

BELL SYSTEM PRACTICES
Teletypewriter Stations

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**MOTOR CONTROL UNITS
USED WITH 14, 15 AND 26
TELETYPEWRITERS
DESCRIPTION, REQUIREMENTS
AND PROCEDURES**

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1. GENERAL

1.01 This section contains the description, apparatus requirements and adjusting procedures for the remote motor-control devices used with the 14, 15 and 26 teletypewriters. These devices provide a means for a distant TWX switchboard operator or PLS attendant to turn on and off a machine at an unattended station.

1.02 This section is reissued to broaden its scope to include two types of motor control not previously in it:

- (1) Built-In Mechanical Motor Control
- (2) 120-Type Subset Motor Control

Thus it is made a section with general coverage of motor control devices. The changes are so extensive that the use of marginal arrows is not feasible.

1.03 The material in this section on the built-in mechanical motor control and the H contacts for electrical motor control was formerly in Section P36.701, which has been cancelled.

2. SUMMARY DESCRIPTIONS OF 3 TYPES OF MOTOR CONTROL**(A) General**

2.01 All of the motor-control devices described herein have in common the fact that the motor is stopped on the receipt of a motor stop signal, which is sometimes FIGS H, sometimes FIGS Blank H and sometimes FIGS M, depending on how the mechanism is arranged. The table of contents and the subsequent discussion indicate which motor-stop signals are associated with each type of motor control on the 14, 15 and 26 teletypewriters.

2.02 The method of starting the motor, different for the various devices, is indicated in the separate descriptions below.

(B) Built-In Mechanical Motor Control—15 TTY Only

2.03 The built-in mechanical motor control (manufacture discontinued) is associated only with the pulling-magnet selector of the 15 typing unit. It is for closed-loop operation, either TWX or PLS. The term "built-in mechanical" refers to the fact that the device which opens or closes the contacts in the motor-power circuit is an integral mechanical part of the typing unit.

2.04 The distant operator or attendant starts an idle machine by first opening the line and then closing it, usually by means of the break key. The resulting succession of operations of the mechanical parts on the machine closes the motor-stop contacts and turns on the power.

2.05 The motor is turned off by the motor-stop signal, which in this case may be either FIGS H, FIGS Blank H, or FIGS M.

Caution: The manual power switch should not be turned off before the keyboard sending shaft comes to rest.

(C) Electrical Motor Control (H Contacts Momentary Close)

2.06 This motor control is associated with either pulling or holding magnets on 14, 15 or 26 teletypewriters. It is for closed-loop operation only, either TWX or PLS. It consists of a set of contacts on the typing unit and a relay-unit, consisting of a start magnet and a stop magnet, in the base, which switches the power supply. The contacts, and the methods of operating them, are different for the 14, 15 and 26 typing units.

2.07 The distant operator or attendant starts the machine by a break, which actuates the start magnet in two steps so that the motor is turned on.

2.08 The motor stops when the motor-stop signal is received. FIGS H or FIGS Blank H, as the case may be, closes the contacts on the typing unit momentarily, just long enough for the stop magnet in the base to pull up and open the power circuit.

(D) 120-Type Subset Motor Control (H Contacts Momentary Open)

2.09 For open-loop TWX stations with 14, 15 or 26 teletype-writers with either pulling or holding magnets, this type of motor control is closely similar to electrical motor control except that the 120-type subset takes the place of the start and stop magnets in the base of the teletypewriter.

2.10 The motor is started in two different ways, depending on the type of subset used:

(a) With the 120D subset, used with the 1 or 1A switchboards, the switchboard operator operates a key which reverses the polarity of the current in the tip conductor of the loop.

(b) With the 120C-type subset, the operator sends a 6-second 20-cycle ring. This also rings the bell.

2.11 The motor is stopped when a motor-stop signal, FIGS H or FIGS Blank H, momentarily opens the H contacts on the teletypewriter and so actuates the relays in the subset. Further details of the subset operation are given in the BSP sections describing them, indexed in the Table of Contents of this section.

(E) Table of Parts Numbers

2.12 Table 1 identifies the various assemblies by parts numbers and also gives, in the notes, some additional descriptive details. It also indexes other applicable Bell System Practices and Teletype Corporation S-specifications.

TABLE 1
SUMMARY OF MOTOR CONTROL MECHANISMS FOR THE
14, 15 AND 26 TELETYPEWRITERS

	Complete Set of Parts	Motor Stop Selection (Note 1)	Parts No. For Contact Mech. On Typing Unit	Relay Unit No. (Note 2)	Notes
For TTY	Built-In Mechanical Motor Control (Mfr. Disc.)				
15	TP82742	FIGS-H	TP82742	—	R1
15	—	FIGS-Blank-H	TP82742 & TP87403	—	R2
15	TP74764	FIGS-M	TP74764	—	R1
	Electrical Motor Control				
14	TP82990	FIGS-H	TP82513	TP82939	R3
15	TP96892	FIGS-H	TP97645	TP97646	7,R4
15	TP96892 & TP87403	FIGS-Blank-H	TP97645 & TP87403	TP97646	3,R5
26	TP98070	FIGS-H	TP98454	TP98455	6,R8
	Motor Control With 120 Subset				
14	TP82513	FIGS-H	TP82513	—	R3
14	—	FIGS-Blank-H	no arrangement available	—	
15	TP87868	FIGS-H	TP87868	—	4,R6
15	TP92153	FIGS-Blank-H	TP87868 & TP87403	—	3,R7
26	—	FIGS-H	TP91722	—	5,R8
26	—	FIGS-H	TP93725	—	5,R8

References:

R1-5037S
R2-P36.464

R3-5042S
R4-P36.476, 5582S

R5-P36.464, P36.476, 5582S
R6-P36.463

R7-5464S, P36.463, P36.464
R8-P40.461

Notes

1. Motor stop selections other than those tabulated may be used, provided a universal function lever is used with the lugs broken off to obtain the desired character. FIGS M is sometimes used with the 14 TTY.
2. The base units for the electrical motor control are identical except for their mountings.
3. Holding-magnet machines will normally require a TP92154 set of parts to convert the Send-Receive Break mechanism for double-blank operation. TP92153 includes TP92154.
4. This set of parts converts a 15S or 15T typing unit to a 15J or 15L typing unit. It includes a function lever and a TP81800 contact assembly.
5. P40.461 also lists parts which must be added with TP91722 or TP93725. TP91722 is for 26 machines equipped with break-lock parts and TP93725 is for 26 machines with signal bell. One of these features must be given up when motor control is added.
6. This set of parts replaces either the break-lock or signal bell feature. One of these features must be given up when motor control is added.
7. This control has a low-resistance start-magnet coil and is used on units operating at 60 mils line current only. TP97645 includes function lever and TP74890 contact assembly.

3. BUILT-IN MECHANICAL MOTOR CONTROL— 15 TELETYPEWRITER

(A) FIGS H

Operation

3.01 **Motor Running:** Line closed, left-hand motor-stop contacts open, right-hand motor-stop contacts closed, armature extension released from inner and outer motor-stop pawls. **Fig. 2**

3.02 **Motor Stop**

(1) When a FIGS H signal is received, selecting the motor-stop function lever, the motors of all machines connected in the circuit that are equipped with FIGS H motor stop will be automatically stopped. **Fig. 2**

(2) As the motor-stop function lever is moved forward in the vanes, its lower rear extension raises the motor-stop lever; this latches the inner motor-stop pawl onto the thick part of its latch on the armature extension.

Figs. 1, 2, 4

(3) Simultaneously, the front extension of the motor-stop function lever moves down, allowing the left-hand motor contacts to close. As the rear extension of the motor-stop contact lever moves up, the front extension moves down against the tension of its spring, and opens the right-hand motor-stop contacts.

Figs. 2, 4, 5

(4) Since both pairs of contacts are wired in multiple, the motor will not stop until the motor-stop function lever is restored to its normal position and the left-hand motor-stop contacts open. The purpose of the left-hand contacts is to hold the motor circuit momentarily closed until the main-bail cam sleeve comes to rest, which insures the disengagement of the main-shaft clutch before the motor stops.

3.03 Motor Start: To start the motor, the switchboard operator first opens the line by means of the break key and then closes it. The following sequence of operations takes place.

(1) When the line is opened, the selector armature extension is moved downward by the armature spring and the upper end of the motor-stop lever, having moved forward a slight distance, is again stopped when its outer pawl catches the cut-away portion of the motor-stop-pawl latch.

Figs. 1, 2

(2) When the operator again closes the line, the armature moves to its operated position, the outer motor-stop pawl unlatches the armature extension, and the motor-stop lever returns to its running position. The extension on the lower portion of the motor-stop lever, which has been holding the motor-stop contact lever away from the right-hand motor-stop contacts, will now permit the spring to move the front extension of the motor-stop lever upward, closing the right-hand motor-stop contacts. The motor is now operating and the teletypewriter ready for sending or receiving.

Figs. 2, 5

Lubrication

3.04 The following points should be lubricated with oil:

- (1) Motor-stop pawls.
- (2) Shoulder-screw.
- (3) Latching surfaces.
- (4) Release-lever bearing.
- (5) Contact-lever bearing.
- (6) Where contact lever protrudes through break mechanism plate.

Requirements and Procedures

3.05 Place typing unit on its right side. The inner motor-stop pawl latching surface should over-travel the rearmost surface of the motor-stop pawl latch Min .010", Max .025" when (1) the platen is in the FIGS position, (2) the Motor-Stop combination is set up, (3) the main-shaft is rotated slowly until the motor-stop function-lever is completely selected, and (4) the armature is in its operated position.

Fig. 1

- (a) To adjust, position the motor-stop-lever bracket, keeping the motor-stop-pawl backstop clear of the inner pawl.

Fig. 2

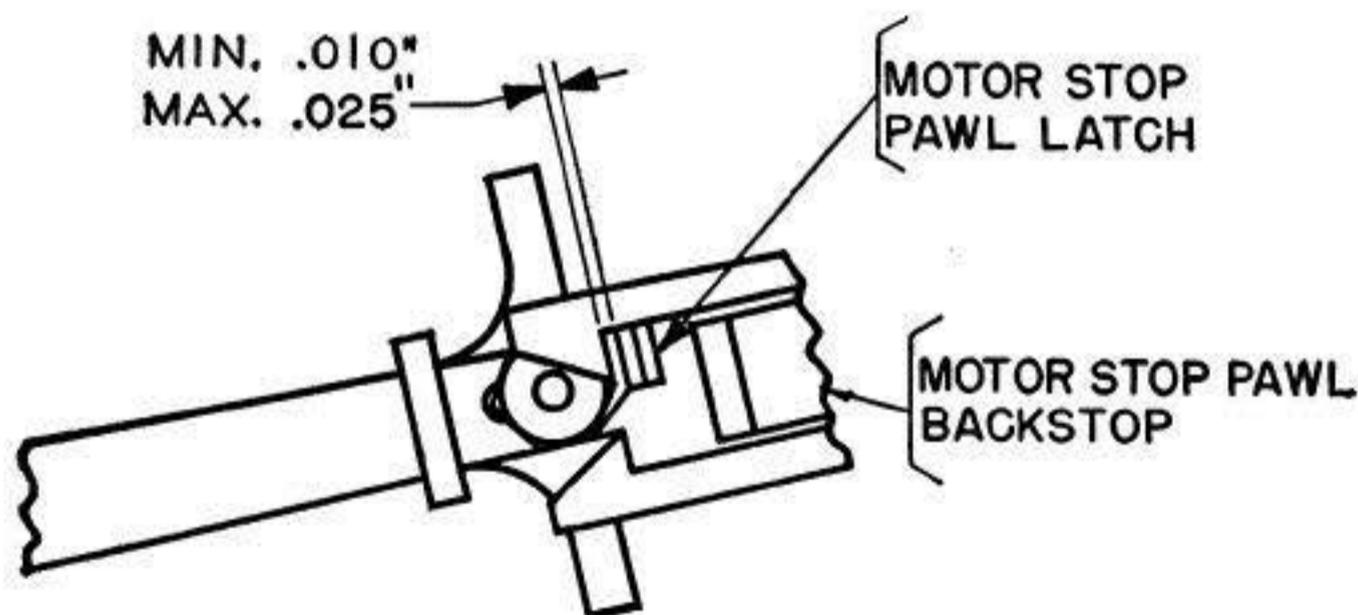


Fig. 1

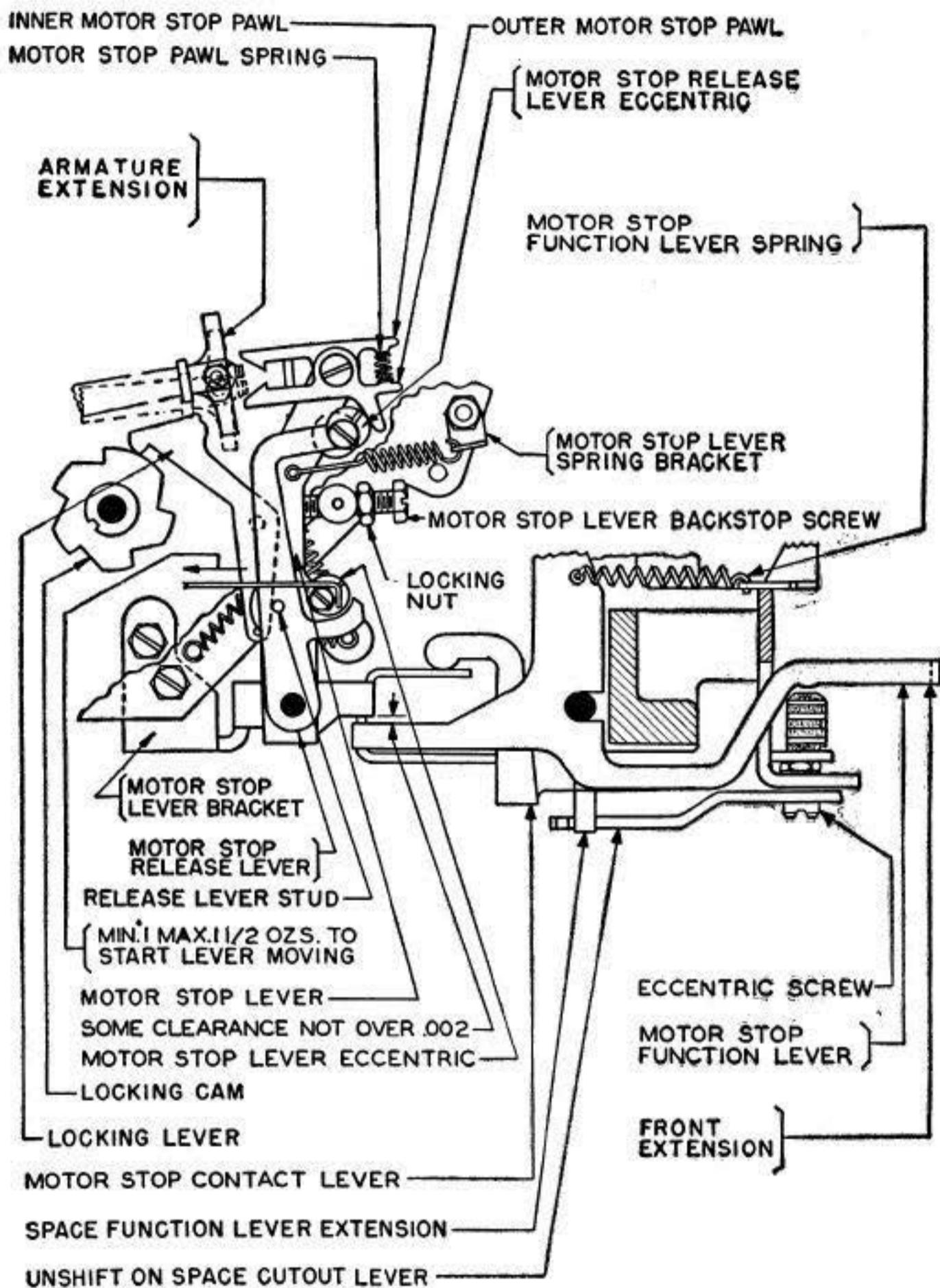


Fig. 2

3.06 The motor-stop-lever eccentric should be in contact with the lower arm of the motor-stop release-lever when (1) the main-shaft is rotated until the printing bail is in its extreme rear position and the locking-lever is on the high part of its cam, (2) the armature is in its operated position, (3) the inner motor-stop pawl is engaged with the pawl latch and (4) the motor-stop release-lever stud is touching the locking-lever. Gauge by eye and feel. **Fig. 2**

(a) To adjust, position the motor-stop-lever eccentric.

3.07 The motor-stop-lever lower edge should clear the motor-stop function-lever rear extension by not more than .002" when (1) the platen is in the LTRS position, (2) the motor-stop combination is set up, (3) the main-shaft is rotated until the printing bail is in its extreme forward position and (4) the motor-stop pawls are released from the latch. **Fig. 2**

(a) To adjust, position the motor-stop-lever backstop-screw.

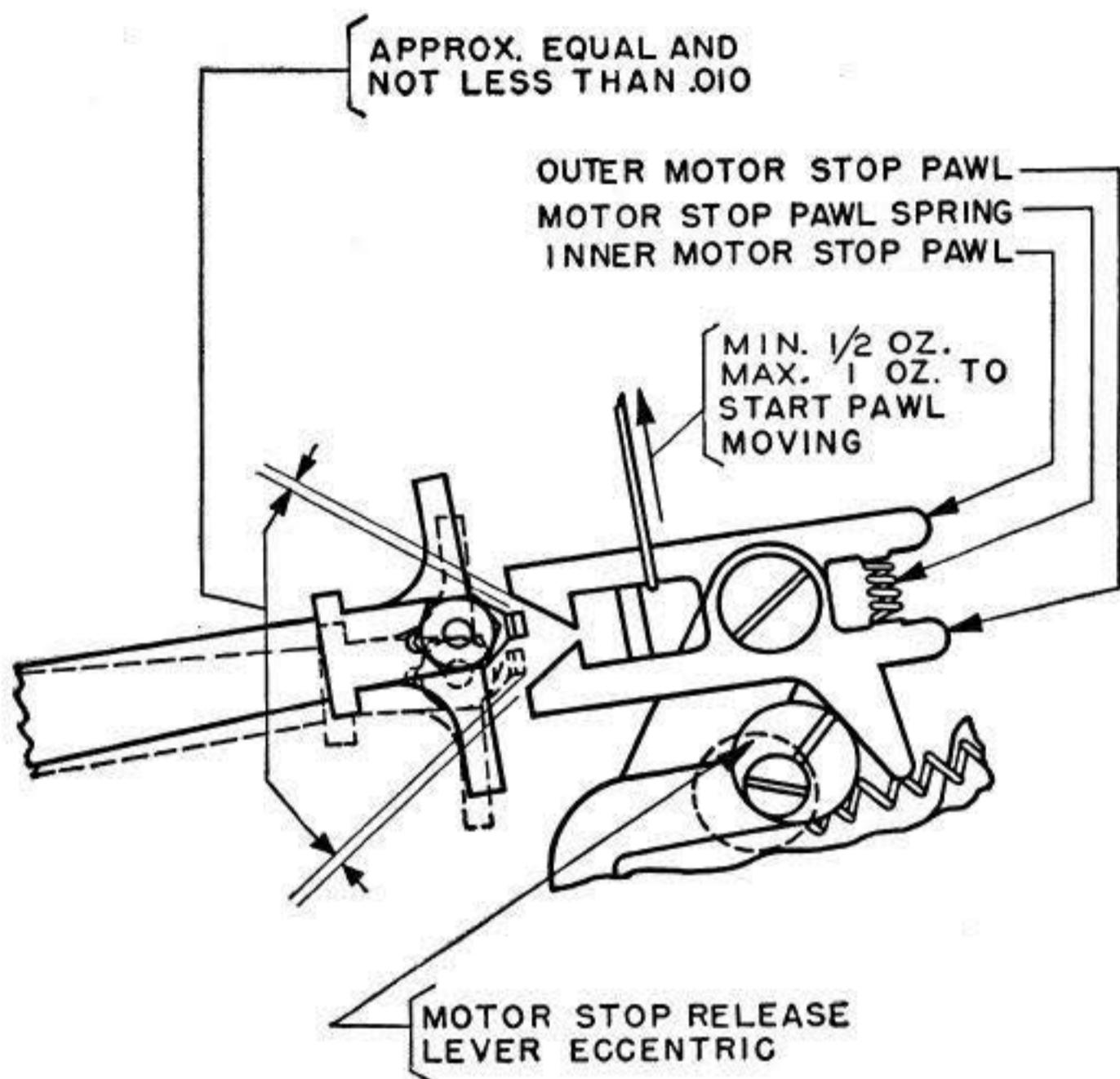


Fig. 3

3.08 The motor-stop pawls should clear their latches by approximately equal amounts, not less than .010", when the armature is moved from its operated to unoperated position with the printing bail in its extreme rear position and the motor-stop release-lever eccentric moved away from the outer-stop pawl. Gauge by eye. **Fig. 3**

(a) To adjust, position the motor-stop pawl backstop. **Fig. 1**

3.09 The motor-stop release-lever eccentric should just touch the outer motor-stop pawl when (1) the main-shaft is rotated until the printing bail is in its extreme rear position and the locking-lever is on the high part of its cam, (2) the

armature is held in its operated position, (3) the inner motor-stop pawl is engaged with the motor-stop pawl latch, (4) the lower arm of the motor-stop release-lever is in contact with the motor-stop-lever eccentric, and (5) the outer pawl is against the motor-stop-pawl backstop. Gauge by eye and feel.

Fig. 2

(a) To adjust, position the motor-stop release-lever eccentric.

3.10 The motor-stop-pawl spring should have a tension of Min 1/2 oz, Max 1 oz measured when the printing bail is in its extreme rear position.

Fig. 3

3.11 The motor-stop-lever spring should have a tension of Min 1 oz, Max 1-1/2 oz measured on the head of the motor-stop-lever eccentric when the motor-stop-contact-lever spring is unhooked and the motor-stop lever is in the unoperated position.

Fig. 2

(a) To adjust, position the spring-bracket on the post of the selector unit.

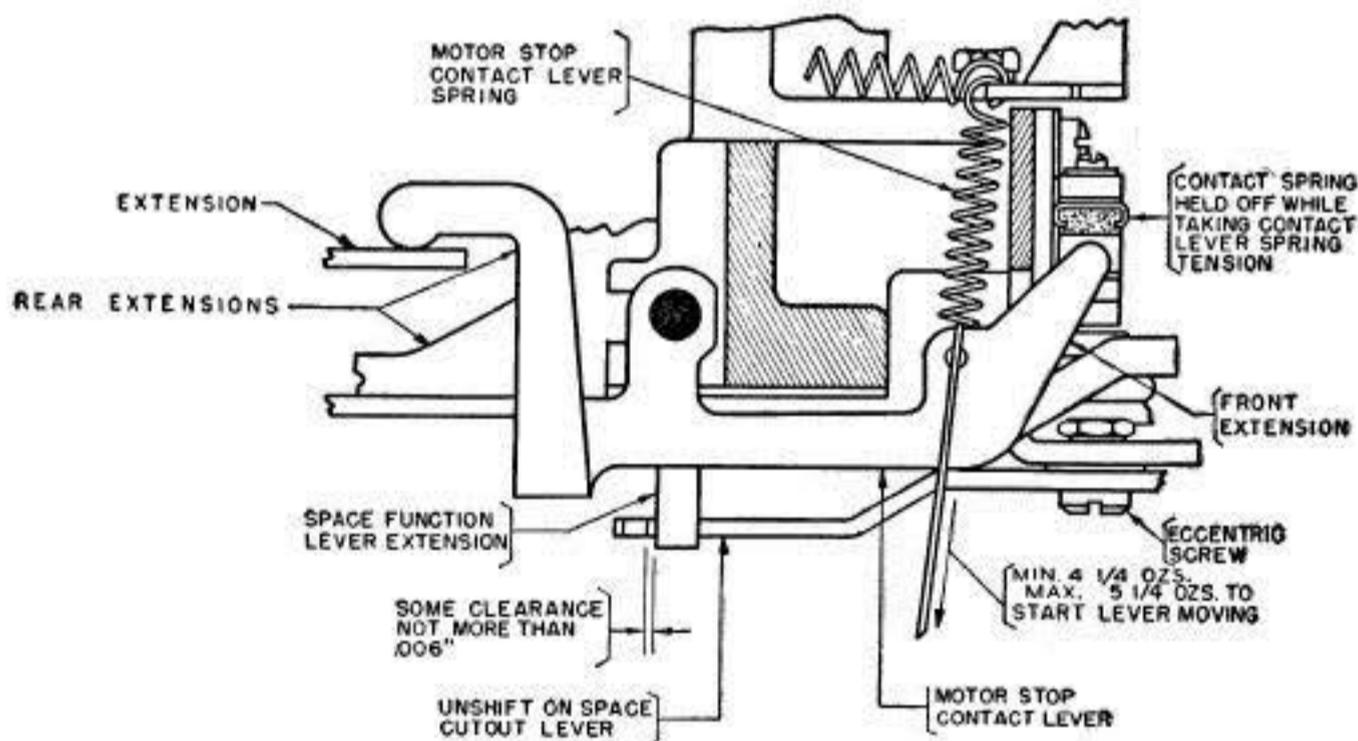


Fig. 4

3.12 The motor-stop contact-lever spring should have a tension of Min 4-1/4 oz, Max 5-1/4 oz when the contact-spring is held away from the lever.

Fig. 4

3.13 The motor-stop function-lever spring should have a tension of Min 5 lb, Max 6 lb when the motor-stop function-lever is resting against the rear edges of its vanes but not selected. Fig. 5

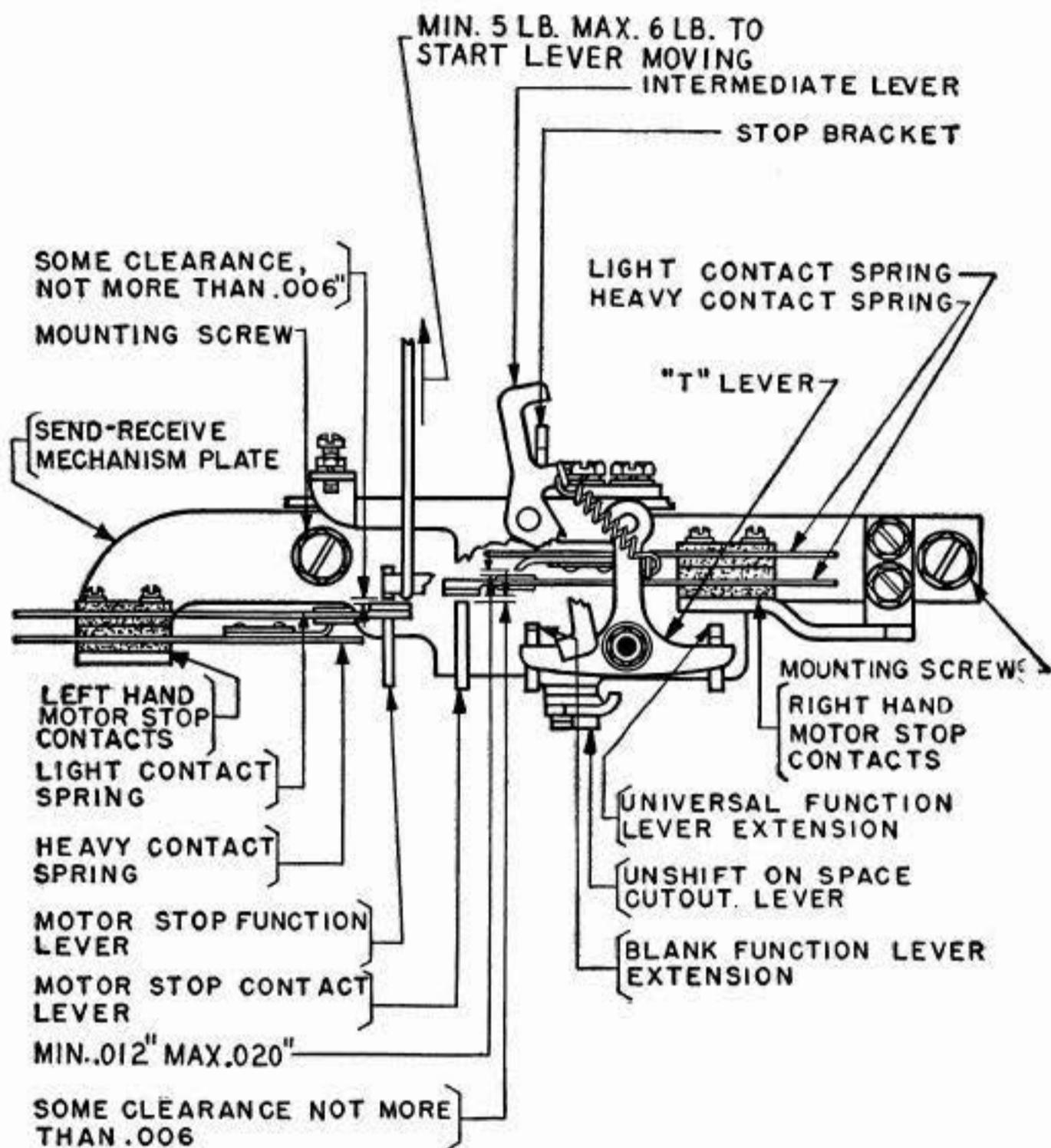


Fig. 5

3.14 **Motor-Stop Contact-Springs:** The right contact-spring assembly closed by the motor-stop contact-lever should meet the following requirements. Fig. 5

(a) The fibre insulator on the light contact-spring should clear the motor-stop contact-lever by not more than .006" when the printing bail is in its extreme rear position, the selector-armature is held operated and the inner motor-stop pawl (see Fig. 3) is engaged with its latch. **Fig. 5**

(1) To adjust, position the contact-spring bracket so that the contact-spring mounting surface is approximately parallel to the top edge of the send-receive mechanism plate. Then bend the light contact-spring if necessary, making sure it is not touching the upper (heavy) contact-spring.

(b) The gap between the contacts should be Min .012", Max .020" when the selector-armature is in an unoperated position and the outer motor-stop pawl is engaged with its latch.

(1) To adjust, bend the upper (heavy) contact-spring. Recheck (a). **Fig. 5**

3.15 The left contact-spring assembly closed by the motor-stop function-lever should meet the following requirements: **Fig. 5**

(a) The fibre insulator on the upper (light) spring should clear the lobe of the motor-stop function-lever by not more than .006" when the printing-bail is in its extreme rear position. **Fig. 5**

(1) To adjust, bend the upper (light) contact-spring making sure the lower (heavy) contact-spring is not bearing against the light spring.

(b) The left motor-stop contacts should just close, as gauged by eye, when the motor-stop function-lever is selected and the main-shaft is rotated until the right motor-stop contacts are about to open.

(1) To adjust, bend the lower (heavy) contact-spring. Recheck (a).

Note: On units using electrical motor control and so not equipped with a right motor-stop contact-spring assembly, this requirement should be disregarded and the gap between the contacts of the left spring assembly should be Min .010", Max .015" when the platen is in the LTRS position, STOP combination is set up and the main-shaft is rotated until the function-levers rest against the vanes.

(B) FIGS Blank H

Operation

3.16 **Motor Stop:** When the FIGS BLANK H signal is received, the motor will be stopped. The FIGS selection moves the 6th vane to the FIGS position and the Blank selection moves the Blank function lever and its extension down. The extension then moves the left arm of the T-lever down. The upper part of the T-lever, the intermediate lever pivot, the spring bracket and the reset lever all move to the left. The lower end of the intermediate lever is then moved against the right side of the blank function-lever extension and the blocking lever is carried to the left by the blocking-lever operating spring on the spring bracket, turning the complete lever in a clockwise direction. The motor-stop function lever is then free of the blocking lever and allowed to move forward into the vanes when the H signal is received. (The blocking lever will not block the motor-stop function lever again until the next spacing operation, and the universal function lever and its extension is moved down; every spacing operation of the printer moves the universal function lever and its extension down. This causes the right arm of the T-lever to move down, moving the upper part of the T-lever, the intermediate lever pivot, the spring bracket and the reset lever to the right.) (Figs. 5 & 6.) (Fig. 6 does not show the right-hand motor-stop contacts.)

3.17 The rest of the motor-control operations are the same as the FIGS H operations described in Paragraphs 3.01, 3.02 (2 and 3) and 3.03.

Lubrication

3.18 The FIGS Blank H and the FIGS H motor-stop mechanisms have the same oil lubrication points, except that the FIGS Blank H mechanism has one additional lubrication point.

(a) Blocking-lever bearing.

Requirements and Procedures

Note 1: Place the typing unit on a base.

Note 2: For identification of parts see Figs. 5 & 6.

Note 3: The requirements and procedures for the FIGS H mechanism also apply to this mechanism.

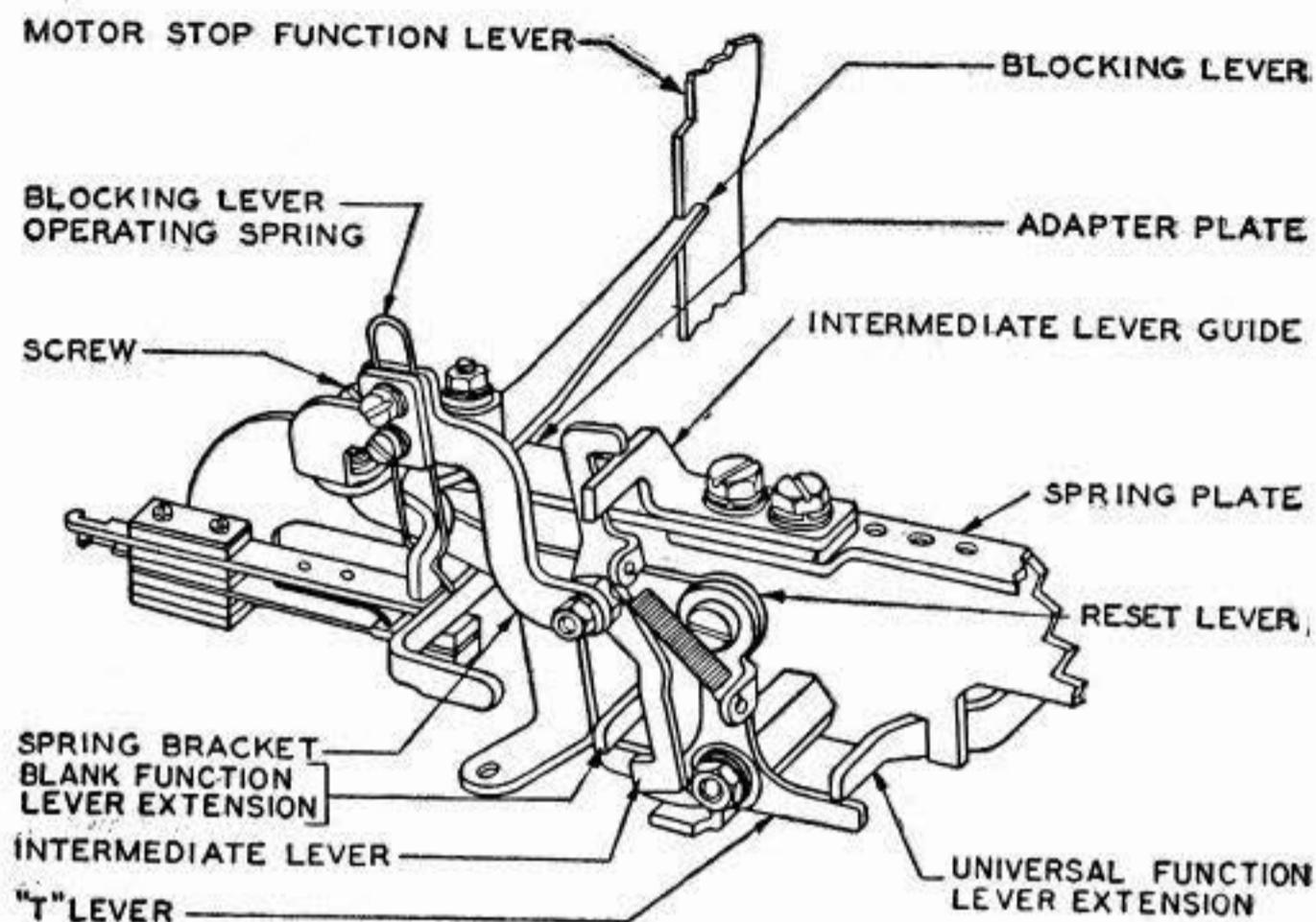


Fig. 6

3.19 The edge of the blocking lever should clear the front edge of the motor-stop function lever by not more than .002" and its rear projection should be in contact with the motor-stop function lever's right side when the space combination is set up on the vanes and the main-shaft is rotated until the function levers rest against the vanes. Gauge by eye and feel.

(a) To adjust, loosen the adapter plate or trigger assembly mounting-screws (the trigger assembly is part of the automatic carriage-return and line-feed assembly) and rotate the assembly around the right screw.

Note: If the motor-stop function lever blocks the travel of the printing bail when the FIGS H combination is selected and the motor-stop function lever is blocked by its blocking lever, recheck requirement 3.19.

Note: Requirements 3.20 and 3.21 should be met simultaneously. They apply only when unit is equipped with automatic carriage-return and line-feed mechanism.

3.20 There should be some clearance, Max .010", between the carriage-return latch-bar and the lobe on the carriage-return extension of the bail assembly when O is selected and the main shaft is rotated until the printing bail is in its extreme forward position.

(a) To adjust, position the trigger guide by means of its elongated mounting-holes.

3.21 There should be Min .005" clearance between the blocking edge of the trigger extension and the front edge of the automatic carriage-return and line-feed function lever, when the play is taken up to make this clearance a minimum and the main shaft is in the stop position.

(a) To adjust, position the trigger guide by means of its elongated mounting holes and recheck 3.20.

3.22 The blocking-lever operating-spring humps should travel approximately equal amounts above and below the center of the blocking-lever's forward extension as send-receive key is moved from Send to Receive position and vice versa. Gauge by eye.

(a) To adjust, position the spring.

3.23 The blocking-lever operating-spring left-arm hump should clear the blocking-lever by Max .004" when, (1) the send-receive mechanism is in the send position, (2) Blank selection is set up on the vanes, (3) the main-shaft is rotated until the blank function lever rests against the vanes, (4) the intermediate lever is not under the blank function-lever, (5) the T-lever is rotated clockwise until it touches the blank function-lever, and (6) the blocking-lever rear projection is resting against the line-feed function-lever.

(a) To adjust, bend the left arm of the spring.

3.24 The blocking-lever operating-spring right-arm hump should clear the blocking-lever by Max .004" after rotating the T-lever clockwise with the printing bail in its extreme rear position when (1) the send-receive mechanism is in the send position, (2) the T selection is set up on the vanes, (3) the main-shaft is rotated until the printing bail is in its extreme forward position, (4) the blocking-lever's blocking-edge and rear projection is in contact with the motor-stop function-lever's front and right sides, respectively, and (5) the T-lever is in contact with universal function-lever.

(a) To adjust, bend the right arm of the spring.

(C) **FIGS M**

3.25 This mechanism operates the same and has the same lubrication and adjusting requirements as the FIGS H mechanism (3.01-3.15). Except for the TP74038 FIGS M motor-stop function lever and the TP82994 name-plate, the operating components are the same.

**4. ELECTRICAL MOTOR CONTROL
(14 TELETYPEWRITER)**

(A) **FIGS H**

Operation

4.01 **Typing-Unit Contact Mechanism:** The typing unit contacts, for this mechanism, are mounted on the left-hand ribbon spool bracket and are operated by a lug on the H typebar. The FIGS selection moves the platen to the FIGS position. Then the H selection selects the H typebar. The lug on the H typebar strikes the operating lever as the pallet on the H typebar strikes the platen. The operating lever then moves the latch lever down, moving the latch-lever extension to the right, and away from the lower latching surface of the contact lever. At the same time the main bail starts to move upward in its travel, releasing its pressure upon the contact lever. This allows the contact-lever spring to pull the contact lever down; then the latch-lever extension is latched by the upper latching surface of the contact lever and the contact-lever adjusting-screw is moved upward, closing the upper pair of contacts. **Figs. 7 & 12**

4.02 At the same instant that the lug on the H typebar has completed striking the operating lever, and is returned to its normal position, the main bail moves downward. When the main bail has reached its downward position against the contact lever, the contact-lever adjusting-screw is moved down, opening the upper pair of contacts and moving the contact lever up, against the tension of the contact-lever spring. This allows the latch-lever extension to be pulled to the left by the latch-lever spring. The latch-lever extension is now returned to the lower latching surface of the contact lever.

4.03 **Relay Unit in the Base.** The relay circuit to shut the motor off is actuated when the contacts on the typing unit are momentarily closed. The operation of the relay unit is similar to the operation of the unit for the 15 teletypewriter discussed in Paragraph 5.02.

Lubrication

4.04 The parts indicated below should be lubricated at the same time as the other parts of the 14 teletypewriter. One drop of oil should be applied to the bearing points of each of the following:

(a) **Contact Mechanism on the Typing Unit**

1. Latch lever
2. Contact lever
3. Operating lever

(b) **Relay Unit in the Base**

1. Start-magnet armature and locking lever*
2. Stop magnet armature*

Requirements and Procedures

4.05 For the H-contact mechanism on the typing unit, the requirements and procedures are given by Figs. 7-13 inclusive. Fig. 7 shows the relation of the parts, while Figs. 8-13 inclusive, show the adjustments.

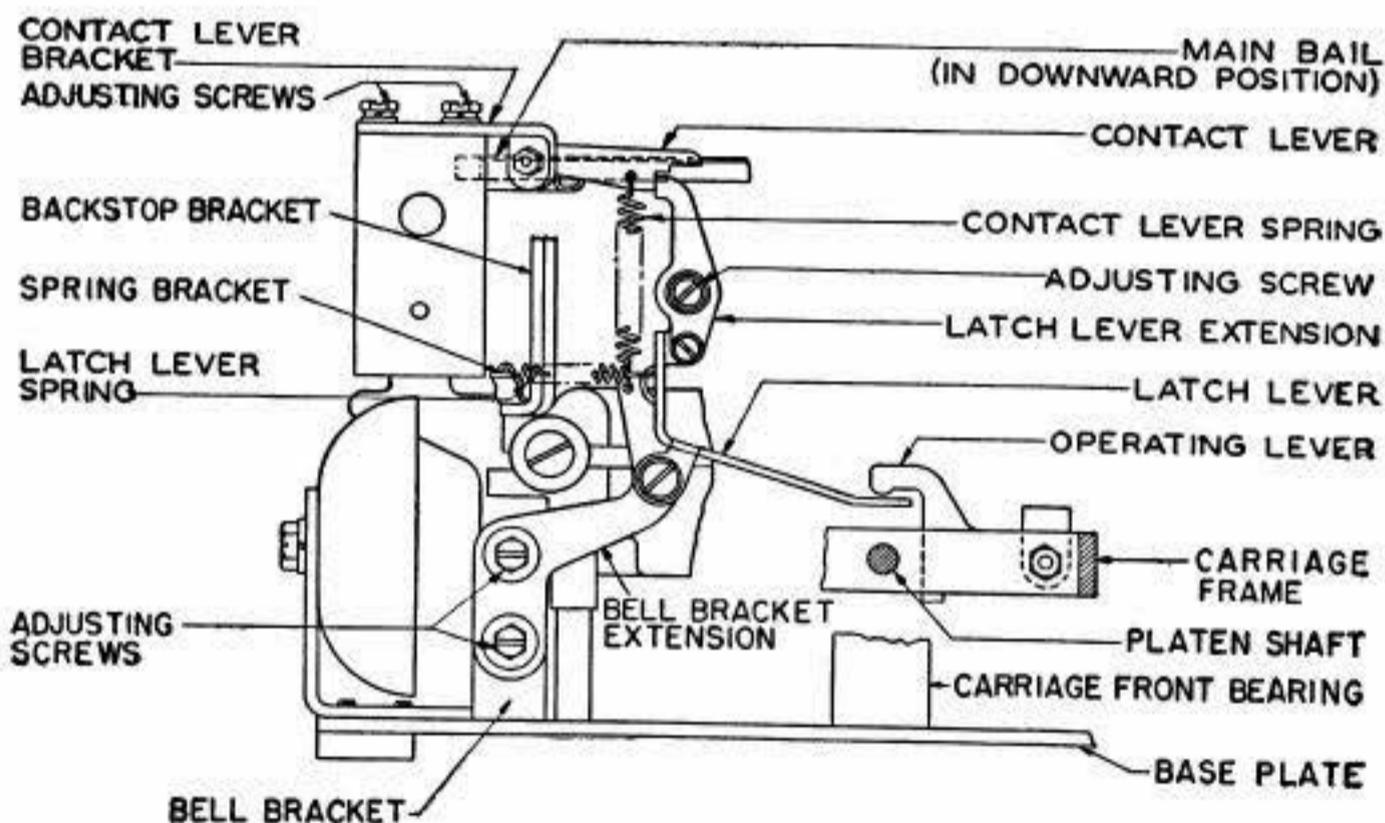


Fig. 7

* When lubricating the pivot points of the motor-stop units, care should be exercised to avoid getting oil between the armature and cores since oil at these points may cause trouble.

4.06 For the **relay unit** in the base, the requirements and procedures are the same as those given for the relay unit of the 15-type teletypewriter in Paragraphs 5.05 to 5.16, inclusive. However for the 14-type base, the base plate has to be removed to get at the relays.

REQUIREMENT:

- MAIN BAIL IN DOWNWARD POSITION.
- (a) MIN. .010", MAX. .045" CLEARANCE BETWEEN SIDE OF CONTACT LEVER AND SIDE OF SPACE RELEASE PULL-BAR
 - (b) CONTACT LEVER SHOULD REST APPROXIMATELY IN MIDDLE OF UPPER END OF LATCH LEVER EXTENSION

TO ADJUST:

POSITION CONTACT LEVER BRACKET

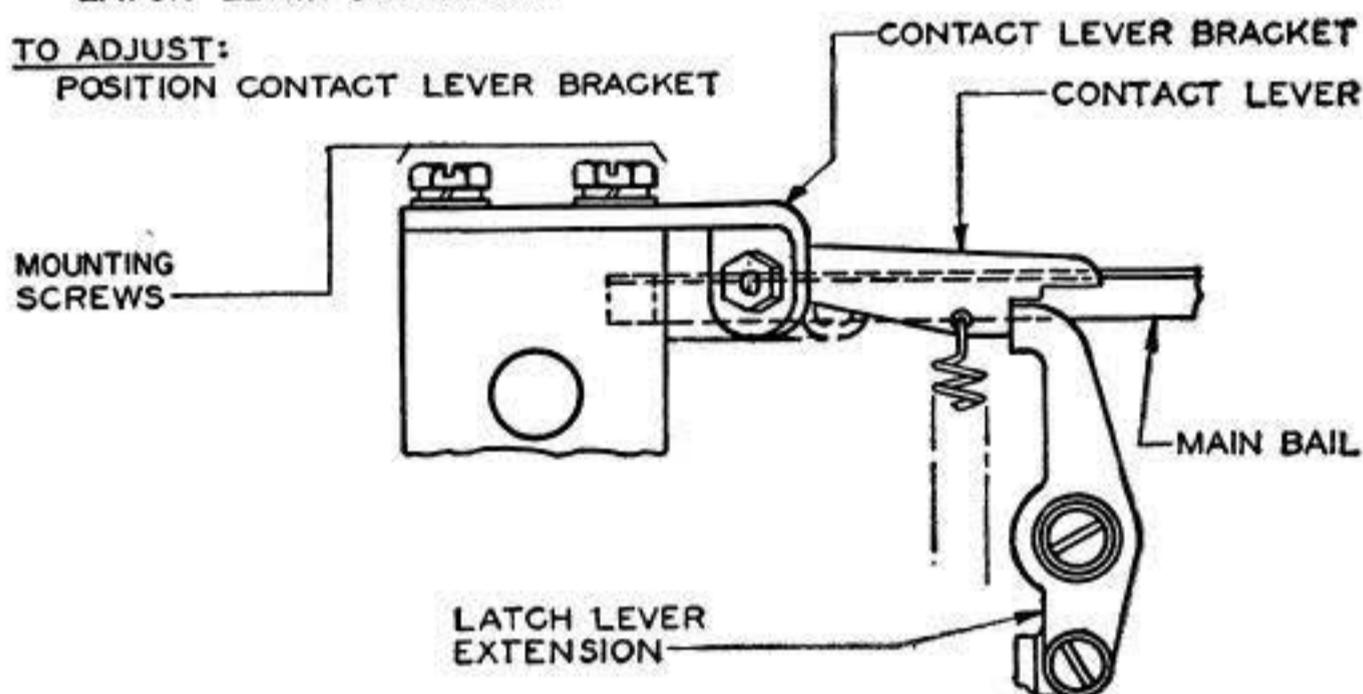


Fig. 8—Contact Lever Bracket

REQUIREMENT

MIN. .015" MAX. .030"

**CONTACT LEVER
RESTING AGAINST
MAIN BAIL**

**TO ADJUST
POSITION BELL
BRACKET EXTENSION**

**MAIN BAIL IN
DOWNWARD POSITION**

**LATCH LEVER EXTENSION
SET APPROXIMATELY
AT THE MID-POINT ON
ITS ADJUSTABLE LIMITS**

**CLAMPING
SCREWS**

**MOUNTING
SCREWS**

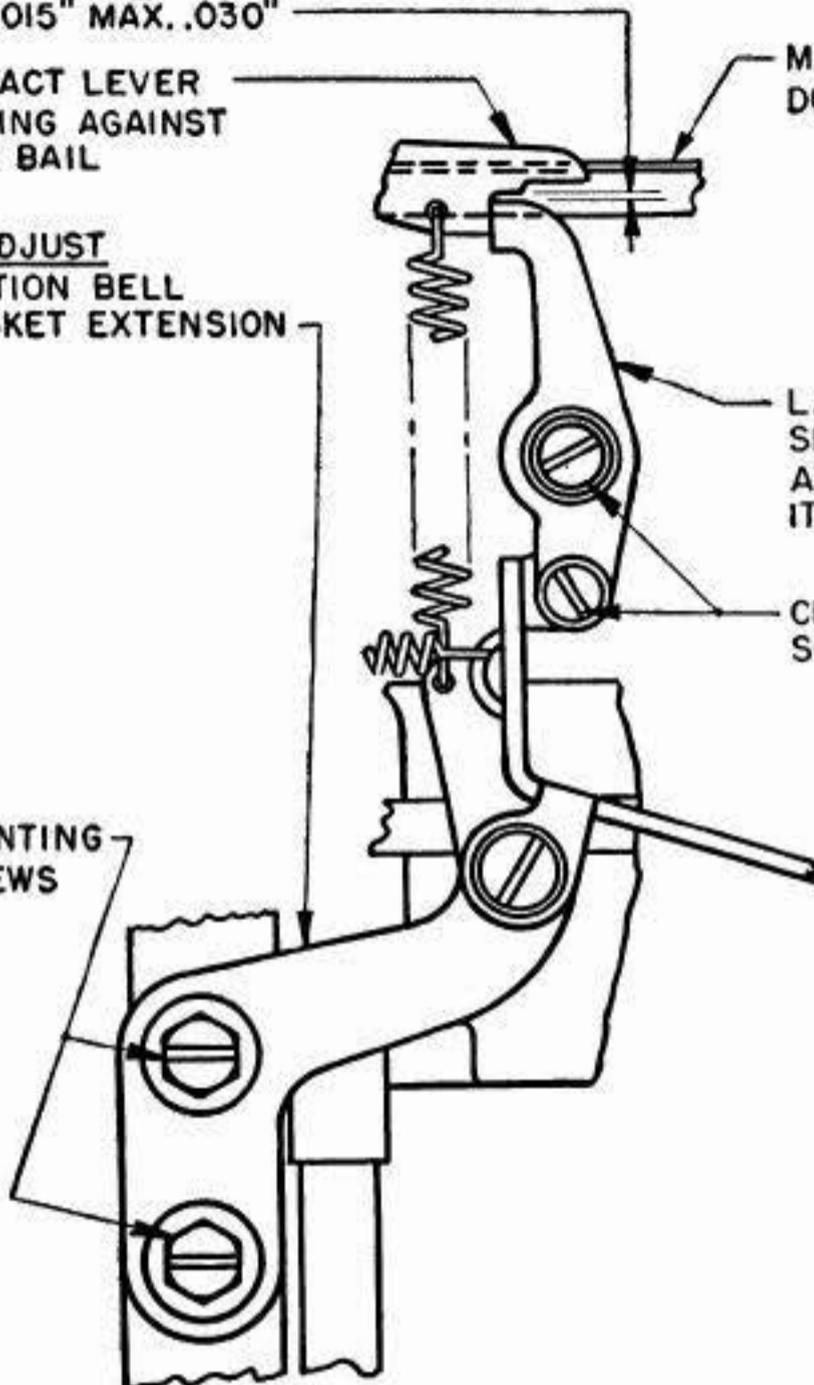


Fig. 9—Bell Bracket Extension

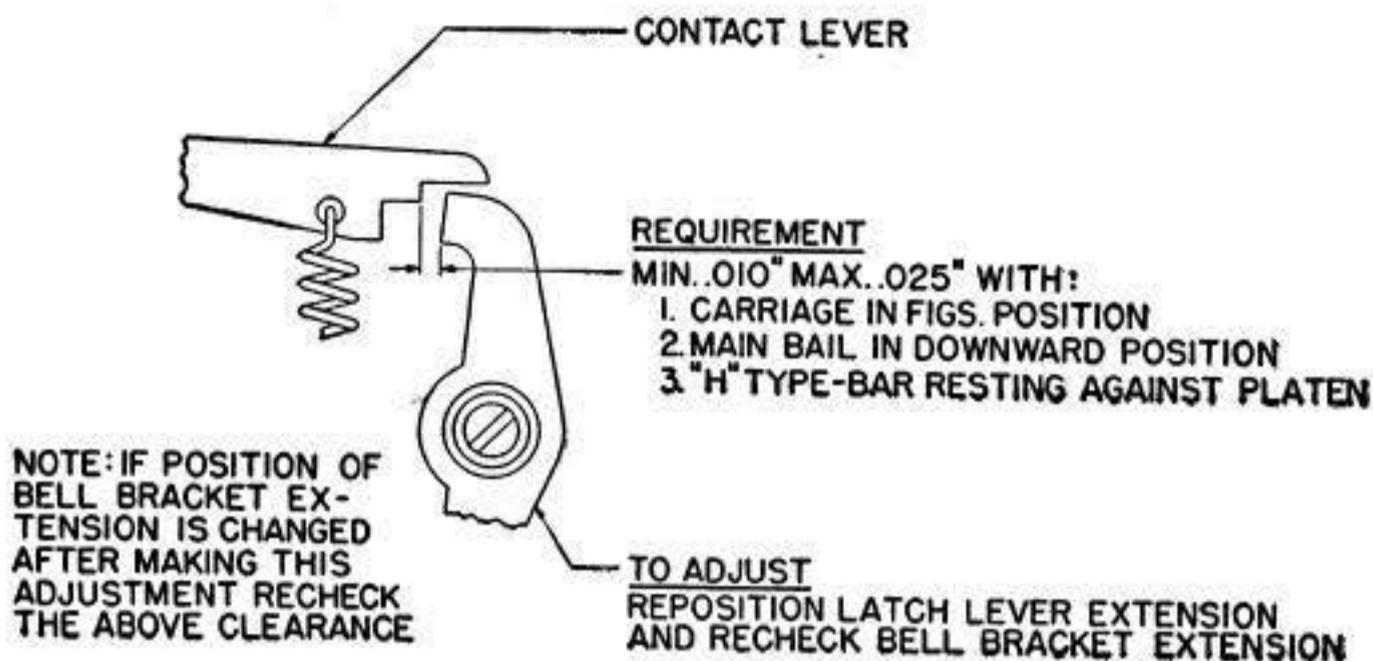


Fig. 10—Latch Lever Extension

REQUIREMENT

(a) CONTACT LEVER SPRING
 MIN. 9 OZ. MAX. 12 OZ.
 TO START LEVER MOVING
 WHEN MAIN BAIL IS IN
 DOWNWARD POSITION.

REQUIREMENT

(b) LATCH LEVER SPRING
 MIN. 1 OZ., MAX. 2 OZ.
 TO START LATCH LEVER
 MOVING WHEN MAIN
 BAIL IS IN DOWNWARD
 POSITION.

REQUIREMENT

(c) OPERATING LEVER SPRING
 MIN. 1/2 OZ. MAX. 1 1/2 OZ.
 TO START LEVER MOVING

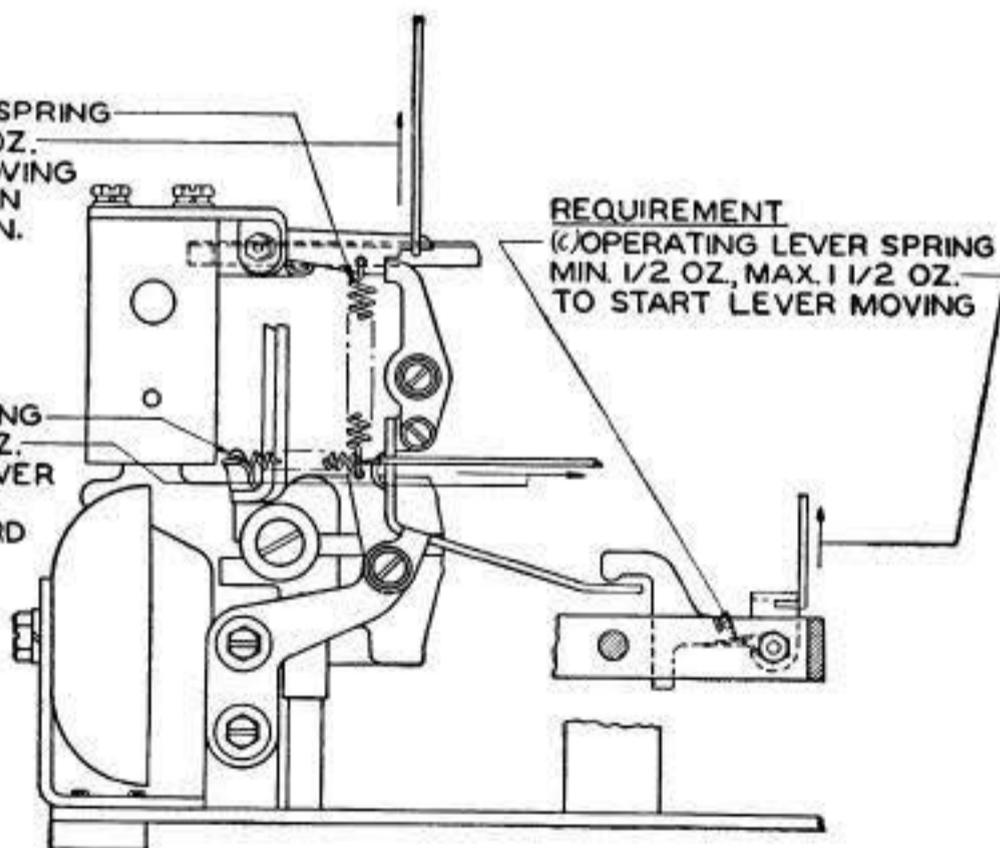


Fig. 11—Springs

REQUIREMENT

- REMOVE CONTACT GUARD. MAIN BAIL IN DOWNWARD POSITION
- (a) SPRING NO. 1 PERCEPTIBLE PRESSURE AGAINST STIFFENER WITH OTHER SPRINGS HELD AWAY
 - (b) SPRING NO. 2 MIN. 3/4 OZ. MAX. 1 1/2 OZ. WITH NO. 3 SPRING HELD AWAY.
 - (c) SPRING NO. 3 MIN. 1/2 OZ. MAX. 1 OZ. WITH NO. 4 SPRING HELD AWAY.
 - (d) SPRING NO. 4 MIN. 1 OZ. MAX. 2 OZ.

TO ADJUST
BEND SPRINGS OR
STIFFENERS

REQUIREMENT

(e) MIN. .010", MAX. .020"

TO ADJUST
BEND STIFFENER

UPPER
CONTACTS

LOWER
CONTACTS

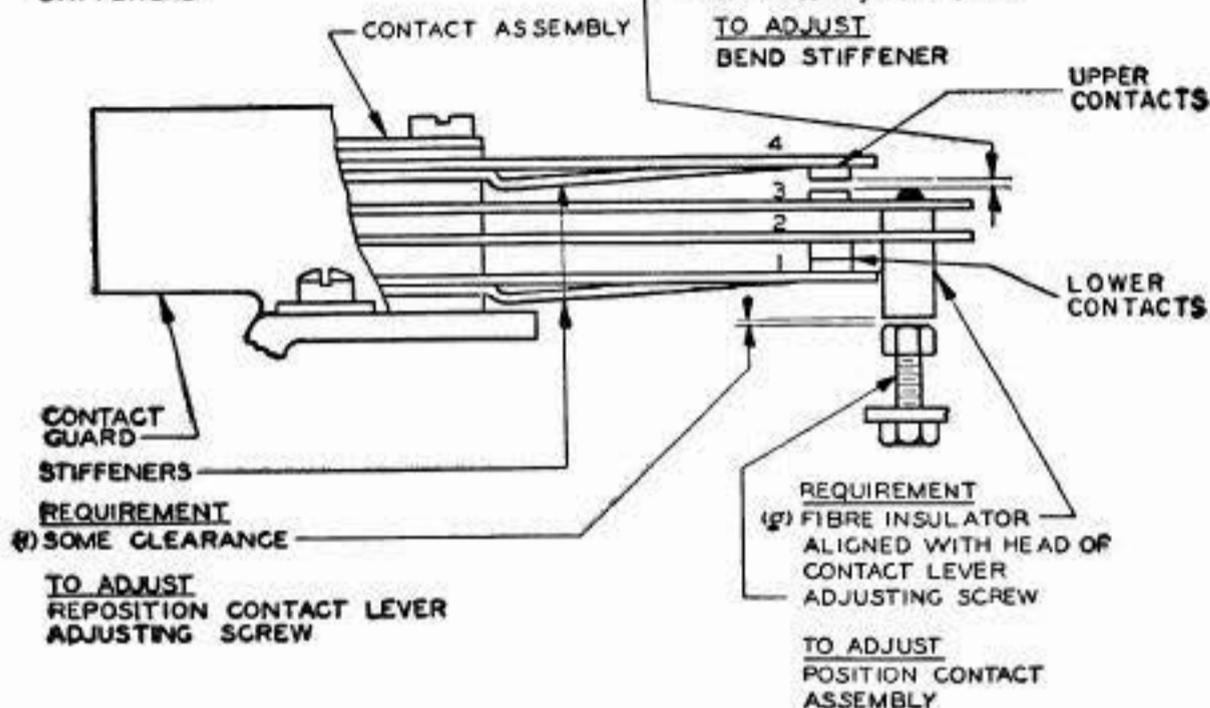


Fig. 12—Contacts

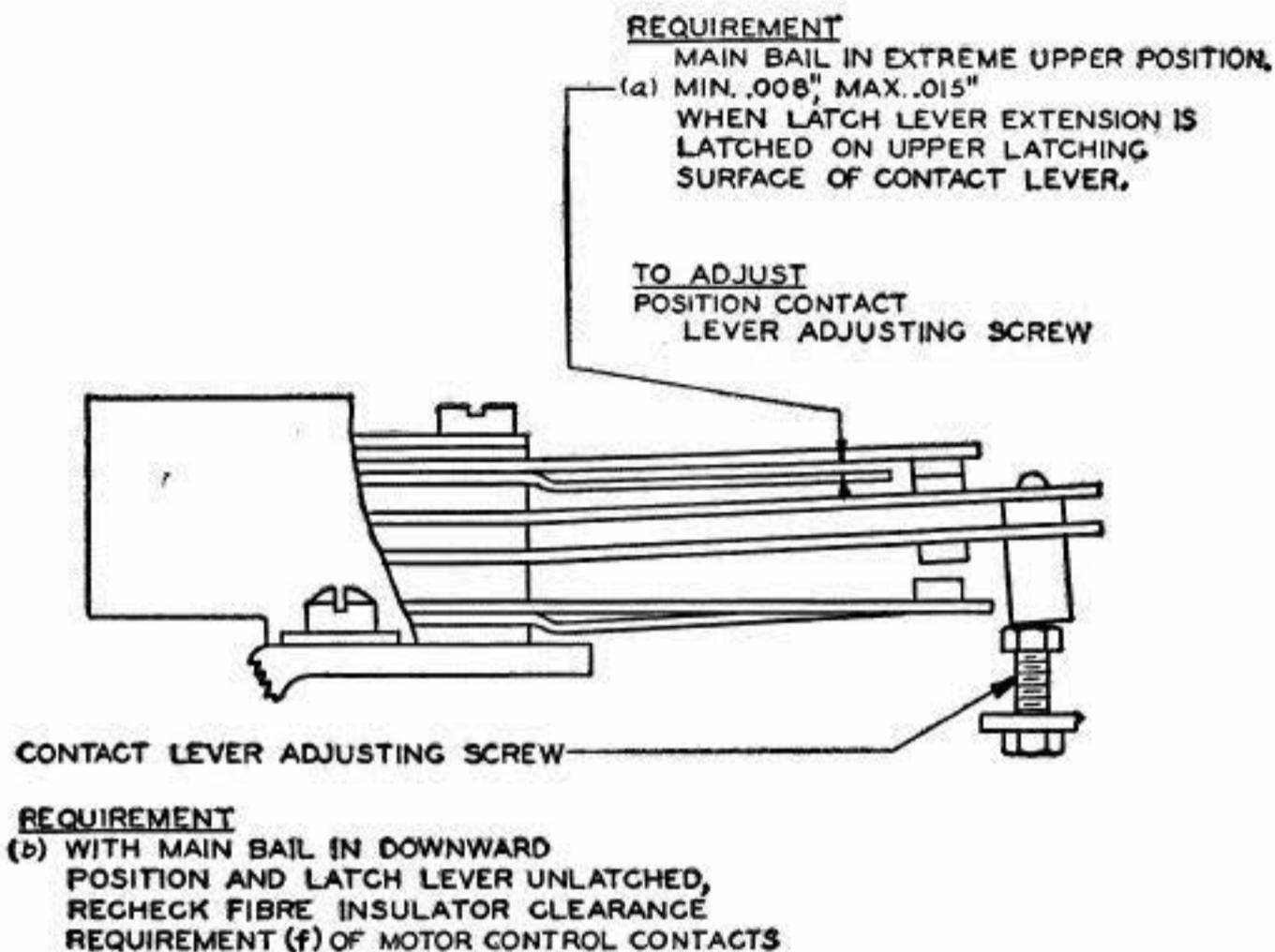


Fig. 13—Contact Lever Adjusting Screw

5. ELECTRICAL MOTOR CONTROL— 15 TELETYPEWRITER

(A) FIGS H

Operation

5.01 The **typing unit H contacts** are similar to the left-hand motor stop contacts of the built-in motor control mechanism shown in Fig. 5.

(a) When the FIGS H signals are received, the motor-stop (H) function lever is selected.

(b) As the motor-stop function lever moves into the vanes, its extension moves down, closing the left-hand motor-stop contacts momentarily. Closure of the contacts actuates the motor-stop relay circuit located in the base. The contacts are opened when the motor-stop function lever moves out of the vanes and its extension moves upward.

5.02 Relay Unit

(a) TTY Motor Running

Note: TTY terminals shown in Fig. 14 for 15D base with line relay. Solid lines indicate wiring within motor-control unit. All external wiring is shown in dotted lines.

(1) Start-magnet and stop-magnet not energized.

Fig. 14

(2) Armature A fully released.

(3) Start-magnet shorted by contacts 1 and 2.

(4) Power circuit to the TTY motor closed by contacts 5 and 6.

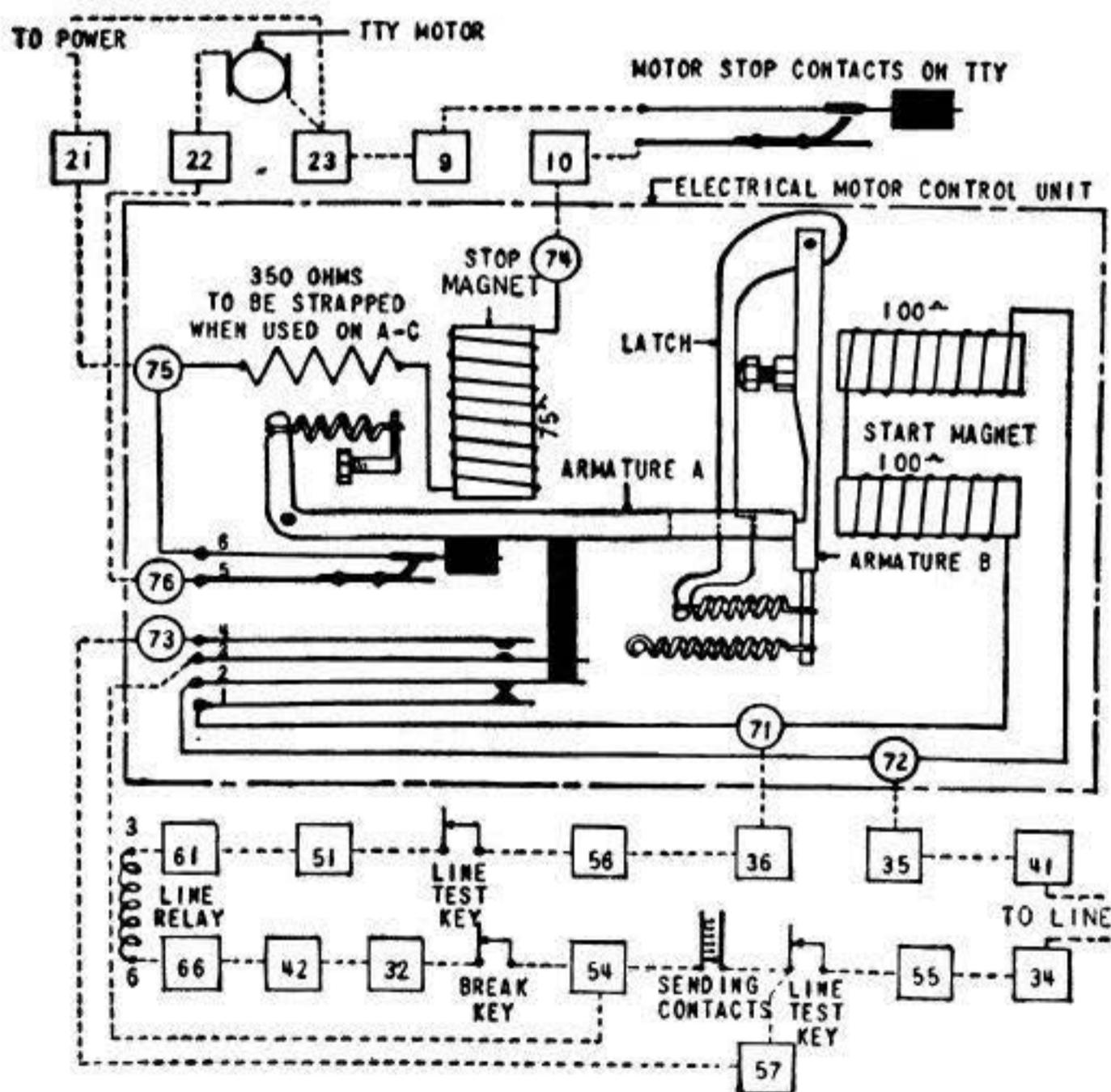


Fig. 14

(b) TTY Receives Motor-Stop Function

Motor-stop contacts close momentarily. (Functions 1 to 6 inclusive take place during the momentary close of the motor-stop contacts.)

- (1) Stop-magnet energized.
- (2) Armature A pulls up.
- (3) Contacts 5 and 6 open, stopping TTY motor.
- (4) Contacts 3 and 4 close, shorting TTY sending contacts.
- (5) Contacts 1 and 2 open, removing short from start-magnet which is then energized by line current.
- (6) Armature B pulls up, latch follows armature B through spring link.
- (7) Stop-magnet de-energized, armature A held in position by latch.

(c) TTY Motor Starts by Opening and Closing of Line
Line circuit opens.

- (1) Start-magnet de-energized.
- (2) Armature B releases, causing latch to release armature A.
- (3) Armature A held in operated position by notch in armature B.

Line circuit closes.

- (1) Start-magnet energized by line current.
- (2) Armature B pulls up releasing armature A to its unoperated position.
- (3) Contacts 5 and 6 close, starting TTY motor.
- (4) Contacts 3 and 4 open, removing short from TTY sending contacts.
- (5) Contacts 1 and 2 close, shorting start-magnet which then releases.

Lubrication

5.03 The parts indicated below should be checked at each routine visit and lubricated if necessary. One drop only should be applied to the points to be lubricated and care should be taken to avoid getting oil between the armatures and the cores. All excess oil should be removed.

- (a) Start-magnet armature and locking lever.
- (b) Stop-magnet armature.
- (c) Both loops of all helical springs.

Requirements and Procedures

5.04 The **H contacts** on the 15 typing unit are adjusted like the left-hand motor-stop contacts of the built-in motor-control mechanism, shown in Fig. 5. The requirements and procedures for the contact-spring assembly are given in Paragraphs 3.13 and 3.15. For the **relay unit** in the base, the following Paragraphs, 5.05 to 5.16, inclusive, apply.

5.05 Start-magnet core: With the start-magnet held in the operated position, there should not be more than .004" clearance between the armature and the shortest core. See Fig. 15 for location of parts.

- (a) To adjust, vary the number of TP82525 (.004") shims between the rear end of the start-magnet cores and the yoke.

Fig. 15

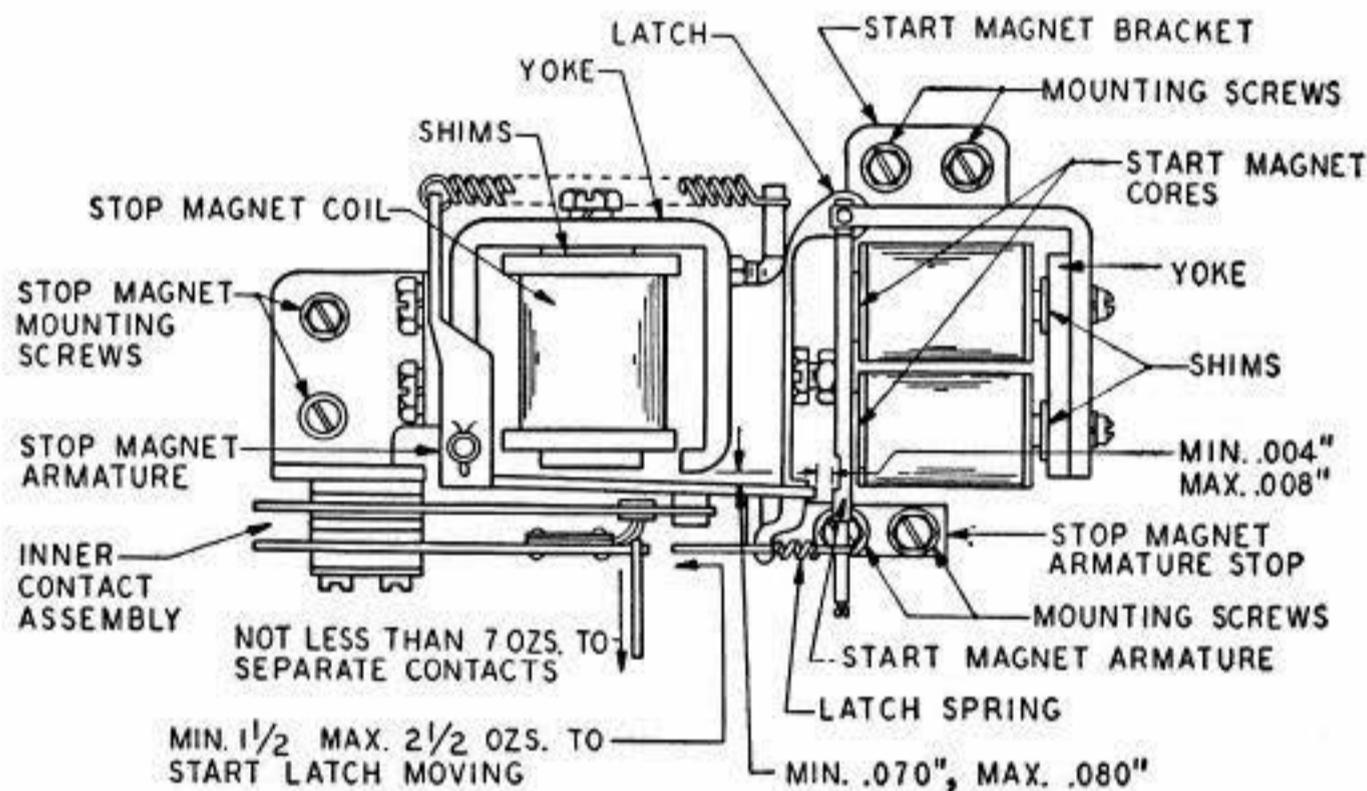


Fig. 15

5.06 Stop-magnet core: With the stop-magnet armature held in the operated position, there should not be more than .004" clearance between the armature and the pole face. See Fig. 16 for location of parts.

Fig. 15

- (a) To adjust, vary the number of TP8896 (.004") shims between the rear end of the stop-magnet core and yoke.

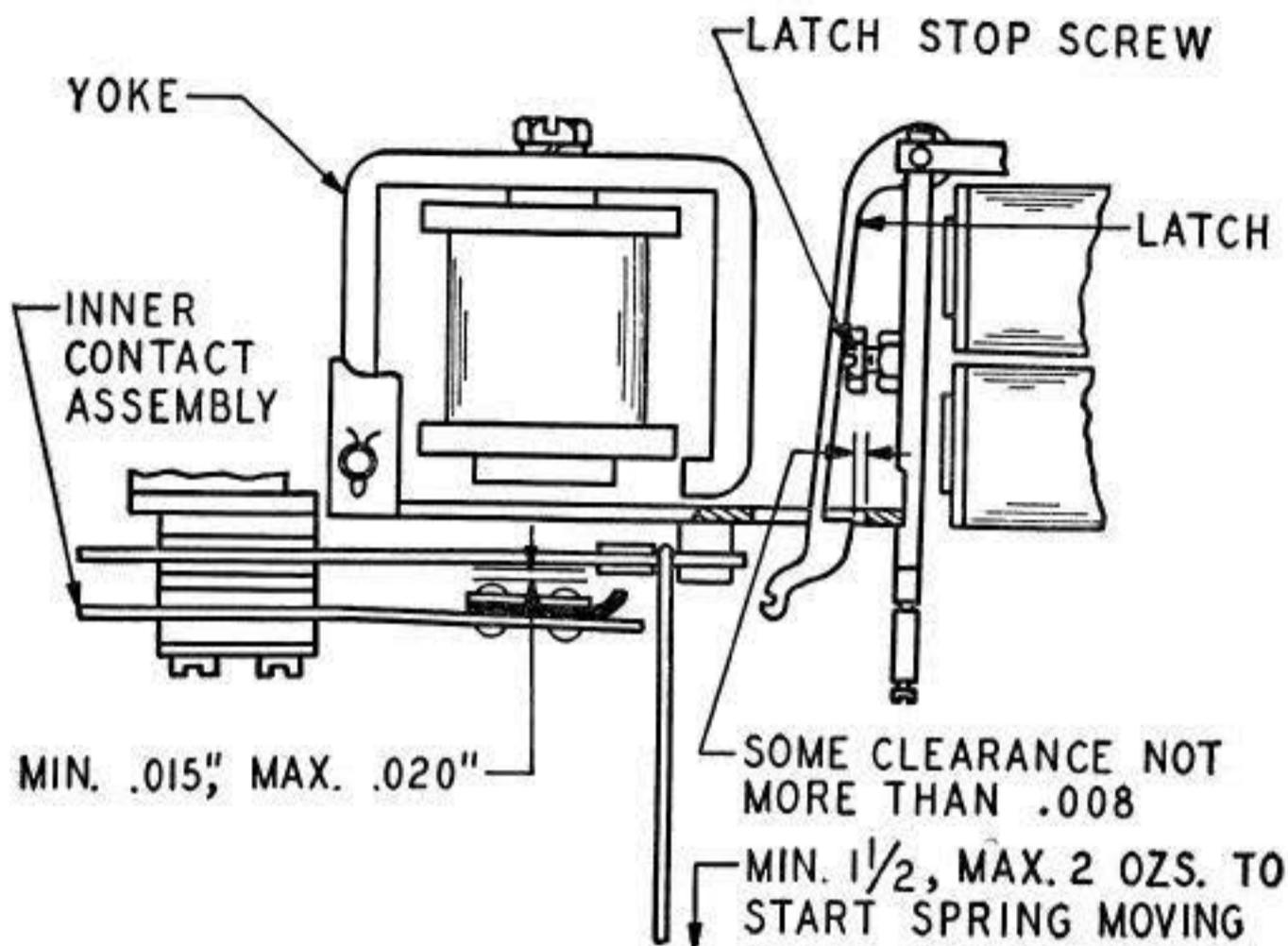


Fig. 16

5.07 Start-magnet bracket: With the stop-magnet armature held so that the inside edge lines up with the outer shoulder on the start-magnet armature, there should be Min .004", Max .008" clearance between the end of the stop-magnet armature and the start-magnet armature at the closest point.

Fig. 15

(a) To adjust, loosen the start-magnet bracket mounting-screws and shift the start-magnet bracket. Tighten the mounting-screws.

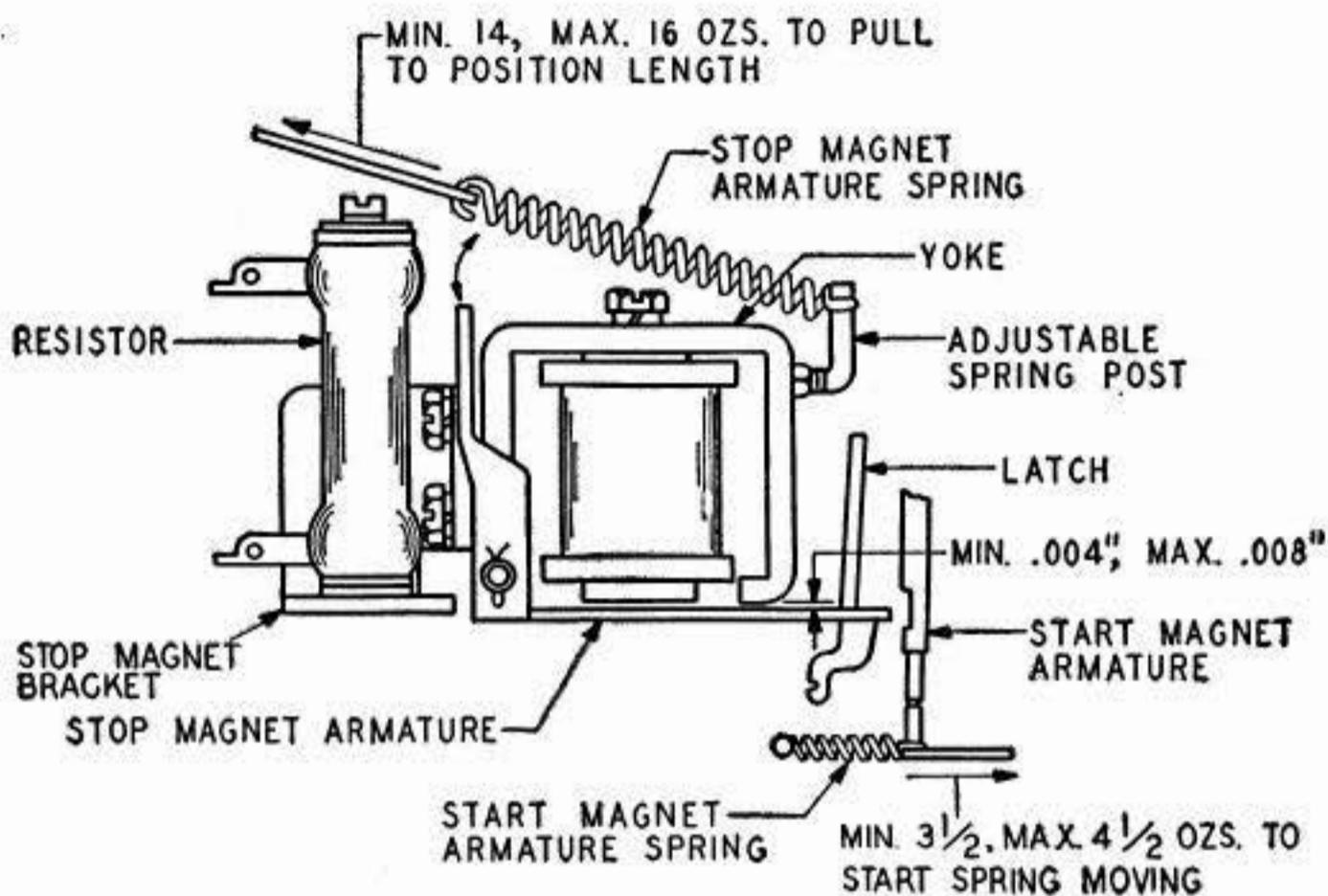


Fig. 17

5.08 Stop-magnet bracket: With the start-magnet armature held in its operated position and with the stop-magnet armature held in its operated position by the latch, there should be Min .004", Max .008" between the stop-magnet armature and the outer face of the yoke at the closest point.

Fig. 17

(a) To adjust, remove the porcelain resistor from its bracket, loosen the mounting-screws which mount the stop-magnet bracket to the base plate and shift the stop-magnet bracket. Tighten the mounting-screws and replace the porcelain resistor.

5.09 Stop-magnet armature-stop: With the stop-magnet armature released against its stop, there should be Min .070", Max .080" clearance between the stop-magnet armature and the outer face of the yoke.

Fig. 15

(a) To adjust, loosen the stop-magnet armature-stop mounting-screws and shift the stop-magnet armature-stop. Tighten the mounting-screws.

- 5.10 Latch stop-screw: With the stop-magnet armature held in the operated position by the notch in the start-magnet armature, there should be some clearance, (not more than .008") between the high part of the latching surface of the latch and the end of the slot in the stop-armature. **Fig. 16**
- (a) To adjust, loosen the latch stop-screw locknut and adjust the latch stop-screw. Tighten the locknut.
- 5.11 Stop- and start-magnet armatures and latch should be free from bind.
- (a) To check, unhook the stop-magnet armature spring, the start-magnet armature spring and the latch-spring. While checking the stop-magnet armature it will be necessary to hold the contact springs clear of the armature.
- 5.12 Stop-magnet armature-spring: With the stop-magnet armature held in its operated position, hook the 32-oz scale in the stop-magnet armature-spring eye. It should require Min 14 oz, Max 16 oz to pull the spring to its normal position length. **Fig. 17**
- (a) To adjust, loosen the adjustable spring-post locknut and adjust the spring-post. Tighten the locknut. Rehook all springs.
- 5.13 Start-magnet armature-spring: With the stop-magnet armature in its operated position, hook the 8-oz scale over the end of the start-magnet armature spring-post and pull horizontally in line with the spring. It should require Min 3-1/2 oz, Max 4-1/2 oz to start the armature moving. **Fig. 17**
- 5.14 Latch-spring: With both armatures released, hook the 8-oz scale over the latch between the spring and the shoulder and pull horizontally. It should require Min 1-1/2 oz, Max 2-1/2 oz to start the latch moving. **Fig. 15**
- Note: To check the requirements in 5.15 remove the two screws directly above the outer-contact assembly pileup and move the assembly out of the way. Tighten the inner-contact pileup mounting-screws.
- 5.15 The inner-contact assembly should meet the following requirements with the stop-magnet armature held operated by the notch in the start-magnet armature: **Fig. 16**
- (a) Hook the 8-oz scale over the long contact-spring between the bakelite insulator and the copper contact surface and pull at right angles to the spring. It should require Min 1-1/2 oz, Max 2 oz to start the spring moving away from the armature.
- (1) To adjust, bend the long contact-spring.

(b) There should be clearance of Min .015", Max .020" between the contact surfaces of the inner contact-springs.

(1) To adjust, bend the short contact-spring.

Note: Replace the outer contact-spring assembly and tighten the pileup mounting-screws.

5.16 The outer contact-spring assembly should meet the following requirements with the stop-magnet armature held operated by the notch in the start-magnet armature.

Fig. 18

(a) The fiber insulator of the long contact-spring nearest the stop-magnet armature should clear the armature by not more than .006".

(1) To adjust, bend the spring-stiffener nearest the armature.

(b) The short contact-spring nearest the armature should bear against its stiffener with a perceptible pressure when the other contact-springs are held off.

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

(c) Hook the 8-oz scale over the long contact-spring nearest the armature at the contact and pull at right angles to the spring. It should require Min 1 oz, Max 1-1/2 oz to separate the contacts when the other long spring is held away.

(1) To adjust, bend the long contact-spring nearest the armature.

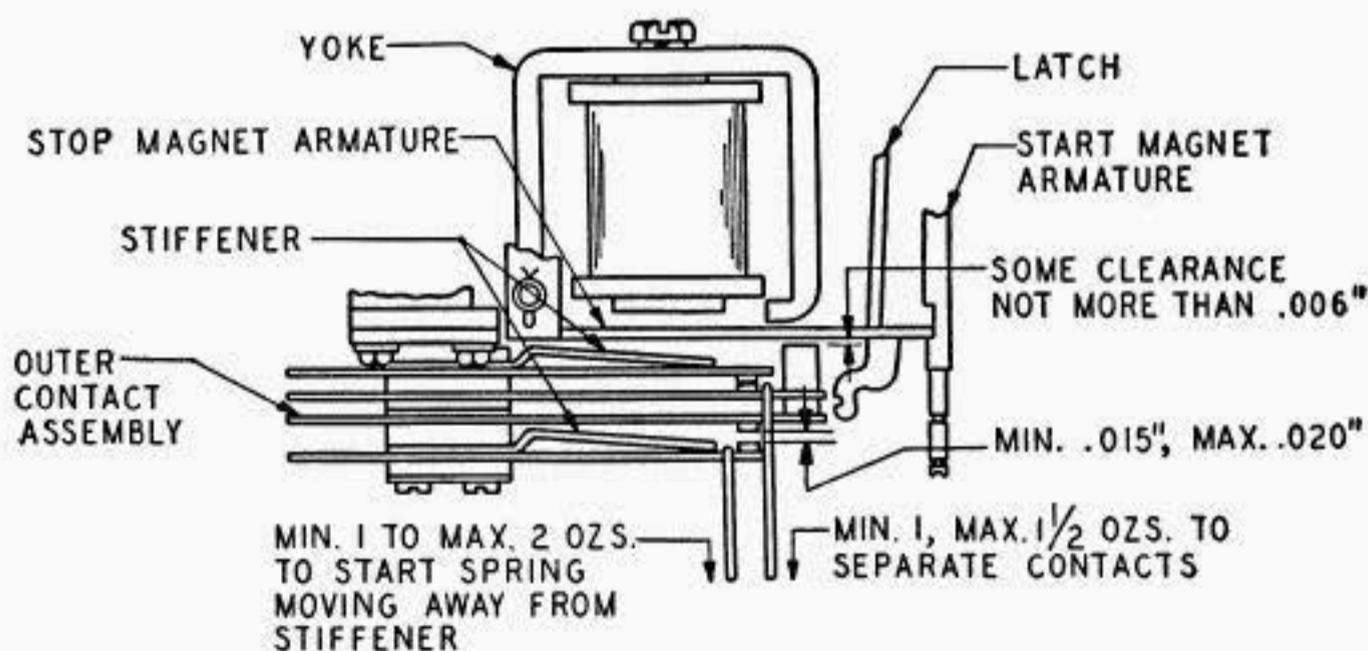


Fig. 18

6.02 When the motor-stop signal is received, the bell function lever moves against its function arm, the intermediate lever is rotated against the function pawl, and as the function pawls are moved toward the rear by the function cam, the bell function pawl is latched by its latch. As the function pawls continue traveling toward the rear, the operating lever is rotated, closing the motor-stop contacts. Closing of the contacts actuates the relay circuit in the base. When the function-bail roller rides to the low portion of its cam, returning the function pawls to their forward position, the operating lever is pulled to its unoperated position by its spring, opening the motor-stop contacts.

6.03 **The relay unit.** The operation of this relay unit is the same as that described for the 15-type machine in Paragraph 5.02.

7. 120 SUBSET MOTOR CONTROL (14 TELETYPEWRITER)

7.01 This motor-control device employs the same contact mechanism on the teletypewriter as was described in Part 4 for the electrical motor control on the 14 teletypewriter with the following exception:

- (a) The lower pair of contacts are used instead of the upper pair. When the contact-operating lever adjusting screw moves upward, these contacts are momentarily opened, to release the relay in the 120 subset, which initiates the action of turning the set off.

The 120-type subset takes the place of the relay unit in the base.

8. 120 SUBSET MOTOR CONTROL (15 TELETYPEWRITER)

(A) FIGS H

8.01 This motor-control device uses the same contact mechanism on the teletypewriter as was described in Part 5 for the electrical motor control and the material there given applies with the exceptions given below. In this case the contacts open momentarily when the motor-stop signal is received and the H function lever goes into selection. The 120-type subset takes the place of the relay unit in the base.

8.02 **H Contacts to Open Momentarily:** The left contact-spring assembly opened by the motor-stop function-lever should meet the following requirements:

- (a) Pressure between the contacts should be Min 4 oz, Max 6 oz measured on the lower (light) spring at the contact as the contacts separate when the printing bail is in its extreme rear position.

- (1) To adjust, bend the lower (light) spring.
- (b) Gap between the contacts should be Min .010", Max .015" when the platen is in FIGS position, H combination is set up, and main-shaft is rotated until the motor-stop function-lever is completely selected.

- (1) To adjust, bend the upper (heavy) spring. Re-check (a).

(B) FIGS Blank H

Note: The FIGS Blank H mechanism differs from the FIGS H mechanism only in the additional parts provided so that a Blank selection must come between the FIGS and the H selections. The contact mechanism on the teletypewriter is the same as that provided for the electrical motor control, except that the contacts are here arranged for momentary open instead of momentary close.

Operation

8.03 The special features of FIGS Blank H operation are the same as those discussed in Paragraph 3.16. Otherwise the operation is the same as the FIGS H operation.

Lubrication

8.04 The lubrication is the same as for the FIGS H mechanism except that one more part requires lubrication with oil, as follows:

- (a) Blocking-lever bearing.

Requirements and Procedures

8.05 The adjusting requirements and procedures for the FIGS Blank H mechanism are the same as for the FIGS H mechanism except for the changes occasioned by the presence of the Blank feature. The special adjustments for the Blank mechanism are given in Paragraphs 3.19 to 3.24, inclusive, for the built-in motor control in the 15-type unit.

9. 120 SUBSET MOTOR CONTROL (26 TELETYPEWRITER)

9.01 This motor stop operation is the same as that described in Part 6, except that the contacts give a momentary open to operate the subset relay. The 120 set takes the place of the relay unit in the base.