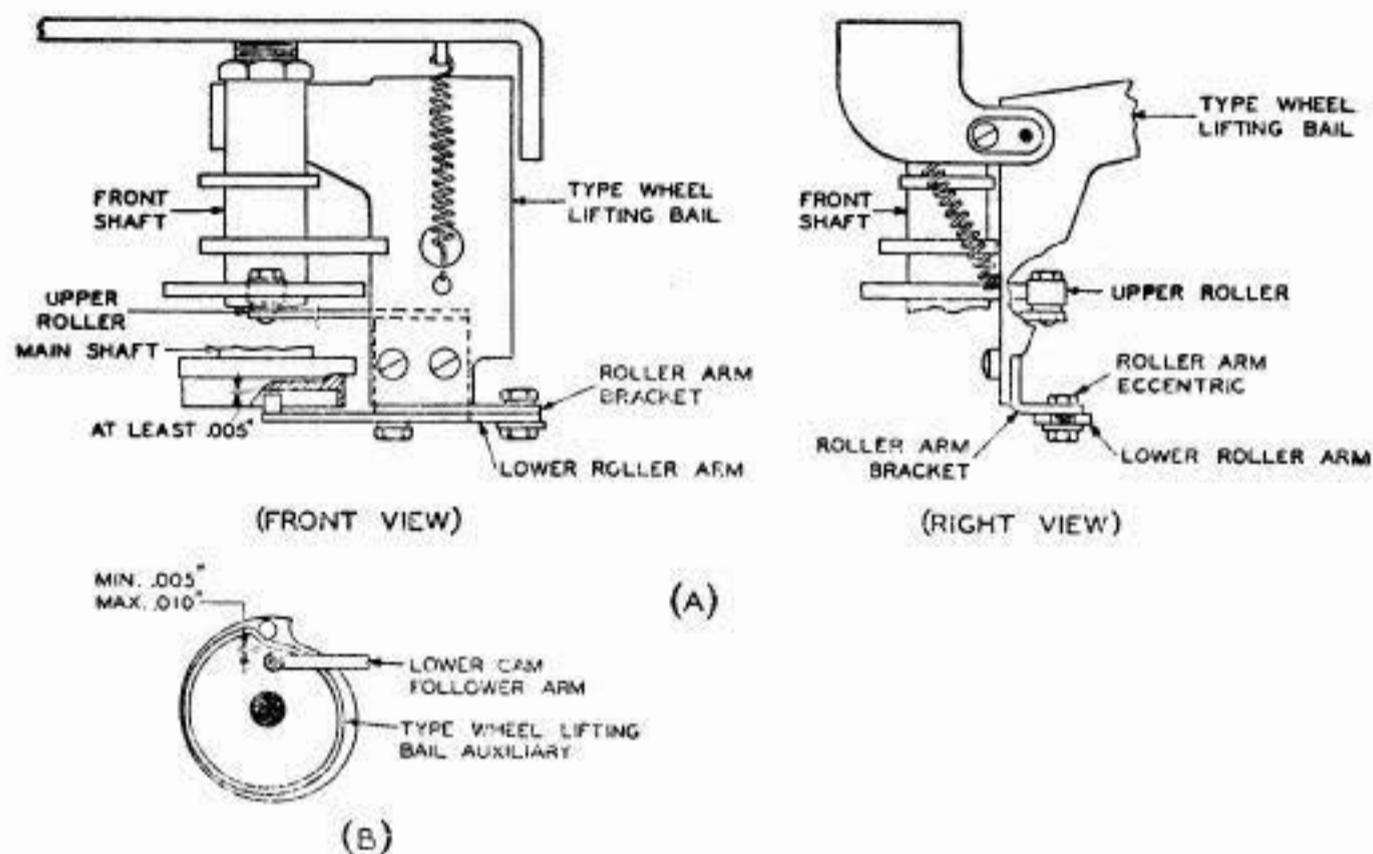
(a) To adjust, reposition clutch throw-out lever stud in its slotted hole.

Note: With proper adjustment, front shaft clutch teeth shall clear each other by at least .006" when the front shaft has been rotated from its stop position in direction opposite to normal rotation until the transfer bail cam follower rests against the incline on its cam.

4.61 **Front shaft clutch throw-out lever spring** shall have a tension of Min. 1 oz. (28 gms.), Max. 3 ozs. (85 gms.) measured as in Fig. 28 at right angles to the throw-out lever when clutch teeth are engaged.

Note: Remove front shaft gear guard.

4.62 **Typewheel lifting bail upper roller** shall ride fully on its cam and the lower roller shall clear (1) the horizontal surface of its cam by at least .005" as in Fig. 29(A) and (2) the camming surface by Min. .005", Max. .010" as in Fig. 29(B), after the motor has been rotated until both cam sleeves are in their stop position, front shaft has been tripped and motor further rotated until typewheel lifting bail upper roller is very near the end of the high part of its cam.



**Fig. 29**

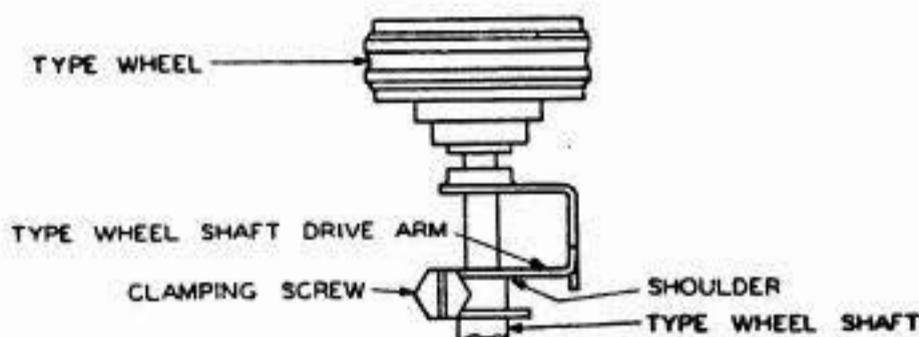
(a) To adjust vertical alignment of rollers, reposition roller arm bracket; to adjust horizontal position of lower roller, reposition roller arm eccentric.

**Note: Reassemble front shaft gear guard and ribbon feed unit on typing unit.**

4.63 **Type alignment:** Top, bottom and both legs of letter "M" shall touch platen at same time when printing hammer is pressed forward manually until pallet touches platen lightly after (1) placing shift plate in "letters" (rear) position, (2) setting up "M" combination, (3) rotating main shaft until printing hammer touches type pallet.

(a) To adjust horizontal alignment, reposition type-wheel drive arm (see Fig. 30); to adjust vertical alignment reposition shift stop arm, (see Fig. 31).

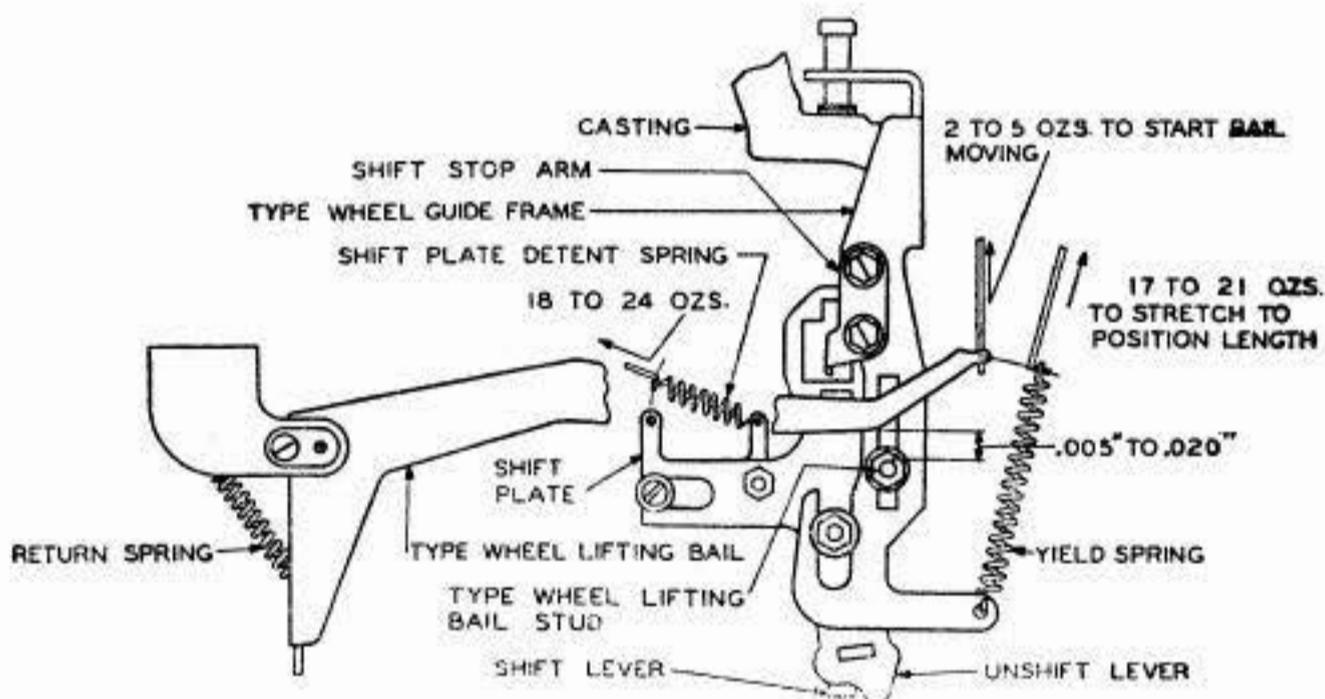
**Note: Drive arm shall rest against shaft shoulder when clamping screw is tightened.**



**Fig. 30**

4.64 **Type wheel lifting bail** shall clear its stud by Min. .005", Max. .020" as in Fig. 31 when shift plate is in "figures" (front) position and motor is rotated until lifting bail upper cam roller is on high part of its cam on the front shaft.

(a) To adjust, reposition lifting bail stud.



**Fig. 31**

4.65 **Type wheel lifting bail yield spring** shall have a tension of Min. 17 ozs. (480 gms.), Max. 21 ozs. (595 gms.) measured as in Fig. 31 when both cam sleeves are in their stop position and type wheel assembly is held down against its stops.

Note: Old style springs had a tension of Min. 26 ozs. (735 gms.), Max. 32 ozs. (900 gms.). New style spring, 95378M, shall be used when old springs require replacement.

4.66 **Type wheel lifting bail return spring** shall have a tension of Min. 2 ozs. (56 gms.), Max. 5 ozs. (140 gms.) measured as in Fig. 31 when both cam sleeves are in their stop positions and lifting bail yield spring is removed.

**Note: Remove platen crank shaft.**

4.67 **Carriage:** All lower case character type pallets shall clear platen roll by Min. .055", Max. .065" when the type wheel is in "letters" position. Check with platen at both extremes of travel.

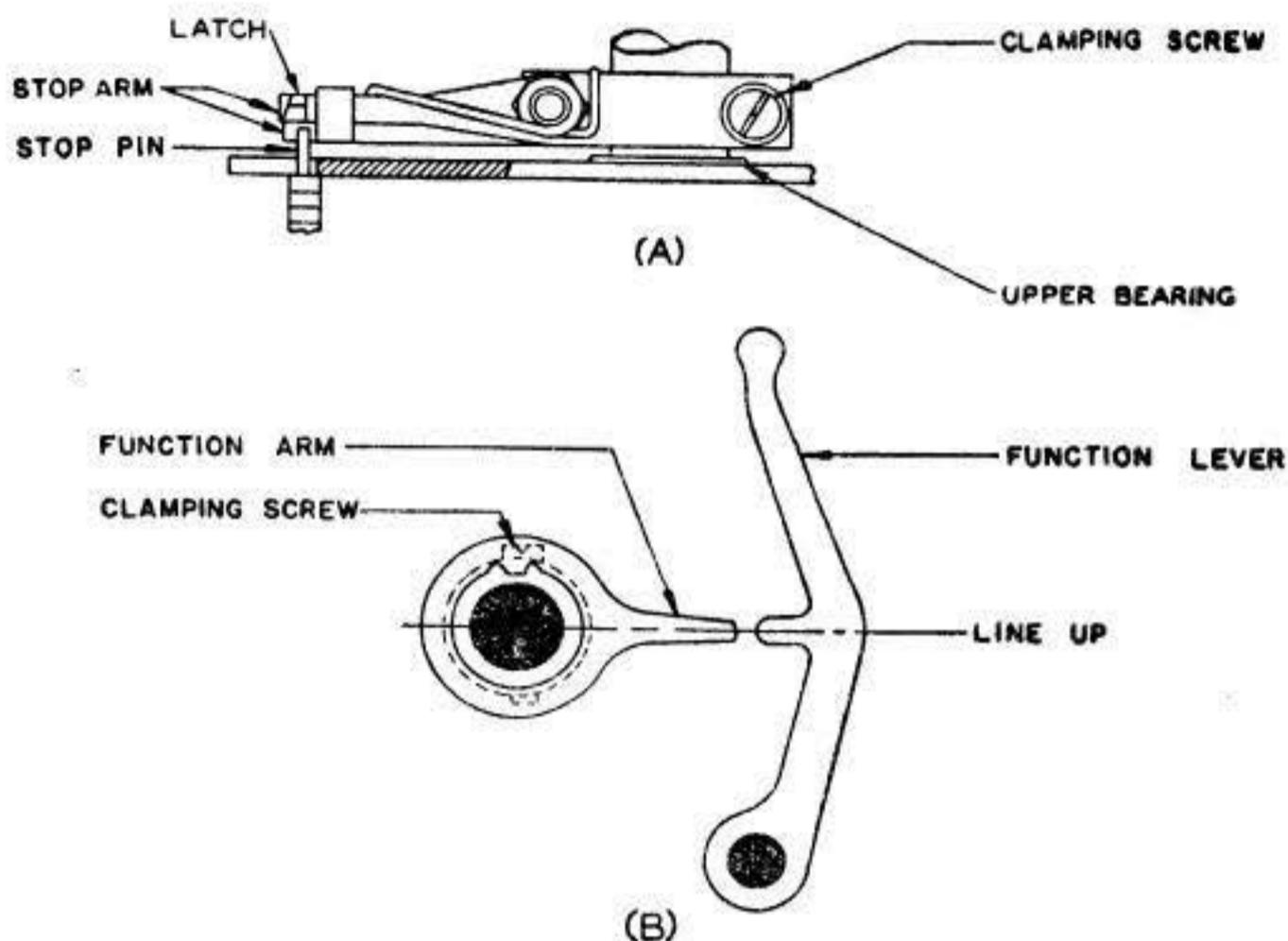
(a) To adjust, use shims, 8896M, between rear carriage bearing rail and supporting casting, using same number of shims at both ends.

4.68 Carriage shall move without bind and not more than .005" play in its bearings as gauged by eye and feel.

(a) To adjust, unhook carriage return draw strap and reposition rear carriage bearing rail. Check 4.89 before readjusting.

4.69 **Type wheel stop arm** shall (1) be located vertically so that the leading edge of its latch clears the top of the selected stop pin by at least .005" as it approaches the pin and the trailing edge of the latch overlaps the selected stop pin by at least the thickness of the latch when the stop arm is latched on the pin; (2) be orientated (rotated on the shaft) so that the projection on the associated function arm lines up with the projection on the associated function lever, as in Fig. 32, when the combination for this function is set up and the stop arm is latched on the selected stop pin.

(a) To adjust, reposition stop arm vertically to align latch and rotate arm to align function arms and levers. If the stop arm is moved recheck type wheel shaft end play 4.25.



**Fig. 32**

4.70 **Unshift lever** shall clear projection on unshift pawl by Min. .005", Max. .015" as in Fig. 33 when "unshift" (letters) combination is set up, type wheel shaft is rotated until stop arm is latched on selected stop pin, main shaft clutch is released and shaft rotated until function bail cam roller is on high part of cam.

Note: Take up play in unshift lever so as to make clearance maximum.

(a) To adjust, reposition unshift lever sideways on its clamping screw.

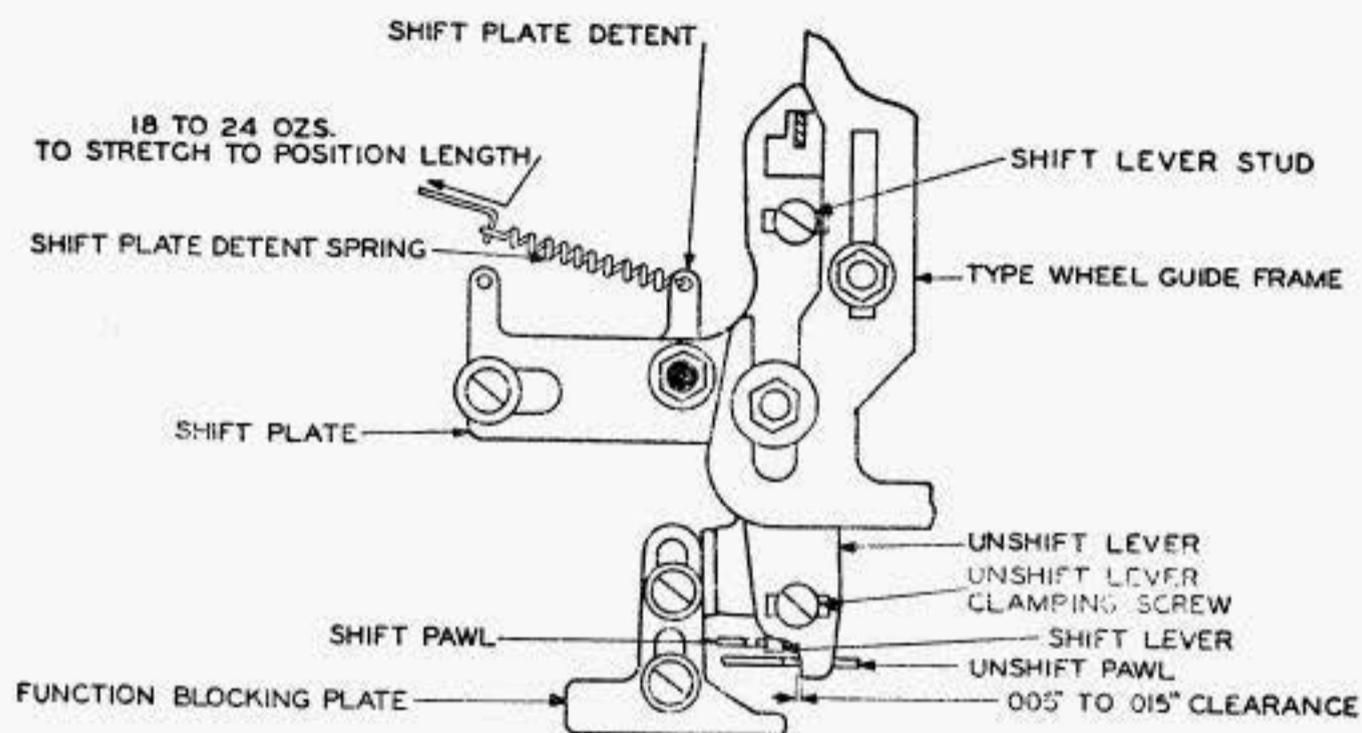


Fig. 33

4.71 **Shift lever** shall clear projection on shift pawl by Min. .005", Max. .015" when "shift" (figures) combination is set up, type wheel shaft is rotated until stop arm is latched on selected stop pin, main shaft clutch is released and shaft rotated until function bail cam roller is on high part of cam.

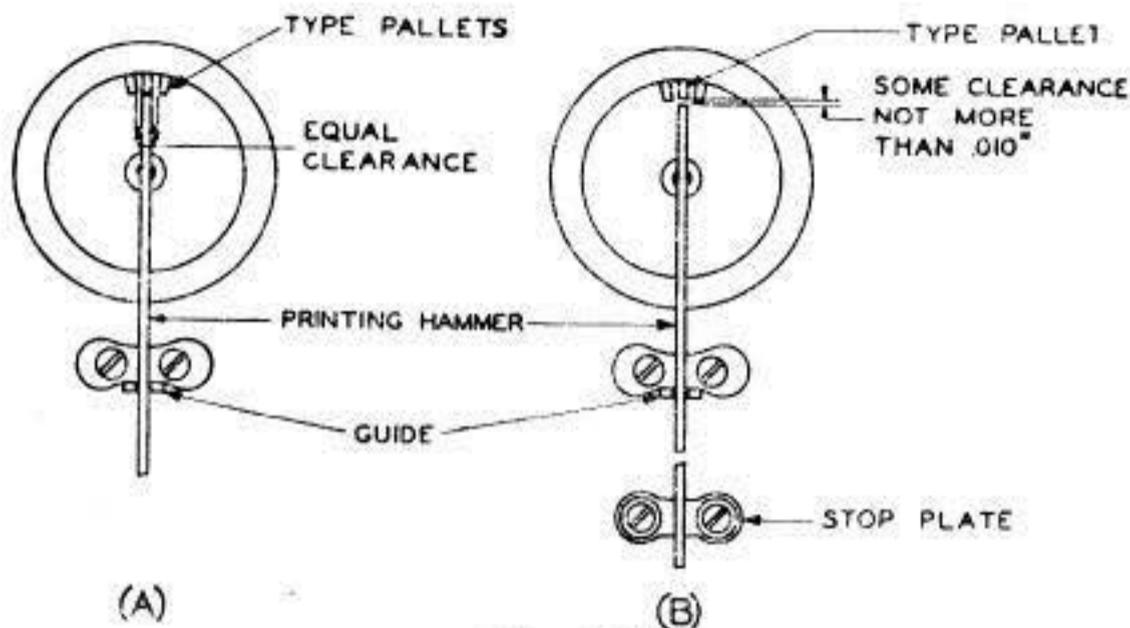
Note: Take up play so as to make clearance maximum.

(a) To adjust, reposition shift lever stud sideways in slot.

4.72 **Shift plate detent spring** shall have a tension of Min. 18 ozs. (510 gms.), Max. 24 ozs. (680 gms.) measured as in Fig. 33.

4.73 **Printing hammer** shall be centrally located, as gauged by eye, between type pallets on either side of selected pallet when main shaft is rotated until the clearance between the printing hammer and the selected pallet is a minimum. See Fig. 34-A.

(a) To adjust, reposition printing hammer guide.



**Fig. 34**

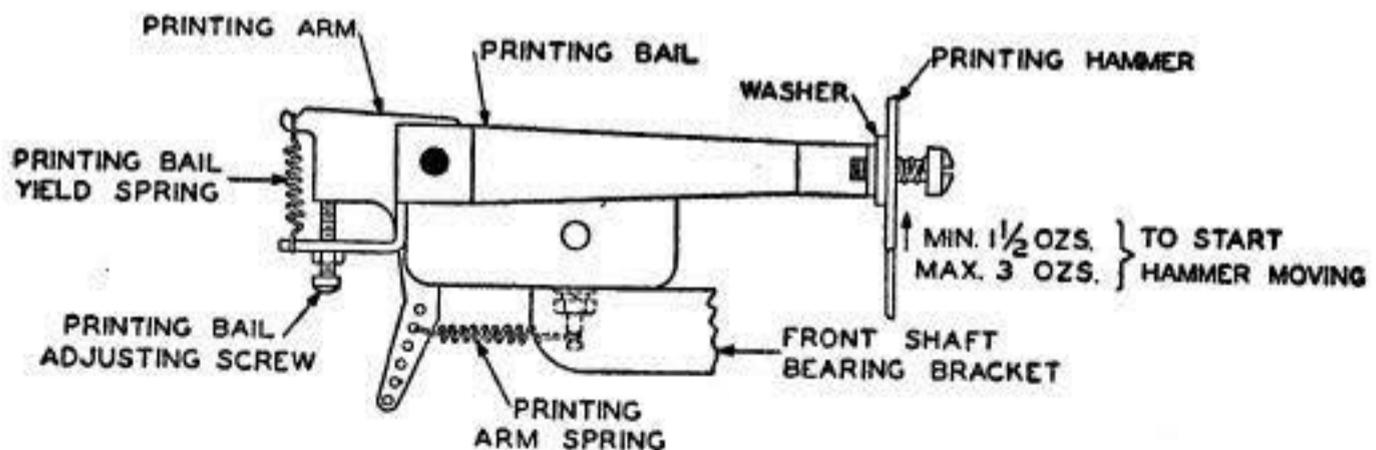
4.74 Printing hammer shall clear type wheel casting by not more than .010" when "line feed" combination is set up, main shaft is rotated until printing hammer is fully operated and the clearance between the hammer and the stop plate is taken up manually.

(a) To adjust, reposition printing hammer stop plate.

4.75 Printing hammer shall clear type pallets by not more than .010" as in Fig. 34-B when printing arm cam roller is on low part of cam.

(a) To adjust, reposition printing bail adjusting screw. See Fig. 35.

4.76 Printing bail yield spring shall have a tension of Min. 1-1/2 ozs. (40 gms.), Max. 3 ozs. (85 gms.) measured as in Fig. 35 when printing arm cam roller is on high part of cam.



**Fig. 35**

4.77 **Printing Arm Spring:** Teletypewriter shall type characters legibly without embossing back of paper or last copy of multiple copy work. (Embossing of punctuation marks is permissible.)

(a) To adjust, move printing arm spring to hole nearer bail pivot to decrease type pallet pressure. See Fig. 35.

Note: Printing arm spring shall have a tension of Min. 22 ozs., Max. 35 ozs. when front and main shafts are in their stop positions and spring, hooked in 2nd hole from arm pivot, is stretched to position length.

4.78 **Paper roller release arm bracket** of the pressure roller mounting plate shall clear front carriage bearing rail by Min. .045", Max. .055" as in Fig. 36 when platen pressure roller release lever is in its latched position.

(a) To adjust, reposition paper roller release arm.

Note: Pressure roller release shaft should have not more than .006" end play.

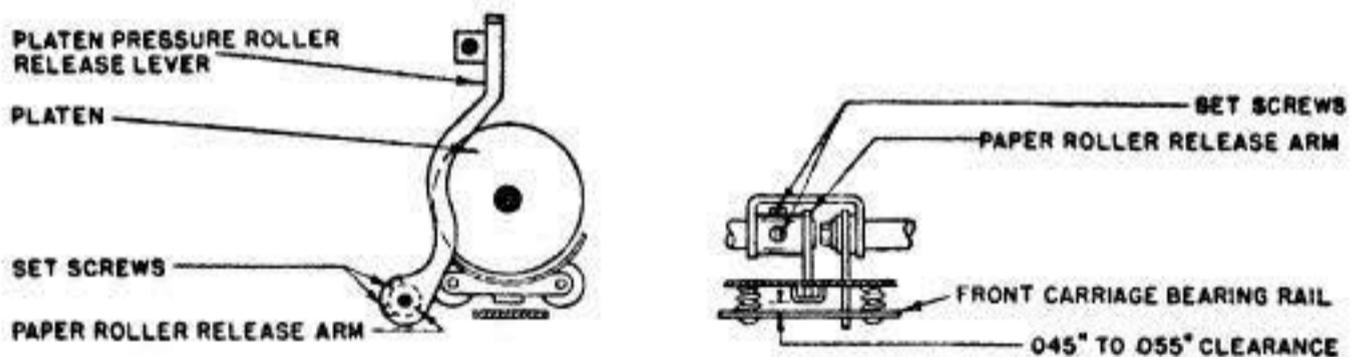


Fig. 36

4.79 **Platen pressure roller springs** shall exert a pressure of Min. 28 ozs., Max. 44 ozs. when compressed to a length of 5/16".

Note: Check only when there is reason to believe rollers are not exerting enough pressure as springs hold their adjustments over long periods.

4.80 **Line feed pawl** shall clear its eccentric backstop by not more than .008", as in Fig. 37, when single-double line feed lever is in "single line feed" position (front end up), line feed pawl is in its operated position and is held lightly against radial face of a ratchet tooth, and line feed detent roller is in hollow between two ratchet teeth.

- (a) To adjust, reposition line feed eccentric back up keeping eccentric head above the body of the screw wherever possible.

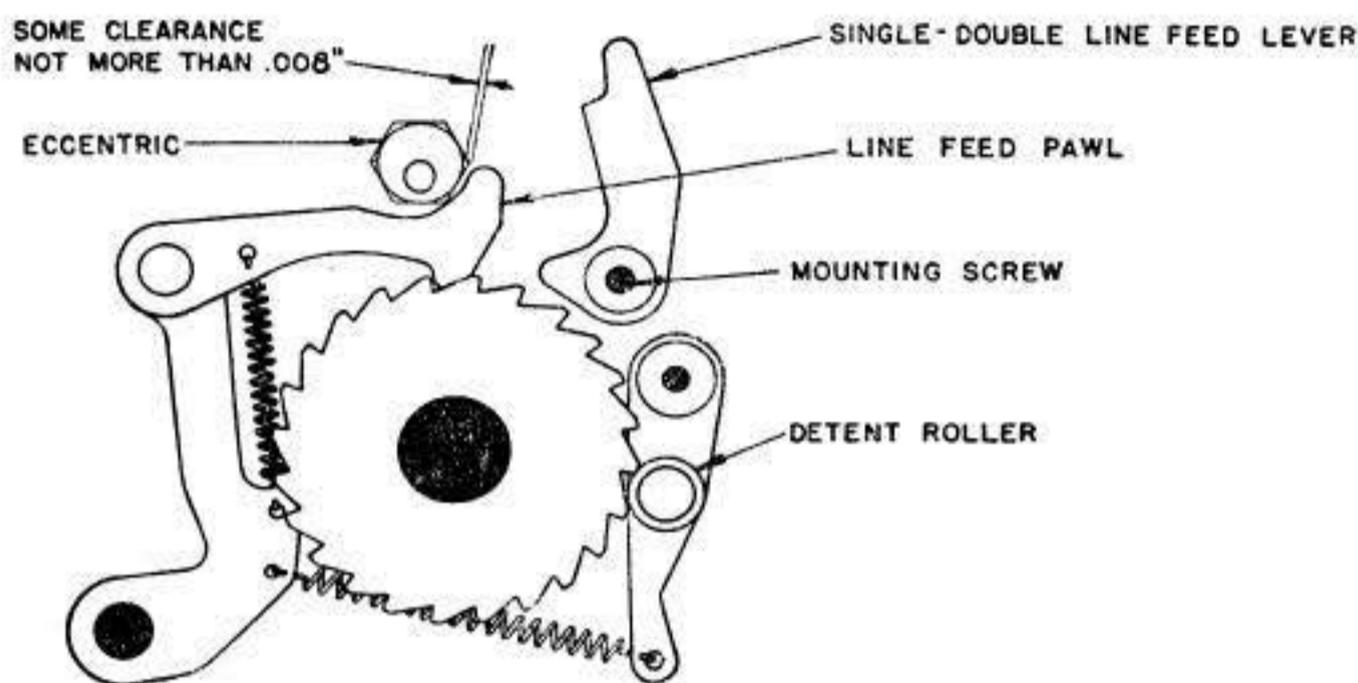


Fig. 37

4.81 Line feed pawl shall just fail to engage one ratchet tooth as in Fig. 38 but shall engage another tooth and advance platen one line space when single-double line feed lever is in "single line feed" position (front end up), detent roller is in a hollow between two ratchet teeth and line feed bail is operated manually.

Note: With some adjustments it may be necessary to operate the line feed pawl before the single-double line feed lever can be shifted.

- (a) To adjust, reposition the single-double line feed lever in its elongated mounting hole.

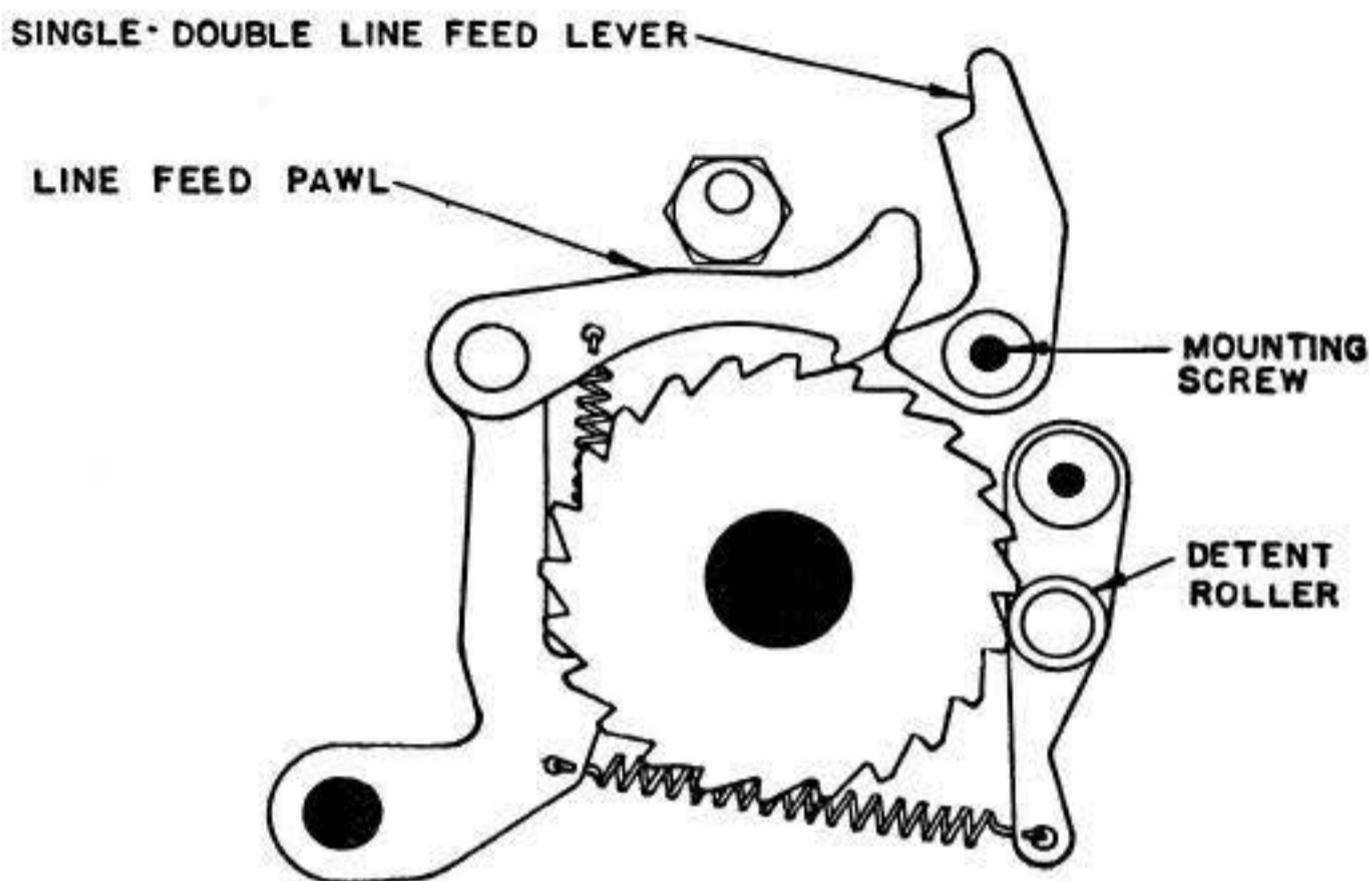


Fig. 38

4.82 **Line feed bail** shall have end play not to exceed .010" and the hole which engages line feed bail adjusting screw (see Fig. 39) shall line up with the screw, as gauged by eye, when the bail is held against right pivot screw, viewed from the front of the typing unit.

(a) To adjust alignment, reposition pivot screw in the frame casting; to adjust end play reposition pivot screw in the pivot screw mounting plate.

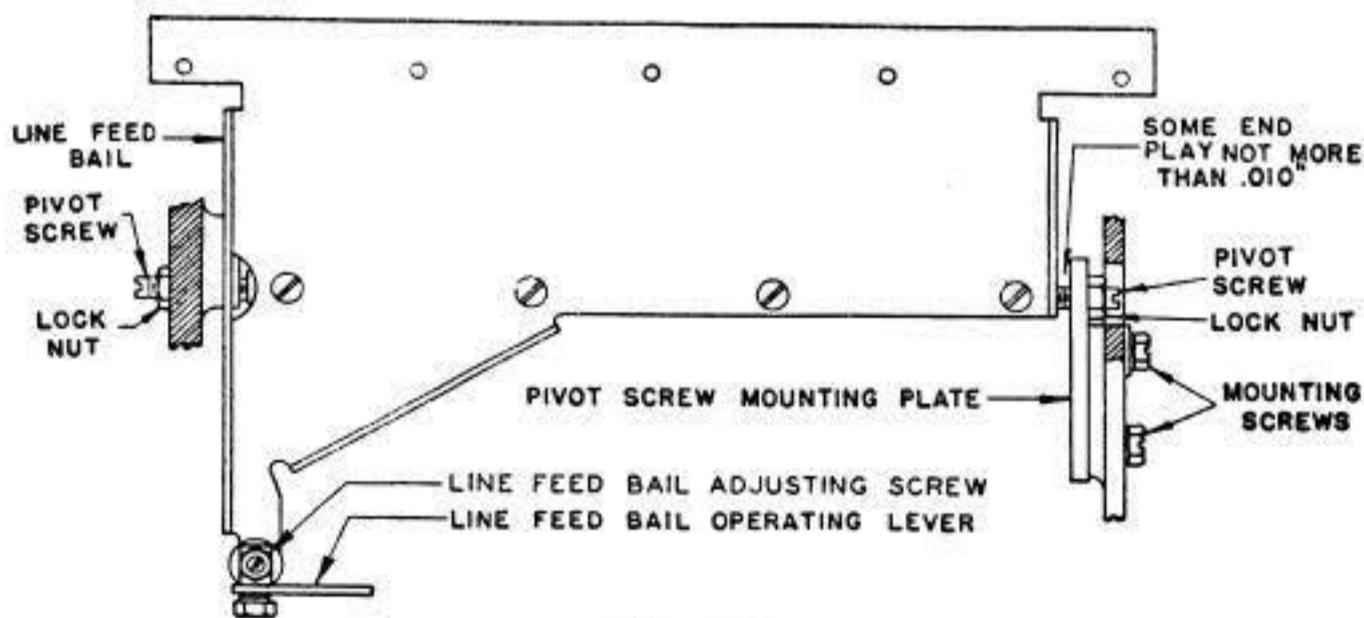
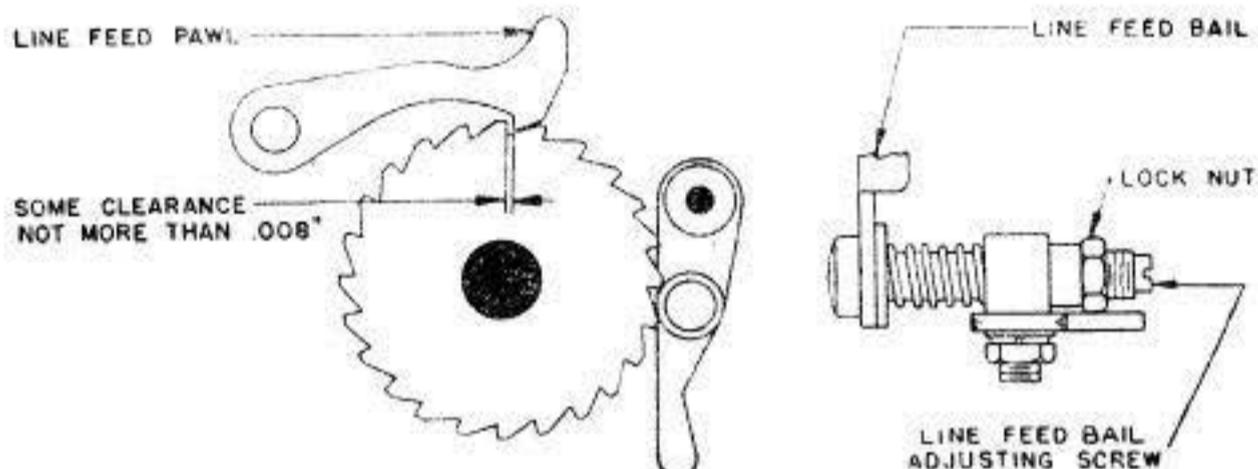


Fig. 39

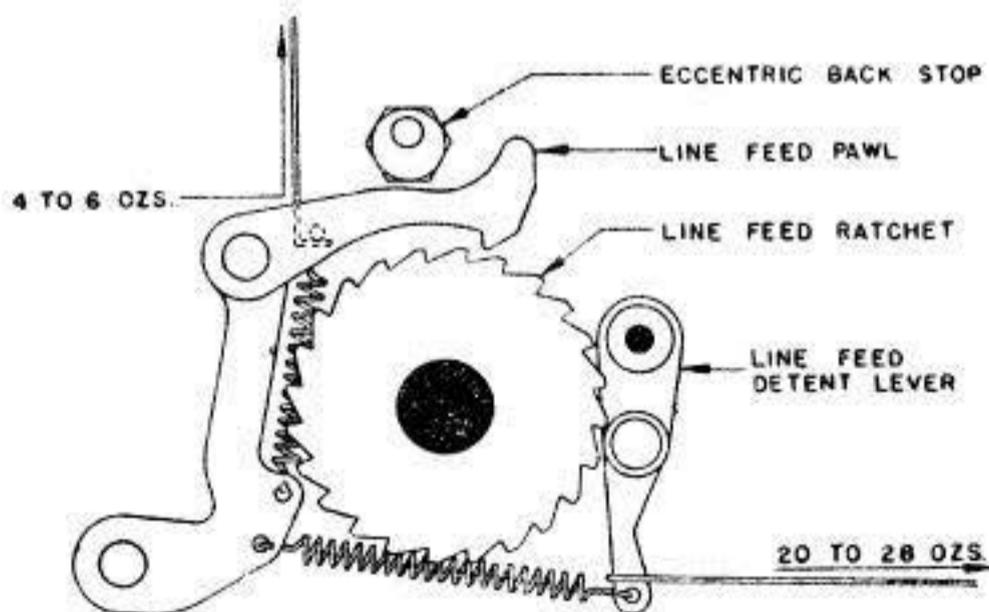
4.83 **Line feed pawl** shall advance platen one line space so that detent roller rests in hollow between two ratchet teeth and shall clear the radial face of the ratchet tooth by not more than .008", as in Fig. 40, with carriage in (1) extreme right position and (2) extreme left position, when single-double line feed lever is in single line feed position, "line feed" combination is set up, main shaft is rotated until function bail roller is on high part of cam, and play in line feed mechanism is taken up by pressing line feed pawl toward front of unit lightly with finger.

(a) To adjust clearance when carriage is to right, viewed from the front of the typing unit, reposition line feed bail adjusting screw; to adjust clearance when carriage is to left, reposition line feed bail pivot screw mounting plate (see Fig. 39). Recheck 4.81.



**Fig. 40**

4.84 **Line feed detent lever spring** shall have a tension of Min. 20 ozs. (565 gms.), Max. 28 ozs. (795 gms.) measured as in Fig. 41 as lever starts to move when main shaft cam sleeve is in its stop position.



**Fig. 41**

4.85 **Line feed pawl spring** shall have a tension of Min. 4 ozs. (115 gms.), Max. 6 ozs. (170 gms.) measured as in Fig. 41 as pawl starts to move when line feed bail is held so feed pawl is in hollow between two ratchet teeth and away from its eccentric stop.

4.86 **Platen** shall have end play not to exceed .006", as in Fig. 42, gauged by eye and feel.

- (a) To adjust, reposition platen on its bearing tube.

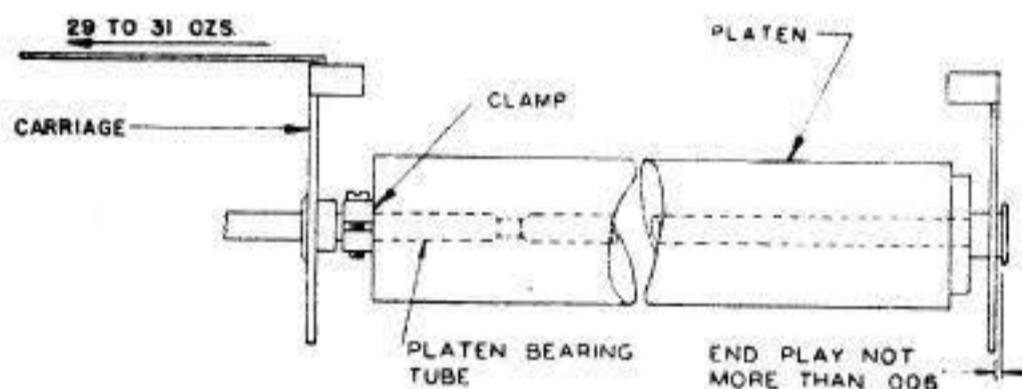


Fig. 42

4.87 **Paper fingers** (outer edges) shall be flush with ends of mounting strips, gauged by eye.

- (a) To adjust, reposition paper fingers on mounting strips.

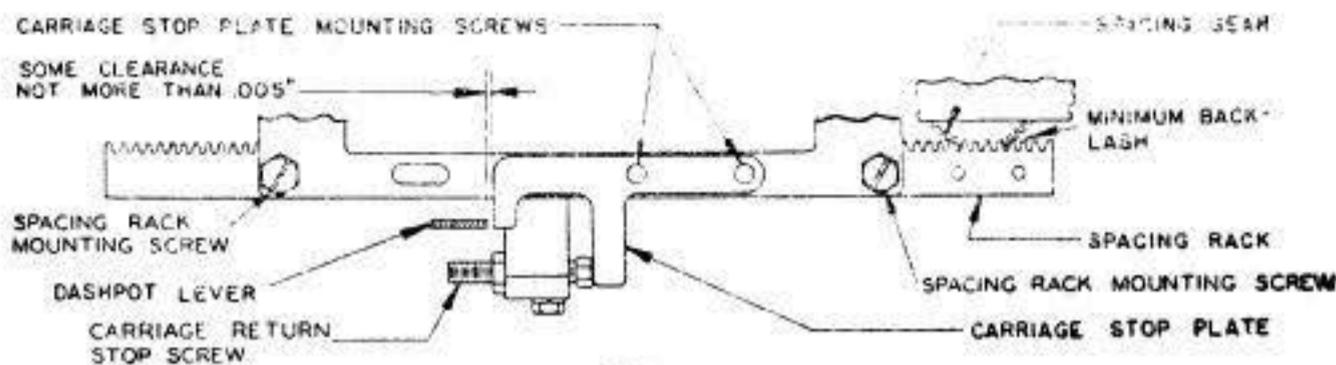
4.88 **Paper fingers** shall press against platen with Min 1-1/2 ozs. (40 gms.), Max. 2 ozs. (56 gms.) measured by pulling horizontally on the extreme top edge of the paper finger when the platen pressure roller release lever is in its unlatched position.

- (a) To adjust, bend vertical portion of paper finger where it joins the horizontal portion.

4.89 **Spacing rack** shall engage spacing gear teeth with minimum backlash without bind throughout its entire travel (see Fig. 43), gauged by eye and feel.

- (a) To adjust, reposition spacing rack.

**Note: Remove platen shaft bracket.**



**Fig. 43**

4.90 **Carriage stop plate** shall clear dashpot lever by not more than .005" as in Fig. 43 (gauge by eye) when carriage is in returned position and dashpot lever is held so that plunger washer stops against dashpot plunger guide.

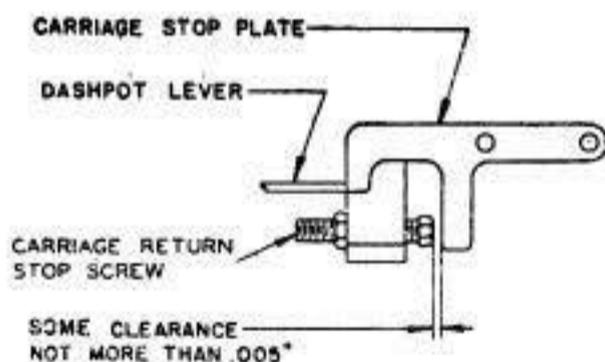
(a) To adjust, reposition carriage return stop screw.

4.91 Center of first character printed shall be 3/4" to 13/16", gauged by eye, from left end of the platen hub when carriage is in extreme right position.

(a) To adjust, reposition carriage stop plate. See Fig. 43.

4.92 Carriage stop plate shall clear carriage return stop screw by not more than .005" as in Fig. 44 (gauge by eye) when main shaft cam sleeve is in stop position, carriage return lever is operated without latching it so that carriage returns to extreme right, and carriage is then moved slightly to left until space retaining pawl engages a tooth on ratchet.

(a) To adjust, loosen spacing ratchet and reposition the ratchet shaft by moving the carriage.



**Fig. 44**

4.93 Carriage stop plate shall clear right margin adjusting screw by Min. .010", Max. .020" as in Fig. 45 after spacing carriage 71 spaces from its extreme right position (72nd position).

Note: Before readjusting check to see that ribbon guide clears line feed detent lever. If not recheck 4.90 and 4.92.

(a) To adjust, reposition right margin adjusting screw.

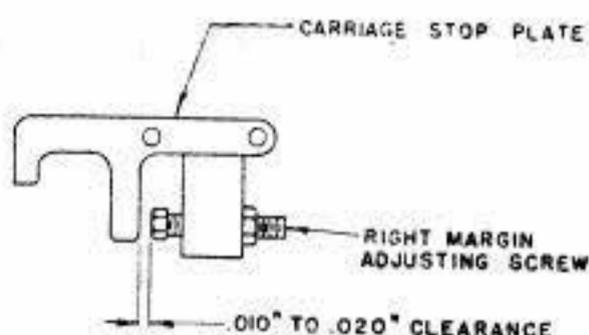


Fig. 45

**Note:** Reassemble platen crankshaft and its bracket so shaft does not bind at any point of platen travel using shims between bracket and casting if necessary.

4.94 **Carriage return release lever** shall clear its link by Min. .005", Max. .015" as in Fig. 46, after the main shaft cam sleeve has been placed in the stop position, the carriage has been returned to its extreme right position, the carriage return lever has been unlatched, carriage has been advanced one space from extreme right position until space retaining pawl engages ratchet tooth, the main shaft cam sleeve has been released and the main shaft has been rotated until the operating bail cam roller is on high part of its cam.

**Note:** Take up play in link to make clearance minimum.

(a) To adjust, reposition eccentric on dashpot lever keeping the center of the eccentric head above the center of the clamping screw.

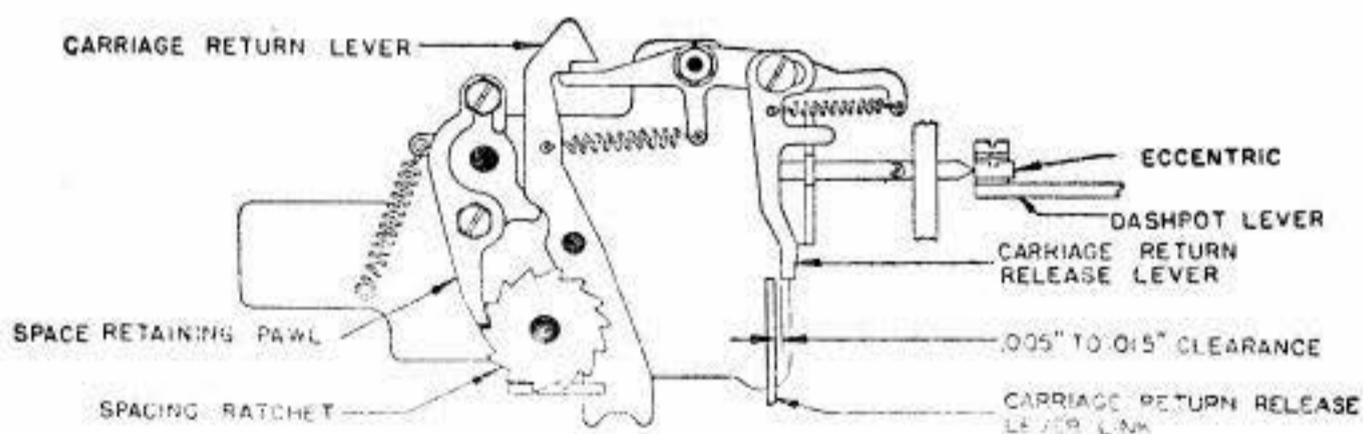


Fig. 46

4.95 **Dashpot lever return spring** shall have a tension of Min. 28 ozs., Max. 36 ozs. when carriage is out of engagement with dashpot lever and spring is stretched to position length.

4.96 **Signal bell hammer** shall clear bell by Min. .020", Max. .040" when main shaft cam sleeve is in stop position.

(a) To adjust, reposition signal bell.

4.97 **Margin bell hammer** shall clear bell by Min. .030", Max. .050" and margin bell hammer pawl shall clear bell adjusting bracket mounting screws by at least 1/64" as in Fig. 47.

(a) To adjust, reposition margin bell hammer eccentric; to obtain pawl clearance, reposition bell and recheck bell hammer clearance.

Note: On old style units with round wire clapper reed, if sufficient pawl clearance cannot be obtained replace mounting screws, washers and nuts with screws, 1028M, washers, 47024M, and nuts, 34-56M.

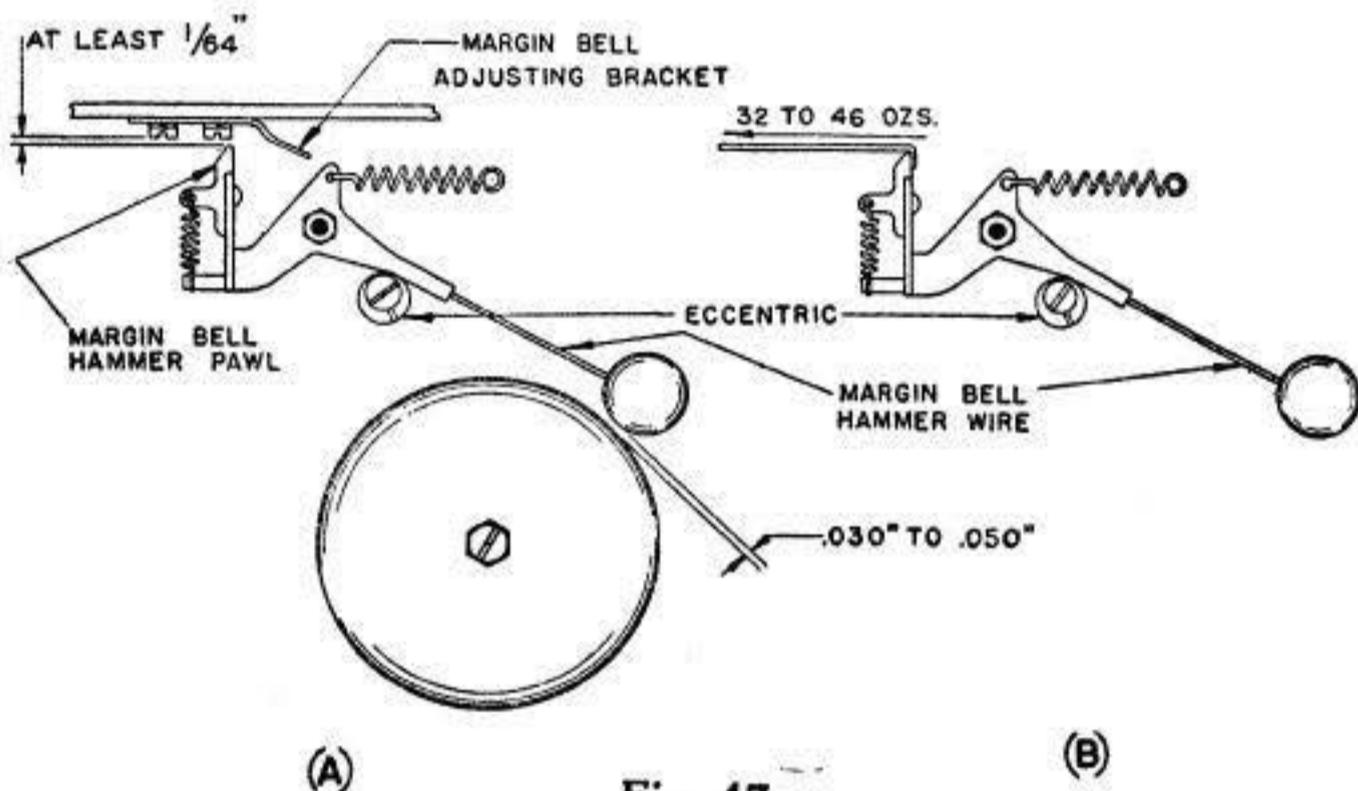


Fig. 47

4.98 **Margin bell** shall ring on the 66th character of a line.

(a) To adjust, reposition margin bell adjusting bracket. See Fig. 47.

4.99 **Margin bell hammer spring** shall have a tension of Min. 32 ozs., Max. 46 ozs. measured as in Fig. 47 when hammer starts to move.

4.100 **Carriage return spring** shall have a tension of Min. 29 ozs., Max. 31 ozs., measured as in Fig. 42 when carriage is in its extreme right position, carriage return lever is latched and dashpot lever is held so that it cannot follow carriage.

(a) To adjust, turn carriage return spring drum hexagon nut clockwise to increase tension, and operate escapement lever to decrease tension.

4.101 **Dashpot Vent Screw:** Carriage shall return from extreme left position with minimum shock without bouncing as gauged by eye, when the carriage return lever is held in its latched position.

(a) To adjust, reposition vent screw. If proper operation cannot be obtained, replace dashpot leather washer.

**Note: Remove ribbon feed unit.**

4.102 **Ribbon reverse lever detent spring** shall (1) be positioned so that lever travels approximately an equal amount either side of detent and (2) have a tension of Min. 2 ozs. (56 gms.), Max. 3 ozs. (85 gms.) measured as in Fig. 48 when detent lever is in either of its two positions.

(a) To adjust, reposition detent spring.

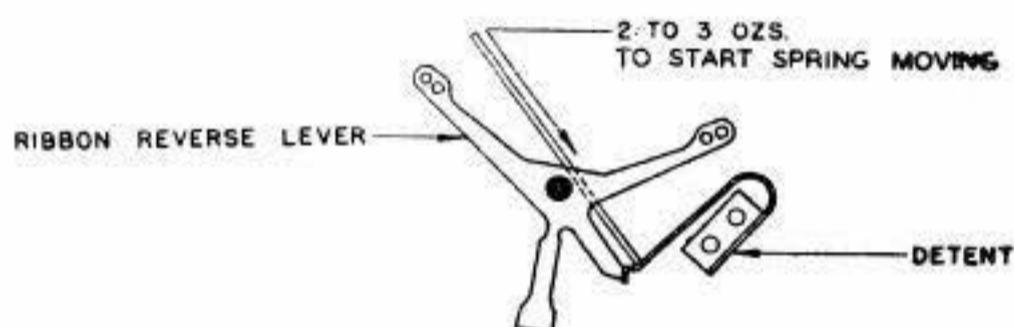


Fig. 48

4.103 **Ribbon reverse lever** shall overlap ribbon feed pawl reversing lugs by approximately same amount when feed pawl is in either right or left position. See Fig. 49.

(a) To adjust, bend thin portion of dovetail end of ribbon reverse lever.

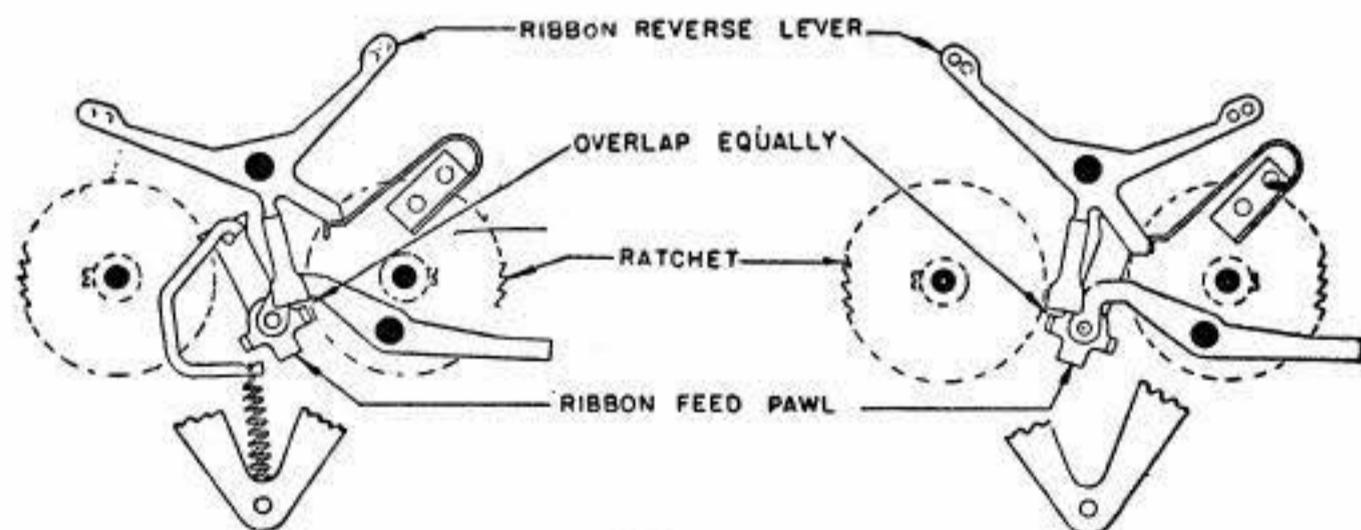


Fig. 49

4.104 **Ribbon spool shafts** shall have end play not to exceed .010".

(a) To adjust, reposition ratchet wheel on shaft.

**Note: Reassemble ribbon feed unit on typing unit and recheck 4.73.**

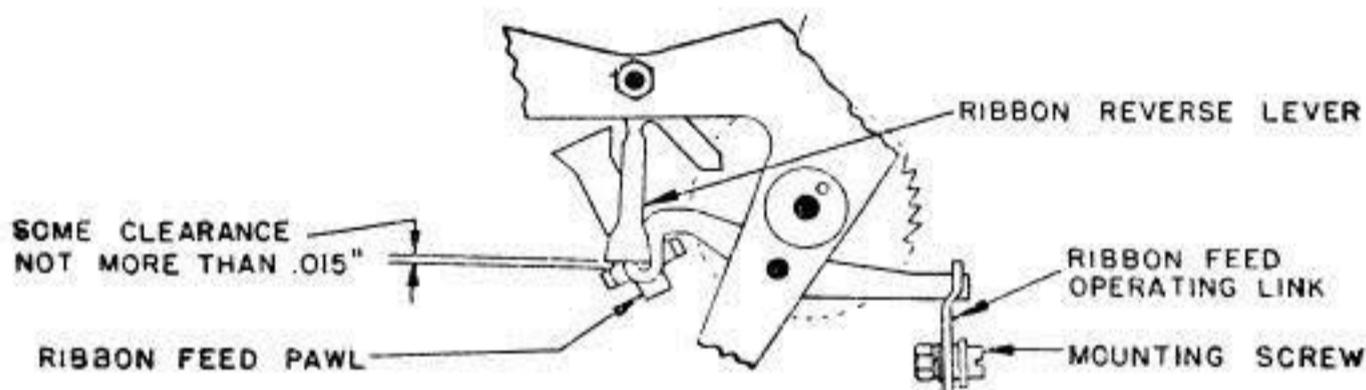
4.105 **Ribbon feed ratchets** shall require Min. 3 ozs. (85 gms.), Max. 6 ozs. (170 gms.), applied on the ribbon spool shaft drive pin at right angles to a line through the pin and the axis of rotation, to start ratchet moving when ribbon feed and check pawls are held away from ratchet.

**Note: Before gauging, check to see that drag springs rest squarely against their positioning nuts.**

(a) To adjust, bend drag spring slightly.

4.106 **Ribbon reverse lever** shall clear ribbon feed pawl reversing projections by not more than .015" as in Fig. 50 when function bail roller is on the high part of cam and feed pawl is resting against the flank of a ratchet tooth. Check both positions of lever.

(a) To adjust, reposition ribbon feed operating link.



**Fig. 50**

4.107 **Ribbon feed pawl spring** shall have a tension of Min. 8 oz. (225 gms.), Max. 10 ozs. (285 gms.) measured as in Fig. 51 when ribbon feed lever is in unoperated position and spring is stretched to position length.

4.108 **Ribbon guide** shall clear upper and lower type pallets in the second slot either side of the "M" pallet by Min. .015", Max. .030" when the typewheel stop arm is latched on the "M" stop pin and the side play in the bearings of the typewheel guide and shaft are taken up in a direction to make these clearances a minimum.

(a) To adjust, reposition ribbon guide on the typewheel guide.

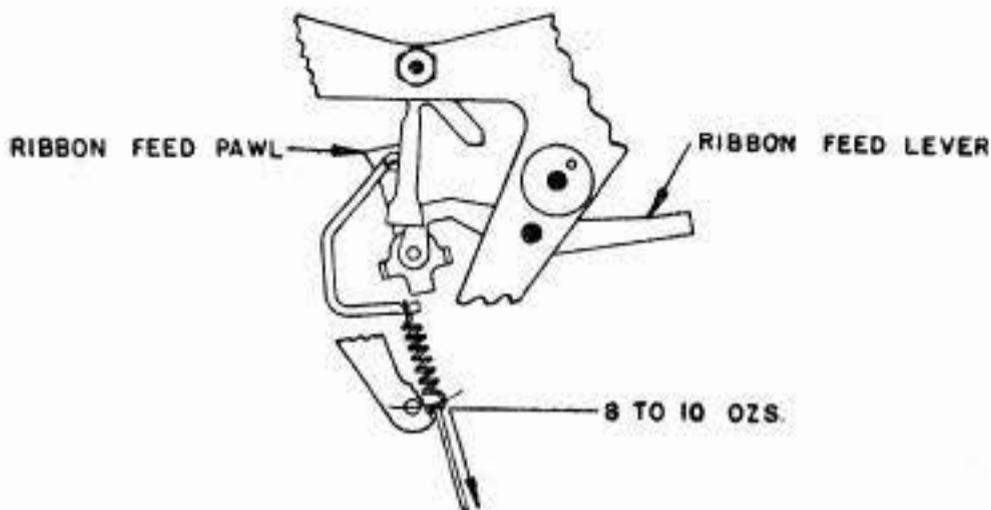


Fig. 51

4.109 **Ribbon feed check pawl spring** shall have a tension of Min. 4 ozs. (115 gms.), Max. 7 ozs. (200 gms.) measured as in Fig. 52.

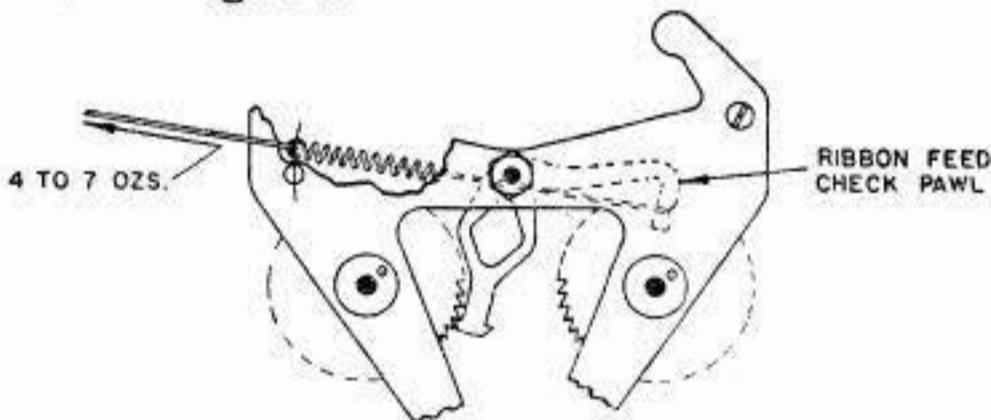


Fig. 52

4.110 **Motor Stop, Remote Signal Bell, and Break-Lock Contacts.** Transfer contacts shall meet the following requirements:

(a) Inside contact spring shall clear upper end of stiffener by Min. .010", Max. .020" as in Fig. 53(A) when shift plate is in "shift" position, "motor stop" combination is set up and main shaft is rotated until stop arm is latched on selected stop pin and function bail cam roller is on high part of cam.

(b) Inside contact spring shall have a tension of Min. 3 ozs. (85 gms.), Max. 5 ozs. (140 gms.) measured as in Fig. 53(B) when spring starts moving away from stiffener. Recheck (a) if tension is changed.

Note: Remove contact bracket to check (b).

(c) Gap between inside and center spring contact points shall be Min. .015", Max. .025" as in Fig. 53(B) when main shaft cam sleeve is in stop position and center spring touches outer spring.

(d) Center contact springs shall have a tension of Min. 3 ozs. (85 gms.), Max. 5 ozs. (140 gms.) measured as in Fig. 53-B when center spring starts moving away from outside spring and main shaft cam sleeve is in stop position. Recheck (c) if tension is changed.

(1) To adjust for above requirements bend contact springs and stiffener.

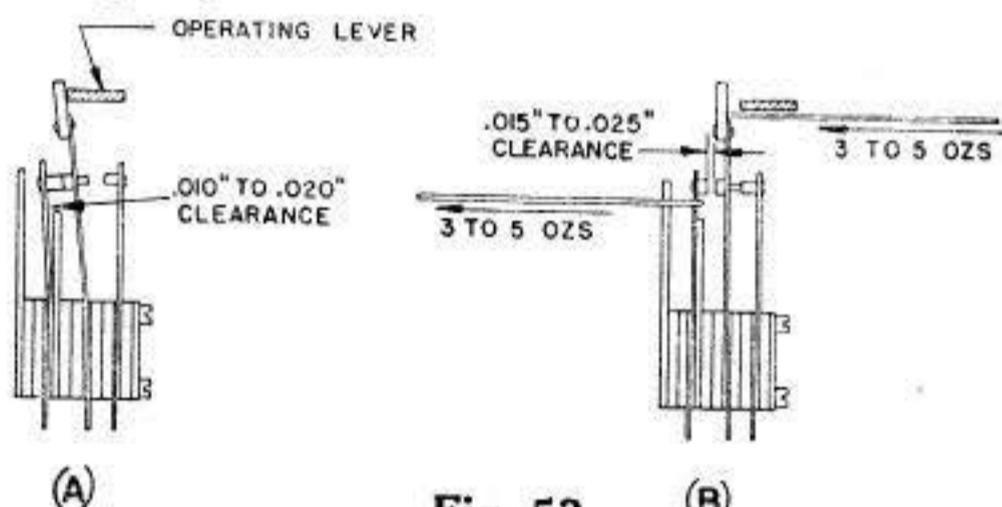


Fig. 53

4.111 **Make and break contacts** shall meet the following requirements:

(a) Gap between "break" contacts shall be Min. .010", Max. .020" and inside "make" contact spring shall clear its stiffener by Min. .010", Max. .020" as in Fig. 54(A) when break-lock lever is latched on units so equipped or when, on units equipped with a non-latching function contact operating lever, the shift plate is in the "shifted" (forward) position, "motor stop" combination is set up on the code discs, and the main shaft is rotated until the stop arm is latched on the selected stop pin and the function bail cam roller is on the high part of its cam.

(b) Gap between "make" contacts shall be Min. .015", Max. .025" as in Fig. 54(B) when break-lock lever is unlatched on units so equipped or when, on units equipped with a non-latching function contact operating lever, the main shaft cam sleeve is in its stop position and the operating lever clears the contact springs.

(c) Outside "make" contact spring shall have a tension of Min. 1 oz. (28 gms.), Max. 3 ozs. (85 gms.) measured as in Fig. 54(B) when it starts moving away from its stiffener.

(d) Inside "make" contact spring shall have a tension of Min. 3 ozs. (85 gms.), Max. 5 ozs. (140 gms.) measured as in Fig. 54(B) when it starts moving away from its stiffener. Recheck (c) if tension is changed.

Note: Remove contact bracket to check (d).

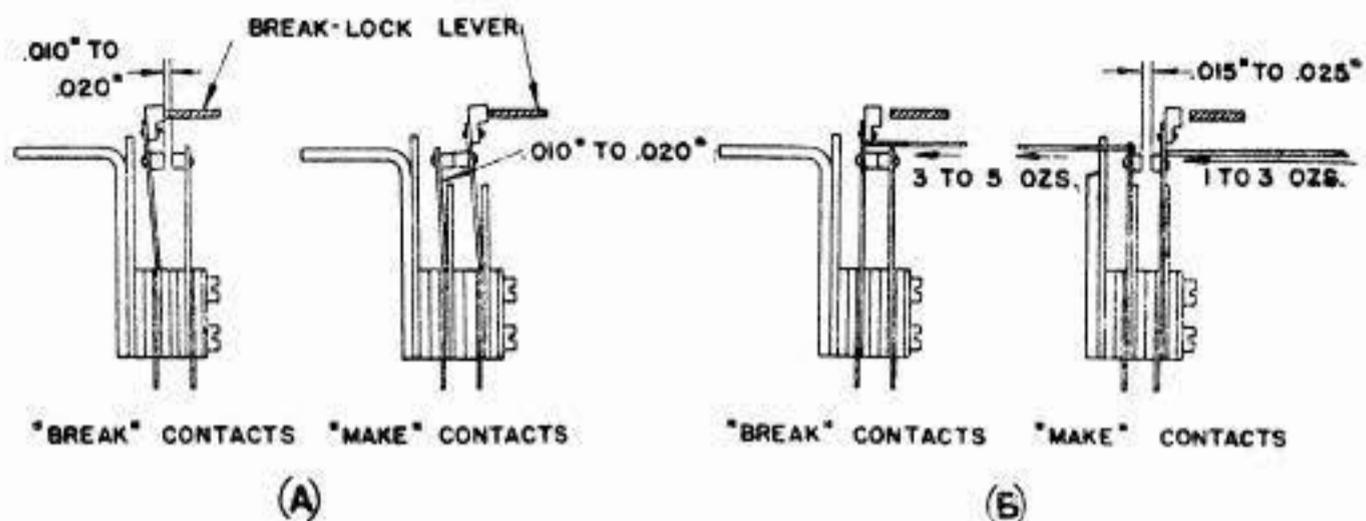


Fig. 54

(e) Inside "break" contact spring shall have a tension of Min. 3 ozs. (85 gms.), Max. 5 ozs. (140 gms.) measured as in Fig. 54(B) when inside "break" spring contact starts moving away from outside "break" spring contact. Recheck (a) if tension is changed.

(1) To adjust for above requirements, bend contact springs and stiffeners.

4.112 **Break-lock lever** shall overtravel its latch shoulder Min. .010", Max. .020" as in Fig. 55 when "blank" combination is set up and main shaft is rotated until type-wheel stop arm is latched on selected stop pin and function bail cam roller is on high part of its cam.

(a) To adjust, reposition break lock lever latch bracket.

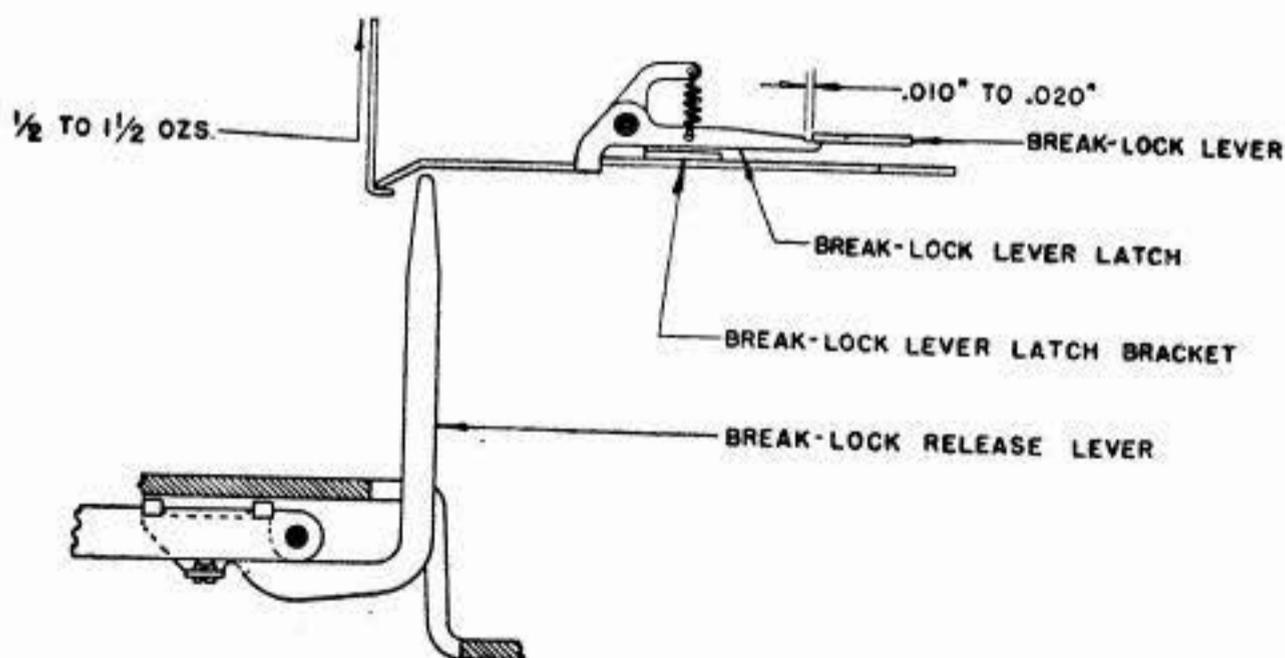


Fig. 55

4.113 **Break-lock lever latch spring** shall have a tension of Min. 1/2 oz. (14 gms.), Max. 1-1/2 ozs. (40 gms.) measured as in Fig. 55 when break-lock lever is in position described in 4.112.

4.114 **Function Blocking Plate:** On typing units equipped with signal bell and motor stop, function blocking plate shall block the action of the two lower function pawls as in Fig. 56(A) when the shift plate is in "figures" position and "signal bell" and "motor stop" functions are alternately selected. On typing units equipped with either signal bell or motor stop with or without the break lock mechanism, blocking plate shall block and project approximately 1/32" below lowest edge of 4th (from top) function pawl as in Fig. 56(B) when shift plate is in "letters" position.

(a) To adjust, reposition function blocking plate when shafts are positioned so cams are in their stop positions.

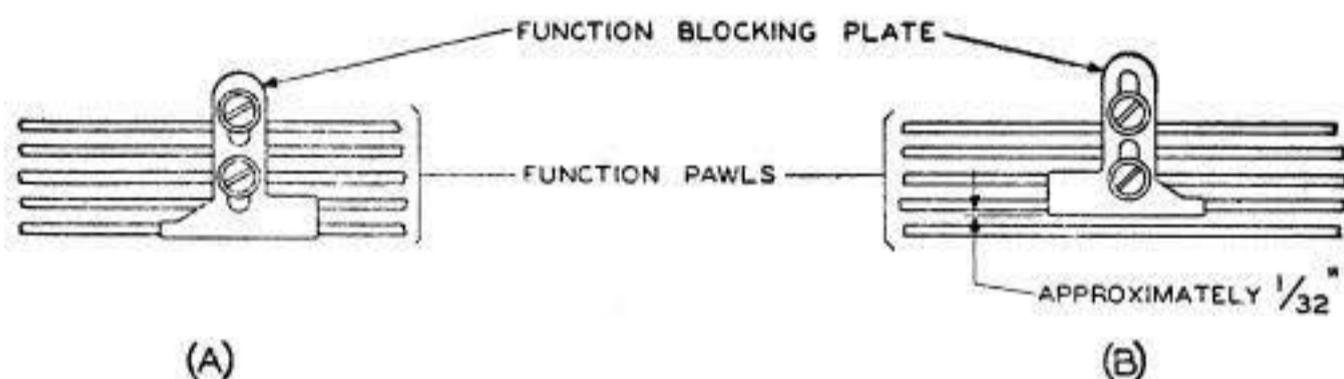


Fig. 56

4.115 **Typing unit slip connection springs** shall clear a flat surface on which typing unit is resting by Min. 7/8", Max. 15/16", when front leg of casting is raised 1-1/4 inches above the surface with a 93847 typing unit supporting post.

(a) To adjust, bend springs.

4.116 **Motor brush springs** shall press brushes against commutator with Min. 5 ozs. (140 gms.), Max. 8 oz. (225 gms.) pressure.

4.117 **Motor rotor thrust spring** shall exert a pressure of Min. 4 lbs. measured by pushing horizontally against the switch end of the rotor shaft as the shaft starts to move.

(a) To adjust, add or remove shims (washers) in end shield bearing at gear end of motor.

<u>Washer</u>	<u>Thickness</u>
94552M	.005"
94553M	.0079"
94554M	.0112"
94555M	.0159"
94556M	.0320"
94557M	.0641"

4.118 **Governor contacts** shall meet the requirements of Section P31.190 covering Adjustment of Governor Contacts.

4.119 **Governor brushes** shall ride in center of governor collector rings and shall project out of holder Min. .015", Max. .050".

(a) To adjust, reposition brush holder bracket.

4.120 **Governor brush springs** shall press brushes against collector rings with Min. 3 ozs. (85 gms.), Max. 4 ozs. (110 gms.) pressure.

4.121 **Speed:** Free speed of receiving shaft in revolutions per minute is 420.4 R.P.M. corresponding to 368 operations per minute, 60 speed.

Note: Word speed is based on 6 operations (five characters and one space) per word. The speed of 368 operations per minute is commonly known as "60 speed."

(a) Check and adjust speed as outlined in P30.020 covering Speed Regulation of Teletypewriter Apparatus.

4.122 **Type Wheel Shaft Friction Clutch:** After running motor at least 10 minutes, a pull of 20 ozs. (565 gms.) applied to type wheel stop arm next to selected stop pin shall hold arm away from pin against drag of friction clutch while motor is running. A pull of 15 ozs. (425 gms.) similarly applied shall not hold arm away from pin.

(a) To adjust, reposition capstan nut on bottom of type wheel shaft using the capstan wrench and taking care to impart no strain in the stop arm.

4.123 **Selector Clutch Torque:** After motor has been run for at least 10 minutes and clutch has been freshly lubricated a pull of 18 ozs. (510 gms.), applied at right angles to the vertical portion of the selector-cam sleeve stop arm when motor is running, shall hold selector cam sleeve from rotating when selector arm is held just clear of its stop. A pull of 14 ozs. (395 gms.) similarly applied shall not hold sleeve from rotating.

- (a) To adjust, recondition or replace felt friction washers, add or replace spring as follows:

Note: Reconditioning of washers by removing them and kneading with the fingers to soften them, or their replacement by new washers will usually be satisfactory in most cases since the spring holds its adjustment over long periods. Before replacing the spring, consideration should be given to the addition of washer shims 96763M, 96764M, or 96765M around nut 72515M at the end of the spring nearest the bearing.

(1) To recondition felt washers; remove range finder assembly, detach locking lever spring and remove retaining disc noting that it has a left-hand thread and unscrews to right, clockwise; remove outer felt washer, cam sleeve assembly, cam sleeve disc, and inner felt washer holding selector levers away from the shaft and rotating cam sleeve disc until notch in its edge registers with points of selector levers; knead felt washers with fingers and saturate with oil as specified in Section P40.601.

(2) To remove clutch spring or add adjusting washers proceed as in (1) and remove clutch driving disc and spring.

4.124 **Function and intermediate lever assemblies**, if dismantled, shall upon reassembly have the lower of the top nuts tightened, then backed off 1/3 turn and locked in that position with the upper nut and the intervening lock-washer.

4.125 **Orientation Range and Distortion Tolerance**: Typing units shall be capable of meeting the orientation range or distortion tolerance requirements given in another section of "P" series covering this subject.

4.126 **Associated paper handling mechanisms** shall meet the following requirements:

(a) Paper chute and small paper roll holder shall clear the associated 26 type cover by 1/4" as gauged by eye when the teletypewriter is assembled on a 26 type table or a baseplate assembly.

(1) To adjust, bend mounting ears by pressing on rear edge of the chute or holder.

(b) Paper guides of the 95947M paper chute shall be parallel, centrally located and spaced so the distance between them at the point where they guide the paper is approximately 1/32" greater than the width of the paper.

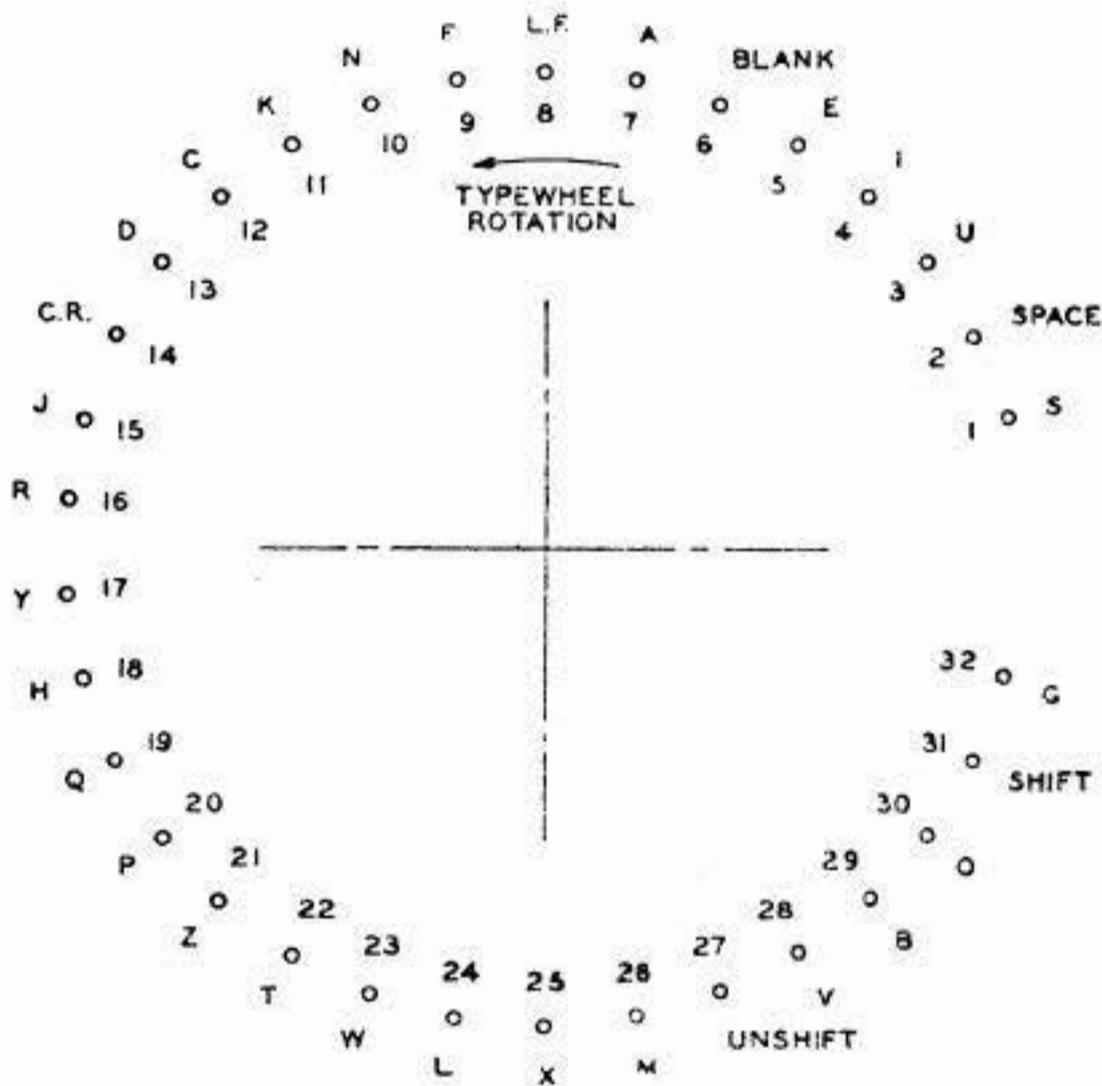
(c) Paper spindle on 26 type table doors shall have end play Min. 1/32", Max. 1/16" as gauged by eye.

(1) To adjust, bend spindle bracket.

(d) Paper spindle brake on 26 type table doors shall be parallel to its supporting bracket and shall ride centrally in the groove of the spindle without pinching the spindle against its mounting bracket when the end play in the spindle is taken up in either direction. Gauge by eye and feel.

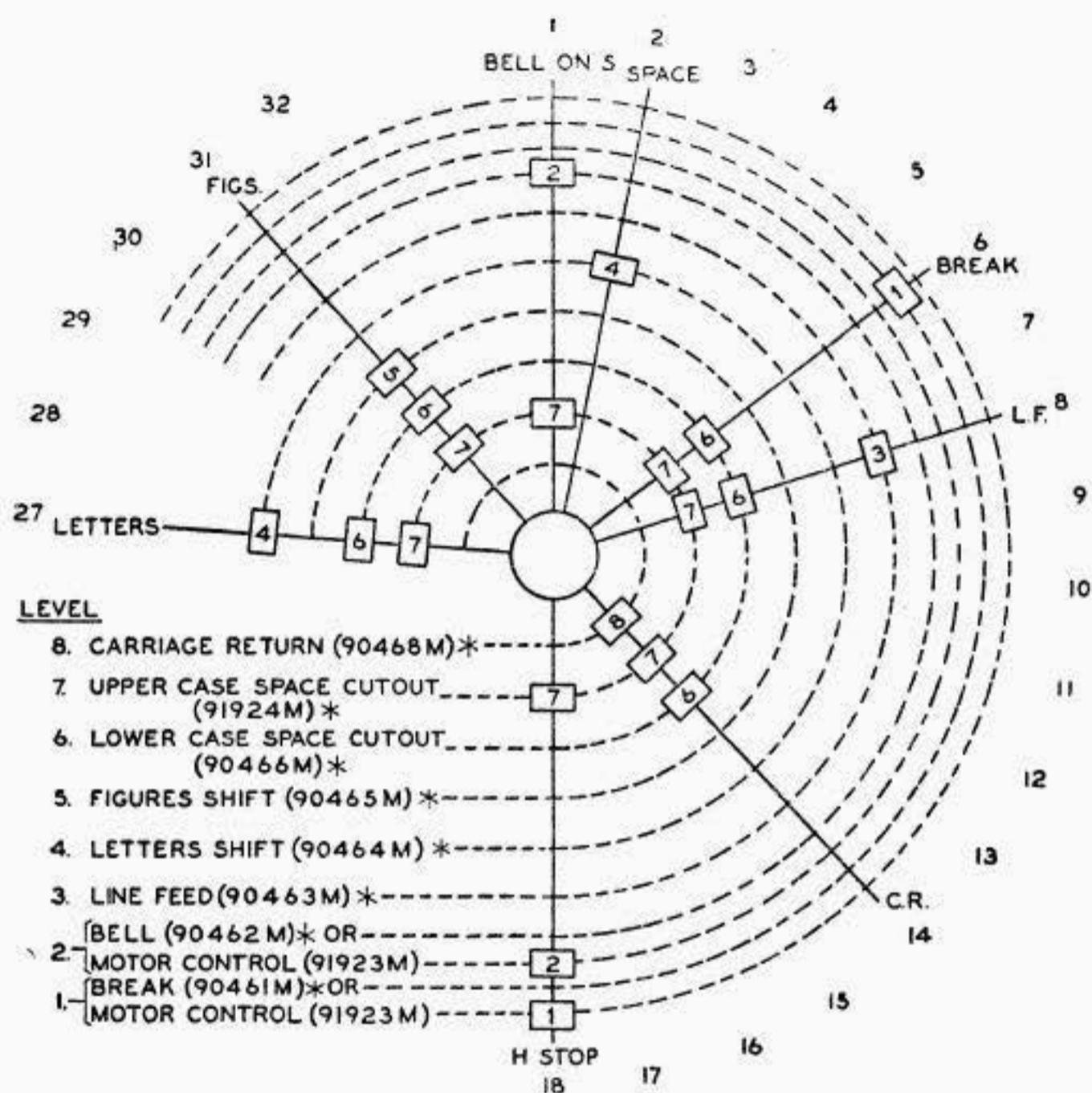
(1) To adjust, reposition brake on its pivot screw, making sure the pivot screw projects through the brake not more than 1/64".

4.127 Figs. 57 and 58 are included to show the arrangement of the function arm assembly and of the stop pins of the pin barrel.



NOTE: THE ABOVE ALSO REPRESENTS THE ARRANGEMENT OF CHARACTERS WHEN LOOKING AT THE UNDERSIDE OF THE TYPEWHEEL.

Fig. 57—Arrangement of Stop Pins of Pin Barrel



ABOVE CATALOG NUMBERS ARE FOR FUNCTION ARMS. FUNCTION ARMS STARRED \* ARE FURNISHED WITH MACHINE REGULARLY. 90474M IS A SPACER FOR USE WHEN FUNCTION ARM IS OMITTED.

**Fig. 58—Function Arm Assembly**