

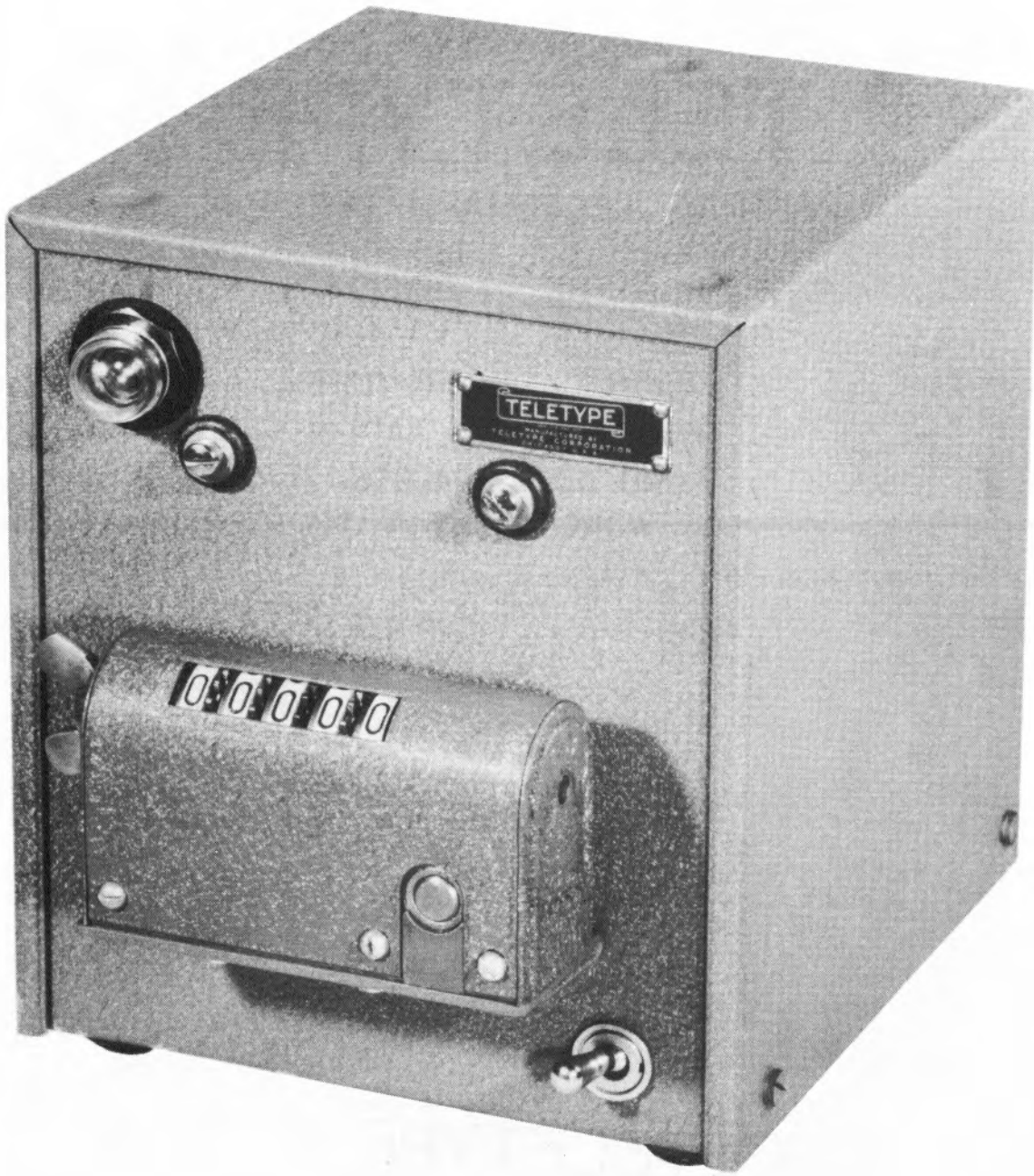
TELETYPE

PRINTING TELEGRAPH SYSTEMS

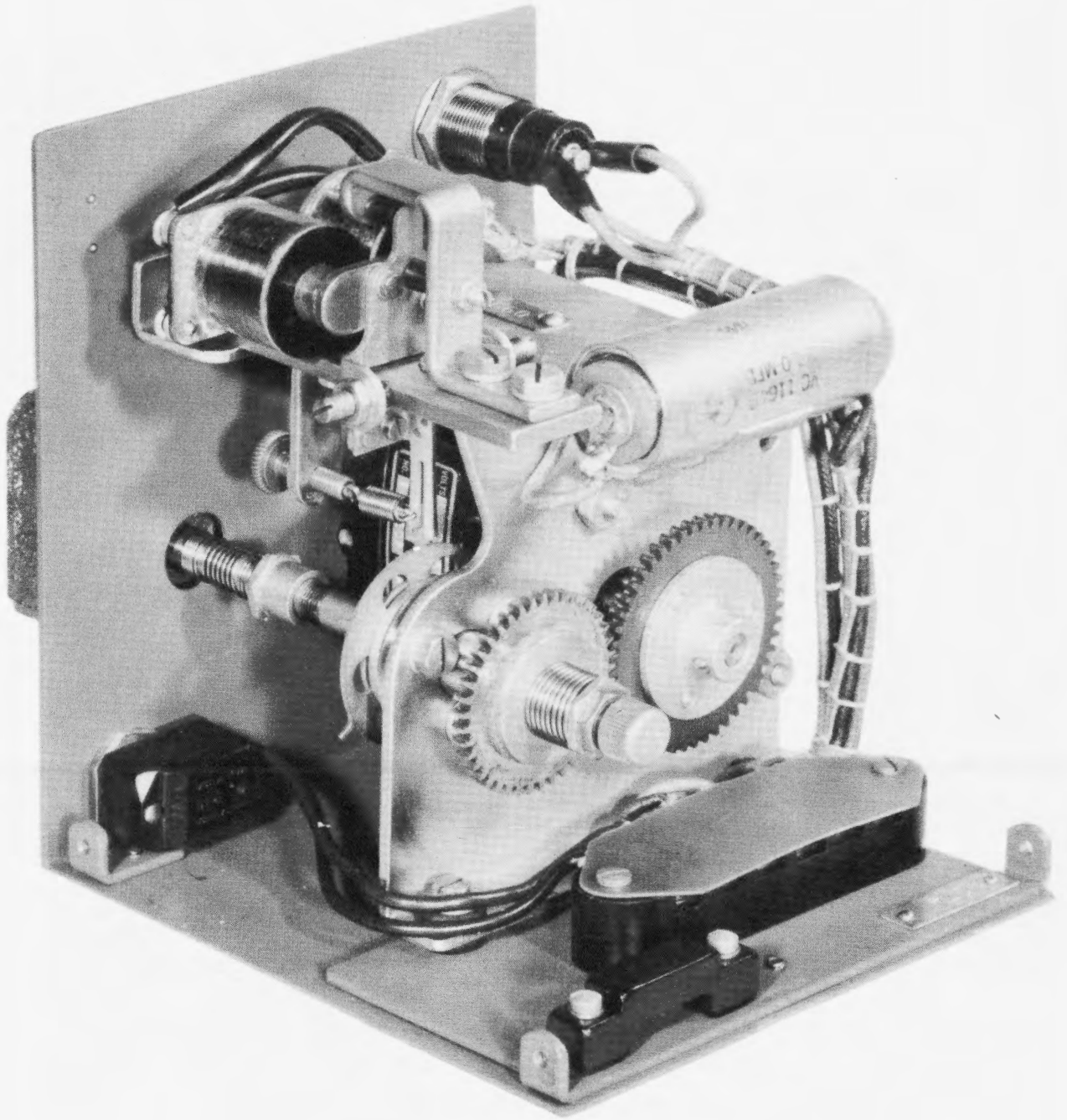
BULLETIN NO.218B

GENERAL DESCRIPTION
THEORY OF OPERATION,
AND ADJUSTMENTS
WORD COUNTER





WORD COUNTER



WORD COUNTER
(WITH COVER REMOVED)



LIST OF EFFECTIVE PAGES

JUNE, 1953

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SECTION I

GENERAL DESCRIPTION

1. GENERAL

a. The Teletype Word Counter is a device for registering the number of words passing over a printing telegraph circuit. It is designed for use in any .060 ampere printing telegraph circuit employing a start-stop five-unit code and neutral signals. The unit consists essentially of a mechanical counter driven by a 110 volt, 60 cycle synchronous motor through a gear chain and a friction clutch, and an escapement mechanism controlled by a selector magnet.

b. The unit is equipped with three small felt feet and the top of the cover contains three matching depressions. This arrangement makes it possible to mount one unit on top of another if so desired. The unit is approximately 6-1/8 inches high, 5-1/2 inches wide, and 7 inches deep.

c. The Word Counter is designed to operate at speeds of 60 or 75 words per minute (WPM). Conversion from one speed to another is made by changing gears.

SECTION 2

THEORY OF OPERATION

1. GENERAL

a. A terminal block located at the rear of the unit facilitates signal line and power source connections. Operation of a power switch to the "ON" position starts the motor and illuminates a neon lamp thereby giving a visual indication that the unit is in condition to receive signals.

b. The Word Counter will count words accurately when the motor is operating from a regulated 60 cycle power supply. If the 60 cycle a-c power supply is not regulated, some errors may be expected depending upon the degree of signal distortion in the telegraph circuit and the variation in power frequency. However, where extreme accuracy is not required, the Word Counter may be considered satisfactory for use on unregulated power supply.

2. OPERATION

a. The synchronous motor connects to the a-c power source while the selector magnet connects to the printing telegraph circuit. The motor drives an escapement mechanism controlled by the selector magnet assembly. The escapement mechanism is coupled to the mechanical counter unit. The gearing between the motor and the escapement ratchet wheel is such that the wheel rotates at one-sixth the speed of a receiving selector cam sleeve. That is, for 60 wpm operation, the speed of the main shaft, on which the ratchet wheel is mounted, is 70 rpm. The armature of the selector magnet is equipped with an extension having a MARKING and a SPACING arm for the control of an escapement ratchet wheel. The SPACING arm has a yield spring on its blocking face. The escapement ratchet wheel is driven through a friction clutch and has six stop lugs. Since the speed is one-sixth the speed of a receiving cam sleeve, and the escapement ratchet wheel is directly coupled to the counter unit, each stop lug corresponds to a single character or code combination and a full revolution of the ratchet wheel to six characters or one word.

b. The selector magnet follows the line signals of the printing telegraph circuit. If there is no current applied to the selector magnets, the spring on the SPACING arm of the armature extension will engage a stop lug on the ratchet wheel and block its rotation after being moved to a point against the SPACING arm. When current is applied and the armature is attracted to the selector magnet, the SPACING arm is replaced by the MARKING arm in the blocking position with negligible rotation of the ratchet wheel between the two stop positions. When released, the spring on the SPACING arm springs back to its normal position thereby preventing it from engaging the stop lug released in a MARK-TO-SPACE transition. Thus, the ratchet wheel will step on MARK-TO-SPACE transitions but not on SPACE-TO-MARK.

c. In operation, the ratchet wheel is blocked by the MARKING arm of the armature extension under a normal closed line condition. The START impulse which precedes the signal code combination causes the armature to release and the extension releases the ratchet wheel to permit rotation. The gear ratio is such that the armature will have responded to all the code impulses of a code combination by the time the next stop lug on the ratchet wheel approaches the armature extension. At this point the STOP impulse will cause the ratchet wheel to be blocked by the MARKING arm of the armature extension. When the subsequent START pulse is received, the cycle is repeated. Thus, for every six groups of code combinations received, the ratchet wheel will have rotated 360° and the counter will have registered one count.

d. Under normal traffic conditions the SPACING arm of the armature extension does not come into play since the armature is in the operated (MARKING) position when the stop lug on the ratchet wheel makes contact with the armature extension. The SPACING arm makes contact with the ratchet wheel only when the signal line current is interrupted or when excessive signal distortion exists.

e. The unit is equipped with a manual control for resetting of the counter.

SECTION 3

MAINTENANCE

1. ADJUSTMENTS

a. GENERAL

(1) The following requirements and adjusting procedures for the maintenance of the Teletype Word Counter are arranged in a sequence that would be followed if a complete readjustment of a unit were undertaken. In following such a procedure, parts or assemblies which are removed to facilitate adjustment should not be replaced until all other adjustments, which would be facilitated by the removal of these parts, are made. If any adjustment is changed, related adjustments should be checked.

(2) The spring tension values indicated in this bulletin are scale readings which should be obtained when Teletype scales are used as specified. Springs which do not meet the requirements specified and for which no adjusting procedure is given, should be replaced by new springs. Ordering information may be obtained from the Teletype parts bulletin.

(3) Before proceeding with any adjustment, read the applicable portion of the adjusting text carefully. After the adjustment is completed, be sure to tighten any screws or nuts which may have been loosened. If a part that is mounted on shims is to be dismantled, the number of shims used at each of its mounting screws should be noted so that the same shim pile-ups can be replaced when the part is re-mounted.

b. WORD COUNTER

NOTE

The motor has built in speed reduction gears. Do not attempt to turn it rapidly by hand. When moving or tightening parts make sure that the ratchet wheel stop lugs are clear of the armature extension stop arms.

(1) Ratchet Wheel Position (Figure 1)

Loosen the motor gear hub set screw and remove the gear and hub assembly. The main shaft should rotate freely with less than .002" end play. To adjust, position the ratchet wheel with its set screw loosened. If necessary, disconnect the counter as follows: With the motor shut off and the ratchet wheel stop lugs held clear of the stop arms, hold the shaft with a wrench on the flat surface of the clutch member and remove the hex cap nut and attached drive spring.

(2) Drive Spring Position (Figure 1)

The drive spring shall grip both shafts with the hook end engaging the notch in the hex cap nut on the main shaft and the other end at least 5 turns on the counter shaft. To adjust, remove counter mounting screws, remove hex cap nut as described above, and remove counter with hex cap nut and drive spring still attached. To increase or decrease the number of turns of the drive spring on the counter shaft, hold the counter shaft and rotate the spring in a direction to loosen its coils while pushing or pulling at the same time. Replace hex cap nut, with attached drive spring and counter, on main shaft. Replace counter mounting screws.

(3) Counter Position (Figure 1)

The counter shaft should turn freely and align with the main shaft. To adjust, position the counter in its oversize mounting holes with the mounting screws loosened.

(4) Motor Position (Figure 2)

The motor gear and the main shaft gear should engage for at least 3/4 their thickness when the motor shaft end play is taken up in each of two directions. The gears should rotate freely with minimum backlash. To adjust, position the motor gear and hub assembly with its set screw loosened to meet the first requirement and position the motor by means of its oversize mounting holes to meet the second requirement.

(5) Clutch Torque (Figure 3)

The clutch torque should be measured after the motor has been running at least ten minutes with the ratchet wheel stationary. Hook an 8 ounce scale under a stop lug on the ratchet wheel and pull vertically in a direction to cause reverse rotation of the wheel. It should require 3-1/4 to 4-1/4 ozs. to just start the ratchet wheel moving. The motor should be turned off before making the adjustment. To adjust, position the torque adjusting nut with the lock nut loosened (left hand thread) being careful not to jam the stop lugs of the ratchet wheel against the stop arms of the armature extension. Tighten the lock nut with similar caution.

(6) Armature Spacing Bumper Screw Position - Preliminary (Figure 4)

With the armature against the spacing bumper, the stop lugs on the ratchet wheel should pass through the slot in the armature extension with at least .002" clearance on each side. To adjust, position the spacing bumper screw with its lock nut loosened.

(7) Armature Spring Tension - Preliminary (Figure 4)

With the stop lugs on the ratchet wheel clear of the armature extension stop arms, apply the push end of an 8 ounce scale to the upper armature mounting screw and push horizontally. It should require 1-1/4 to 1-1/2 ozs. to just start the armature moving away from the spacing bumper. To adjust, position the armature spring adjusting screw with its lock nut loosened. Recheck preceding adjustment.

(8) Armature Marking Bumper Screw Position - Preliminary (Figure 5)

With the motor running and the armature operated slowly by hand, the ratchet wheel should escape from the yield spring of the spacing stop arm of the armature extension just before the armature strikes the marking bumper. To adjust, position the marking bumper screw with its lock nut loosened.

(9) Armature Position (Figure 6)

The armature should pivot freely on its pivot screws with a minimum amount of end play. The marking stop arm of the armature extension should meet a stop lug on the armature squarely and stop it in a vertical position. To adjust, position the armature by means of its pivot screws to meet the first requirement and position the armature extension by means of its oversize mounting holes to meet the second requirement. If necessary, reposition the entire magnet assembly by means of the oversize holes in its base plate.

(10) Armature Spacing Bumper Screw Position - Final (Figure 7)

With the motor running and the armature manually operated to the marking position, place a .002" gauge between the armature and the spacing bumper and release the armature. The yield spring on the spacing arm of the armature extension shall stop all stop lugs on the ratchet wheel and still meet the preliminary requirement. To adjust, refine the spacing bumper screw position and use a .003" gauge in place of a .002" gauge between the armature and the spacing bumper.

(11) Magnet Bracket Position (Figure 8)

With the motor turned off and the selector magnet steadily energized, the armature should clear both magnet cores by at least .002" and should be approximately equidistant from them. To adjust, position the magnet bracket by means of its oversize mounting holes. While positioning magnet bracket for this requirement, see that the magnet cores do not extend beyond either end of the armature.

(12) Armature Marking Bumper Screw Position - Final (Figure 5)

With the motor running and the magnet energized, the ratchet wheel will be stopped by the marking stop arm of the armature extension.

When the ratchet wheel is backed up manually it should clear the yield spring on the spacing arm of the armature extension. To adjust, refine the marking bumper screw position. Recheck magnet bracket position.

(13) Armature Spring Tension - Final (Figure 4)

Connect the Word Counter into a .060 ampere loop containing a variable resistor and send an undistorted test message to the unit. The counter should operate without error while the line current is being reduced to .048 ampere and should fail before the line current is reduced to .035 ampere. To adjust, refine the armature spring tension.

2. LUBRICATION

a. GENERAL

(1) The oil and grease specified in Specification 5288S should be used to lubricate the equipment.

(2) Unless otherwise specified, one or two drops of oil at each of the places indicated will be sufficient. Use oil for lubrication at all of the places listed in the following, except where the use of grease is specified. Avoid excessive lubrication. Do not allow lubricant to get on magnet pole faces or armature.

(3) Oil both loops of all helical springs.

b. WORD COUNTER

(1) Motor oil holes (2). Motor oil holes in upright position - 5 drops each hole.

(2) Motor shaft bearing at gear end.

(3) Counter drive shaft bearings (2).

(4) Main shaft bearings (2).

(5) Armature pivot screws (2).

(6) Clutch felt washers - saturate.

(7) Gear teeth - light film of grease.

(8) Armature extension blocking arms - oil - grease - oil on blocking surface.

(9) Main shaft. Hold ratchet wheel stop lugs clear of blocking arms and remove knurled cap nut (left hand thread) from rear of main shaft. Remove felt wick from shaft and saturate. Reinsert wick and tighten cap nut with fingers only. A rubber ring inside the cap nut provides locking and sealing action.

(10) Counter. The counter requires lubrication very infrequently. When necessary, remove the counter and its cover and lubricate as follows:

(a) Wheel bearings - oil sparingly.

(b) Gears - oil - grease.

(11) Drive spring does not require lubrication.

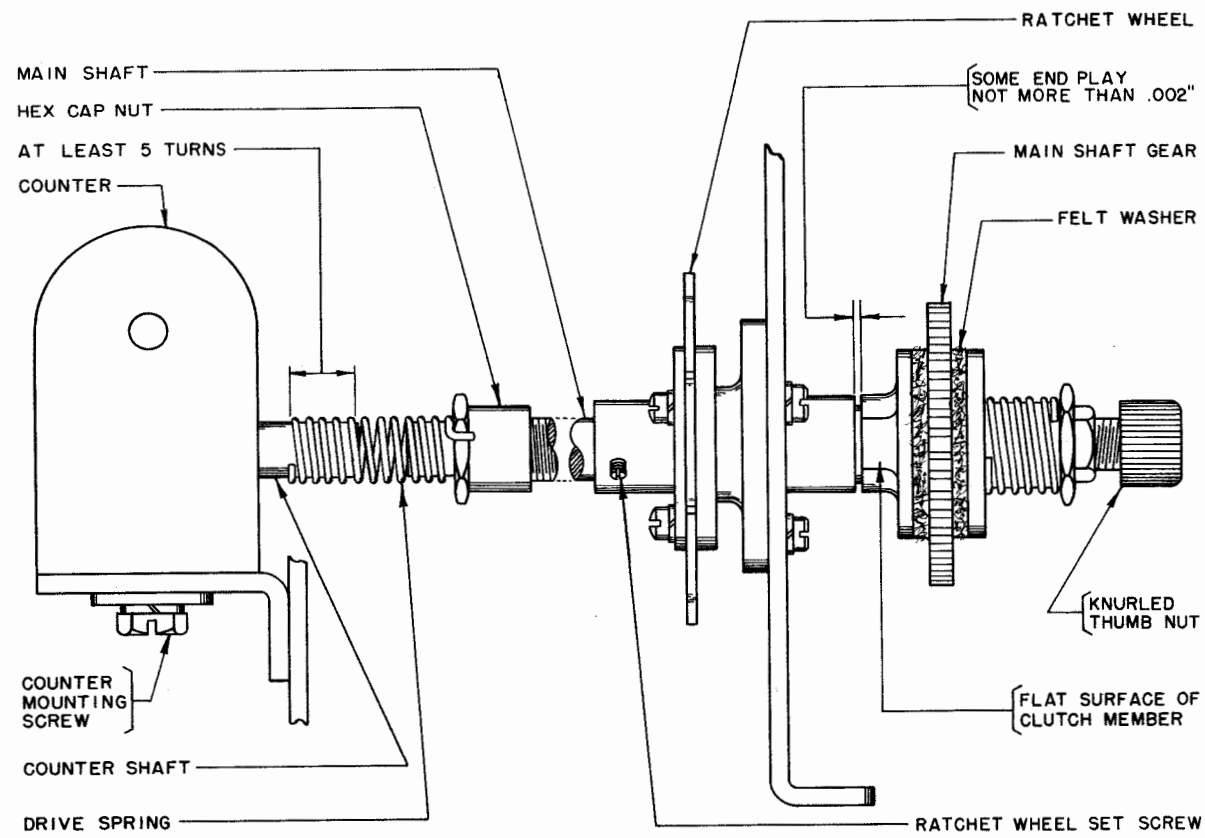


FIGURE 1

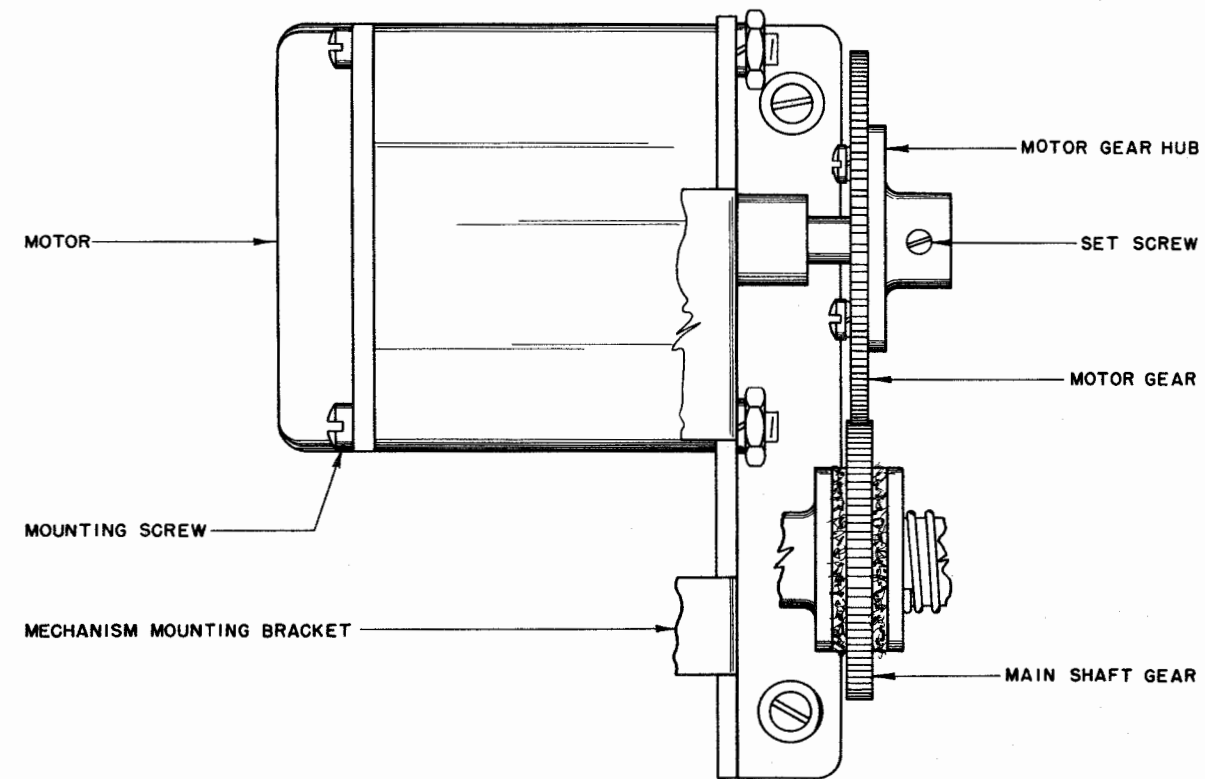


FIGURE 2

ORIGINAL

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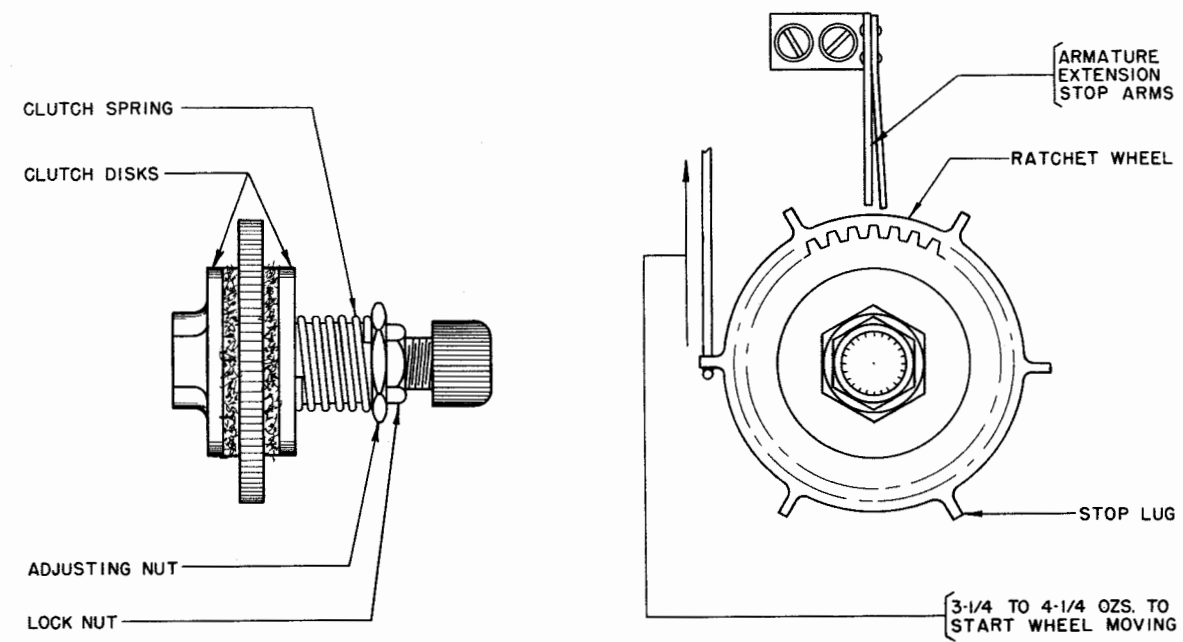


FIGURE 3

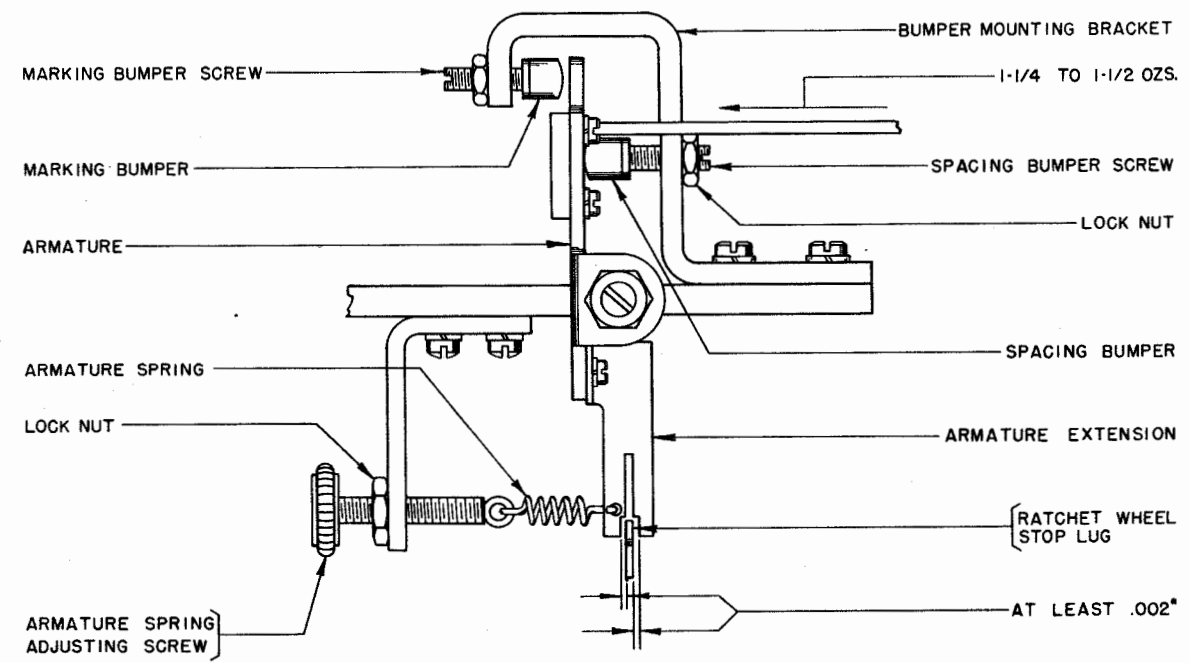


FIGURE 4

3-3, 3-4

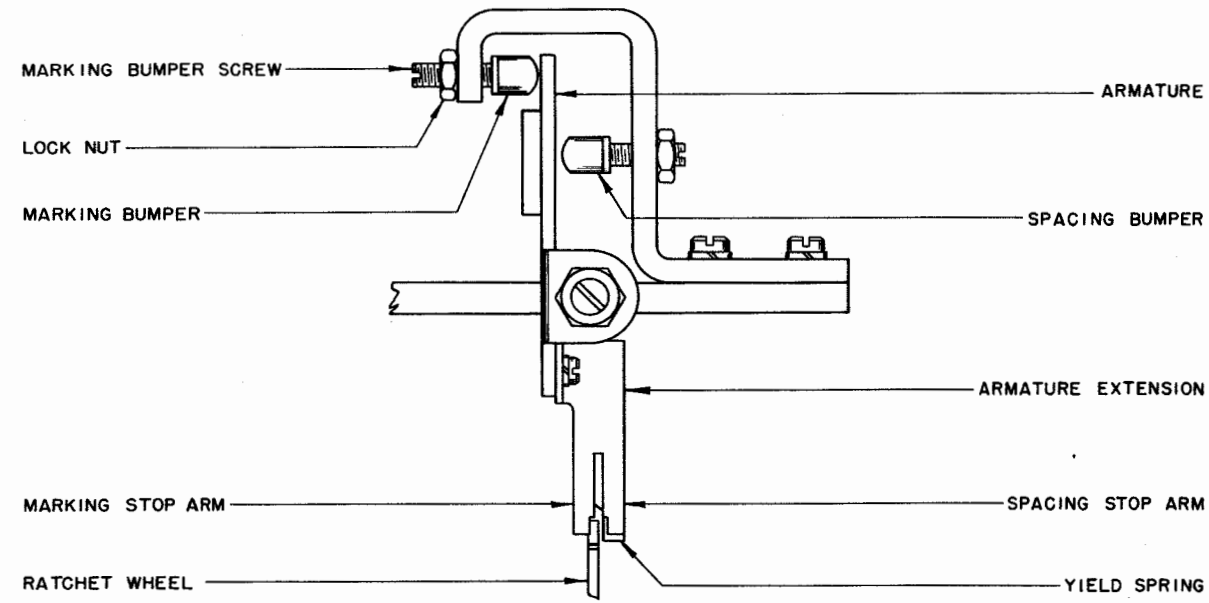


FIGURE 5

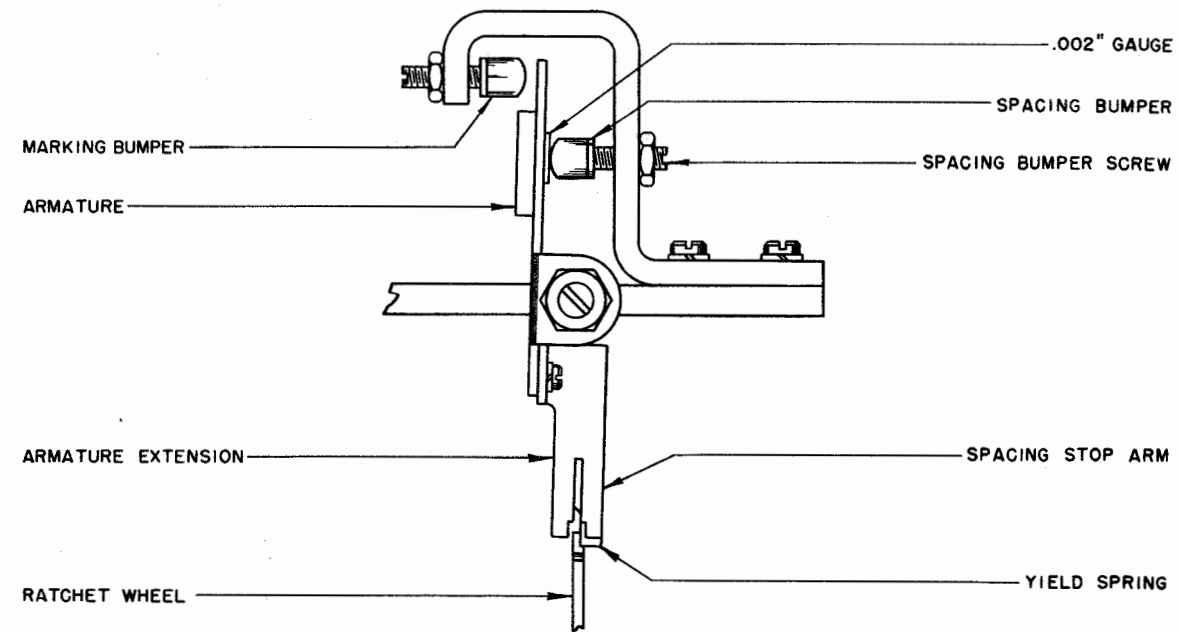


FIGURE 7

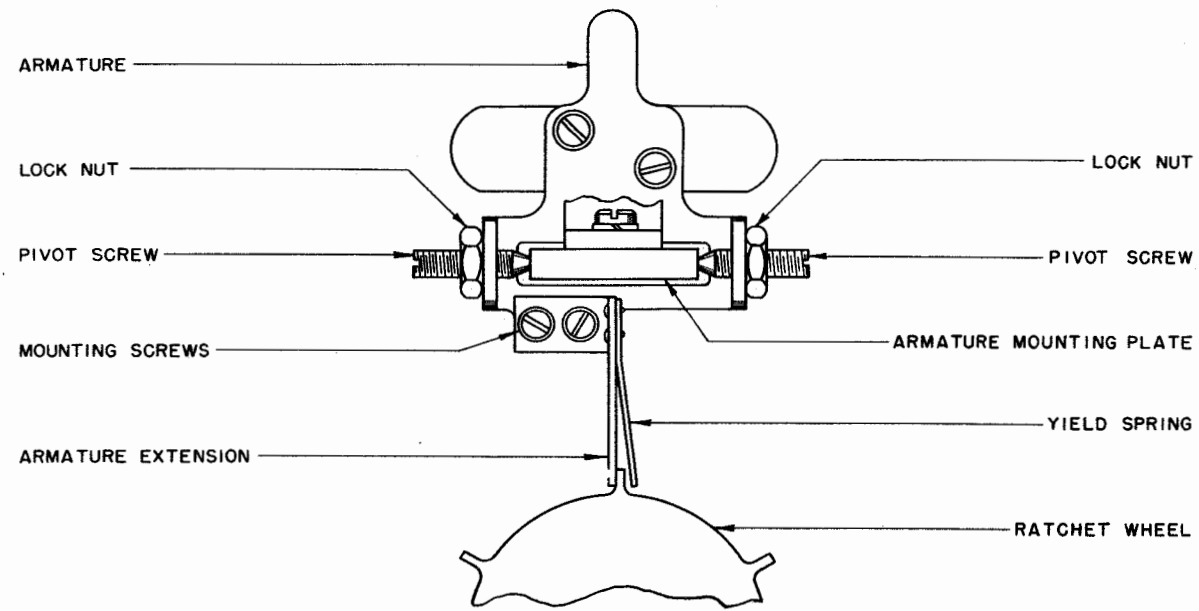


FIGURE 6

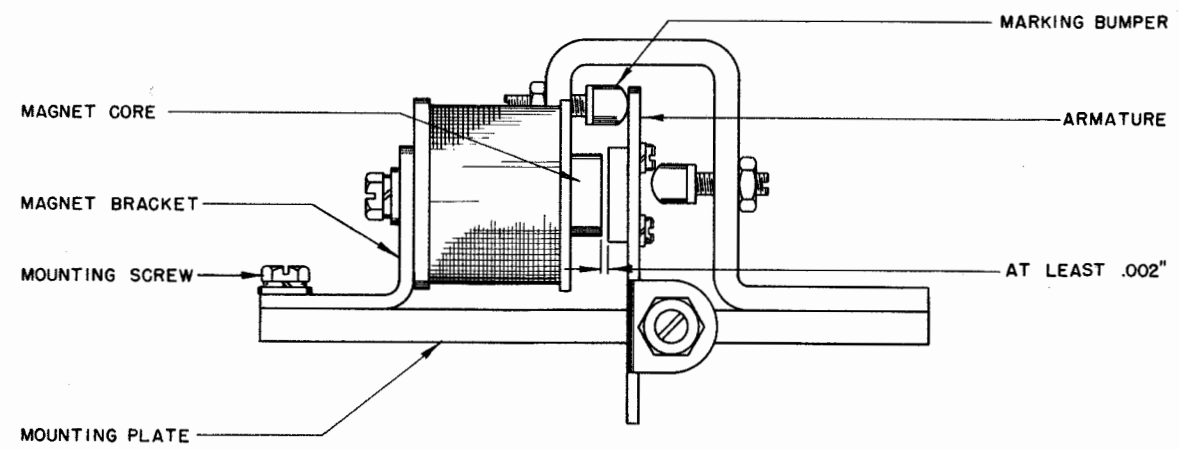


FIGURE 8