

M300  
Rev. C  
800 Registers



**RED SEAL  
MEASUREMENT**



## 800 Series Register Operating and Maintenance



**NOTE:** Before continuing through this manual, please read the revised section information shown below.

**Section 2 - 112. Hammer Mechanism, Figure 2-39: Hammer Mechanism**

Refer to the drawing on page 10 of document P-300, Parts List for 800 Series Registers. Note the new items in the mechanism - item 14, the Hammer Spring, and item 54, the Hammer Lift Lever Assembly.

**Section 6-42, Dismantling the Register, Figure 6-11: Removal of the Print Unit, Register Unit, and Preset Unit.**

Refer to the drawing on page 10 of document P-300.

**Section 6-53, Register Unit Overhaul, Figure 6-12: Register Unit Disassembly (1<sup>st</sup> Stage)**

Instead of figure 6-12, refer to the drawing on page 2 of document P-300. Note the Changes in item 16, the Left Side Plate (window cut-out) and item 39, the Reset Stop Lever Assembly (tab on back side and filled-in gap before the stop).

**Section 6-53, Register Unit Overhaul, Figure 6-14: Register Unit Disassembly (2<sup>nd</sup> Stage)**

Instead of figure 6-14, refer to the drawings on pages 2 and 3 of document P-300.

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MODEL 831



MODEL 832



MODEL 833



MODEL 834

Figure 2-1. The 830-Series Registers

## Section 1 INTRODUCTION

1-1. This service manual is designed to cover all 800-Series Registers. It provides the reader with sufficient information to maintain and overhaul any of the models and types.

1-2. The manual is principally an over haul handbook that gives details for locating and removing the source of any malfunction. However, to aid the repairman in finding the reason for the malfunction more readily, a DESCRIPTION section has been included which provides the names and functions of the parts and subassemblies, and points out the differences between mechanism in the various models of Register

1-3. When using the Overhaul section, take particular notice of its arrangement. It is divided first into general information required for overhauling *all* Registers. (This first portion describes general overhaul procedures, tool requirements, methods for isolating the malfunctions to a particular major Unit, and instructions for dismantling the Register to remove the defective Unit.) Thereafter the overhaul of each of the major Units, and their variations, are covered completely (disassembly, repair, and reassembly) in separate procedures. Then following these individual procedures, a Final Assembly procedure explains how the major Units are put together and given final adjustment.

### **Note**

As pointed out in the OVERHAUL sections, the Register should be dismantled *only* far enough to remove the cause of malfunction. However, to cover all contingencies, complete disassembly and reassembly procedures are included for use as needed.

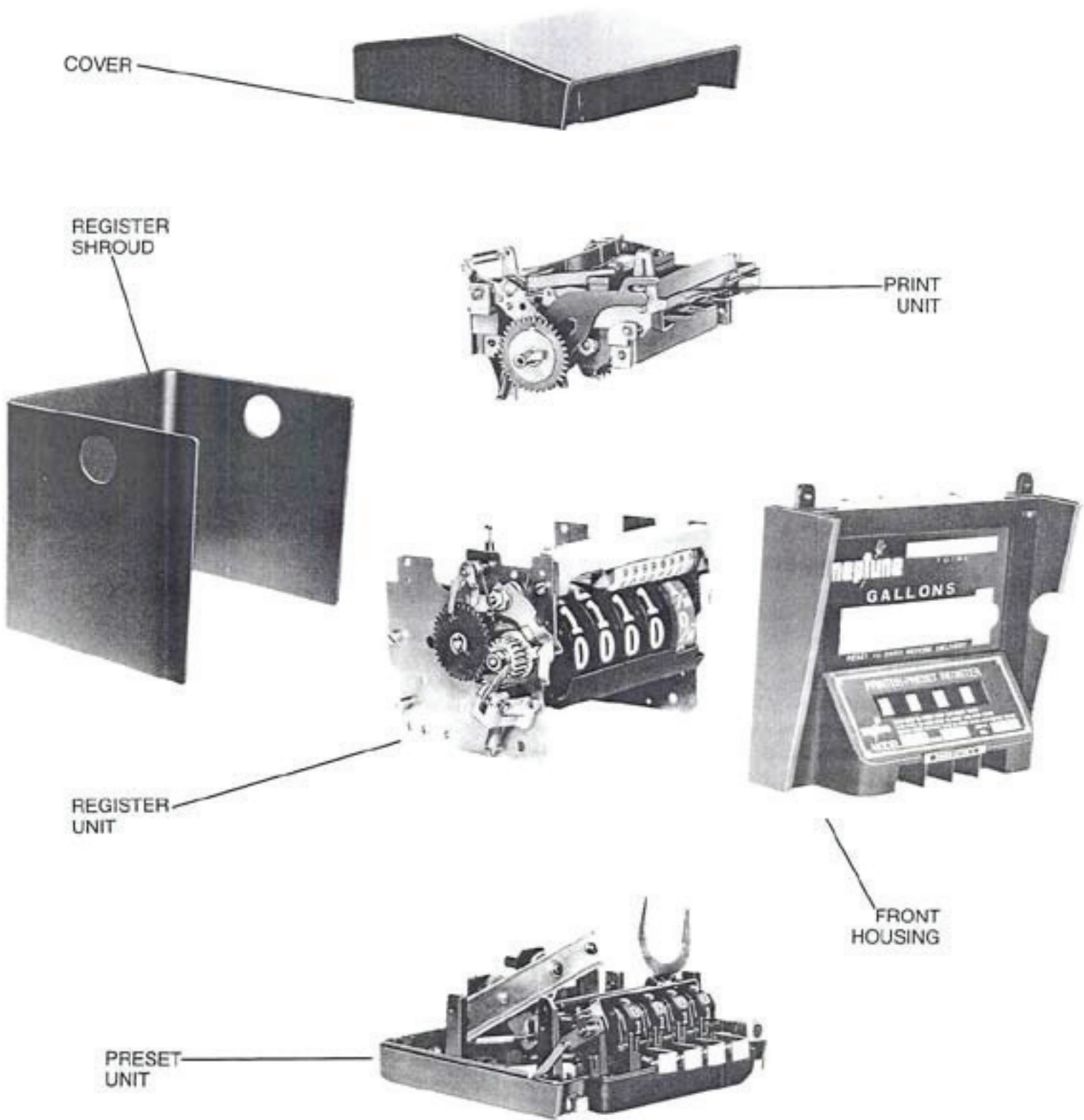


Figure 2-2. Register (Model 834), Major Units

## Section 2 DESCRIPTION

### 2-1. GENERAL

2-2. The 800-series Registers are devices that record the volume passed through flowmeters. These Registers are one basic design, and with minor design changes, can be used to measure gallons, liters, pounds, or other units of quantity.

2-3. The 800-series Registers are produced in the 830 series, which registers in tenths, and in the 840 series which registers in units. Both the 830 and 840 series are further subdivided according to the function or combination of functions which they will perform, such as registering the quantity, printing the quantity, and automatically stopping the flow after a preset quantity has been delivered. (See figure 2-2).

**2-4. Model 831 and 841 Series Registers.** The 831 and 841 are basic Registers which are composed of a counter mechanism (register unit) enclosed in a housing.

**2-5. Model 832 and 842 Series Registers.** The 832 and 842 Register has, in addition to the basic register mechanism, a preset unit which controls a valve in a line to the flowmeter. This preset unit is a triggering device that allows a valve to close when a preset quantity has been recorded by the register.

**2-6 Model 833 and 843 Series Registers.** The 833 and 843 Register are the Printer models. These are made up of the basic register mechanism and a ticket printing mechanism (print unit), but do not contain the preset feature. The ticket printing mechanism records on a delivery receipt the reading of the register before and after delivery. It also records the serial number of the delivery, and imprints the ticket with the identifying mark of the register.

**2-7. Model 834 and 844 Series Registers.** The 834 and 844 Registers contain the preset feature as well as the printing feature.

**2-8. Variations.** Minor variations in the construction of the basic models of Register permit the Registers to satisfy a number of special requirements. These modifications are indicated by a coding system stamped on name plates on the front housing of the Register. This code and the model number combined become the designation for the unit.

2-9. The variations include, among others, differences in:

- Input gearing to permit use on flowmeters operating in reverse direction
- Method of coupling the register unit and the preset

mechanism to permit the use on high or low capacity flowmeters.

- Preset tripping mechanism to permit either a single or two-stage shutoff of the valve in the line to the flowmeter.

### 2-10. DETAILED DESCRIPTION

#### 2-11. Register Unit.

**2-12. General.** The register unit (fig. 2-3 and fig 2-4) is the main component of all 800-series Registers. It converts the rotary output of a flowmeter into a numerical reading of the quantity. The register unit, with minor differences, is used on all models of Register. These differences are mainly in linkages, and in the readings on the No. 1 (right hand) indicating wheel.

2-13. The register unit consists principally of a drive unit bracket, a bevel gear and clutch, register wheels, a reset mechanism, a zero stop pawl assembly, a shutter mechanism, and a totalizer assembly. (See figure 2-4.)

2-14. The drive unit bracket transmits the output of the flowmeter to the bevel gear and clutch. (See figure 2-5.) This, in turn, through gearing (on the right side plate) drives the register wheels to provide an indication of the quantity passed through the flowmeter. It also drives the totalizer wheels to indicate the cumulative total.

2-15. The reset mechanism returns the register wheels to a preset index point (zero). The zero stop pawl assembly in conjunction with a detent on the 2-tooth gear of the No. 1 register wheel, establishes the zero position of the No. 1 register wheel. The shutter mechanism, which is operated when the reset mechanism is operated, obscures the register wheels during the resetting.



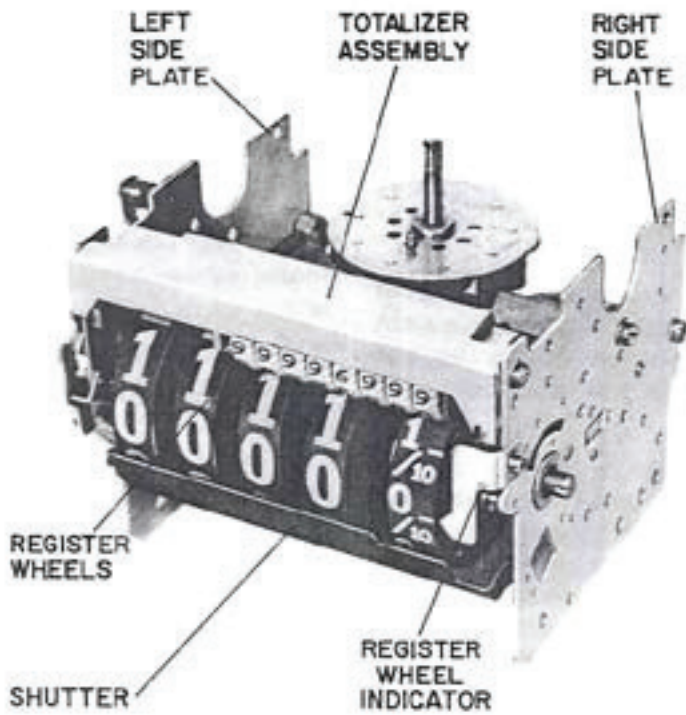


Figure 2-3. Register Unit, Front View

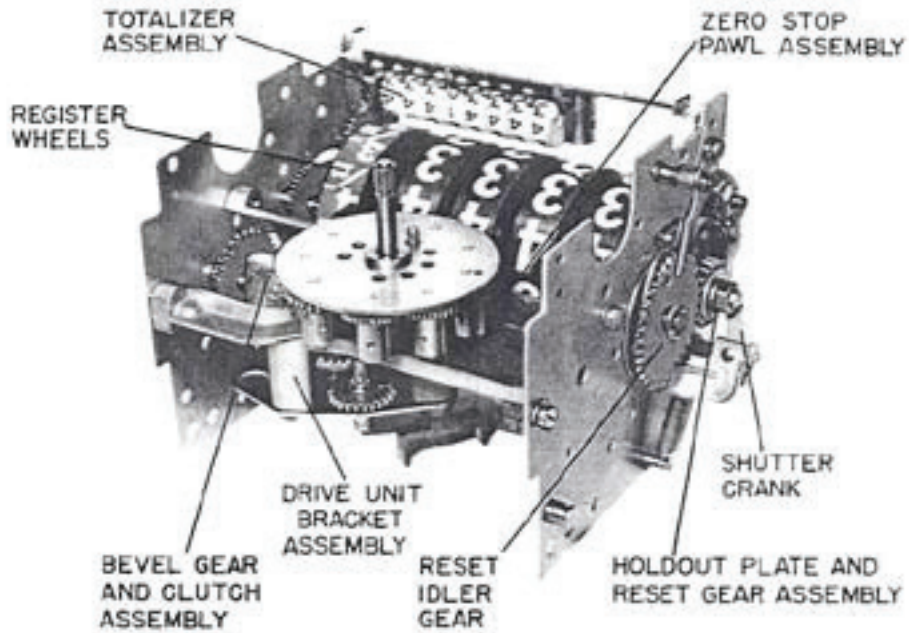


Figure 2-4. Register Unit, Rear View

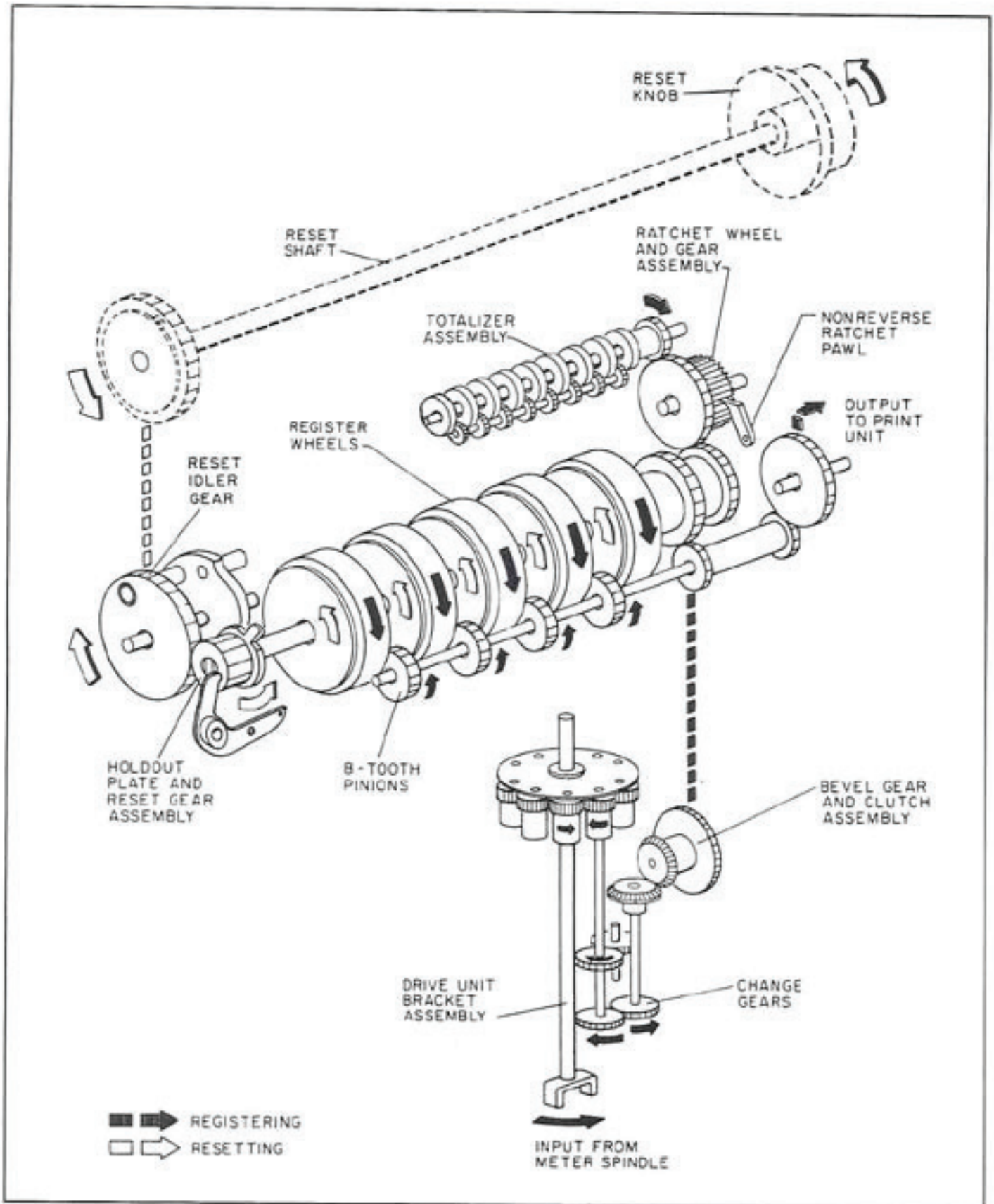
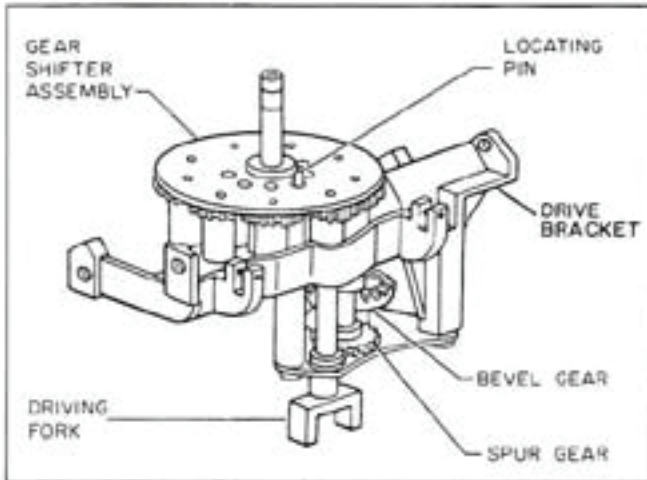


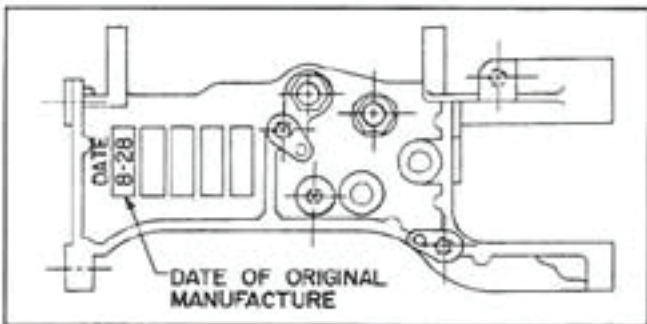
Figure 2-5. Register Unit, Mechanical Schematic

**2-16. Drive Unit Bracket.**

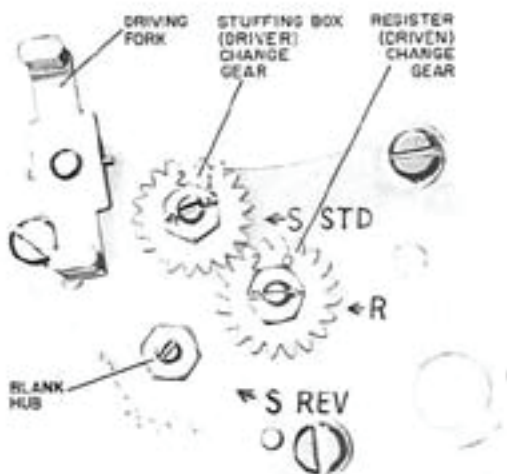
2-17. The drive unit bracket (fig. 2-6) is a gear train that consists essentially of a driving fork, a set of spur gears, a gear shifter assembly, and an output bevel gear. Five date pads are provided on the drive bracket itself. The first pad is stamped with the month and year of original manufacture of the register. Additional pads are provided for future dates of remanufacture, overhaul, or repair in the field (See figure 2-7).



**Figure 2-6. Drive Unit Bracket Assembly**



**Figure 2-7, Drive Bracket Date Pads**



**Figure 2-8. Change Gears**

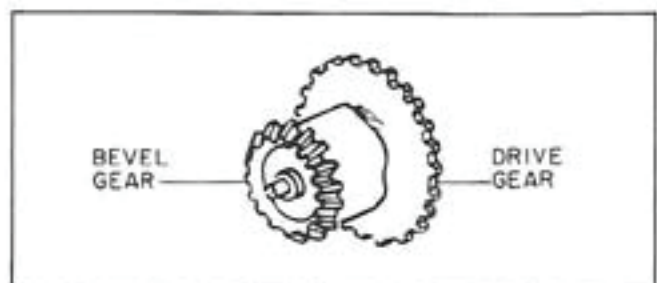
2- 18. The driving fork couples the gearing to the output star wheel on the flowmeter spindle, and transmits this rotary motion through a shaft to the gear shifter mechanism.

2-19. The gear shifter is a plate containing nine gears, each with a sleeve coupler. These nine gears, arranged around the periphery of the shifter plate, range in number of teeth from 24 to 32 or 20 to 36. These gears, which mesh with the adjacent gear, permit the selection of eight successive gear ratios, lettered "A" to "H". These ratios range from 24:25 to 31:32 on the standard unit to 20:22 to 34:36 on the wide range unit, which is normally found on a "pounds" or "kilograms" register. The shifter mechanism provides for calibrating the register to compensate for small (0.15 percent for the standard unit or .5 percent for the wide range unit) variations in the metering flow caused by wear within the flowmeter or by variations in the viscosity of the liquid. A spring loaded spindle on which this plate is mounted assures positive coupling of the shifter gear sleeves with the input and output shafts, and a fixed locating pin assures proper alignment. This locating pin has a small hole in it through which a seal wire can be inserted. The gear shifter is standard equipment in all printer registers, and can be retrofitted to non-printer registers.

2-20. The output from the shifter is transmitted through the change gear shaft and change gears (fig. 2-8) to drive the output bevel gear. The ends of the shafts on which the change gears are mounted are split to accommodate shear keys in the hubs of the change gears. These shear keys provide protection to the gearing and to the register unit in the event of a jammed mechanism. A reverse drive gear shaft, marked "S REV", is connected by spur gears to the change gear shaft to permit reversal of the output of the drive unit bracket assembly. The end of this shaft is also split to accommodate one of the change gears, but is normally fitted with a blank hub.

**Note**

Simplified (nonreversible type) drive unit bracket assemblies have neither shifter nor change gears. They consist essentially of a drive fork, a pair of reduction gears (30:29 ratio), and a pair of spur gears (1:1 ratio) to drive the output bevel gear. Simplified units are used in installations where the flowmeter calibration is provided externally.



**Figure 2-9. Bevel Gear and Clutch Assembly**



## 2-21. Bevel Gear and Clutch

2-22. The bevel gear and clutch (fig. 2-9) through a gear train, transmits the output of the drive unit bracket assembly to the register wheels. The assembly consists of a bevel gear, a spur gear, and a detent-type clutch. The clutch prevents damage to the register in the event of reverse flow through the flowmeter.

### Note

On two-way registers the clutch feature is not required. The parts used, however, are the same but are pinned together. The nonreverse pawl and spring is also omitted from the right side plate (See fig. 6-11, items's 17 and 18).

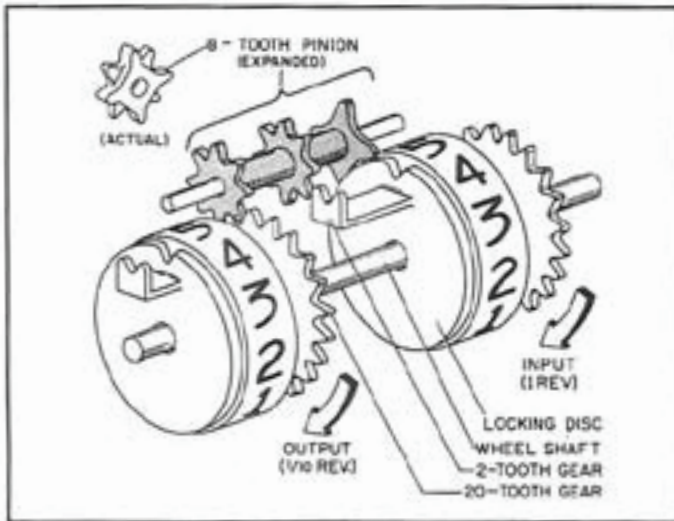


Figure 2-10. Geneva-Type Drive Mechanical Schematic

## 2-23. Register Wheels

2-24. The register wheels are five indicating drums coupled together by general-type drives. (See figure 2-10.) The drums, numbered 1 to 5 from right to left, are similar in appearance and function but differ somewhat on construction. The No. 2, 3, and 4 wheels are alike, each consisting of a cup (drum) which is graduated from 0 to 9, a 2-tooth gear, a hub, a 20-tooth gear, a spring-loaded detent ring, and a reset pawl and spring. (See figure 2-11.)

### Note

A geneva-type drive (fig. 2-10) permits the right-hand wheel (at the end of each revolution) to drive the left-hand wheel 1/10 turn. The drive consists essentially of a 2-tooth gear and locking disc (which rotate with the right-hand wheel), an 8-tooth pinion (which has four wide teeth), and a 20-tooth gear (which rotates with the left-hand wheel.). With each revolution the 2-tooth gear advances the pinion by two teeth,, causing the 20-tooth gear to advance by two teeth. The locking disc, which bears against the wide teeth, keeps the left hand wheel from turning by preventing the pinion from rotating except when the 2-tooth gear engages the pinion. (The notch in the disc permits the pinion to turn when the 2-tooth gear is engaged.)

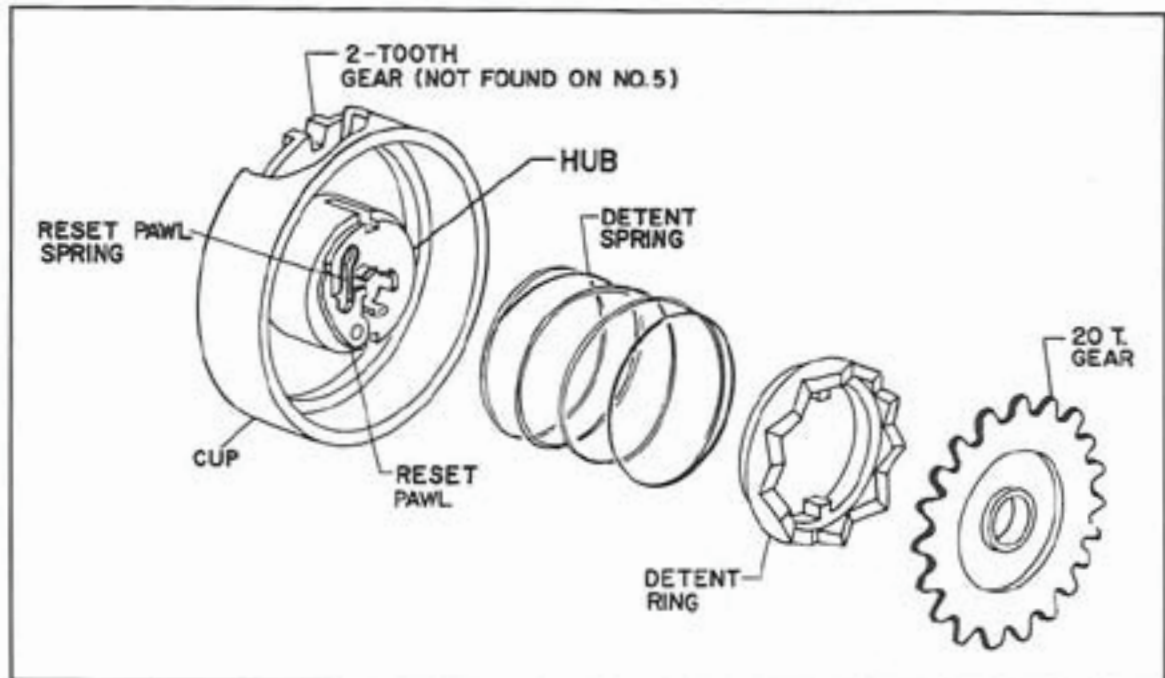


Figure 2-11. No. 2, 3, 4, and 5 Register Wheel Components

2-25 The cup and the 2-tooth gear of the No. 2, 3, and 4 wheels are attached to and rotate with the hub. The 20-tooth gear is mounted to rotate about the hub during reset, but then locks against the hub after reset is complete. The wheel shaft engages the reset pawl to lock it against the notches in the 20-tooth gear during normal operation, then, as the wheel shaft is shifted axially during reset, the reset pawl engages a slot in the wheel shaft and releases the 20-tooth gear. (See "Reset Mechanism", paragraph 2-27). The No. 5 wheel is the same as the No. 2, 3, and 4

wheels except that it does not include a 2-tooth gear.

2-26. The No. 1 wheel, which may be graduated in units, units with tenths graduation, or tenths (figure 2-12), differs from the other wheels in that it includes a take-off (cam or gear) for driving a preset unit, and has an input drive gear and slip-clutch arrangement instead of the 20-tooth gear and spring loaded detent.

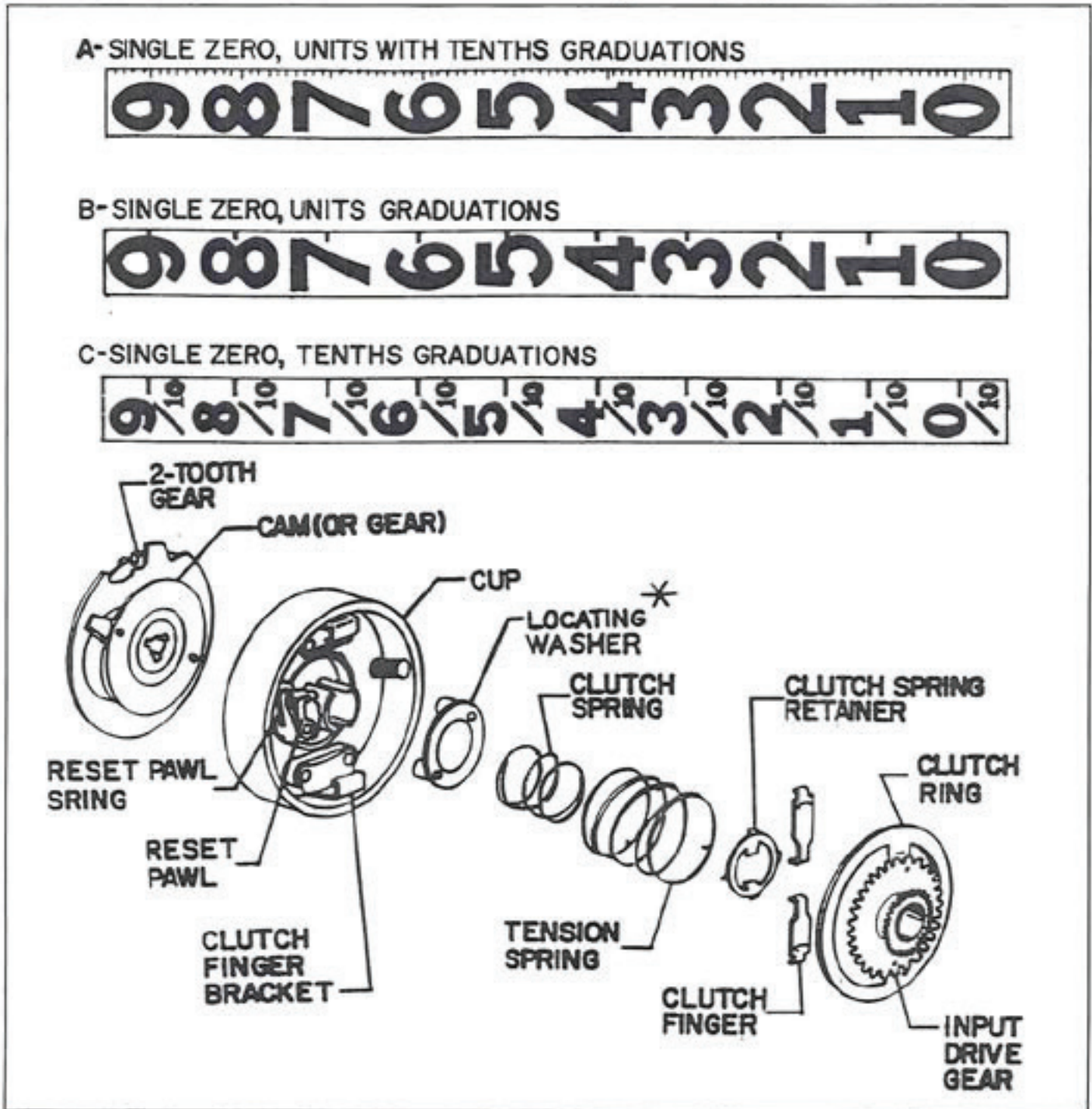


Figure 2-12. No. 1 Register Wheel Components



## 2-27. Reset Mechanism

2-28. The reset mechanism provides means for returning the register wheels to zero. This mechanism, which is actuated by the reset shaft of either a print unit or a nonprint unit, consists essentially of a reset idler gear, a holdout plate and a reset gear assembly, a reset stop lever assembly, a reset lever latch, and the wheel shaft. The mechanism is operated whenever the reset knob is rotated toward the rear of the unit; that is, clockwise as viewed from the right-hand side of the Register. (See figure 2-5.)

2-29. During the resetting cycle, the reset idler gear drives the holdout plate and reset gear assembly to turn

the wheel shaft. (See figure 2-5.) As the gear, shaft, and holdout plate rotate, a tab on the holdout plate rides up on a cam attached to the left side plate of the register unit. (See A and B, figure 2-13.) The camming action shifts the wheel shaft to the left side of the register unit. This shifting causes a washer on the shaft to disengage the No. 1 register wheel clutch and the 20-tooth gears in the No. 2, 3, 4, and 5 register wheels, and aligns the notches in the wheel shaft with the reset pawls in the hubs of the wheels. Thus, as the shaft rotates, the notches "pick up" the reset pawls, and drive the wheels.

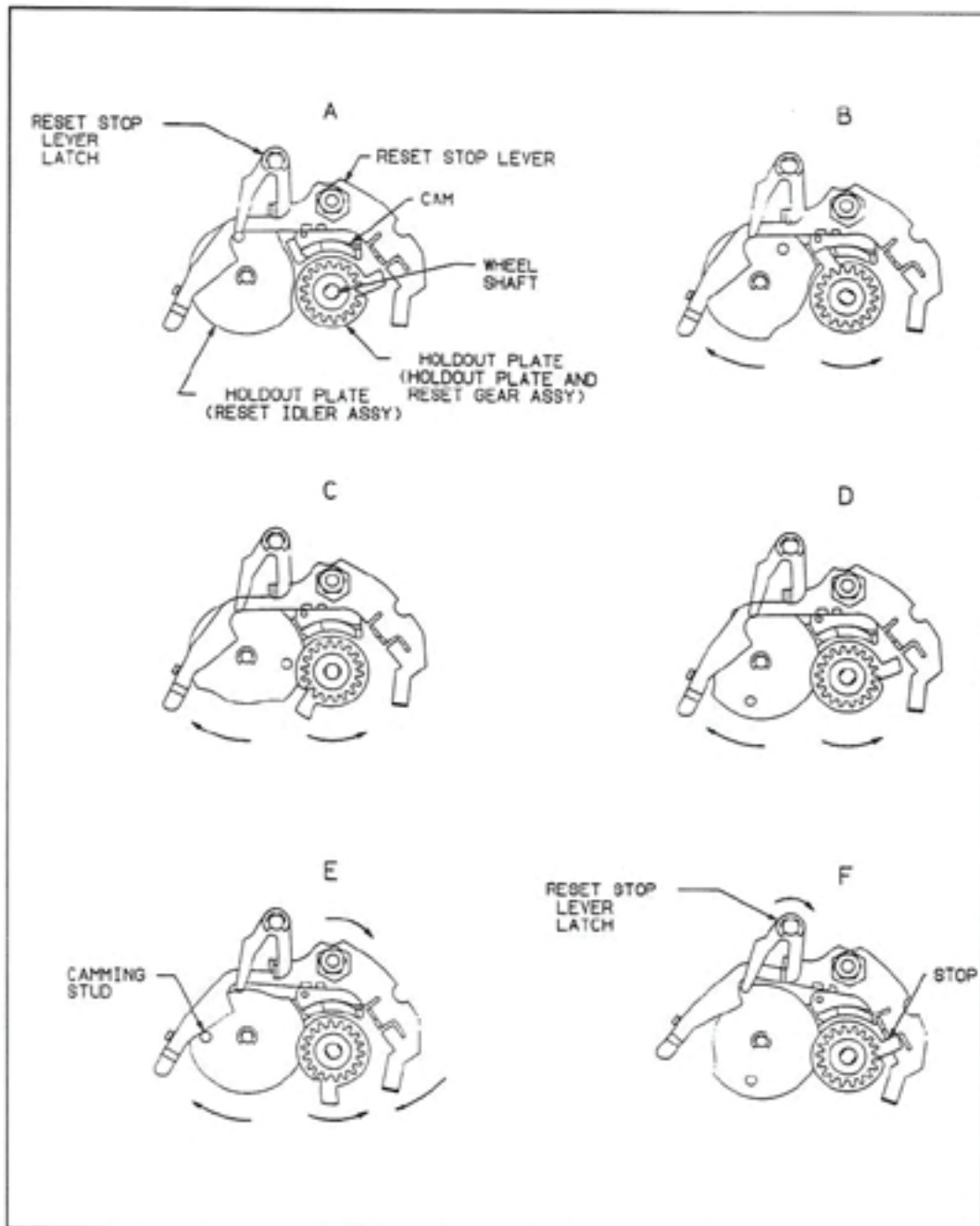
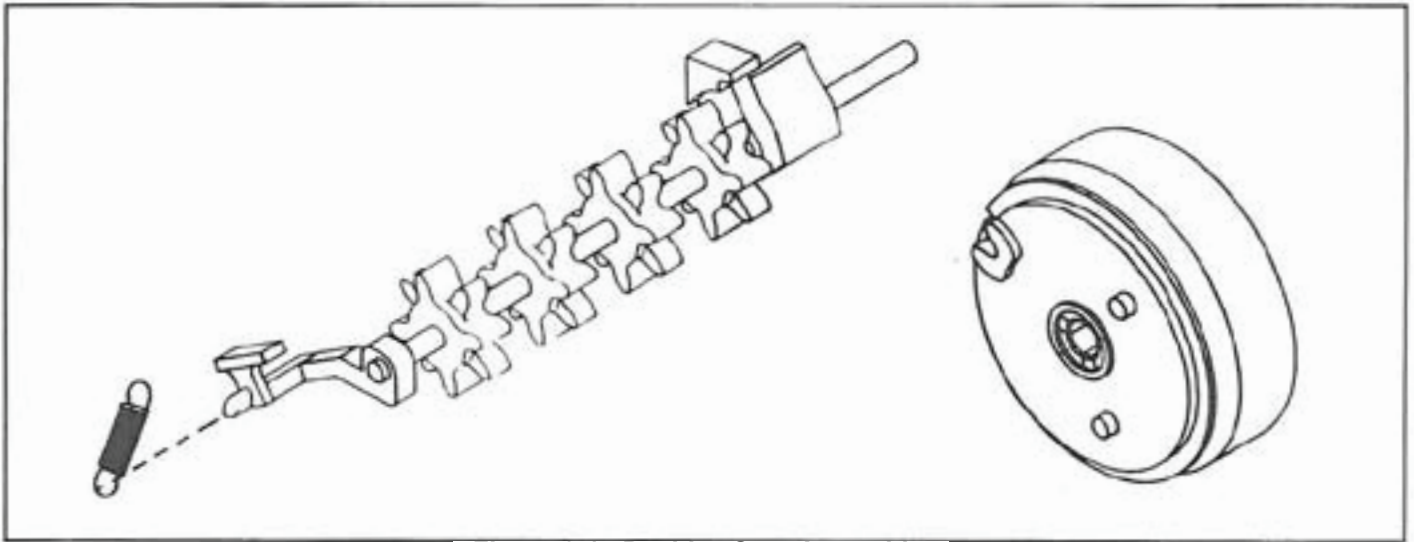


Figure 2-13. Register Unit Reset Mechanism Actions



**Figure 2-14 Positive Stop Assembly**

2-30. As the resetting operation continues, the tab of the holdout plate rides off the cam. (See C, figure 2-13.) The shaft, however, is prevented from shifting to the right by a plate on the reset idler. This plate, which engages the holdout plate, keeps the wheel shaft displaced to the left until the shaft has completed two full revolutions. (See C, D, and E, figure 2-13.)

**Note**

Two full revolutions are required to insure that the shaft picks up all register wheels.

2-31. As the wheel shaft approaches the end of its second revolution, a camming stud on the reset idler tilts the reset stop lever into the path of the tab on the holdout plate and the lever latch locks the stop lever in place. (See F, figure 2-13.) Thus the shaft is stopped at a pre-established zero point, at which point the holdout plate and the lever latch locks the stop lever in place. (See F, figure 2-13.) Thus the shaft is stopped at a pre-established zero point, at which point the holdout plate tab is released, the shaft shifts to the right, and the reset pawls and clutch couple the wheels (cups) to the 20-tooth gears and input drive gear.

**Note**

The reset stop lever is mounted on an eccentric hub by which the stopping point of the shaft can be adjusted.

2-32. As the reset knob is released at the completion of the resetting cycle, a spring-loaded reset knob return arm (on nonprint reset shaft units) reverses the reset shaft. This causes the reset stop lever latch to unlatch the stop lever, readying the reset mechanism for the next cycle. On print unit models, the latch releases the stop lever at the end of the “pint out” operation.

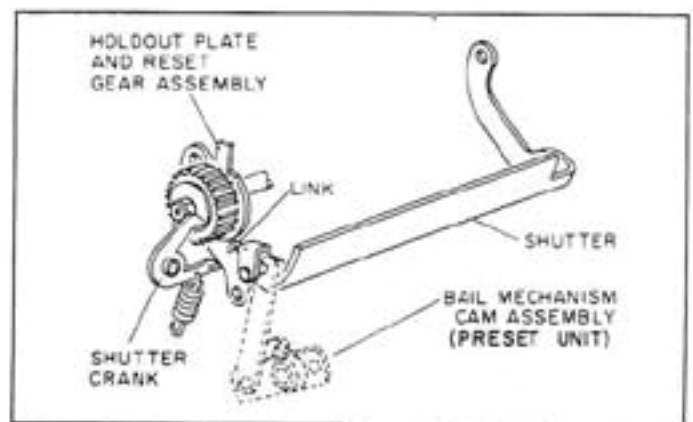
**2-33. Positive Stop Assembly**

2-34. The 8-tooth pinion shaft assembly (Figure 2-14) maintains the zero position of the No. 1 register wheel. This assembly consists of the pinion shaft, 8-tooth pinions, transfer lever and the positive stop lever. This assembly is secured on each end so that it rotates the positive stop lever into the two-tooth gear of the No. 1 register wheel.

2-35. The transfer lever is attached to the reset stop lever by a spring. During the reset cycle in which the reset stop lever is lifted and locked into position, the transfer lever is lifted, also causing it to rotate the pinion shaft. With the transfer lever and the positive stop lever attached to the pinion shaft, the positive stop rotates toward the two-tooth gear of the No. 1 register wheel. As the No. 1 register wheel reaches the zero position, the positive stop rotates toward the two-tooth gear of the No. 1 register wheel. As the No. 1 register wheel reaches the zero position, the positive stop lever falls into the notch of the two-tooth gear and maintains this position until the reset knob is released, resulting in the release of the reset stop lever.

**2-36. Shutter Mechanism**

2-37. The shutter mechanism (fig. 2-15) obscures the register wheels during resetting. It also serves to actuate



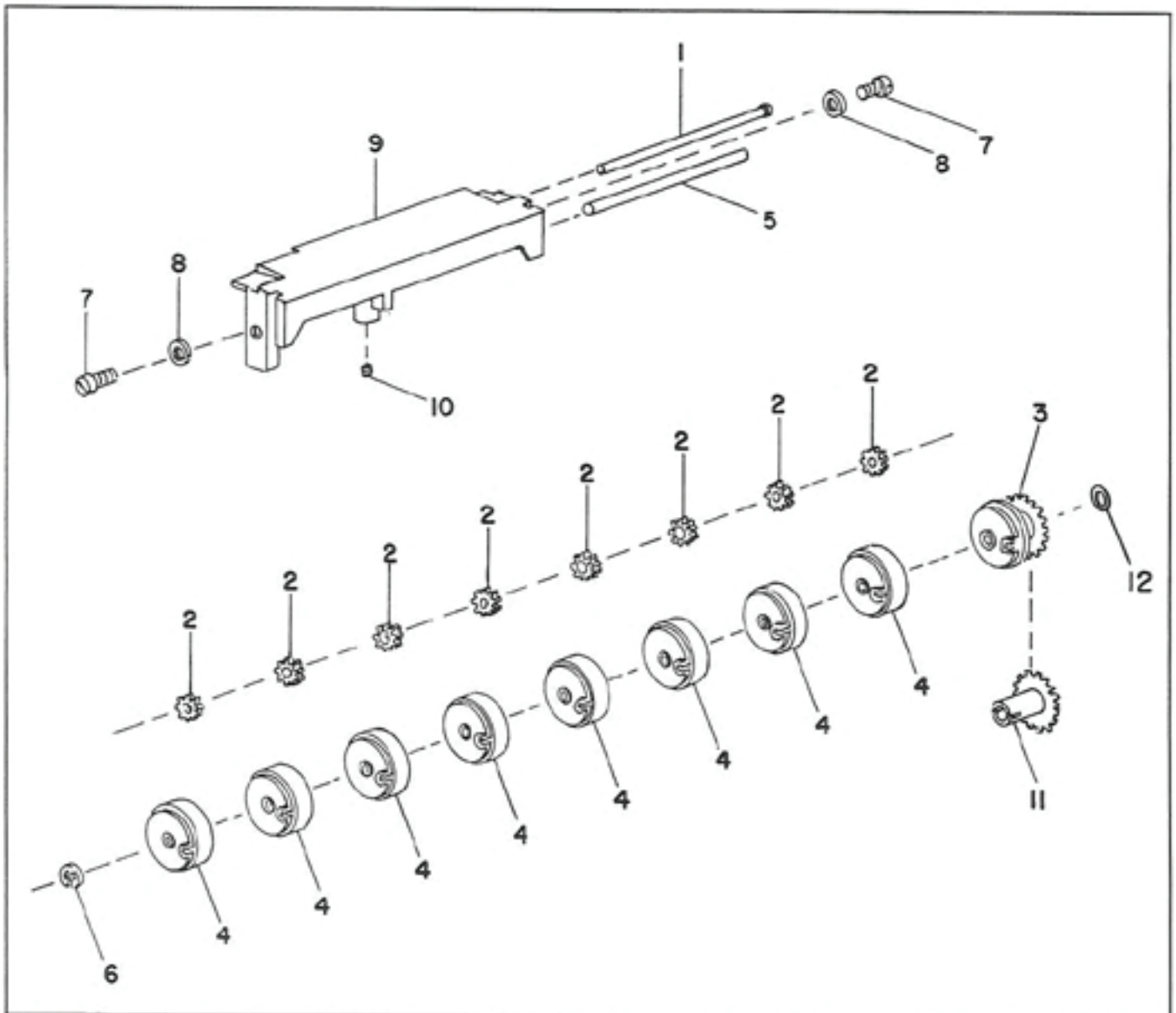
**Figure 2-15. Shutter Mechanism**

The bail operating cam to lift the feed pawl bracket of the preset unit to prevent rotation of the preset setting wheels. The mechanism consists of the shutter, shutter crank and a link. The shutter, pivoted on the side plates of the register, is coupled by the link to the shutter crank. The shutter crank is spring loaded- to bear against the reset gear and holdout plate assembly of the reset mechanism, and to hold the shutter in the open position. Thus, when the wheel shaft is shifted to the left at the beginning of resetting, the crank raises the shutter to obscure the wheels.

### 2-38. Totalizer Assembly

2-39. The totalizer assembly (fig. 2-16) is a cumulative registering device driven through a ratchet wheel and gear assembly by the register wheel drive gearing. (See figure 2-5.) The input to the totalizer is applied to a drive gear assembly (3 fig. 2-16) at a 10:1 ratio, or to a drive gear assembly (11, fig. 2-16) at a 1:1 ratio, depending upon the ratio of the gearing to the register wheels.

2-40. The totalizer consists principally of the totalizer wheels (4, fig 2-10) and a drive gear (3 or 11) coupled together by 10-tooth pinions in a geneva-type drive arrangement similar to that shown in figure 2-10. Each of the wheels has a 20-tooth gear and a 2-tooth gear that mesh with the 10-tooth pinions.



- 1. Pinion shaft
- 2. Pinion (bronze)
- 3. Drive gear assembly (10:1)
- 4. Totalizer wheel

- 5. Wheel shaft
- 6. Retaining ring
- 7. Screw
- 8. Lock washer

- 9. Bracket
- 10. Setscrew
- 11. Drive gear assembly (1:1)
- 12. Thrust washer

**Figure 2-16. Totalizer Assembly**

**2-41. Preset Unit**

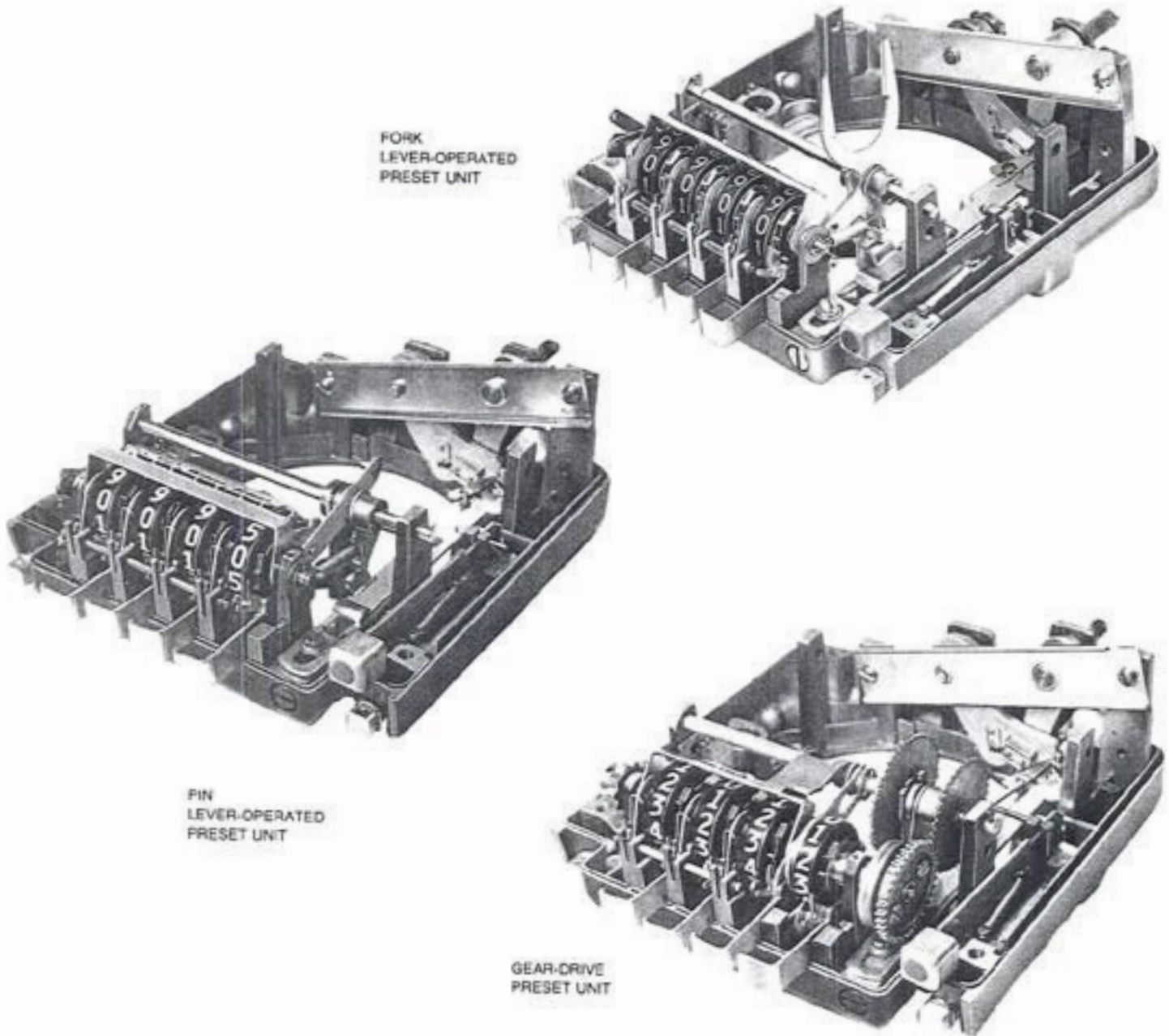
2-42. The preset unit is a device that automatically controls the closing of a valve (furnished with the flowmeter) to stop delivery at any preset quantity. The unit, which is housed in the base of the Register and is driven by a take-off from the register unit, is manufactured in three basic designs, namely, a fork lever-operated type, a pin lever-operated type, and a gear-drive type. (See figure 2-17).

**Note**

The preset units, though sufficiently different to

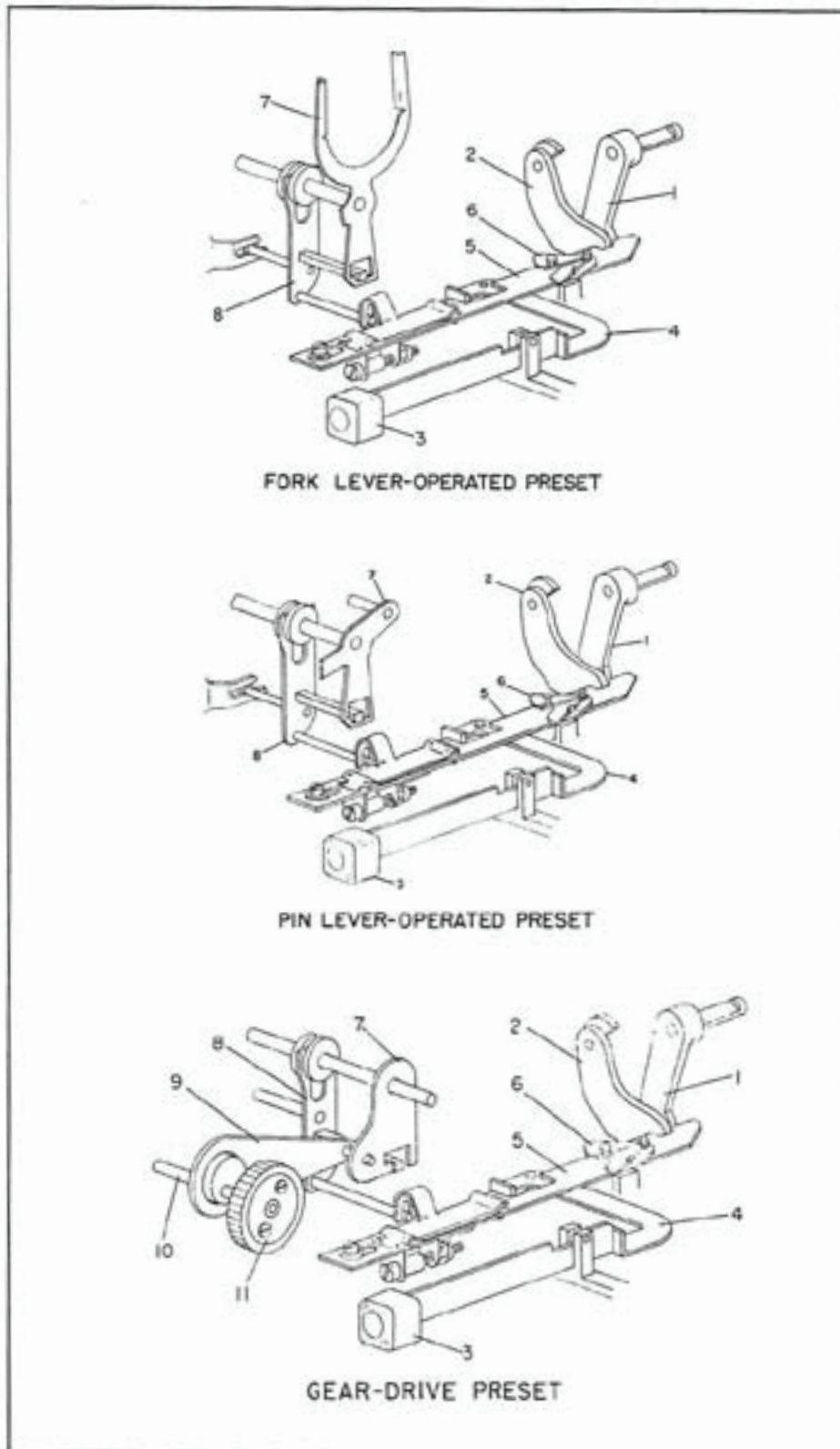
require separate overhaul procedures, are nevertheless sufficiently alike to be covered by a common description. The differences, however, are compared at the appropriate places in the text.

2-43. Each of the preset units consist essentially of a preset base, a tripping mechanism, and a setting wheel mechanism.



**Figure 2-17. Preset Units**





- |                         |                               |                            |
|-------------------------|-------------------------------|----------------------------|
| 1. Trip lever           | 5. Trip slide                 | 9. Trip cam and lever unit |
| 2. Trip latch           | 6. Trip slide retaining lever | 10. Setting wheel shaft    |
| 3. Emergency stop lever | 7. Operating lever            | 11. Drive gear             |
| 4. Crank                | 8. Trip link                  |                            |

**Figure 2-18. Tripping Mechanisms**



## 2-44. Preset Base

2-45. The preset base is the structural part of the unit, and supports the components of the tripping mechanism and the setting wheel mechanism. It also serves as the base of all Registers, whether equipped with a preset mechanism or not.

2-46. The base is a one-piece die casting with integral posts and brackets, precision dripped and machined to locate and mount the components. Two clamping screws (for mounting the Register on a flowmeter) are installed in the left- and right-hand sides of the base.

## 2-47. Tripping Mechanism

2-48. The tripping mechanism is a lever and latch device that triggers the closing of an autostop valve on the flowmeter as a preset quantity is reached. This mechanism is basically the same in each of the various types of preset units, but differs somewhat in construction and operation. (See figure 2-18). The principal differences are in the use of single and double tripping features to permit the closing of the valve in either one or two steps, and in its method of actuation. Essentially, each of the tripping mechanisms consists of a trip lever and includes some components of the setting wheel drive mechanism by which it is operated. (See figure 2-19).

2-49. The trip lever is mounted on a shaft, linked to a valve operating mechanism on the flowmeter, and swings between its limits of travel as the valve is opened and closed. The trip latch is arranged to hold the trip lever

raised to keep the valve open, while the trip slide holds the latch. The emergency stop lever, which permits immediate release of the tripping mechanism, operates a crank to shift the slide to one side and release the latch.

2-50. The tripping mechanism is cocked by the operating of the valve. As the valve opens, the trip lever swings to its raised position. At the end of the swing, the lever operates the trip latch, causing the latch to rise. As the latch rises, it cams the trip slide aside against spring pressure. Thus the trip lever is held in its cocked position by the trip latch, which in turn is held by the trip slide. (See figure 2-19).

2-51. The release of the tripping mechanism (both single and double trip) is controlled by the position of the roller bracket cams of the setting wheel mechanism, and is powered by the input from the register unit. The releasing actions of a single trip mechanism are accomplished as follows:

- a. During the delivery, the trip lever is latched up as shown in figure 2-19. Meanwhile, the operating lever is oscillated by the register unit, and the setting wheels rotate from a preset quantity towards zero. As the wheels progress toward zero, the roller bracket cams, which are part of the setting wheels, position the roller bracket assembly. (Refer to paragraph 2-63). These cams hold the roller bracket "out" until the half-moon cutouts of each of the cams align with the roller (at which point the setting wheels read zero). (See figure 2-20).

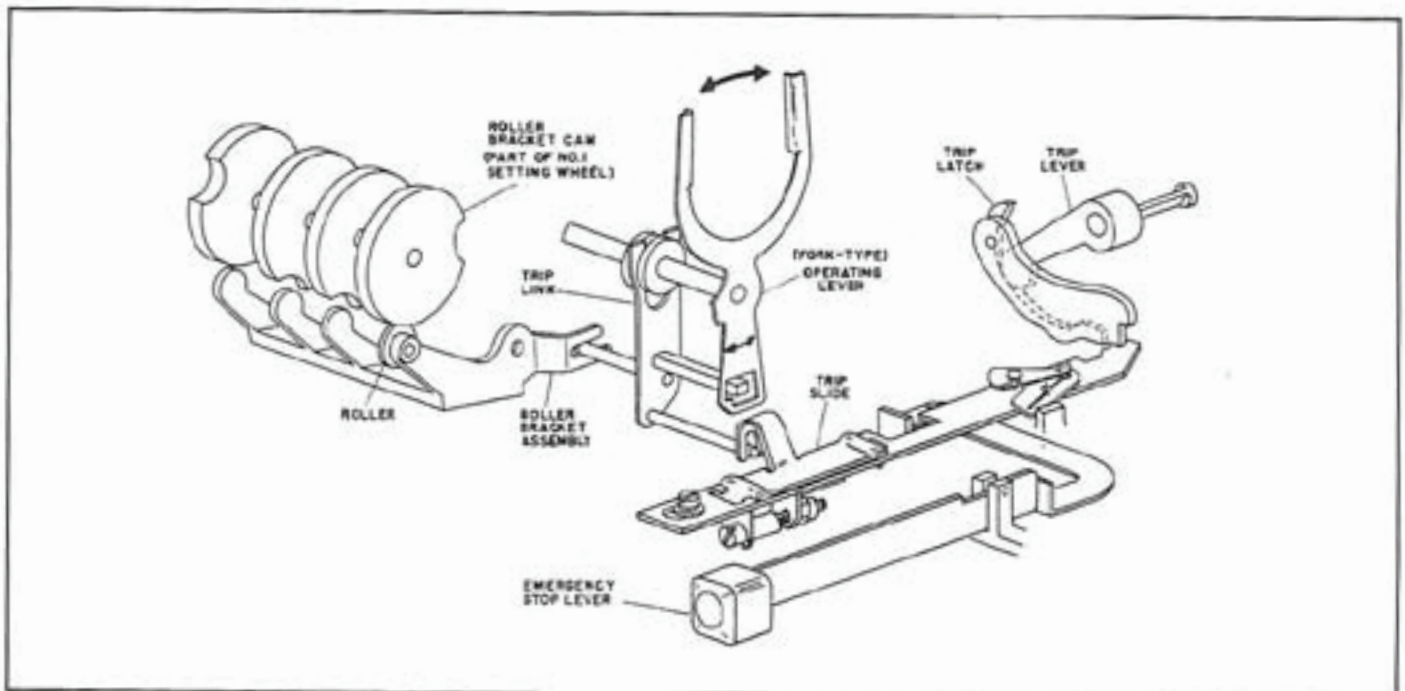


Figure 2-19. Single-Trip Mechanism Operation (Trip Lever Cocked)

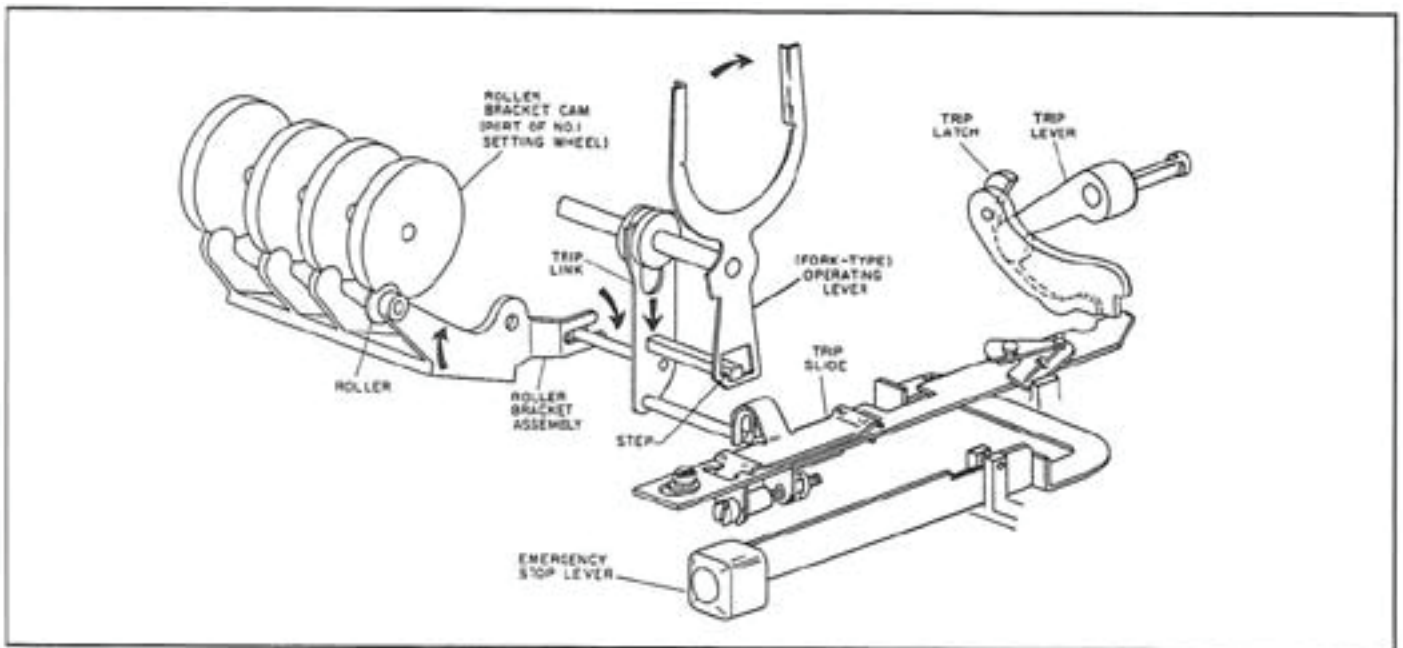


Figure 2-20. Single-Trip Mechanism Operation (Trip Link Couples Trip Slide to Operating Lever)

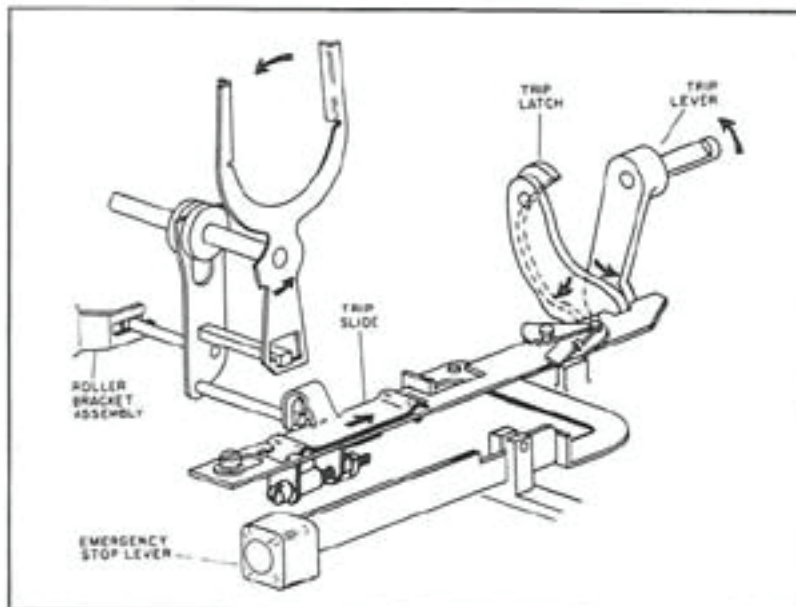


Figure 2-21. Single-Trip Mechanism Operation (Trip Slide Releases Trip Latch)

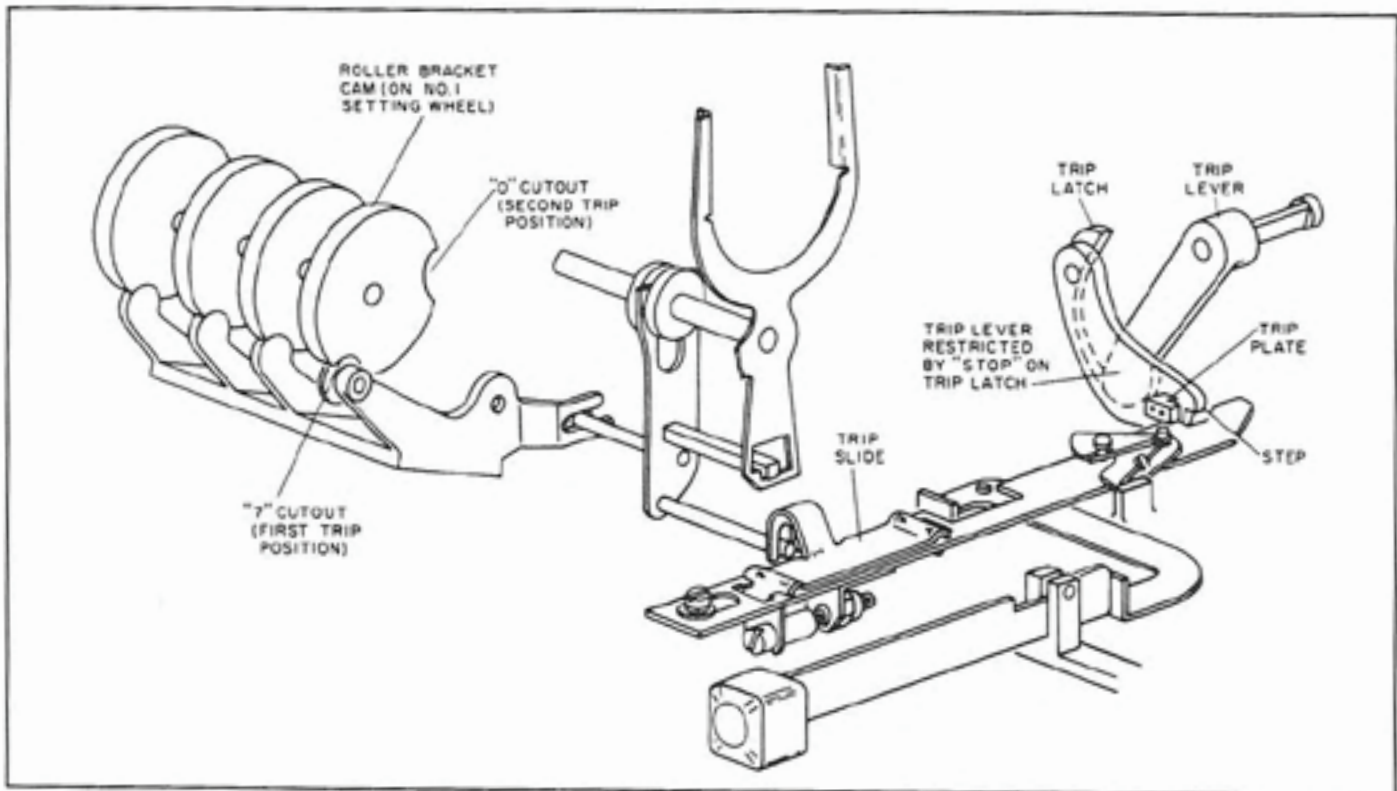
**Note**

While the roller bracket assembly is held out, it holds the trip link raised, keeping the square pin on the link from contacting the “step” on the operating lever. (See figure 2-19.) Thus the operating lever can continue to oscillate without actuating the tripping mechanism.

b. As the delivery nears completion, and the setting wheels reach zero, the half-moon cutouts in the roller bracket cams align with the roller, permitting the roller bracket to be partially rotated by spring

action. (See figure 2-20.) When this occurs, the roller bracket lowers the trip link to bring the square pin into contact with the stop on the operating lever.

c. As the operating lever swings forward at the completion of the delivery, the step on the lever drives the square pin in the link toward the rear of the preset unit. (See figure 2-21.) This action causes a pin on the trip link to drive the trip slide toward the rear, aligning a notch in the slide with the trip latch. As this occurs, the latch drops to release the lever and the valve closes.



**Figure 2-22. Double-Trip Mechanism Operation (First Tripping Actions)**

2-52. The releasing actions of double-trip mechanisms are essentially the same as those of single-trip mechanisms; the tripping is controlled by half-moon cutouts on the roller bracket cams of the setting wheels, and the trip latch is released by the movement of the trip slide. The mechanisms differ in that the trip slide is operated twice to release the trip latch in two steps; first at a fixed amount before zero, and then at zero. The fixed amount (generally 7, 20, 40, 70, 200, or 300) is determined by the location of an additional half-moon cutout at the proper position on the proper roller bracket cam, thus providing two setting wheel readings at which the cutouts on the roller bracket cams will align. (See figure 2-22). The remaining actions are identical except that as the trip latch drops through the notch in the trip slide, it is stopped part way in its swing by a trip plate on the latch. When the trip slide is returned forward, a step on the trip latch engages the slide. (This step holds the latch in an intermediate position). As a result of these actions, a stop on the trip latch permits the trip lever to swing only part way. Then when the trip slide operates again, the latch drops completely.

### 2-53. Setting Wheel Mechanism.

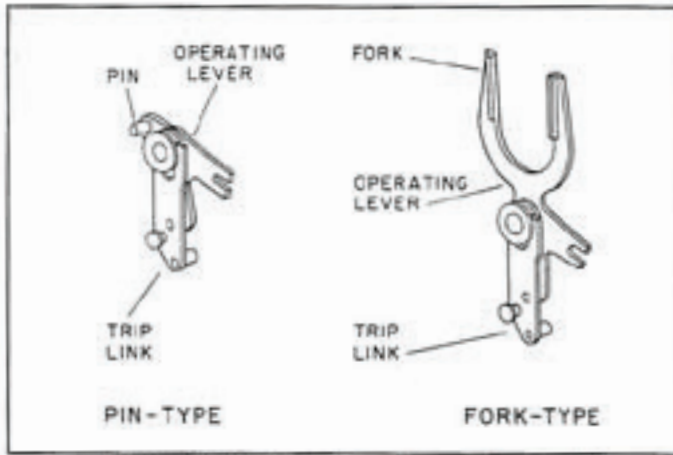
2-54. The preset setting wheel mechanism is a ratchet-driven indicator wheel device. It registers the quantity that remains to be delivered, and actuates the tripping mechanism to permit a valve on the flowmeter to close when a preset quantity has been delivered. It consists, essentially, of a driving mechanism and a wheel mechanism.

2-55. Driving Mechanism. The driving mechanism, actuated by the No. 1 wheel of the register unit, advances the netting wheels in synchronism with those of the register unit, and shifts the trip slide of the tripping mechanism as the preset quantity is reached. The driving mechanism is of two basic types: the lever-operated type and the gear operated type.

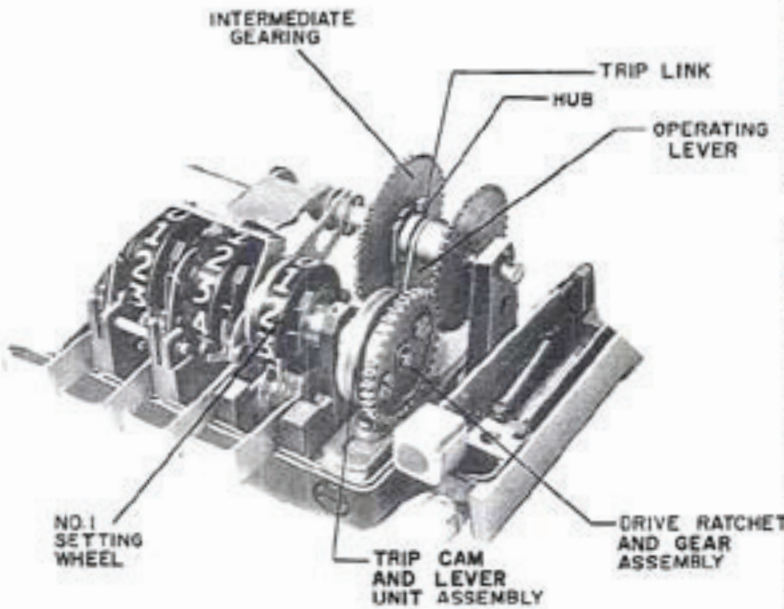
2-56. *Lever-operated drive.* Two types of lever-operated driving mechanisms are used: a fork type and a pin type. Each consists principally of an operating lever and a trip link, mounted on a shaft behind the wheel mechanism. (See figure 2-23). The operating lever transmits the oscillations produced by a cam on the No. 1 register wheel to a ratchet mechanism (feed pawl bracket assembly) that rotates the setting wheels. The trip link couples the operating lever to the tripping mechanism so that the movement of the lever operates the trip slide when the delivery is completed.

2-57. The trip link, a flat plate forked at its upper end, slides up and down on the hub of the operating lever. It has three pins; one engages the trip slide, one engages the roller bracket, while the third (square pin) projects through a stepped cutout in the operating lever. (See figure 2-19). In operation, the link is raised and lowered by the action of the roller bracket, and is held raised (out of contact with the step in the cutout) until the completion of a delivery. When the delivery is complete, the roller bracket lowers the link, the square pin contacts the step,





**Figure 2-23. Operating Lever Assemblies**



**Figure 2-24. Gear-Operated Driving Mechanism**

and the lever assembly actuates the trip slide.

**2-58. Gear-operated drive.** The gear-operated drive transmits the rotary motion from the No. 1 wheel of the register unit directly to the No. 1 setting wheel of the preset unit. It also converts this motion into oscillations to drive the trip slide of the tripping mechanism. The gear-type drive consists of an intermediate gearing and operating lever assembly, a trip link, a drive ratchet and gear assembly, and a trip cam and lever unit assembly. (See figure 2-24).

**2-59.** The intermediate gearing and operating lever assembly is composed of a pair of spur gears on a common hub, and an operating lever. One gear meshes with the spur gear on the No. 1 register wheel; the other meshes with the drive ratchet and gear assembly. The operating lever, pivoted on the gear hub, serves the same function as the fork or pin type operating lever on the lever-operated drives. The trip link is the same as those used on lever-type units.

**2-60.** The drive ratchet and gear assembly is a combined spur gear and ratchet wheel that prevents reverse rotation of the setting wheels during resetting of the register unit. Its gear is driven by the intermediate gearing, and drives the trip cam and lever unit assembly. (A spring-loaded pawl mates with the ratchet wheel). Two pan head screws in elongated holes hold the gear and ratchet wheel together and provide a vernier adjustment for synchronizing the No. 1 setting wheel with the No. 1 Register wheel.

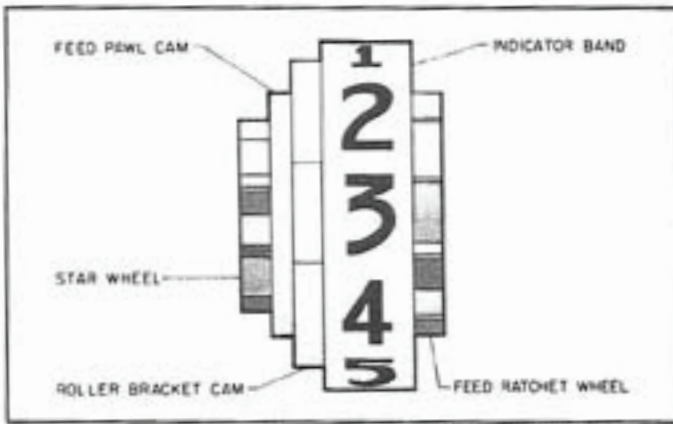
**2-61.** The trip cam and lever unit assembly, through the setting wheel drive shaft, drives the No. 1 setting wheel. It also converts the rotary motion of the drive ratchet and gear assembly into an oscillating motion for driving the operating lever on the intermediate gearing. (See figure 2-18). The assembly consists of a pawl plate, a trip cam, and a trip cam arm.

**2-62.** The pawl plate houses the pawl that engages the drive ratchet and gear assembly. It is mounted on the setting wheel shaft and is coupled by a diametrical slot in its hub to a pin in the shaft. The trip cam, an eccentric attached to the pawl plate, drives the trip cam arm which is coupled by a pin to the operating lever. A star wheel on the left end of the setting wheel drive shaft prevents it from drifting and insures a positive positioning of the No. 1 setting wheel.

**2-63. Wheel Mechanism.** The wheel mechanism actuated by the driving mechanism, provides a visible indication of the quantity remaining to be delivered, and initiates the tripping action when a preset quantity has been delivered. The wheel mechanism is manufactured in two basic designs: the ratchet-type and the gear-type.

**2-64. Ratchet-type wheel mechanism.** The ratchet-type wheel mechanism is used in the lever-operated preset unit. (See figure 2-17). It consists of four setting wheels, a shaft, a feed pawl bracket assembly, a bail mechanism cam assembly, a roller bracket assembly, and four setting keys.

**2-65.** The four setting wheels, designated "1" to "4" from right to left, are mounted to rotate freely about the setting wheel shaft. They are advanced by ratchet pawls in the feed pawl bracket assembly, which engage the feed ratchet wheels on the right-hand side of the setting wheel. Each setting wheel is a plastic part with five functional surfaces. (See figure 2-25). These surfaces include an indicator band, star wheel, feed ratchet wheel, and two cams, one of which is the feed pawl cam, the other is the roller bracket cam.



**Figure 2-25. Setting Wheel Functional Surfaces**

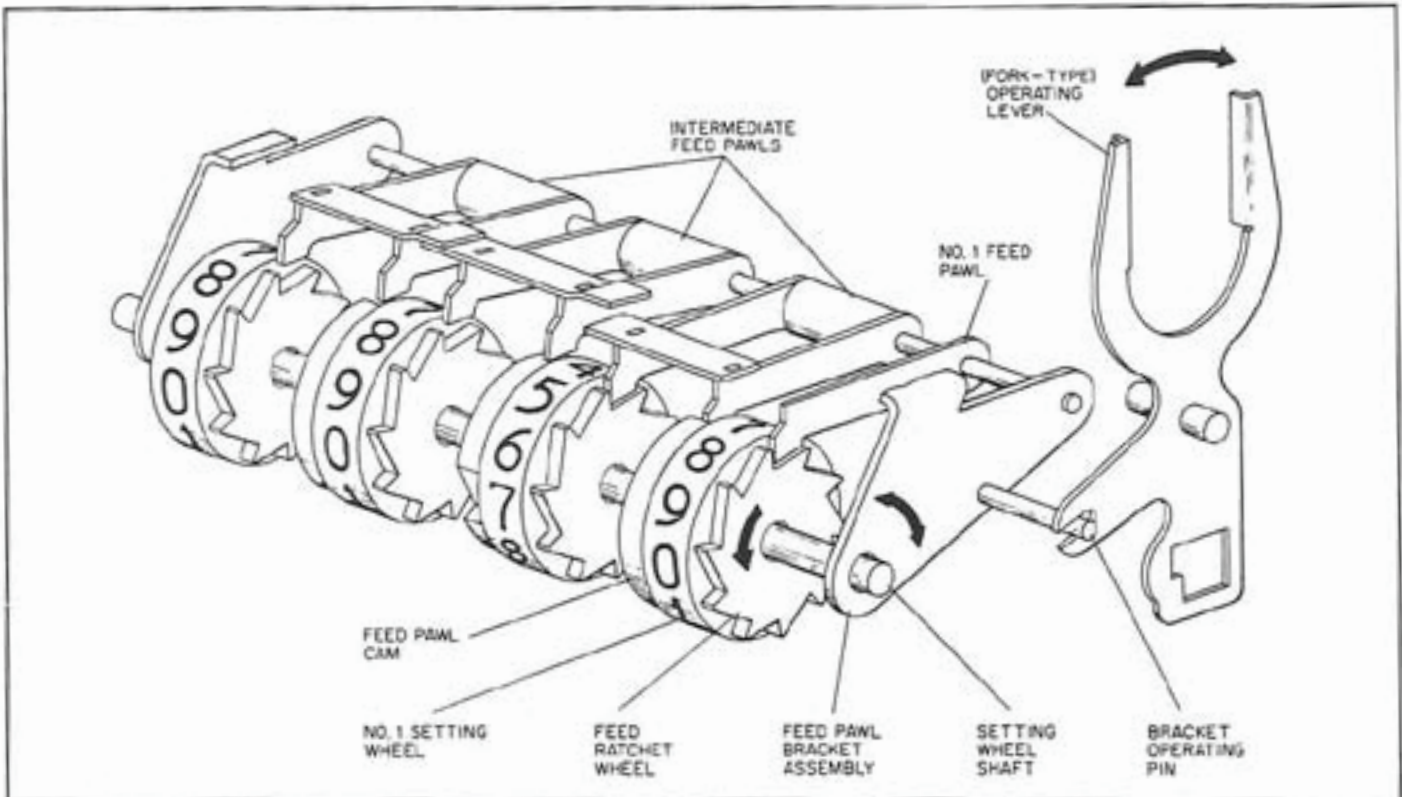
- a. The indicator band has ten positions, or graduations, from zero to nine. (On the No. 1 setting wheel of "pounds" or "kilograms" Registers, the ten graduations are "0", "5", "0", "5", etc.)
- b. The star wheel with ten detent positions, functions in conjunction with a wheel stop pawl, to locate positively the position of the indicator band at one of the ten positions.
- c. The feed ratchet wheel, which operated in conjunction with a feed pawl on the feed pawl bracket assembly, advances the No. 1 setting wheel one-tenth of a turn, with each oscillation of the feed pawl bracket assembly (See figure 2-26).

- d. The roller bracket cam, which operates in conjunction with the roller bracket assembly, prevents the preset mechanism from tripping the valve closed until the setting wheel reads zero. This cam is cylindrical, except for a crescent-shaped detent (cutout) which aligns with the arms of the roller bracket when the indicator wheels read zero.

**Note**

In double-trip preset mechanisms, the No. 1 setting wheel, and sometimes the No. 2 or No. 3 setting wheel, has a second cutout in this cam. These secondary cutouts permit the roller bracket to operate at some predetermined quantity before the wheels reach zero, and thereby allow the valve trip mechanism to close the valve part way.

- e. The feed pawl cam is a cylindrical surface with a single notch in it. The cam works in conjunction with a cam follower which is coupled to a feed pawl that operates the setting wheel to the left. The cylindrical surface of the cam prevents a feed pawl from engaging the ratchet wheel on the setting wheel to the left. The notch, however, allows this feed pawl to engage when the right-hand setting wheel has reached zero. When this occurs, the feed pawl bracket assembly advances both setting wheels one-tenth of a turn on the next oscillation of the operating lever.

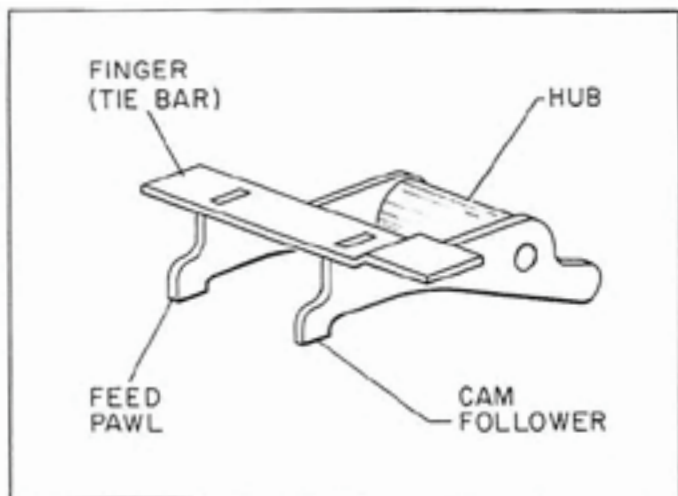


**Figure 2-26. Wheel Mechanism (Ratchet Type), Mechanical Schematic**



2-66. The feed pawl bracket assembly is a pawl carrier that translates the oscillating motion of the driving mechanism into rotary motion for advancing the setting wheels. The assembly, pivoted on the setting wheel shaft, consists of a bracket, a No. 1 feed pawl, three intermediate feed pawls, and a bail.

- a. The bracket is a U-shaped support that positions the feed pawls to make contact with the ratchet wheels of the setting wheels. It is pivoted on the setting wheel shaft, and is driven by a forked arm on the operating lever. (See figure 2-26).
- b. The feed pawls, mounted on a shaft on the bracket, are spring-loaded to engage the setting wheels. The No. 1 feed pawl is mounted at the right-hand end of the bracket and is located to operate the No. 1 setting wheel.
- c. Intermediate feed pawls (fig. 2-27) consist of a feed pawl and a cam follower mounted on a common hub, and joined to operate together by a tie bar or finger. The feed pawl drives the ratchet wheel of the setting wheel to the left. The cam follower rides of the cylindrical feed pawl cam of the setting wheel to the right, and prevents the feed pawl from engaging the ratchet wheel until the right-hand wheel has made one revolution. At the completion of the revolution, the follower drops into a notch in the cylindrical cam for one-tenth of a turn of the right-hand wheel. When the follower drops into the notch, the feed paw engages the ratchet wheel on the left-hand wheel and advances the left-hand wheel one-tenth of a turn.
- d. The finger, or tie-bar, of the intermediate feed pawl



**Figure 2-27. Intermediate Feed Pawl**

serves to interlock the actions of the intermediate pawl to the left with those of the pawls to the right. This interlocking action permits each setting wheel to hold a zero reading until the setting wheel to its right also reads zero. Thus, when the right hand intermediate pawl is raised, all pawls to the left are held in the raised position, regardless of whether the cam follower pawl of the intermediate pawl to the left is positioned over a notch in its associated setting wheel.

- e. The bail is a crank-operated arm, mounted in the feed pawl bracket so that it can raise all the pawls simultane-

ously against their springs. It is actuated by the bail mechanism cam assembly during resetting of the Register. This feature prevents the oscillations of the feed pawl bracket assembly from advancing any of the setting wheels as the register wheels are rotated during the resetting.

2-67. The bail mechanism cam assembly operates the bail of the feed pawl bracket assembly during the resetting of the Register. This assembly, pivoted on the left-hand end of the setting wheel shaft, consists of a cam and a link. The cam operates against a crank pin on the bail, while the link, which is connected to the shutter is raised to obscure the register wheels.

2-68. The roller bracket assembly is a lever that lowers the trip link of the tripping mechanism to couple the trip slide to the operating lever when all the setting wheels read zero. (See figure 2-19). The roller bracket, located beneath the preset setting wheels, has four fingers, or arms, arranged to bear against the roller bracket cams of the four setting wheels. These fingers drop into the half-moon cutouts of these cams when the setting wheel is at zero. A roller on the right-hand finger rides on the roller bracket cam of the No. 1 wheel, and holds the other four fingers away from their respective cams, except when the No. 1 wheel is at zero.

2-69. The setting keys are manually operated, pawl-carrying slides used to rotate the setting wheels to predetermined values. The slides, mounted beneath the wheels, are located and guided by notches in the housing and in the roller bracket shaft. A spring-loaded pawl on each of the keys engages the ratchet wheel of its associated setting wheel, and advances the setting wheel one-tenth turn each time the key is depressed.

2-70. Gear-type wheel mechanism. The gear-type wheel mechanism consists of four setting wheels, a feed pawl bracket assembly, a roller bracket assembly, four setting keys, and a bail operating mechanism.

2-71. The setting wheels of the gear-type mechanism are the same as for the ratchet-type mechanism, except for the No. 1 setting wheel. (Refer to paragraph 2-65). The No. 1 setting wheel is different in two respects. (See figure 2-28). First, it is driven in a continuous rotary motion by direct coupling to the input gearing. Secondly, it produces the oscillating motion required to operate the feed pawl bracket assembly. The No. 1 setting wheel consists of a wheel, a roller bracket cam, a feed cam, and a cam slide.

- a. The No. 1 wheel provides two functions; one of

bearing the numerical indications, and the other of providing a ratchet wheel for use in setting. The hub of the wheel is slotted diametrically to engage a pin in the shaft by which it is driven.

- b. The roller bracket cam, which is a separate part in this assembly, serves the same function as the corresponding surface on the ratchet-type wheels, (Refer to paragraph 2-65d).
- c. The feed cam, in conjunction with the cam slide, converts the rotary motion of the No. 1 wheel into an oscillating motion for operating the feed pawl bracket assembly. The cam is a single, rinse eccentric that drives the slide through one cycle of operating with each rotation of the wheel. The slide is a flat plate with an elongated hole that rides on the hub between the feed cam and a guide (shroud). (See figure 2-28). A pair of cam studs on the slide follow the feed cam. A slide stud on the opposite surface of the slide engages a forked arm of the feed pawl bracket assembly. Thus, the feed pawl bracket assembly oscillates through one full cycle with each rotation of the No. 1 setting wheel.

2-72. The feed pawl bracket assembly is similar to that of the ratchet type units. (Refer to paragraph 2-66). It differs in that it operates only three of the setting wheels, and therefore requires only two intermediate feed pawls rather than three. Also, it does not include a bail mechanism for lifting of the pawls during resetting of the register. A ratchet between the drive ratchet and gear assembly and the trip cam and lever unit assembly uncouples the drive to the feed pawl bracket assembly). However, lifting of these pawls is required during manual setting of the No. 1 setting wheel, and is accomplished by an independent

bail operating mechanism.

2-73. The roller bracket assembly is the same as for the ratchet-type wheel mechanism. (Refer to paragraph 2-68).

2-74. The four setting keys serve the same functions as those of the ratchet-type wheel mechanism. (Refer to paragraph 2-69). The No. 1 setting key, however, serves an additional function. It actuates the bail operating mechanism to lift the feed pawls from the setting wheels as its pawl advances the No. 1 setting wheel.

2-75. The bail operating mechanism is a linkage that lifts the feed pawls during resetting of the No. 1 setting wheel. It consists of bail assembly and the bail bracket assembly.

- a. The bail assembly is a lever, pivoted on the idler wheel shaft, and located so that it will contact the single (No. 2 wheel) pawl and the first intermediate pawl on the feed paw bracket assembly.
- b. The bail bracket assembly is a bell crank, mounted on the roller bracket shaft so that it will transmit the motion of the No. 1 setting key to the bail assembly. Thus, when the No. 1 key is depressed, the key rotates the bail bracket assembly to depress the bail. The bail, in turn, raises the feed pawls from the setting wheels. An adjusting screw on the bail bracket assembly permits adjustment in this linkage.

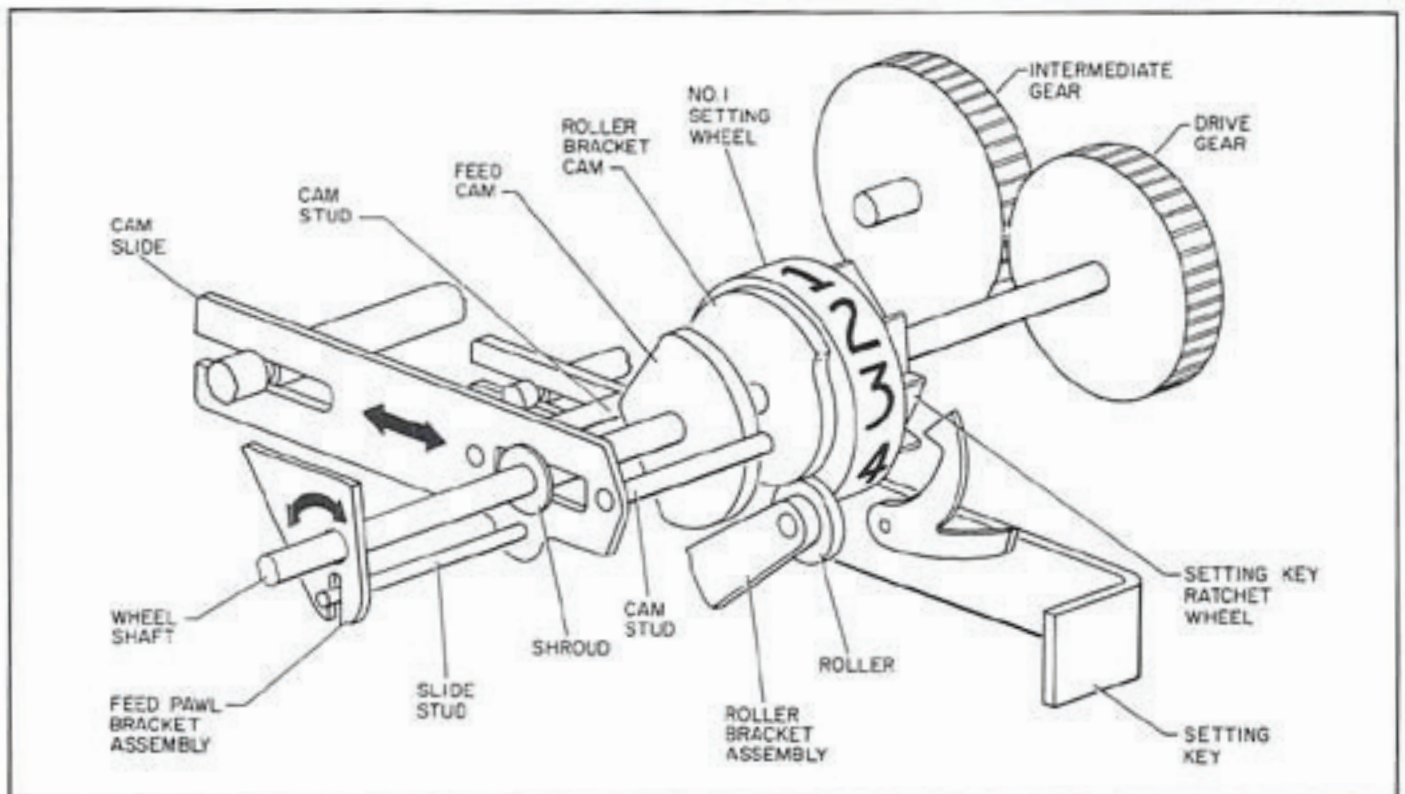


Figure 2-28. No. 1 Setting Wheel Drive (Gear-Type Wheel Mechanism) Schematic

**2-76. Reset Shaft Assembly**

2-77. The reset shaft assembly (fig. 2-29) is a device that permits the register wheels to be reset manually to zero. It is mounted on the top of the register unit so that its shaft ends project through the sides of the register housing to accommodate a reset knob, and is positioned so that its gear meshes with the reset idler gear on the register unit.

**Note**

This assembly is used on non-printer models of Register. In printer models the print unit has a self-contained reset shaft. (Refer to paragraph 2-100).

2-78. The assembly consists basically of a shaft (1, fig. 2-29), brackets (2), a reset gear assembly (3), and a spring-loaded reset knob return arm (4).

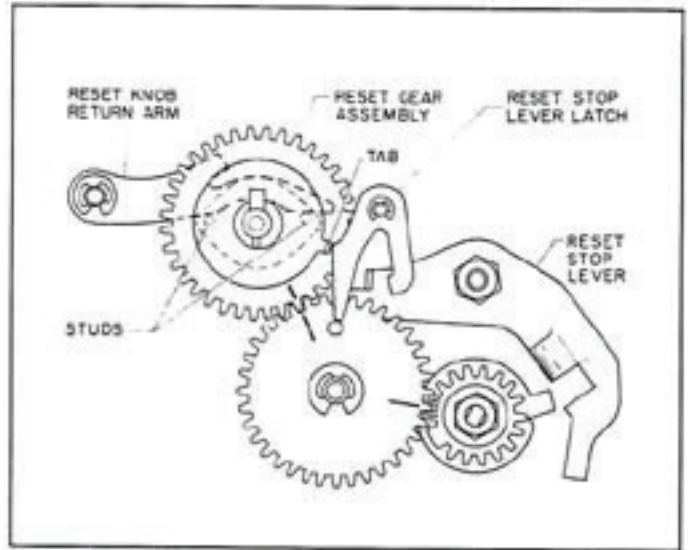
2-79. The reset knob return arm serves to reverse the rotation of the reset shaft slightly so that a tab on the reset gear assembly releases the reset stop lever latch on the register unit. (See fig. 2-30). The return arm is spring-loaded to bear against two studs that project from the reset gear assembly, and thus causes the gear hub to back off as the reset knob is released.

2-80. The reset gear assembly is composed of a 36-tooth gear, mounted to rotate between two plates attached to a hub. Two studs project from the inner plate to be actuated by the reset knob return arm, and a tab projects from the outer plate to contact the latch on the register unit. A ratchet arrangement between the gear and the hub permits rotation of the gear in one direction only. A reference

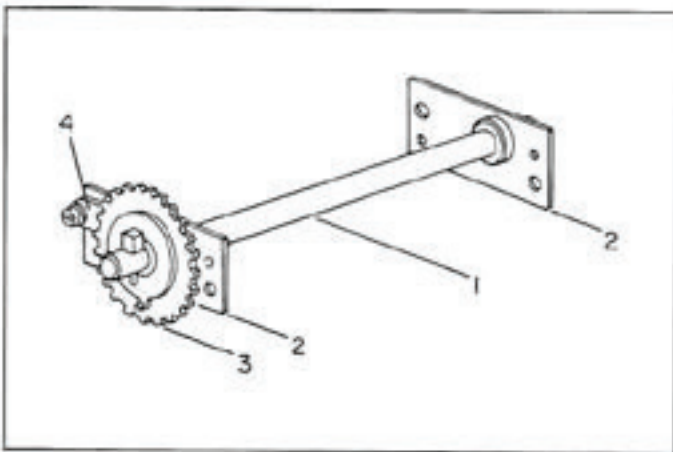
mark on the outer race of the gear establishes the correct mesh with the reset idler gear on the register unit.

**2-81. Print Unit**

2-82. The print unit (fig. 2-31) is a delivery receipt printing device that records the quantity delivered, the serial number of the delivery, and the identification of the Register. It is mounted in the top of the Register, and is driven by a gear take-off from the register unit. With the exception of minor differences, all print units are of two types: totalizer type or zero-start type.

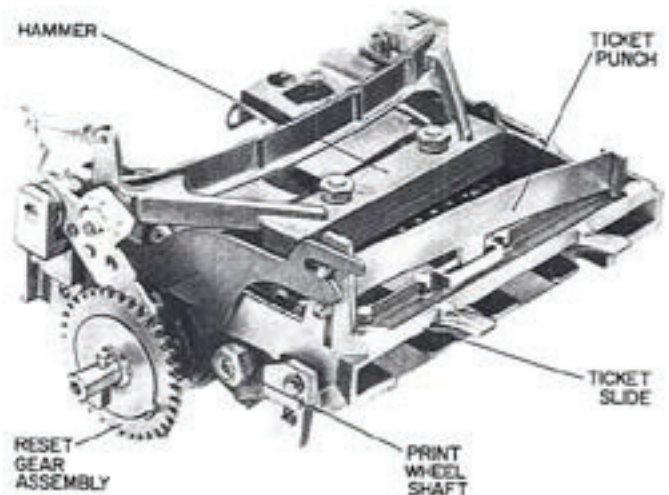


**Figure 2-30. Reset Gear Arrangement**



- 1. Reset Shaft
- 2. Reset Shaft Bracket
- 3. Reset Gear Assembly
- 4. Reset Knob Return Arm

**Figure 2-29. Reset Shaft Assembly**



**Figure 2-31. Print Unit (Zero-Start Type)**



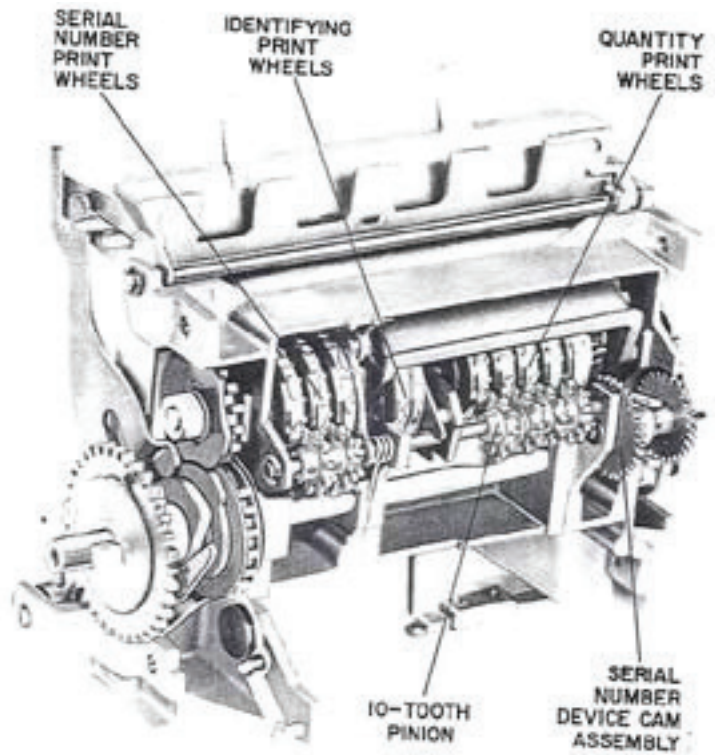
a. *Totalizer type print unit.* The totalizer type print unit prints cumulative readings. At “print in” it prints the previous total; at “print out” it records the new total. (See figure 2-32).

**Note**

The quantity delivered is determined by subtracting the two totals.

b. *Zero-start type print unit.* The zero-start type print unit prints a zero quantity reading at the beginning of each new delivery (to show that the Register has been cleared), and the quantity delivered at the end of delivery. (See figure 2-32).

2-83. The two types of print units differ principally in the print wheel mechanism. (The zero-start unit includes means for resetting the quantity print wheels to zero; the totalizer does not). The minor differences in print units are limited to variations in type faces on the print wheels. In general, each print unit consists of print wheels, a reset shaft assembly, a ticket slide assembly, and a hammer mechanism.



**Figure 2-33. Print Unit (Zero-Start Type), Bottom View**

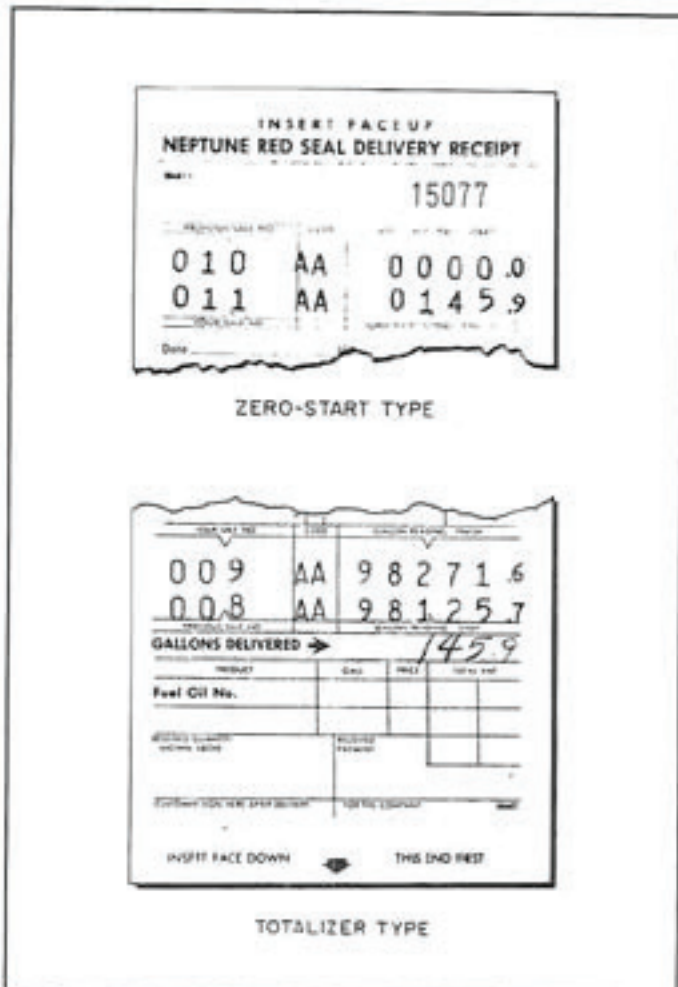
**2-84. Print Wheels.**

2-85 The print wheels are a set of raised-letter stamping wheels, arranged in three groups to rotate about a common shaft. (See figure 2-33). One group registers the quantity of the delivery; the second, the identification; and the third, the serial number of the delivery. The wheels, except the identifying print wheels, are driven by an input from the register unit and by the operation of the ticket slide. (See figure 2-34).

2-86. *Quantity Print Wheels.* The quantity print wheels are a group of five (or six) wheels, coupled together by 10-tooth pinions in a geneva-type drive arrangement similar to that shown in figure 2-9. The quantity print wheels are located at the right-hand end of the wheel shaft, and are driven, through gearing on the serial number device cam assembly, by the gears of the register unit. (See figure 2-34).

2-87. *Intermediate quantity print wheels.* The intermediate quantity print wheels consist basically of a printing surface with ten raised figures (0 to 9), a 2-tooth gear, and a 20-tooth gear. The 2-tooth gear, through one of the 10-tooth pinions, drives the 20-tooth gear of the wheel to its left at a 1:10 ratio.

a. The totalizer type wheels are essentially unit



**Figure 2-32. Typical Delivery Receipts**



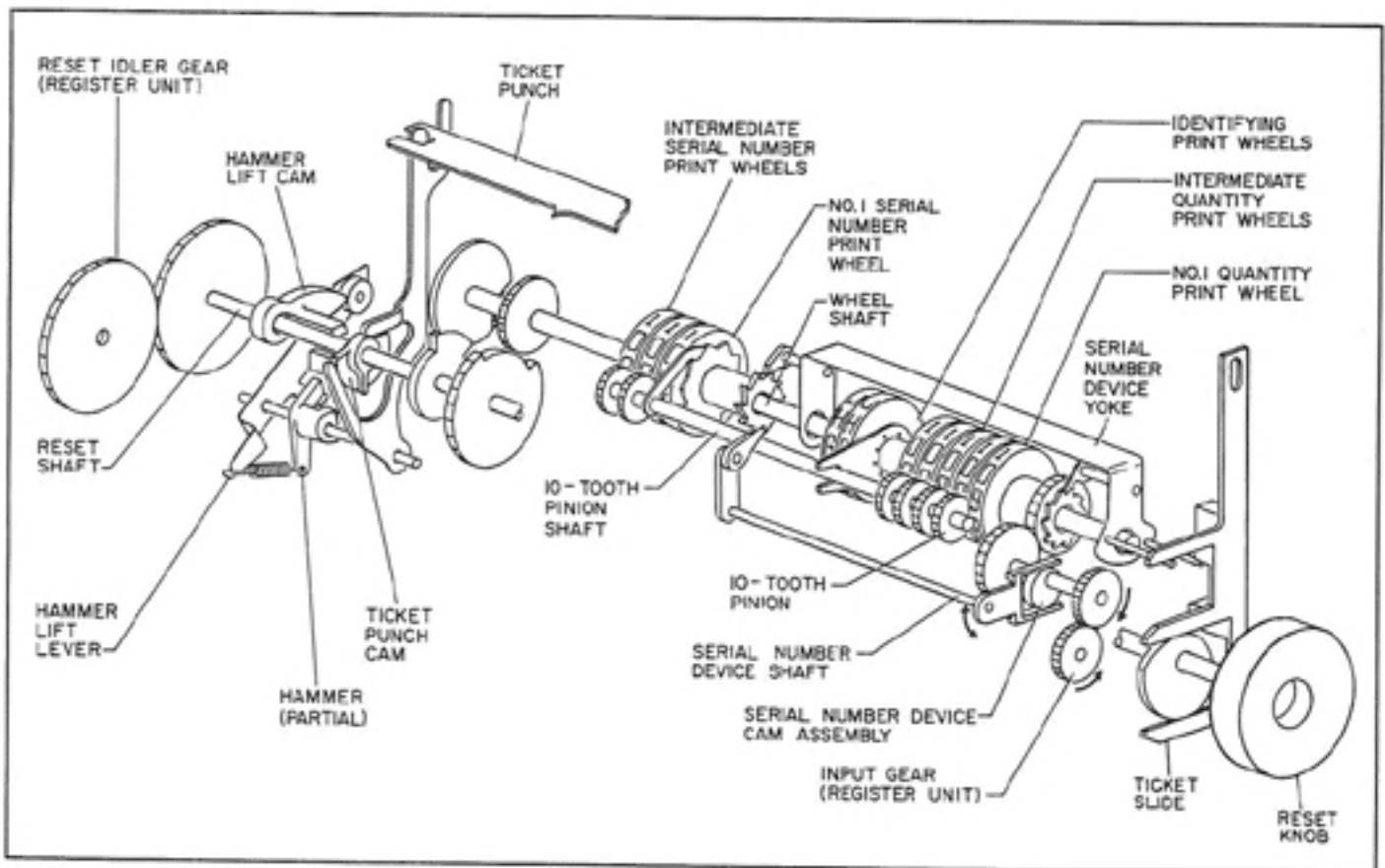


Figure 2-34. Print Unit (Zero-Start Type), Mechanical Schematic

assemblies that rotate on a shaft.

- b. The zero-start type wheel assemblies have two additional features that permit them to be ratcheted to a zero reading when the Register is reset. First, the assembly includes a ratchet that permits the cup (printing surface) to rotate to any one of ten positions while the 20-tooth gear is held stationary by the 10-tooth pinion (which is locked by the wheel at the right). Secondly, the assembly is equipped with a spring-loaded reset pawl that engages a groove in the wheel shaft. This pawl permits the shaft to drive the print wheel back to a zero index position during resetting.

2-88. *No. 1 quantity print wheel.* The No. 1 quantity print wheel is similar to the intermediate wheels in appearance and function. However, it includes additional features that are required for aligning the wheel with the intermediate wheels before printing. In zero-start print units, the No. 1 wheel also includes means for preventing the wheels from turning in the event of reverse operation of the Register, and for permitting the wheels to be returned to zero during resetting.

2-89. The No. 1 print wheel is an assembly consisting of a wheel assembly, a drive gear and stop plate assembly, and (on zero-start units only) a ratchet assembly. (See figure 2-35).

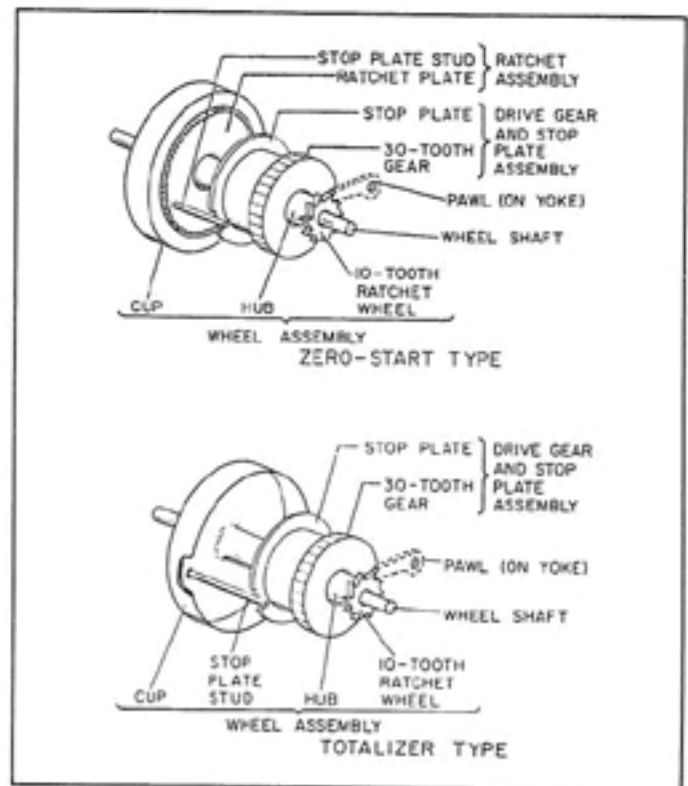


Figure 2-35. No. 1 Quantity Print Wheel, Mechanical Schematic

2-90. The drive gear and stop plate assembly is mounted to rotate about the hub, and is driven by gearing on the serial number device cam. (See figure 2-34). An elongated notch in the stop plate of this assembly drives the wheel by means of the stop plate stud. (The notch provides play so that the numerals on the cup of the No. 1 wheel can be aligned with those of the intermediate wheels before "print out").

2-91. The ratchet assembly (on the zero-start type No. 1 wheel) is mounted to rotate about the hub of the wheel assembly, and is arranged to drive the wheel assembly through a ratchet during registering. (The ratchet permits the wheel assembly to be returned to zero during "print in", while the 30-tooth gear is held stationary by the gearing from the register unit).

2-92. The 10-tooth ratchet wheel permits the pawl on the serial number device yoke to advance the No. 1 wheel for proper alignment with the other wheels prior to printing.

2-93. Identifying Print Wheels. The identifying print wheels are a pair of stationary printing wheels arranged to rotate about a common hub. The wheels are mounted on the print wheel shaft, and are held stationary by a forked arm that engages the 10-tooth pinion shaft. (See figure 2-34).

Each of the wheels is set manually to any of 10 positions (for 90 combinations), at which it is retained by an internal detent mechanism.

2-94. Serial Number Print Wheels. The serial number print wheels are a group of three wheels, coupled together by two 10-tooth pinions. The intermediate wheels are identical to the totalizer-type intermediate quantity print wheels. The No. 1 serial print wheel differs in that it has a 10-tooth ratchet wheel in place of the 20-tooth input gear, and is equipped with a 20-tooth star wheel to position the numerals properly.

2-95. The serial number print wheels are driven by two separate pawls in two separate actions. One pawl on the serial number device shaft advances the No. 1 wheel 1/20 turn as the Register begins to operate the serial number device cam assembly at the start of a delivery. (See figure 2-34). The No. 1 wheel is then held in this position by the star wheel, and the numerals of the wheel remain out of alignment with (half-way between) those of the other wheels. The second pawl on the serial number device yoke advances the No. 1 wheel an additional 1/20 turn when the ticket slide is shifted just prior to the printing out operation. Thus, the serial number is advanced one numeral (1/10 turn) per delivery.

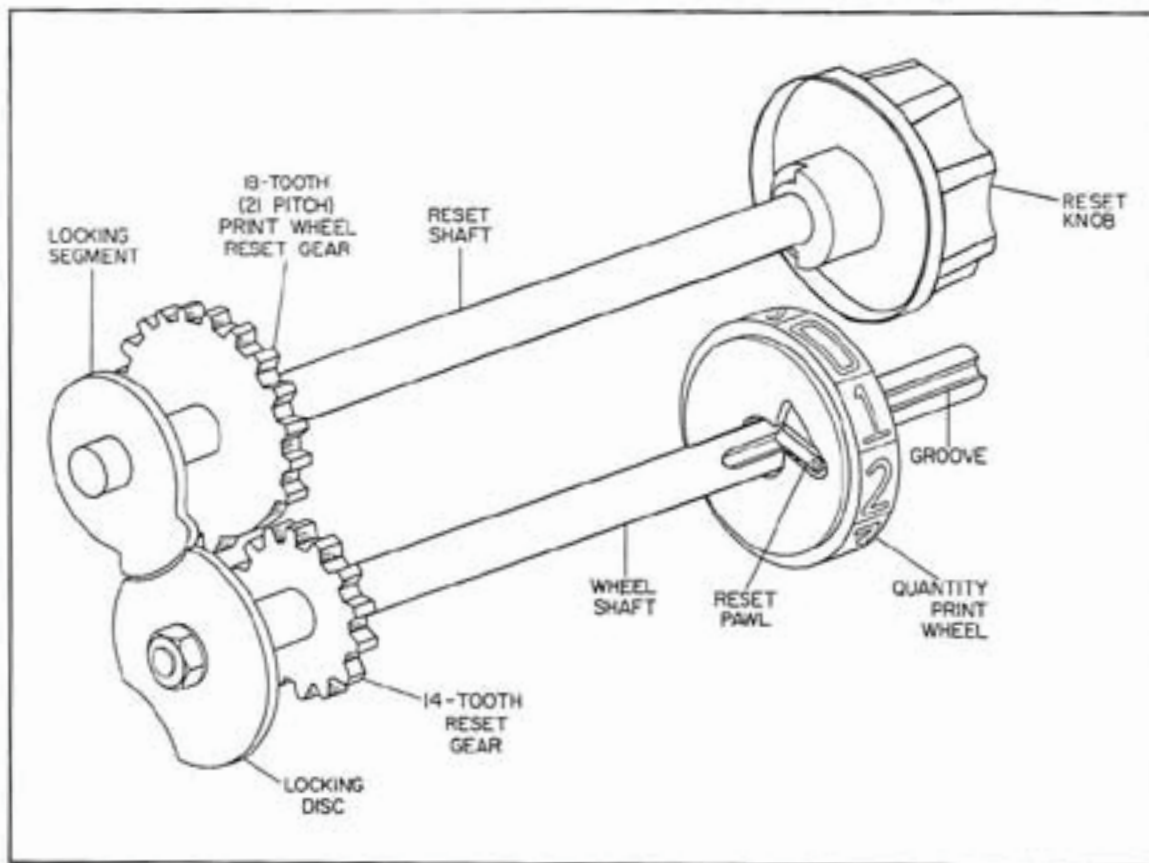


Figure 2-36. Zero-Start Print Wheel Reset Mechanism

2-96. Wheel Shaft. The wheel shafts of the totalizer and the zero-start print units differ. The totalizer wheel shaft is a simple spindle about which the wheels rotate. The shaft of the zero-start type mechanism, however, has a groove along a portion of its length so that it can engage reset pawls on the quantity print wheels and rotate them during resetting.

**Note**

The zero-start shaft is a part of the zero-start print wheel reset mechanism which is factory adjusted to ensure accurate indexing of the quantity print wheels to zero. The parts attached should never be removed or rotated on the shaft.

**2-97. Zero-Start Print Wheel Reset Mechanism**

2-98. The zero-start print wheel reset mechanism provides means for returning the quantity print wheels to zero when the reset knob is rotated during resetting of the Register. The mechanism consists essentially of a gear and locking segment on the reset shaft, and a gear and locking disc on the wheel shaft, and includes the reset pawls of all the quantity print wheels. (See figure 2-36).

2-99. During resetting, the reset shaft rotates the 18-tooth gear, which drives the 14-tooth gear and the wheel shaft. Rotation of the wheel shaft, in turn, causes the groove in

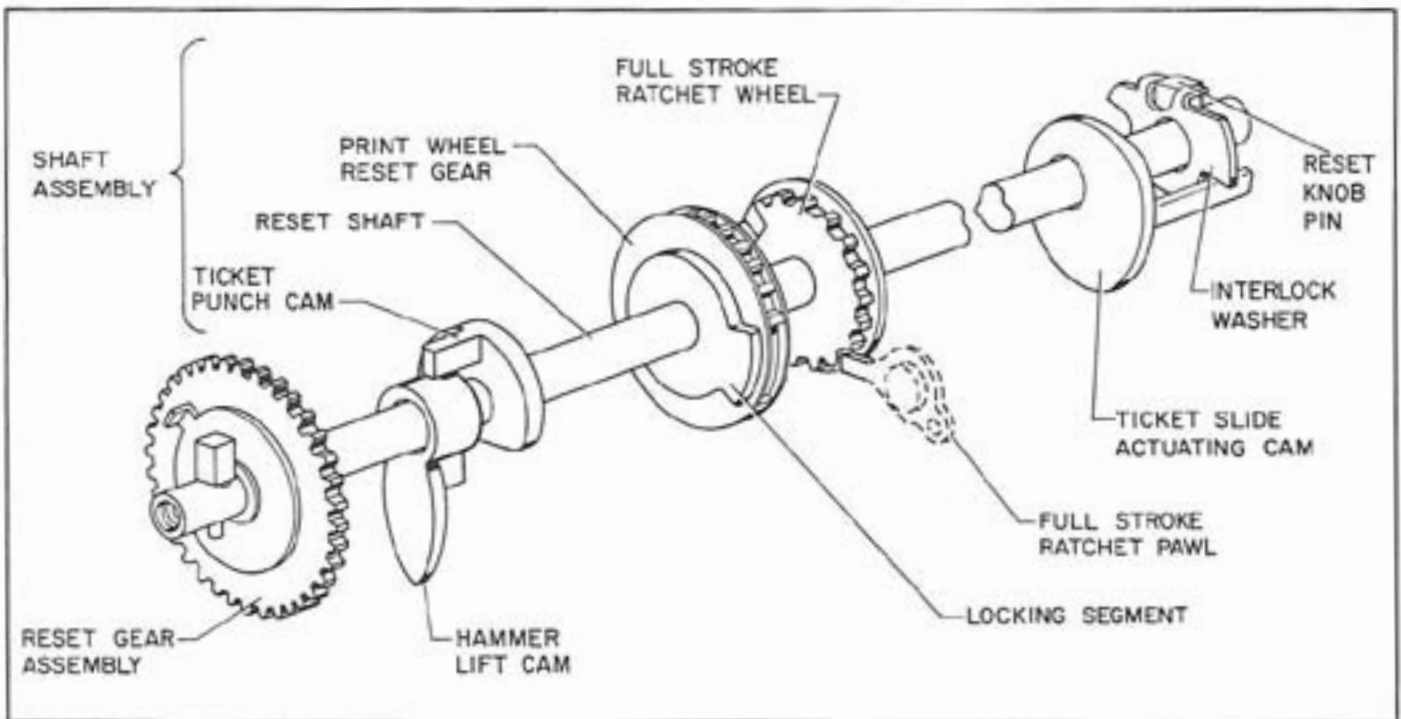
the shaft to engage the reset pawl on the quantity print wheel, and thus rotate the wheel.

**Note**

A three-tooth space in the 18-tooth gear permits the reset shaft to be rotated an extra 1/7 turn both during the print-in and print-out operations; that is, before and after the 14-tooth gear has been rotated. The lag thus produced is required for the synchronization of the operation of the ticket punch, the shifting of the ticket slide, and the actuation of the hammer with the resetting and alignment of the print wheels. (Refer to paragraphs 2-106 and 2-112). The locking segment, in conjunction with the locking disc, prevents the wheel shaft from rotating when the 14-tooth gear becomes unmeshed from the 18-tooth gear in the three-tooth space. (See figure 2-36).

**2-100. Reset Shaft**

2-101. The reset shaft of the print unit performs the same functions as those of the reset shaft assembly used on nonprint unit Registers. The shaft of the print unit, however, differs somewhat in construction to permit it to operate the ticket slide and the hammer mechanism. The reset shaft consists of a shaft assembly, a ticket slide actuating cam, a hammer lift cam, and a reset gear assembly. (See figure 2-37).



**Figure 2-37, Print Unit Reset Shaft**



2-102. Shaft Assembly. The shaft assembly is a factory assembled unit that includes a print wheel reset gear and locking segment, a full stroke ratchet wheel, and a ticket punch cam. (See figure 2-37).

- a. The reset gear and segment operate the zero-start wheel reset mechanism. Refer to paragraph 2-97).
- b. The full stroke ratchet wheel is a 16-tooth ratchet wheel that permits the shaft to operate in either direction, provided rotation is complete in each direction. (A single deep notch in the ratchet wheel permits the full stroke ratchet pawl to turn around”).
- c. The ticket punch cam operates a ticket punch actuating lever to raise and lower the ticket punch. The cam is so arranged that the punch is lowered at the beginning of the print-in cycle and is raised at the completion of the print-out cycle. A protrusion or dog on the side of the cam engages and drives the hammer lift cam whenever the reset shaft is rotated.

2-103. Ticket Side Actuating Cam. The ticket slide actuating cam, mounted to rotate freely about the right-hand end of the reset shaft, cams the ticket slide forward on the print-in cycle and toward the rear for the print-out cycle. (See figure 2-37). A dog on the inner side of the cam contacts a stop on the print frame to limit cam rotation; a dog on the outer side engages a flat on the reset knob, which drives the cam when the knob is rotated. (An interlock washer, anchored to the reset shaft by the reset knob pin, serves to drive the ticket slide actuating cam when the reset knob is mounted on the left-hand end of the shaft.

2-104. Hammer Lift Cam. The hammer lift cam, mounted to rotate freely about the left-hand end of the reset shaft, is arranged to cam the hammer lift lever at the completion of the print-in and print-out cycles. It has a protrusion on its hub that engages a dog on the ticket punch cam so that the ticket punch cam rotates the hammer lift cam whenever the reset shaft is rotated. (See figure 2-37).

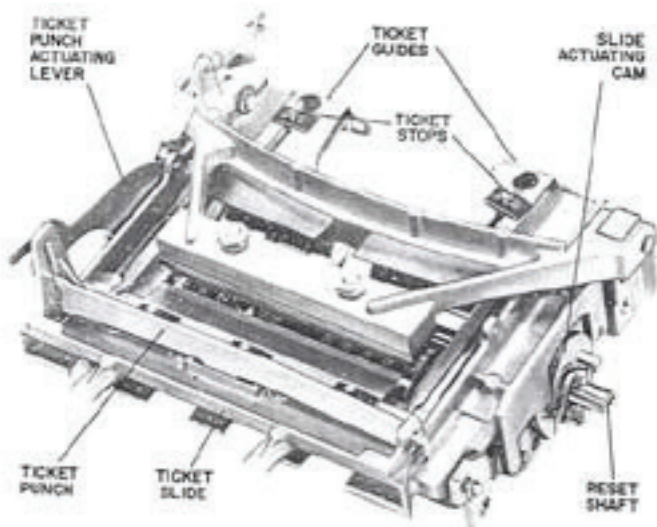


Figure 2-38. Ticket Slide

2-105. Reset Gear Assembly. The reset gear assembly, mounted on the left-hand end of the reset shaft, is similar to the of the reset shaft assembly. (Refer to paragraph 2-76). It drives the reset gearing of the register unit during the print-in cycle, but does not release the reset stop lever latch on the register automatically upon release of the knob. (This releasing action takes place as the reset knob is reversed slightly).

### 2-106. Ticket Slide

2-107. The ticket slide assembly is a movable carriage that positions the ticket (delivery receipt) between the print wheels and the hammer mechanism so that the reading of print wheels will be stamped in the correct location on the ticket. The assembly includes a slide, ticket guides, ticket stops, and a ticket punch. (See figure 2-38).

2-108. The slide is a cast unit that supports and locates the other components of this assembly, it is mounted to slide back and forth on the print frame, by means of two shafts that project through elongated holes in the casting. Two integral fingers or projections on the right-hand side of the slide casting serve as cam followers by which the slide actuating cam on the reset shaft shifts the slide assembly back and forth. A third finger actuates a pin on the serial number device yoke assembly to advance the serial numbers.

2-109. The ticket guides and stops assure correct alignment of the ticket with the print wheels. The guides have elongated mounting holes to permit sidewise adjustment of the ticket position. Movable stops, which slide back and forth in the tops of the guides, permit vertical adjustment of the reading on the ticket.

2-110. The ticket punch, mounted in the front of the ticket slide, prevents removal of the ticket from the print unit until the print-out cycle is completed. The punch, actuated by a ticket punch actuating lever, is pivoted at the right-hand end of the slide, and is positioned by a guide slot at the left. A shaft point in the center of the punch arm pierces and holds the ticket captive.

2-111. The ticket punch actuating lever, actuated by the ticket punch cam on the reset shaft, raises and lowers the ticket punch. The actuating lever, with its forced slot, permits the lever to remain engaged with the ticket punch as the ticket slide shifts back and forth. The short time of the fork permits the lever to be repositioned above the punch, thus locking the punch until the completion of the print-out operation at the end of the delivery.

### 2-112. Hammer Mechanism (See P300 pages 10, 11, &12)

2-113. The hammer mechanism (fig. 2-39) is a spring-operated hard-rubber cushion (platen) that strikes the ticket against the type on the print wheels. It is triggered by the hammer lift cam on the reset shaft (par. 2-100) when the reset knob is rotated during the print-in and print-out cycles. The mechanism consists of a hammer cushion, a hammer, a hammer lift lever assembly, and springs.



2-114. The hammer cushion is a composition rubber striking surface attached to the hammer by two integral studs and nuts. Oversized mounting holes in the hammer allow for slight adjustment in the position of the cushion to ensure the proper contact with the type.

2-115. The hammer, an arm pivoted on shafts at the rear of the print frame, is raised and lowered by the hammer lift lever assembly as the lever follows the hammer lift cam on the reset shaft.

2-116. The hammer lift lever is a cam follower arm that drives the hammer up and down. It is pivoted on the left-hand hammer shaft, and is operated by the hammer lift cam on the reset shaft against the pressure of the hammer spring. The lever is coupled to the hammer by a tab that bears against a lug on the hammer, and is arranged so that the hammer can swing down independently of the lever. A hammer retaining spring, arranged between the lever and the hammer, holds the hammer into contact with the tab of the lever. This spring coupling normally holds the hammer cushion of the type of the print wheels to provide clearance for inserting and withdrawing the ticket. It also permits the hammer to overtravel on the printing stroke so that the cushion can stamp the ticket against the type.

### 2-117. Housing

2-118. The housing, which encloses the Register, consists of a cover, a shroud, and a front housing assembly, and includes a reset knob, washer, retainer, and a hole plug. (See figure 2-40).

2-119. Cover. The cover is a one-piece cast unit that is attached by four screws to the front housing and to posts on the preset base of the Register. (Covers for Printer models include a spring loaded hinged dust cover that closes the ticket slide opening when not in use).

2-120. Register Shroud. The register shroud is a sheet metal wrap-around that covers the two sides and the back of the Register. It is held in place by grooves in the cover the front housing, and the preset base.

2-121. Front Housing Assembly. The front housing assembly (fig. 2-40), which encloses the front of the Register, is mounted on the preset base and supports the cover. The front housing consists principally of a supporting frame and a plastic window for viewing the register wheels and the totalizer. It bears an instruction plate on which the Register is identified by model, code, and serial number.

2-122. The style of the front housing used depends upon the difference in the models of Register. (See figure 2-40). Register with neither print units nor preset mechanisms are provided with a totally enclosed front housing. Those with preset units require openings for the setting keys and an additional window for viewing the setting wheels.

2-123. Reset Knob, Washer, Retainer, and Hole Plug. The reset knob is mounted on the end of the reset shaft by a nylock-insert screw and lock washer. A felt washer and washer retainer is held in place by the knob to seal the shroud. The hub of the knob is designed to engage the square head knob pin on the reset shaft to drive the shaft; it also has flats that contact and drive the ticket slide actuating cam on Printer model registers. There is a hole plug inserted in the shroud on the opposite end of the shaft. The reset knob and hole plug are interchangeable for either left-hand or right-hand operation.

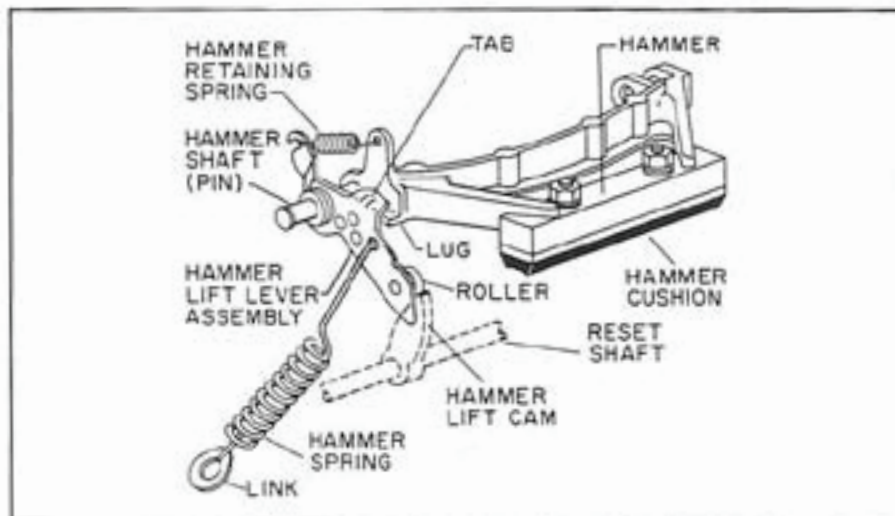


Figure 2-39. Hammer Mechanism

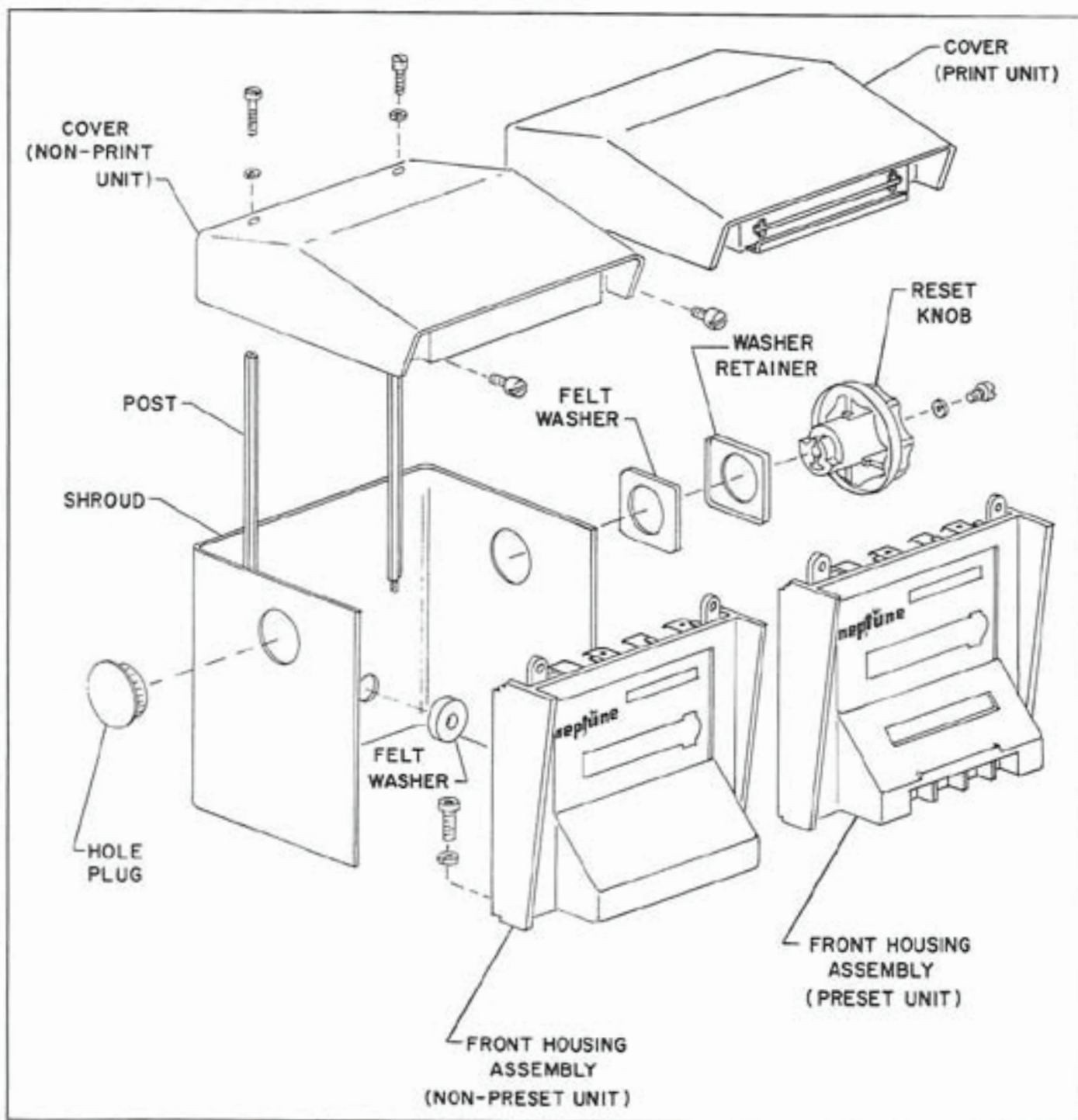


Figure 2-40. Housing

# Section 3

## INSTALLATION AND PREPARATION FOR USE

### 3-1. GENERAL

3-2. This section covers the installation of the Register on the flowmeter, and the calibration of the Register to the flowmeter.

### 3-3. INSTALLATION

#### 3-4. Pre-Installation Inspection

3-5. Before installing the Register on the flowmeter, check the following:

- a. Examine the flowmeter to see that the case bolts and all flange bolts are tight, and that there is no leakage from the stuffing box on the flowmeter spindle.
- b. Check that the Register clamp studs are properly located on the flowmeter to orient the front of the Register properly and that the studs are tight.
- c. Check that the Register driver connector (star wheel coupler) is installed on the flowmeter spindle tightly.
- d. Inspect the change gears on the bottom of the register unit to see that they are installed properly to provide the correct ratio and direction of rotation.
- e. Check the over-all operation of the Register as described in paragraphs 6-4 through 6-22.

#### 3-6. Mounting the Register

3-7. Clean the mounting surfaces of the flowmeter and the Register, and install the Register as follows:

- a. Back out the two clamping screws in the Register until the two mounting holes are clear.
- b. Lower the Register onto the clamp studs on the flowmeter, making certain that the driving fork engages the star connector on the flowmeter spindle properly. Tighten the clamp screws.
- c. Install (on Preset models only) the valve linkage on the shaft that extends from the rear of the Register. (Refer to the proper Operating and Maintenance Manual for instructions).
- d. Make necessary adjustments as outlined in paragraph 3-8, and calibrate and seal the Register as described in paragraph 3-20.

#### 3-8. Installation Adjustments

3-9. Before calibrating and sealing the Register, make the following adjustments.

#### 3-10. Non Preset Registers

3-11. Registers that have neither a preset mechanism nor a print unit require no particular 3-20.

#### 3-12 Preset Registers

3-13. The adjustment of the Preset model Registers is limited to adjusting the valve linkage, and regulating the tripping point of the mechanism.

3-14. Valve Linkage Adjustment. The valve linkage must be adjusted so that the tripping mechanism latches when the valve is completely open, and so that the valve closes completely when the tripping mechanism is released. Also, the adjustment must be such that the linkage is loose, both when the valve is completely closed and when it is held wide open manually. (Refer to the applicable Operating and Maintenance Manual for specific instructions.)

3-15. Tripping Point Adjustment. The tripping point of the Preset tripping mechanism must be adjusted so that when the valve closes, the Register will read the desired amount exactly

#### Note

The tripping point required is dependent upon such things as the speed of valve closing, the rate of flow through the flowmeter, and the characteristics of the fluid being measured.

3-16. Adjust the tripping point as follows:

- a. Set the Preset setting wheels for a sample quantity, and allow the amount to pass through the flowmeter. Note that as the tripping mechanism closes the valve, the visible wheels on the register unit indicate the desired reading exactly.
- b. If the reading is not correct, remove the slotted screw (cover and lock washer from the adjusting screw hole in the housing at the left-hand side of the emergency stop button (See figure 4-2).
- c. If the reading noted in paragraph 3-16a has not reached zero before the valve trips closed, insert a screwdriver into the adjusting screw hole, and turn the adjusting screw *clockwise*.

#### Note

One turn of the adjusting screw will change the tripping point by one-quarter of a graduation of the No.1 register wheel.

- d. If the reading in paragraph 3-16a has gone beyond zero, turn the adjusting screw *counter-clockwise*.
- e. Reset the Preset mechanism, and operate the again to check the adjustment. Reinstall the cover screw and lock washer in the adjusting screw hole.
- f. On Registers that trip at *5-pound increments only*, if the preceding adjustments are not sufficient, make further corrections as described in paragraph 3-17.

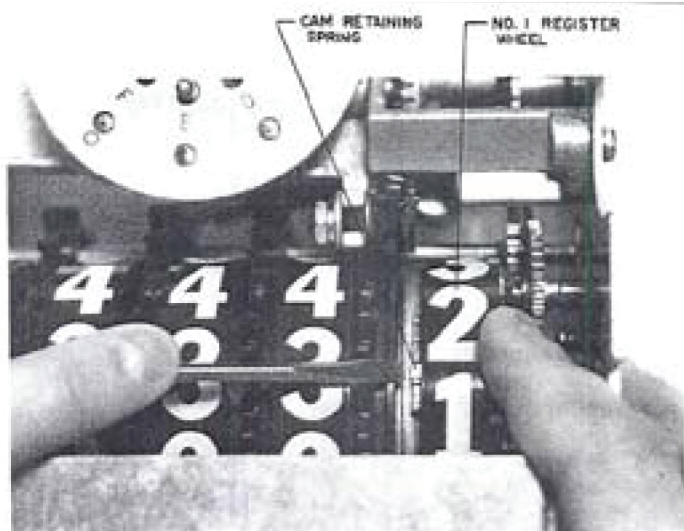
3-17. Make additional adjustment to 5-pound increment Registers as follows:

- a. Take out the four mounting screws, and remove the top cover from the Register.
- b. Referring to figure 3-1, lift the cam retaining spring on the No. 1 register wheel, and rotate the cam in relation to the wheel as required. Then readjust the tripping mechanism (if necessary), as described in paragraph 3-16.

**Note**

A movement of one notch will change the tripping point by about 1/4 pound.

- c. If the valve closes before the reading reaches zero, move the cam toward the *rear* of the Register.
- d. If the reading reaches zero and the valve has not closed, move the cam forward toward the front of the Register.

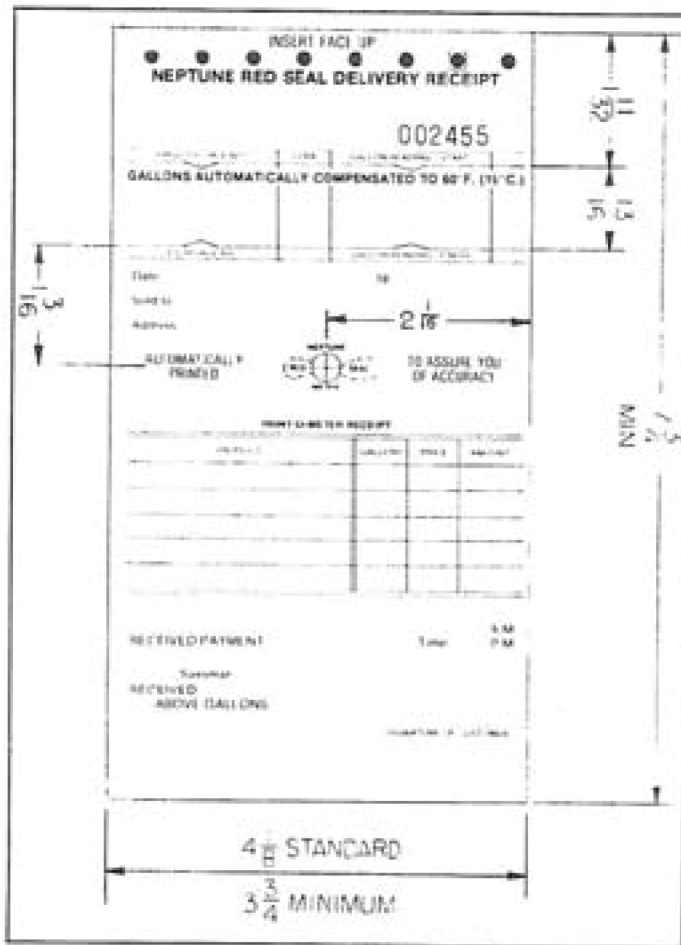


**Figure 3-1. Adjusting 5-Pound-Increment Register**

**3-18. Printer Registers**

3-19. The adjustment of Printer model Registers is limited to the positioning of the guides, and stops, and hammer. These are adjusted as follows.

- a. Take off the top cover of the Register by removing four screws.
- b. Insert a delivery ticket. A ticket of as many as four copies utilizing sub-zero temperature carbons may be used (see figure 3-2). Note that the ticket guides (fig. 3-3) are parallel, that the ticket slides freely between the guides, and that the total clearance between the ticket and the guides is 1/16 to 1/8 inch.
- c. Operate the reset knob to “print in” and “print out”. Then remove and examine the ticket to see that the printing is in the proper located both horizontally and vertically and the numerals are complete and legible.
- d. To make the ticket guides parallel, take out the screws, remove the guide and bend the tail of the guides are required. Reinstall the guide, and secure it with its two screws and lock washers.
- e. To relocate the ticket horizontally, loosen the screws (fig. 3-3) holding the ticket guides, and reposition the guides the right or left as required. Retighten the screws.
- f. To relocate the ticket vertically, slide both ticket stops in the keyhole slots forward or backward as required.
- g. If complete numeral is not legible, loosen the two nuts on the hammer assembly (fig. 6-20), relocate the hammer cushion, and retighten the nuts.
- h. Recheck the guide and stop alignment and replace the cover.



**Figure 3-2. Typical Delivery Ticket**



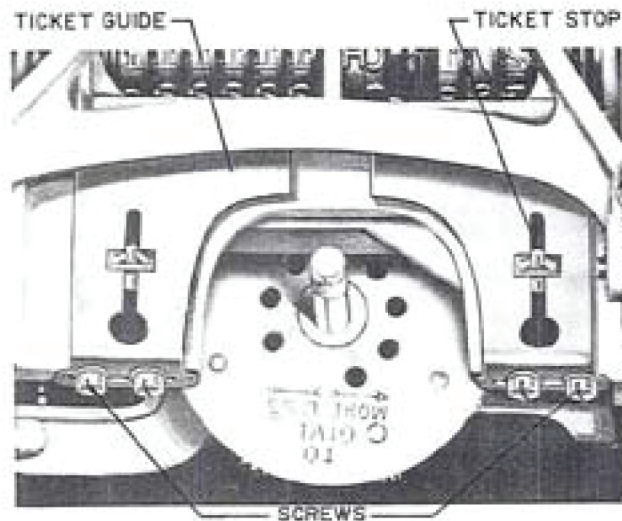


Figure 3-3. Adjusting Ticket Guides and Stops

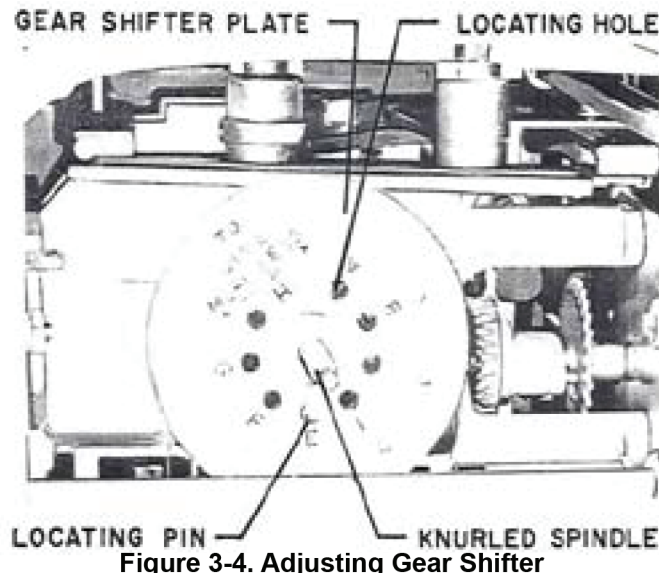


Figure 3-4. Adjusting Gear Shifter

### 3-20. CALIBRATION

3-21. Calibration is the adjustment of the Register to the particular flowmeter on which it is to be used. This adjustment consists of varying the gear ratio of the Register to compensate for minor discrepancies in the flowmeter or for differences in the characteristics of the material being metered.

3-22. Calibration of the flowmeters must be performed by *authorized personnel only*, using approved and certified measuring containers or other equipment.

3-23. The equipment recommended is a test measure equal to at least the amount the flowmeter can deliver during one minute at its maximum discharge rate. However, when calibrating flowmeters that measure in pounds, or that measure viscous liquids in gallons, the testing should be done by weighing the material, using containers of known weight, and reliable scales having a capacity of 300 to 500 pounds (plus the weight of the container).

3-24. Fill the test measure with liquid passed through the flowmeter under test, and compare the reading of the Register with the measured quantity. Repeat this process several times, noting that the readings are consistent.

3-25. If the readings are consistently more or less than the measured delivery, adjust the Register as follows:

- Calculate the percentage difference between the reading and the measured amount by dividing the difference by the recorded amount.
- Take out the four screws and remove the top cover of the Register.
- Note the position of the gear shifter. (See figure 3-4.)

#### Note

The gear shifter has a series of locating holes (lettered from A to H) in its plate into which a

locating pin enters to hold the shifter at any of eight positions. Each position permits the calibration to be altered by approximately 0.15 percent for the standard shifter, or .5 percent for the wide range shifter, which is normally found on a "pounds" or "kilograms" register. The wide range shifter, which is normally found on a "pounds" or kilograms" register. The wide range shifter can be easily identified because it has a bright steel gear shifter has a brass gear shifter plate. The gear shifter comes from Red Seal Measurement in the "E" position. This is a center position which allows four positions to give less and three positions to give more. The "F" position on the standard shifter allows a 1:1 ratio throughout the register if 33R and 33S change gears are used.

- Lift the gear shifter by the knurled spindle in the center of the plate, and rotate the plate as required: *clockwise* (as viewed from the top) to decrease the Register reading, or **counterclockwise** to increase the reading.

#### Note

If the error exceeds 0.5 percent for the standard shifter or 1.5 percent for a wide range shifter, return the gear shifter to position "E," and recalibrate the flowmeter by replacing change gears (fig. 2-8) with gears of proper ratio in accordance with Change Gear Chart, Form TSG-100

- Recheck the calibration, replace the top cover, and secure it with the four screws and two lock washers.

3-26. Lockwire the two front cover screws and the two Register clamping screws, and seal with an authorized seal, if required.

## Section 4 OPERATION

4-1. The operation of the Register depends upon the model of Register and the units of which it is composed; that is, register unit, preset unit, and print unit.

### 4-2. NON-PRESET REGISTERS

4-3. Referring to figure 4-1, reset the register (visible) wheels to zero by rotating the reset knob clockwise (as viewed from the right-hand side) until the knob stops. Then release the knob; it will spring back slightly.

4-4. To check the total (cumulative) quantity delivered by the flowmeter, read the quantity on the totalizer.

### 4-5. PRESET REGISTERS

4-6. Referring to figure 4-2, reset the register (visible) wheels to zero by rotating the reset knob fully clockwise (as viewed from the right) until it stops, and release the knob.



4-7. Depress the setting keys individually to rotate the setting wheels to the desired reading.

4-8. Open the valve to the flowmeter to start the delivery.

**Note**

Opening the valve will cock the preset tripping mechanism which will hold the valve open until the delivery is complete. As the delivery is completed, the setting wheel reading will be zero.

**4-9. PRINTER REGISTERS**

4-10. Referring to figure 4-3, check that the reset knob is rotated fully counterclockwise (as viewed from the right).

4-11. Insert a delivery ticket under the spring loaded dust cover until the ticket hits its stops.

4-12. Rotate the reset knob fully clockwise (to print in).

**Note**

The delivery ticket will now be held in place by a punch. *Do not attempt to remove it* until after the ticket has been printed out; it will tear.

4-13. Start the pump, and make the delivery.

4-14. At the completion of the delivery, rotate the reset knob fully counterclockwise (to print out), and remove the delivery ticket.

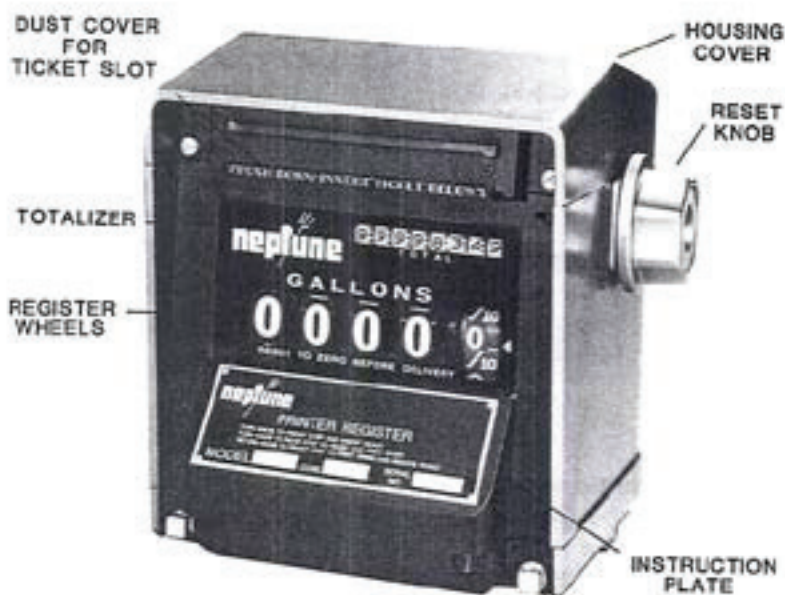


Figure 4-3. Printer Model Register

## Section 5 MAINTENANCE

### 5-1. GENERAL

5-2. Maintenance of the Register is limited to cleaning and to those operations which will locate the sources of possible troubles without remove the Register from the flowmeter, and without breaking the seals. If malfunctions are found, remove the Register from the flowmeter for overhaul, as required. (Refer to Section 6.) The Maintenance operations are divided into cleaning, inspection, operational checks, and minor adjustment.

### 5-3. CLEANING

5-4. Regularly clean the housing of the Register to remove accumulations of dirt and grease, food products, or chemical deposits. Use a suitable cleaning solvent, being careful that the solvent does not enter the mechanism. Due to clouding or discoloration, it may become necessary to replace the register mask (Refer to paragraph 6-217).

#### CAUTION

Use only mild detergents and water to clean Register windows. *Do not* use abrasive or spray type cleaners or solvents and thinners which may soften or cloud the plastic windows.

### 5-5. INSPECTION

5-6. Inspect the Register at regular intervals to see that it is mounted securely on the flowmeter; that the housing is not damaged; that the housing cover, the reset knob, and hole plug are securely attached; that the front housing windows are not excessively scratched or clouded; and that the register wheels are clean and legible. Also check that the lockwire and seals are intact to ensure that the calibration of the Register has not been tampered with.

5-7. Perform operation checks as described in paragraph 5-10.

5-8. Check (on preset models only) that adjusting nuts on valve operating linkage are secure.

5-9. If the Register requires service, prepare a service report, giving details of the service required.

#### Note

The Register can be removed from the flowmeter (for overhaul) by loosening the clamping screws in the base and lifting it off the mounting studs. Note R and S change gears (refer to fig. 2-8, paragraph 2-20).

### 5-10. OPERATIONAL CHECKS

#### 5-11. General

5-12. Two general operational checks are performed on all Registers; calibration and reset mechanism operation.

Other checks are performed, as required, depending upon the model of Register. These are covered in paragraphs titled Preset Operational Checks and Printer Operational Checks (pars. 5-15 and 5-24).

**5-13. Calibration Check.** Check the calibration of the flowmeter (and recalibrate, if necessary) as described in paragraph 3-20. While pumping liquid through the flowmeter during calibration observe that the register wheels and totalizer wheels advance properly, that registration is consistent and not erratic, and that the wheels are not discolored or defaced.

**5-14. Reset Mechanism Check.** Check the resetting of the Register by rotating the reset knob clockwise (as viewed from the right) to its stop, and releasing it. Note that the register wheels index to read 0000.0, and that they align in a straight line. Note that the shutter swings freely to mask the wheels as they rotate, and drops completely when resetting is complete. Note also that the reset knob (on Non-Printer Registers) backs off slightly as it is released after resetting.

#### 5-15. Preset Operational Checks

5-16. Preset operational checks test the operation of the setting keys, the setting wheels, the tripping mechanism, and the emergency stop button.

**5-17. Setting Key Checks.** Depress each of the setting keys and note that its associated setting wheels indexes by one digit. Note also that the keys operate freely and return properly under spring pressure. Also note on gear drive Preset units that the No. 2 wheel does not index as the No. 1 wheel is indexed from "9" to "0".

**5-18. Setting Wheel Checks.** Using the setting keys, set in a sample reading on the setting wheels.

#### Note

When setting in a sample reading on double trip Preset Registers, make certain that the amount set in is equal to or above the minimum amount stated on the instruction plate on the front housing.

5-19. Start the pump, and open the valve to the flowmeter. Then as the flowmeter operates, note that the setting wheel quantity decreases as the register (visible) wheels reading increases.

5-20. Reset the Register by operating the reset knob, and observe that the setting wheel reading remains stationary.

**5-21. Tripping Mechanism Checks.** Set in a sample quantity on the setting wheels. Then operate the valve, and note that the tripping mechanism latches it open. Depress the emergency stop lever, and note that the valve trips closed.



5-22. Reset the Register to zero, and set in a sample quantity on the setting wheels.

5-23. Start the pump, and open the valve. At the end of the delivery, note that the valve has tripped closed when the reading of the register (visible) wheels coincide exactly with the sample reading set into the setting wheels. If not, adjust the tripping point as described in paragraph 3-15.

**Note**

On double-trip preset mechanisms also note that the valve closes partially to reduce the rate of flow at a predetermined reading before the end of the delivery. (The first trip usually takes place at a reading of 7, 40, or 70 on the setting wheels, depending upon the type of preset unit).

**5-24. Printer Operational Checks**

5-25. Printer operational checks test the ticket printing operation and the operation of the print wheels.

**5-26. Ticket Printing Checks.** Install a ticket in the print

unit, and operate the reset knob to print-in and print-out. Remove and examine the ticket, noting that the numerals are clear, legible and complete, and that they are printed in the proper locations on the ticket. If the numerals are not clear, the hammer springs may be weak. If the numerals are not complete, check the alignment of the hammer cushion. If the numerals are not in their proper locations, readjust the ticket guides and stops. (Refer to paragraph 3-18).

**5-27. Print Wheel Checks.** Install a ticket in the print unit, operate the reset knob to print-in, and pump a quantity through the flowmeter. Print-out, remove the ticket, and examine the readings. The print ticket quantity reading must coincide with the quantity passed through the flowmeter as indicated by the Register wheels; the serial number reading must have advanced by one digit, and all numerals must be in alignment.

**Note**

On zero-start print units, the quantity print wheels must return to a zero reading on the print-in cycle, and must show the quantity delivered at print-out.

## 5-28. TROUBLES AND REMEDIES CHART

TROUBLE	PROBABLE CAUSE	REMEDY
REGISTER NOT OPERATING -- (LIQUID FLOWING)	1. Bypass around flowmeter open. 2. Damaged flowmeter.  3. Frozen condensation inside Register. 4. Sheared key in change gear.  5. Damaged Register  6. Change gears omitted. 7. Gear Shifter out of position.	1. Close bypass. 2. Remove Register, pass fluid through flowmeter, and note that the star wheel coupling rotates properly. 3. Remove Register, clean, and relubricate. 4. Remove Register; overhaul to remove cause of shearing, and replace defective change gear. 5. Remove and overhaul. (Refer to Section 6.) 6. Install change gears. 7. Relocate Gear Shifter.
CONSISTENT OVER or UNDER-REGISTRATION	1. Register not calibrated to flowmeter.	1. Calibrate. (Refer to paragraph 3-20.)
ERRATIC OVER-REGISTRATION	1. Air passing through flowmeter, or excessive suction.	1. Correct flowmeter malfunction.
ERRATIC UNDER-REGISTRATION	1. Flowmeter not operating properly.	1. Check for leakage around flowmeter, for dirt in flowmeter measuring chamber; and for wear or other damage.

## 5-28. TROUBLES AND REMEDIES CHART (cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
	<ol style="list-style-type: none"> <li>2. Sheared key in change gear.</li> <li>3. Damaged Register.</li> </ol>	<ol style="list-style-type: none"> <li>2. Remove Register, repair cause of shearing, and replace defective change gear.</li> <li>3. Remove and overhaul. (Refer to Section 6.)</li> </ol>
PRESET DOES NOT HOLD VALVE OPEN	<ol style="list-style-type: none"> <li>1. Valve connecting link improperly adjusted.</li> <li>2. Defective tripping mechanism.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust linkage in accordance with applicable Operation and Maintenance manual.</li> <li>2. Remove and overhaul Register. (Refer to section 6).</li> </ol>
PRESET DOES NOT SHUT OFF FLOW PROPERLY	<ol style="list-style-type: none"> <li>1. Valve linkage improperly adjusted.</li> <li>2. Tripping mechanism improperly adjusted.</li> <li>3. Damaged Register.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust linkage in accordance with applicable Operating and Maintenance manual.</li> <li>2. Readjust tripping point. (Refer to paragraph 3-15.)</li> <li>3. Remove and overhaul. (Refer to Section 6.)</li> </ol>
DELIVERY TICKET IMPROPERLY PRINTED	<ol style="list-style-type: none"> <li>1. Ticket guides or stops in wrong location.</li> <li>2. Ticket hammer improperly located.</li> <li>3. Worn or defective ticket hammer cushion, or loose or weak springs.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust guides and stops. (Refer to paragraph 3-18.)</li> <li>2. Reposition hammer cushion over print wheels. (Refer to paragraph 3-18.)</li> <li>3. Remove and overhaul Register to replace defective parts. (Refer to Section 6.)</li> </ol>
<p>REGISTER MALFUNCTION</p> <p>A. Shutter not dropping completely after reset.</p> <p>B. Register wheels not agreeing with print wheels NOTE: Compare the readings on the register wheels and print wheels with the totalizer to determine which is incorrect.</p> <p>C. Register wheels do not reset to zero.</p>	<ol style="list-style-type: none"> <li>1. Shutter bent against register wheels, mask, or indicator.</li> <li>2. Weak shutter crank spring.</li> <li>3. Broken reset pawls in register wheels.</li> <li>1. Clutch in No. 1 register wheel slipping.</li> <li>2. Register wheels not transferring properly.</li> <li>3. Ratchet in No. 1 print wheel slipping.</li> <li>4. Print wheels not transferring properly.</li> <li>1. Reset pawls in register wheels broken.</li> <li>2. Improper cam adjustment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Bend shutter to straighten.</li> <li>2. Replace spring.</li> <li>3. Replace reset pawls.</li> <li>1. Replace clutch fingers and clutch ring.</li> <li>2. Inspect register wheel two-tooth gears and transfer pinions Replace if necessary. Adjust side plate bushings to set proper end play. (Refer to paragraph 6-229).</li> <li>3. Replace No. 1 print wheel.</li> <li>4. Inspect printer two-tooth gears and transfer pinions; Replace if necessary. Adjust adjusting plate to set proper end play. (Refer to paragraph 6-158).</li> <li>1. Replace reset pawls and springs.</li> <li>2. Readjust cam of Reset stop lever.</li> </ol>

## 5-28. TROUBLES AND REMEDIES CHART (cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
D. Print wheels do not reset to zero.	<ol style="list-style-type: none"> <li>1. Reset pawl spring or ratchet spring broken.</li> <li>2. Worn non-reverse pawl.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace print wheel.</li> <li>2. Replace non-reverse pawl.</li> </ol>
E. Register jams during reset.	<ol style="list-style-type: none"> <li>1. Reset gearing not timed properly.</li> <li>2. Print unit reset shafts not timed properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove and overhaul register unit to correct timing.</li> <li>2. Remove and overhaul shafts not timed properly.</li> </ol>
F. Ticket cannot be inserted into printer.	<ol style="list-style-type: none"> <li>1. Torn ticket inside print unit.</li> <li>2. Ticket punch not raising completely.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove cover and remove torn ticket.</li> <li>2. Replace bent ticket punch actuating lever.</li> </ol>

## Section 6 OVERHAUL

### 6-1. GENERAL

6-2. The overhaul of the 800 Series Register is limited to:

- a. The isolation of the trouble to the defective Unit.
- b. The removal of the defective Unit (par. 6-41).
- c. The overhaul (disassembly, repair, and reassembly) of that Unit. (Refer to paragraphs 6-53, 6-106, 6-115, 6-167, and 6-209).
- d. The inspection of the other Units to ensure continued proper functioning.
- e. Final reassembly and inspection of the complete Register. (Refer to paragraph 6-215).

6-3. Inspection Before Disassembly.

### 6-4. VISUAL INSPECTION

6-5. Visually inspect the Register for damage to the shroud, for cracks in cover, base, and front housing castings, for broken lugs, broken or bent reset knob, cracked, broken or opaque windows, and for damaged discolored, or illegible wheel faces. Also check that clamping screws are not bent or damaged.

6-6. On preset models, check that keys, levers, and trip lever shank are not bent or damaged. Also check for damage to ticket slot cover on models equipped with Print Units.

### 6-7. OPERATIONAL CHECKS

6-8. Perform the following operations on the register and check that the results specified are obtained. If these results are not observed, remove the defective Unit and inspect and disassemble it to the extent necessary to isolate the source of trouble.

6-9. Be sure change gears are installed (refer to paragraph 2-20), rotate the driving fork (up inside the register), and observe that:

- a. The register drive operates freely, without binding.
- b. The low-number register wheels advance.
- c. The low-number totalizer wheels advance.
- d. Rotation of drive fork in one direction will advance register wheels, while opposite rotation of the fork will cause a clutch to disengage the drive so that register wheels will not rotate.

#### Note

On "two-way drive" models (Registers that run in either direction alternatively) rotation of drive fork in one direction must advance the register wheels; rotation in the opposite direction must rotate register wheels in the opposite direction.

6-10. Rotate reset knob toward the rear (clockwise, viewed from the right), about one turn to a stop.

- a. Register wheels must index to read 0000-0, and must align in a straight row.
- b. Register shutter must mask the wheels during reset and drop completely after reset.

**6-11. Preset Operational Checks.** On Preset models, in addition to the general inspection before disassembly, perform the following operational checks, and observe that the Preset Unit meets all operational requirements.

6-12. Press each setting key. Each key must operate freely with a positive spring action. Each setting wheel must index by one digit each time its key is depressed.

#### Note

On "gear drive" Preset models the No. 1 setting key (at the right-hand side) requires greater pressure to operate. It is designed that way to ensure a positive indexing of the No. 1 wheel.

6-13. Set a sample quantity on the setting wheels, using the setting keys. Rotate the driving fork and observe that the set quantity decreases as the register wheels advance.

6-14. Set a sample quantity on the setting wheels. Then cock the tripping mechanism by rotating the projecting shaft of the trip lever fully counterclockwise (as viewed from the rear) until it is latched. It is generally necessary to use a wrench to rotate the latch to the latched position, unless the emergency stop button is depressed.

#### Note

On some Registers a minimum quantity must be set into the Preset mechanism. This quantity is shown on the front housing above the setting keys.

6-15. Depress the emergency stop button; the tripping mechanism must release.

6-16. Again latch the tripping mechanism. Then operate the driving fork, and check that:

- a. Setting wheel reading decreases toward zero.
- b. As setting wheels reach zero, the tripping mechanism releases.

#### Note

On "double-trip" Preset models, the mechanism must trip in two steps. (The shaft will rotate partially at some quantity before zero, and completely at zero).

6-17. Operate reset knob through a complete reset cycle; the setting wheels must remain stationary.



6-18. Printer Operational Checks. On Printer models, perform these additional checks, and observe that the Print Unit meets all specified requirements.

6-19. Rotate the reset knob counterclockwise (as viewed from the right-hand side of the Register) to "print out."

6-20. Insert a sample ticket, and rotate the reset knob clockwise to "print in." With the ticket printed in, check that it is held in place by the ticket punch.

6-21. With the ticket in place, operate the driving fork for several turns to change the quantity on the register.

6-22. Rotate the reset knob to "print out", and remove the ticket. Examine the ticket for the following:

- a. The ticket must be printed clearly and legibly.
- b. The printed numerals must be complete and properly aligned. (Refer to paragraph 3-18).
- c. The printing must be in the proper location on the ticket. (Refer to paragraph 3-18).
- d. The serial number of the delivery must have advanced by one digit.

**Note**

The serial number of the delivery must not advance if the driving fork has not been rotated between "print in" and "print out."

- e. The quantity reading at the finish of the delivery must have advanced by the amount that the register wheels have changed.

**Note**

On totalizer print models the subtracted quantity should be within one digit (lowest order) of the quantity indicated by the register wheels.

- f. The "print in" quantity should be all zeros (on zero-start models only).

**6-23. GENERAL OVERHAUL PROCEDURES AND PRECAUTIONS**

**6-24. When Disassembling:**

- a. When dismantling the Register into its various subassemblies and parts, provide means for storing parts to protect them against dirt and loss.
- b. The totalizer reading of the Register is important to its owner; by means of this he keeps records of total quantities measured by the Register. Therefore, before performing any operation that will alter the totalizer reading, make a notation of it so that the reading may be returned to the original quantity after overhaul.
- c. It is important to make a notation of the placement, order, and number of parts removed. Reference to the exploded parts drawings will be found helpful in the identifying and locating of the various parts. However, the quantity of some parts, such as shims, may vary from instrument to instrument.

**6-25. When cleaning:**

- a. It will be helpful, but not essential, to have a supply of compressed air available at the workbench. A jet of compressed air directed at the parts to be cleaned will dislodge foreign matter that may not be removed by normal cleaning processes.
- b. Use an approved cleaning solution such as Stoddard solvent, Varsol, or other hydrocarbon base solvent to remove all traces of grease or oil. This can best be accomplished by the use of a brush or a clean cloth saturated with the cleaning solution.

**6-26. When Inspecting:**

- a. Pay particular attention to all parts with operational surfaces such as ratchet wheels, pawls, gears, rollers, slides, etc. Look for scratches, burrs, scores, and generally worn or damaged surfaces and edges.
- b. Be sure that all indicating surfaces, such as the numerals on the indicating wheels of the register unit or the Preset are clear and legible. Handle these indicating surfaces with care; grease or lubrication will discolor these surfaces and they are particularly subject to scratching.
- c. Carefully note the condition of all springs. They must be clean, free from corrosion, and appear to be strong enough to apply the torsion, tension, or compression for the job they are intended to do.
- d. Carefully check the condition of all bearings. Most of the bearings in the 800 Series Registers are of the simple sleeve type. Therefore, it is particularly important that the bearing surfaces be free from imperfections and dirt, and that they are properly lubricated with clean, fresh lubricant at reassembly.
- e. Watch for the security of all types of attachment and fasteners, other than normal screws and nuts. Be sure that all staked pins and parts are secure; that all pins are tight and seated; that all split retaining rings are securely seated and free from wear.

**6-27. When Reassembling:**

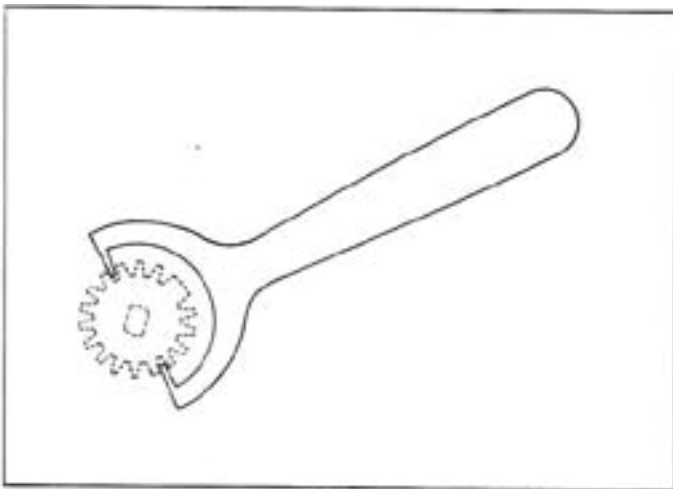
- a. Be sure that all running parts are properly lubricated prior to reassembly. Use only the proper grease at the places specified (see paragraph 6-41).
- b. Follow carefully the adjusting procedures given in the reassembly instructions. It is obvious that unless these adjustments are properly made, the Register will fail to perform satisfactorily.
- c. It is important to check the relative positions of the numerals on the totalizer, the print unit, and the register. The numerals on each of these units must be in exact alignment, top and bottom. Instructions for attaining this alignment are given at reassembly.
- d. Failure to perform properly such a simple operation as hooking a spring, seating a retaining ring, or tightening a screw, may result in malfunctioning of the Register after reassembly, at which time the improperly fitted part may be very difficult to find. Therefore it is important that even these simple operations be performed very carefully.

**6-28. OVERHAUL TOOLS AND MATERIALS REQUIRED**

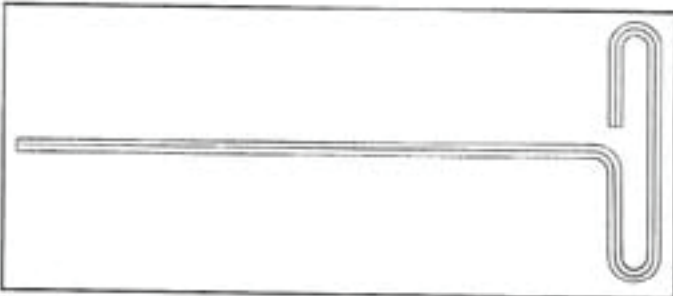
6-29. The overhaul of the 800-Series Register can be performed with standard shop tools (screwdrivers, wrenches, pliers, etc.) There are, however, a few tools that will facilitate disassembly and reassembly. These special tools may be purchased from Red Seal Measurement in a kit (Part No. 73000-010.)

**6-30. Tools**

6-31. Reset Gear Holding Tool. The reset gear holding tool (fig. 6-1) is used for holding the holdout plate and reset gear assembly (21, fig. 6-12) on the register unit while loosening or tightening is attached nut.



**Figure 6-1. Reset Gear Holding Tool**



**Figure 6-2. T-Wrench, 3/16 x 10 Allen**

loosening the socket-head cap screws that attach the Front Housing Assembly to the base.

6-33. End Play Gauge. The end play gauge (figure 6-3) is used to set the proper clearance for register wheel end play.

6-34. Print Wheel Assembly Tool. The print wheel assembly tool (fig. 6-4) is necessary for reassembling the print wheels. The bullet nose on the rod cams aside the pawls in the print-wheel hubs to provide clearance for the shaft.

6-35. Loading Tool. The loading tool (fig. 6-5) is used for reassembling the register wheels. It cams aside the pawls in the register-wheel hubs to provide clearance for the shaft.

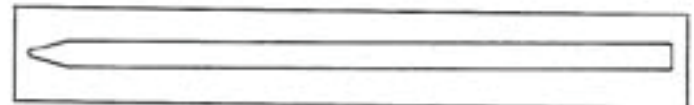
6-36. Side Plate Bushing Adjustment Tool (In). The side plate bushing adjustment tool (in) (figure 6-6) is used to tap the side plate wheel shaft bushing sleeves in to adjust the register unit for proper register wheel end play.

6-37. Side Plate Bushing Adjustment Tool (Out). The side plate bushing adjustment tool (out) (figure 6-7) is used to tap the side plate wheel shaft bushings to move the sleeves out to adjust the register unit for proper register wheel end play.

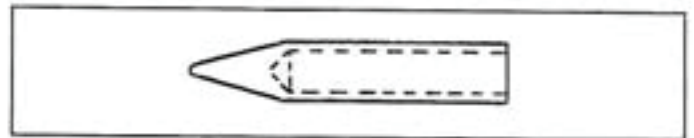
6-38. Reset Shaft Tool. The reset shaft tool (figure 6-8) is used to replace the actual reset shaft assembly or print unit for convenience only during assembly and adjustment.



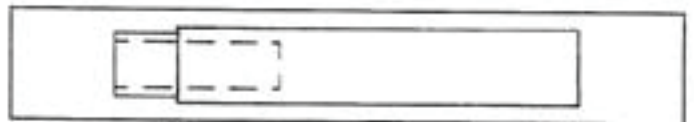
**Figure 6-3. End Play Gauge**



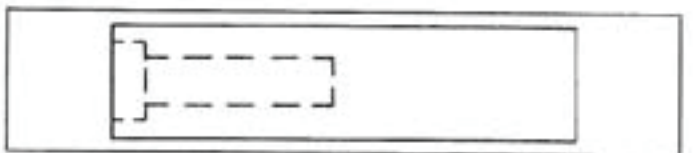
**Figure 6-4. Print Wheel Assembly Tool**



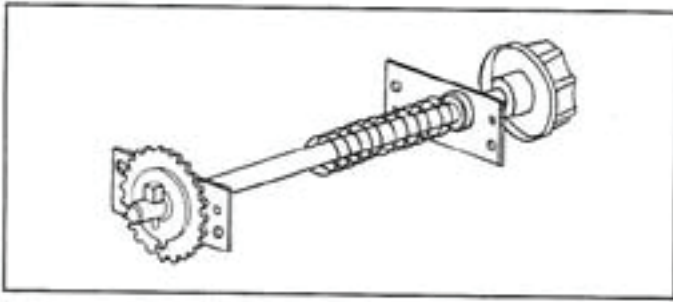
**Figure 6-5. Loading Tool**



**Figure 6-6. Side Plate Brushing Adjustment Tool (In)**



**Figure 6-7. Side plate Bushing Adjustment Tool (Out)**



**Figure 6-8. Reset Shaft Tool**

**6-39. Materials**

6-40. Cleaning Solvent. Stoddard solvent, Varsol, or other suitable hydrocarbon compound (U.S. Government Specification P-S-661, or equal).

6-41. Grease. Low temperature, low torque, grease (U.S. Government Specification MII-G-16908; Exxon BEACON P290; or equal).

**6-42. DISMANTLING THE REGISTER**

6-43. Before dismantling the Register, rotate the reset knob clockwise (as viewed from the right-hand side of the Register) to its stop.

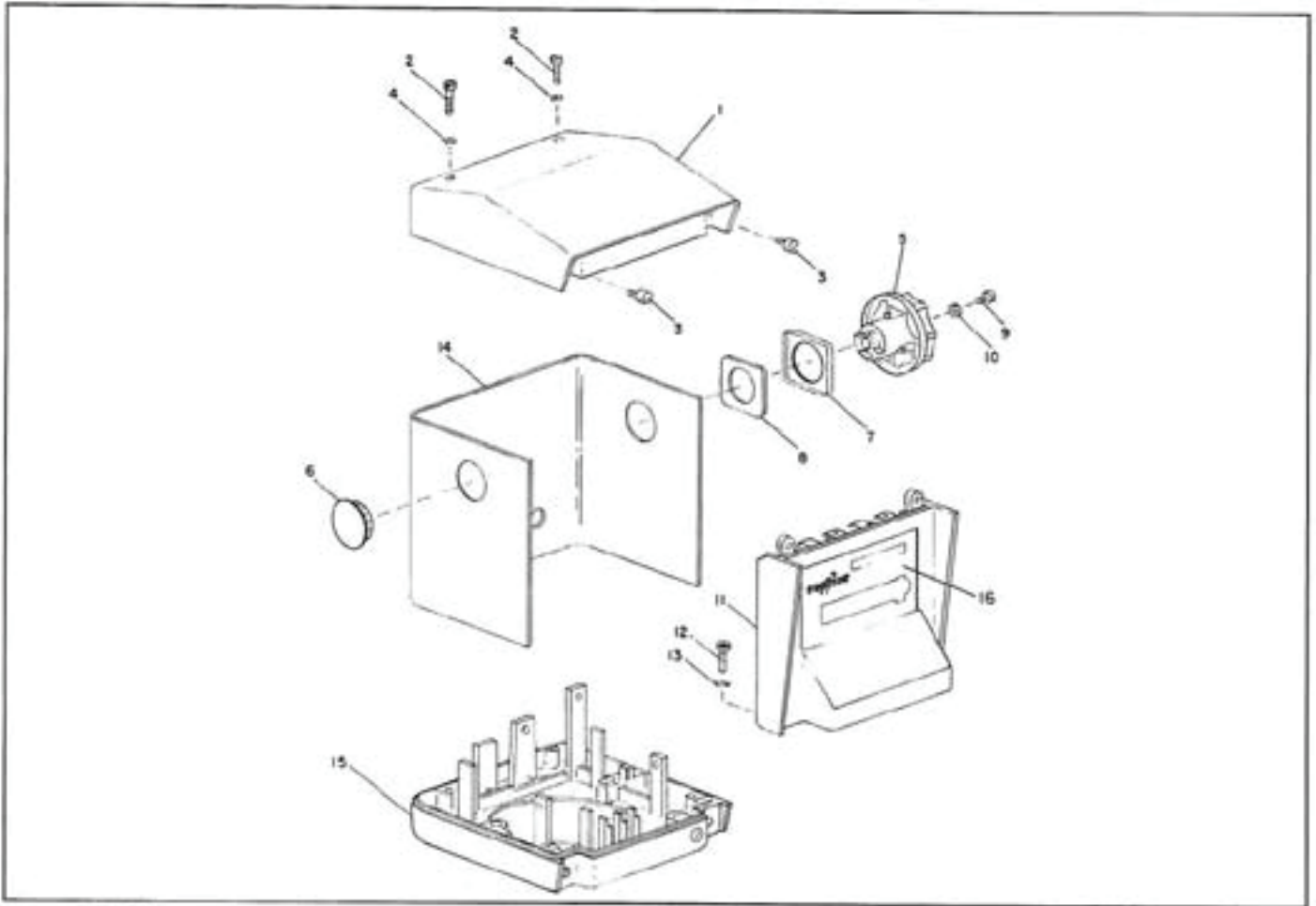
**Note**

On Printer model registers, also rotate the knob counterclockwise to its limit to "print out."

6-44. Remove four screws (2 and 3, fig. 6-9) and lock washers and lift off cover (1).

**Note**

When removing cover from Printer model Registers, lift rear of cover first, and slide it forward to unhook it from ticket slide.



- |                |                 |                            |                                   |
|----------------|-----------------|----------------------------|-----------------------------------|
| 1. Cover       | 6. Hole plug    | 11. Front housing assembly | 14. Register shroud (wrap-around) |
| 2. Screw       | 7. Retainer     | 12. Screw                  | 15. Base assembly                 |
| 3. Screw       | 8. Felt washer  | 13. Lock washer            | 16. Register mask                 |
| 4. Lock washer | 9. Screw        |                            |                                   |
| 5. Reset Knob  | 10. Lock washer |                            |                                   |

**Figure 6-9. Housing**

6-45. Remove screw (9, fig. 6-9) and lock washer (10) from reset knob (5), and take off knob, retainer (7), and felt washer (8).

6-46. Loosen register shroud (wrap-around) (14) from front housing assembly (11) and base assembly (15), and then remove it.

6-47. Using T-wrench (fig. 6-2), unscrew screws (12, fig. 6-9) that secure front housing assembly (11) to the base (15) and remove it.

6-48. Remove the reset shaft assembly (nonprint models) in paragraph 6-49 or 6-50 as applicable.

6-49. *Reset shaft assembly removal.* Referring to figure 6-10, remove the reset shaft assembly as follows:

- a. Unhook the reset knob return spring (5).
- b. Take out retaining ring (11).
- c. Remove two screws (10), nuts (8), and lock washers (9) that hold the right-hand reset shaft bracket (2) to the right side plate of the register unit.
- d. Slide the assembled shaft (1), reset gear (3), and right-hand bracket (2), toward the left to provide clearance for removing the left-hand reset shaft bracket (2).
- e. Remove retaining ring (6), reset knob return arm (4), and spring (5)
- f. Remove nuts (8), lock washers (9), screw (10), and stud (7), and lift the assembly from the register unit.

6-50. *Print unit assembly removal.* Remove the print unit as follows:

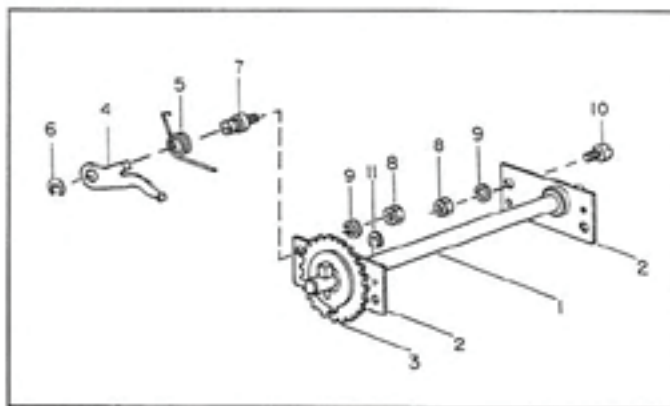
- a. Referring to P300 pages 10, 11, &12, unhook and remove hammer spring (14) and hammer lift stop (15).
- b. Remove the screw (5, fig. 6-11), and take off ticket punch lever guide (4). Replace the screw. (It holds the left-hand end of the totalizer.)
- c. Remove four screws (6) and lock washers (7), and lift off print unit (1).

6-51. On Preset model registers (other than gear-drive types) remove retaining ring (12, fig. 6-11) and shutter link connecting pin (11) from shutter (10) to uncouple the link (9) of the bail mechanism cam.

6-52. *Register unit assembly removal.* Remove three short screws (13, fig. 6-11), one long screw (14), and lock washers (15), and lift off register unit (17) from base (8), being careful not to lose spacer (16).

#### Note

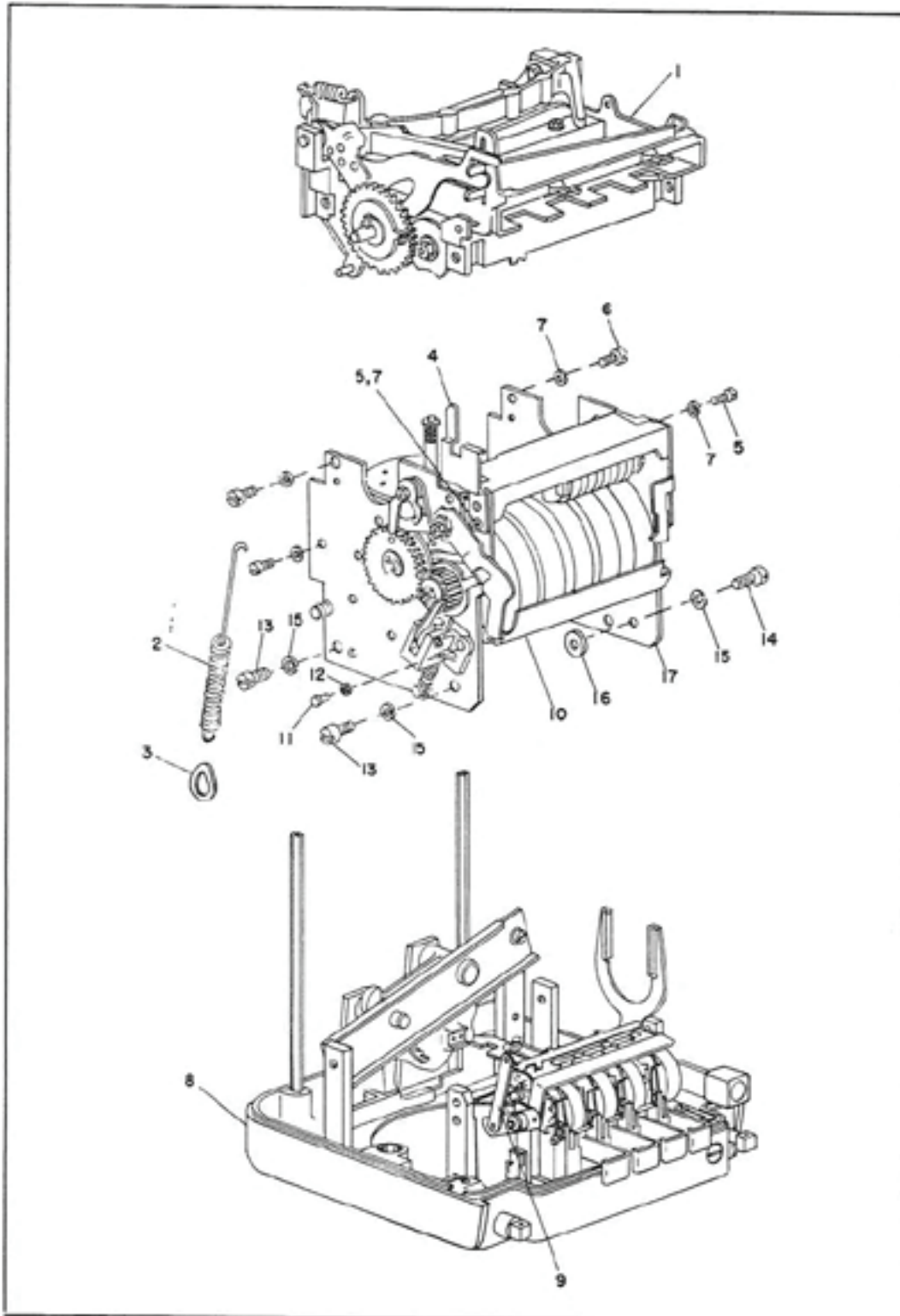
On "pin-type" Preset model Registers (refer to paragraph 2-56) it may be necessary to rotate the No. 1 register wheel to create sufficient clearance between the register unit and the Preset unit so that the cam follower on the No. 1 register wheel can be unhooked from the Preset operating lever.



- |                             |                               |
|-----------------------------|-------------------------------|
| 1. Reset shaft              | 7. Reset knob return arm stud |
| 2. Reset shaft bracket      | 8. Nut                        |
| 3. Reset gear assembly      | 9. Lock washer                |
| 4. Reset knob return arm    | 10. Screw                     |
| 5. Reset knob return spring | 11. Retaining ring            |
| 6. Retaining ring           |                               |

**Figure 6-10. Reset Shaft Assembly**





- |                             |                            |                   |
|-----------------------------|----------------------------|-------------------|
| 1. Print unit               | 7. Lock washer             | 13. Screw (short) |
| 2. Hammer spring            | 8. Base                    | 14. Screw (long)  |
| 3. Hammer spring link       | 9. Bail mechanism cam link | 15. Lock washer   |
| 4. Ticket punch lever guide | 10. Shutter                | 16. Spacer        |
| 5. Screw                    | 11. Link connecting pin    | 17. Register unit |
| 6. Screw                    | 12. Retaining ring         |                   |

**Figure 6-11. Removal of Print Unit, Register Unit, and Preset Unit  
(See P300 pages 10, 11, & 12)**

## 6-53. REGISTER UNIT OVERHAUL

### 6-54. Inspection Before Disassembly

6-55. Examine the register unit visually for missing retaining rings, loose or missing screws, disconnected or weak springs, worn or damaged gears, bent or broken parts, and for other evidence of malfunction.

6-56. Be sure change gears are installed (Refer to paragraph 2-20), rotate the driving fork, and check that the register drive operates freely, without binding, and that the register wheels and totalizer wheels advance properly.

6-57. Temporarily install the reset shaft and knob (or the print unit), meshing the gears with timing marks aligned as described in "Final Assembly" (par. 6-218). Rotate the reset knob and note that the reset gearing functions without jamming or binding, that the register wheels realign properly to zero, and that the shutter operates freely.

### 6-58. Disassembly

6-59. Referring to figure 6-12, take out screws (2) and lock washers (3), and remove totalizer assembly (1).

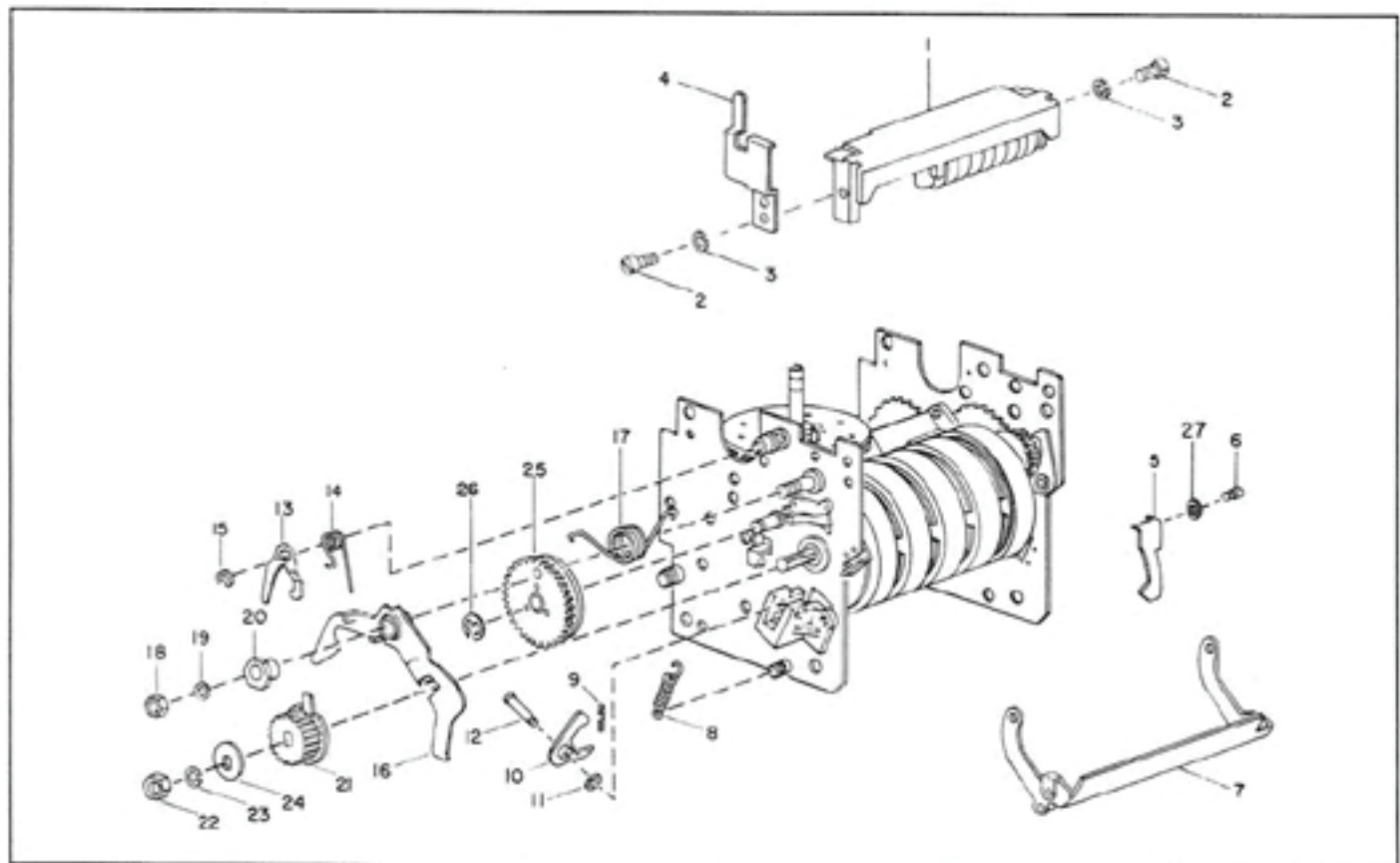
6-60. Remove screw (6) and lock washer (27), and lift off register wheel indicated (5).

(See P300 pages 2-5)

6-61. Remove the shutter mechanism as follows:

- a. Unhook shutter crank spring (Refer to drawing or page 2 and 3 form P300).
- b. Remove the retainer rings (15) from the side plate studs that secure each end of the shutter.
- c. Carefully remove the shutter (46, Drawing on page 3 of form P300) by sliding the left hand shutter arm out of the shutter link (44, Drawing on page 2 of form P300) attached to the shutter crank (42, Drawing on page 2 of form P300).
- d. Remove retaining ring (15 & 48, Drawing on page 3 of form P300). Shutter Crank pin (41, Drawing on page 2 of form P300).

6-62. Take off retaining ring (15), reset stop lever latch (13), and latch spring (14).



1. Totalizer assembly
2. Screw
3. Lock washer
4. Ticket punch lever guide
5. Register wheel indicator
6. Screw
7. Shutter

8. Shutter crank spring
9. Shutter link
10. Shutter crank
11. Retaining ring
12. Pin.
13. Reset stop lever latch
14. Latch spring

15. Retaining ring
16. Reset stop lever
17. Lever spring
18. Nut
19. Lock washer
20. Reset stop lever eccentric
21. Holdout plate and reset

- gear assembly
22. Nut (left-hand thread)
23. Lock washer (left-hand)
24. Flat washer (special)
25. Reset idler gear assembly
26. Retaining ring
27. Flat washer

**Figure 6-12. Register Unit Disassembly (1st Stage)**  
(See P300 pages 2-5)

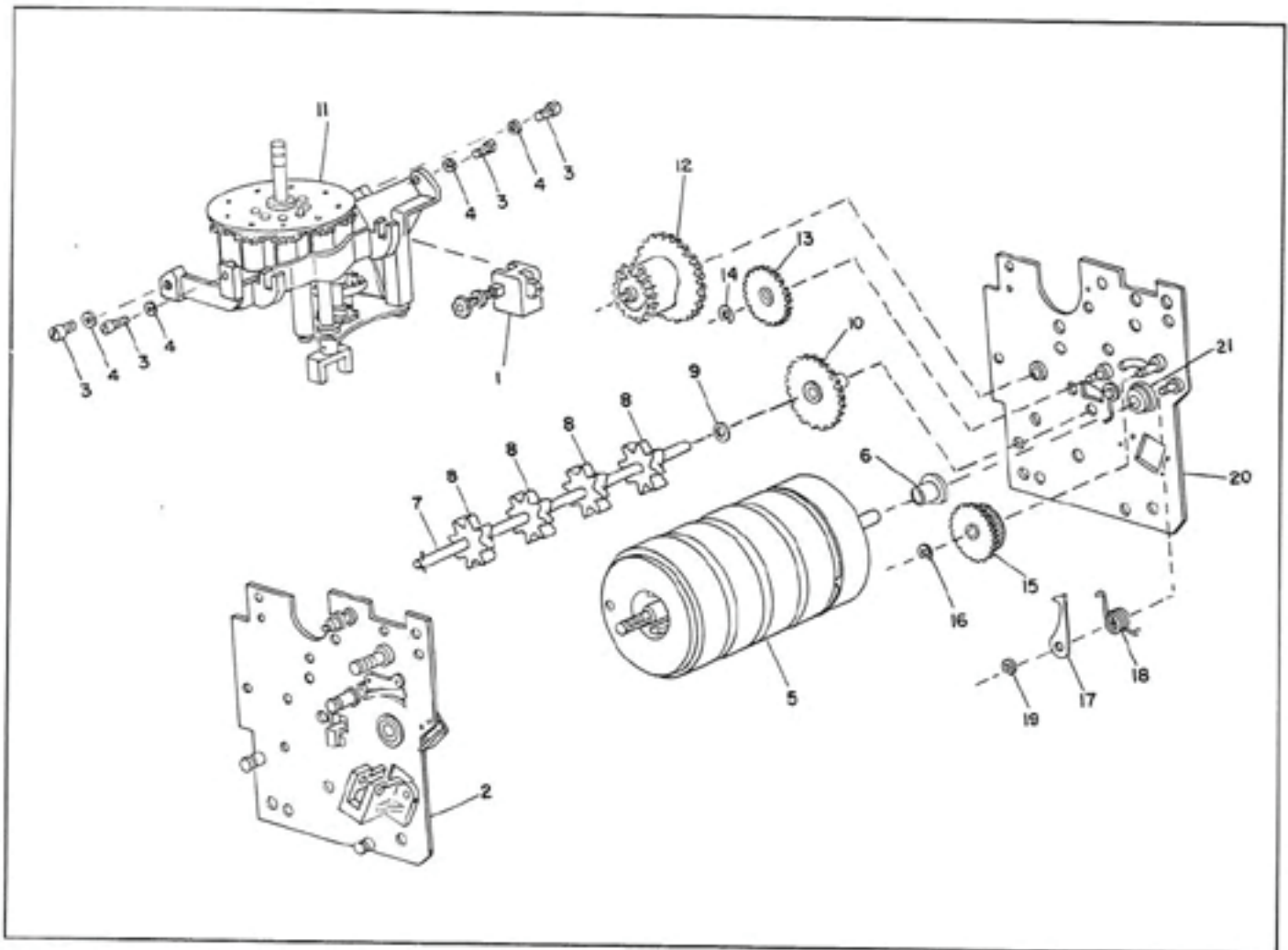
6-63. Remove reset stop lever (16) by unhooking spring (17), and taking off nut (18), lock washer (19), and eccentric (20).

6-65. Remove retaining ring (26, fig. 6-12), and take out reset idler gear assembly (25).

6-64. Using reset gear tool (fig. 6-1), hold holdout plate and reset gear assembly (31, fig. 6-12), and loosen *left-hand* threaded nut (22) from wheel shaft. Take off the gear, *left-hand* lock washer (23), and special flat washer (24).

**Note**

If a tool is not available, use a nonmetallic wedge between the gears to prevent the wheel shaft from turning.



- 1. Zero stop pawl assembly
- 2. Left side plate
- 3. Screw
- 4. Lock washer
- 5. Register wheels and shaft assembly
- 6. Sleeve
- 7. Shaft

- 8. 8-Tooth pinion
- 9. Thrust washer
- 10. Drive gear
- 11. Drive unit bracket assembly
- 12. Bevel gear and clutch assembly
- 13. Gear (print unit take-off)
- 14. Retaining ring

- 15. Ratchet wheel and gear assembly
- 16. Retaining ring
- 17. Nonreverse pawl
- 18. Pawl spring
- 19. Retaining ring
- 20. Right side plate
- 21. Bushing assembly

**Figure 6-14. Register Unit Disassembly (2nd Stage)**  
(See P300 pages 2-5)

6-66. Referring to figure 6-14, remove zero stop pawl assembly (1).

6-67. Take out two screws (3) and lock washers (4), and take off the left side plate (2).

**Note**

Disassembly of the left side plate is not recommended; replace the entire assembly, if damaged.

6-68. Lift out the register wheels and shaft assembly (15, Fig. 6-14), sleeve (6), shaft (7) and 8-tooth pinions (8), thrust washer (9), and drive gear (10).

6-69. Remove two remaining screws (3) and lock washers (4), and take off the drive unit bracket assembly (11) and the bevel gear and clutch assembly (12).

6-70. Do not disassemble the components (13 to 19 inclusive) from the right side plate (20) unless they are worn or damaged. Do not attempt to repair any of the parts; replace them with new ones.

**6-71. Repair.**

**6-72. Register Wheels and Shaft Assembly**

6-73. Referring to figure 6-15, disassemble the register wheels and shaft assembly as follows:

- a. Slide No. 5 (1), 4, 3, and 2 (2) off wheel shaft (5).
- b. Take off No. 1 wheel (3), with attached drive gear and clutch assembly. Take off one plain washer (4) and one snap washer (6).

6-74. Check wheel shaft (5) for burrs or excessive wear at lots. Replace if necessary.

**Note**

Slightly nicked or chipped slots do not affect wheel shaft performance .

6-75. Disassemble, clean and inspect No. 2, 3, 4, and 5 wheels. Replace worn or damaged parts and reassemble (Refer to figure 2-11).

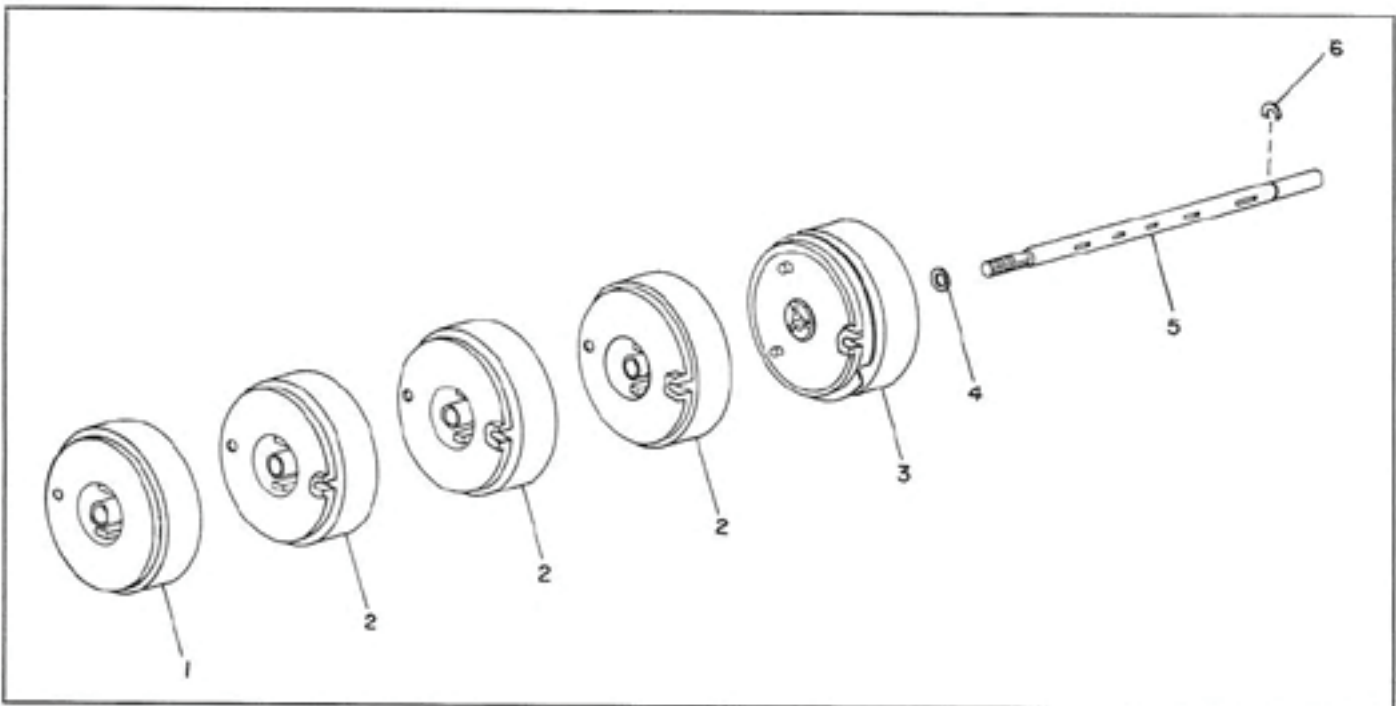
**Note**

Do not apply grease to register wheel components.

6-76. Disassemble, clean, and inspect No. 1 wheel. Clutch ring will slide out from clutch finger brackets, then depress clutch spring retainer fully to remove clutch fingers; clutch spring retainer, tension spring, and clutch spring will release from the cup (Refer to figure 2-12). Replace worn or damaged parts and reassemble.

**Note**

Do not bend clutch fingers and do not apply grease to register wheel components.



- 1. No. 5 register wheel
- 2. No. 2,3, and 4, register wheels
- 3. No. 1 register wheel
- 4. Plain washer (special)
- 5. Wheel shaft
- 6. Snap washer (special)

**Figure 6-15. Register Wheels and Shaft Assembly**



6-77. Apply a light film of grease to the shaft, and reassemble the register wheels and shaft as follows:

- a. Referring to figure 6-15, mount a snap washer (6) in the outer shaft groove, opposite the threaded end of wheel shaft (5). Slide one plain washer (4) on the shaft, followed by No. 1 wheel (with drive gear and clutch ring assembled). Shaft must be inserted into the right side of the wheel.

**Note**

As the shaft is inserted, the reset pawl in the hub of the wheel must be lifted. A specially designed loading tool, (fig. 6-5), which automatically lifts the pawl, is available from Red Seal Measurement.

- b. Insert the shaft into the right side of the No. 2, No. 3, No. 4, and No. 5 wheels in the same manner.

**Note**

The No. 5 wheel differs from the No. 2, 3, and 4 wheels in that it does not have a 2-tooth gear (see paragraph 2-25). Be sure it is the last wheel inserted on the shaft.

- c. Set the assembly aside in a clean container until ready for reassembly of the register unit.

**6-78. Drive Unit Bracket Assembly**

6-79. Referring to figure 6-16, disassemble the drive unit bracket assembly as follows:

- a. Record preset setting of gear shifter assembly (1).

**Note**

Observe the letter at the hole in which the index pin is located. Holes are lettered from A to H. Use the original setting in reassembly.

- b. Take retaining ring (5, fig. 6-16) from top of gear shifter rod (2). Lift out the gear shifter (1). The rod, spring (3), washer (4), and attached retaining ring (5) will drop out of bracket (6).
- c. Note the number of teeth and location of each change gear (7). Tag each gear as removed with "R", "S STD", or "S REV", to indicate the shaft from which it was taken.

**Note**

The number of teeth is stamped on the gear. Plate (9) is stamped "R" and "S STD" (or "S REV") to indicate gear positions for standard or reverse operation.

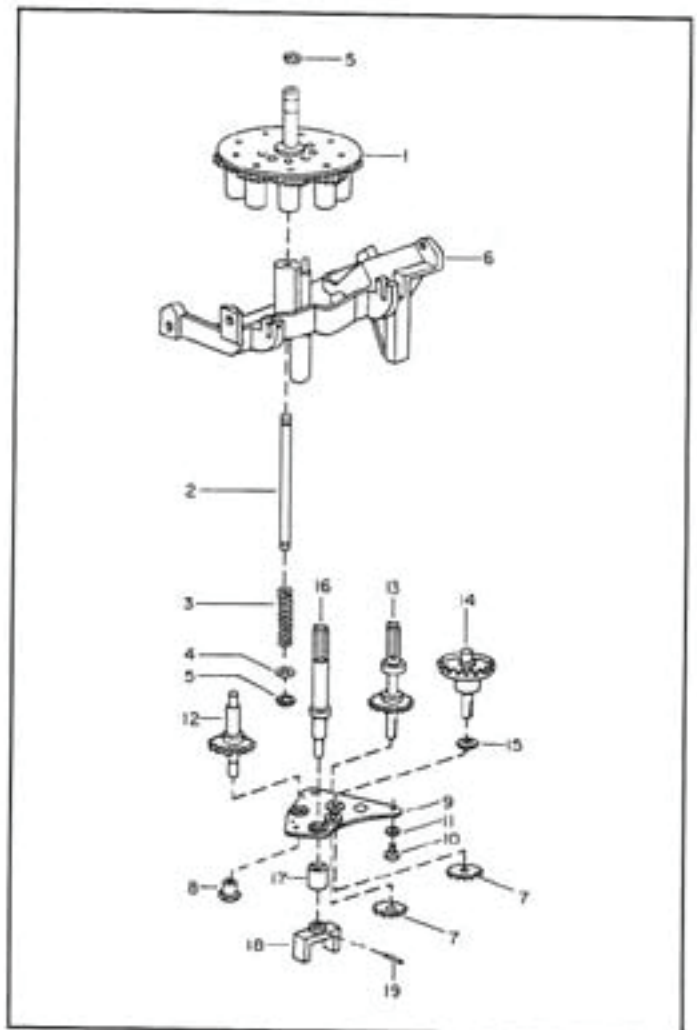
- d. Take off change gears (7) and (on some models) blank hub (8) after pinching slotted ends of shafts (12, 13, and 14) sufficiently to release the gears and hub. Do not close slots because each gear carries a drive key

which must slide out of the slot.

- e. If further disassembly is required, due to damage or wear of reversing gears (12, 13), or bevel gear (14), remove plate (9) by taking out three screws (10) and lock washers. [Drive out pin (19) and remove driving form (18) and spacer (17) *only* when necessary to remove drive shaft (16).]

6-80. Check change gear ("S REV") shaft (13) and gear shifter drive shaft (16) for wear or damage on gear teeth and splines. Also check driving fork (18), and all gears for wear or damage. Replace all parts which are damaged or worn.

6-81. Examine the gear shifter assembly (1) to see that the gears are securely held, but rotate freely on their shafts. Check also that the entire gear train rotates freely when one gear is turned. Replace entire unit if damaged or worn.



- |                          |                              |
|--------------------------|------------------------------|
| 1. Gear shifter assembly | 11. Lock washer              |
| 2. Gear shifter rod      | 12. "S-REV" drive gear shaft |
| 3. Spring                | 13. "S-STD" drive gear shaft |
| 4. Washer                | 14. "R" spindle bevel gear   |
| 5. Retaining ring        | 15. Shim                     |
| 6. Bracket               | 16. Gear shifter drive shaft |
| 7. Change gear           | 17. Spacer                   |
| 8. Blank hub             | 18. Driving fork             |
| 9. Plate assembly        | 19. Pin                      |
| 10. Screw                |                              |

**Figure 6-16. Drive Unit Bracket Assembly**

6-82. If drive unit bracket has been disassembled, reassemble as follows:

- a. If the drive shaft (16) has been removed, install spacer (17), driving fork (18), and pin (19).
- b. Apply a light film of grease to the shafts (12, 13, 14, and 16), and mount the gears and shafts in the bracket (6). Secure plate (9) to the bracket with three screws (10) and lock washers (11).
- c. Mount retaining ring (5), washer (4), and spring (3) on gear shifter rod (2), and insert rod through bottom of bracket (6). Mount gear shifter (1) on the rod, and secure with upper retaining ring (5).
- d. Reinstall the change gears (7) and blank hub (8) on the correct shafts (as recorded before disassembly), and spread the ends of the shafts.
- e. Position the gear shifter assembly in its original position (as recorded at start of disassembly). Refer to paragraph 6-79a.)
- f. Apply a generous coating of grease to all gear teeth and rotate the driving fork to operate the gearing. Operation must be smooth without binding.
- g. Store the assembled unit in a clean covered container until ready for reassembly.

### 6-83. Bevel Gear and Clutch Assembly

6-84. Check that detent between drive and bevel gears operates positively (See figure 6-17). Check for wear of gear teeth and detent pin. Replace complete unit if worn or damaged.

#### Note

On two-way Registers the bevel gear and the drive gear of this assembly are pinned together. Therefore, check that they do not rotate with respect to one another.

### 6-85. Zero-Stop Pawl Assembly

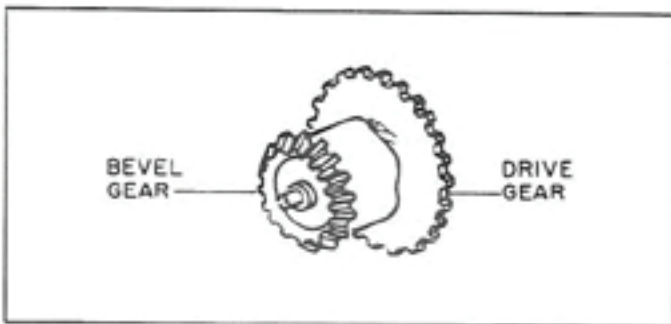


Figure 6-17. Bevel Gear and Clutch Assembly

### 6-87. Totalizer Assembly

6-88. Before disassembling the totalizer (fig. 6-19), record the reading so that it may be reset into the totalizer upon reassembly. Then, proceed as follows:

- a. Slide out 8-tooth pinion shaft (1), and catch the eight pinions (2).
- b. Back out headless set screw (10), and remove retaining ring (6) between the left-hand totalizer wheel (4) and the bracket (9).
- c. Push shaft (5) out of bracket (9) by inserting a suitable rod in the left side hold for screw (7). Catch the wheels as the shaft is withdrawn.

6-89.. Check that totalizer wheels are legible. Examine gear and pinion teeth, and shafts for wear. Also examine the bracket for cracks, stripping, stripped threads, or other defects.

6-90. Reassemble the totalizer as follows:

- a. Slide stepped end of totalizer wheel shaft (5, fig. 6-19) through the right-hand end of totalizer bracket (9).
- b. As the shaft is advanced, mount thrust washer (12) and drive gear (3), with the shaft entering the gear side. Then mount totalizer wheels (4). Numerals must face in one direction).

#### Note

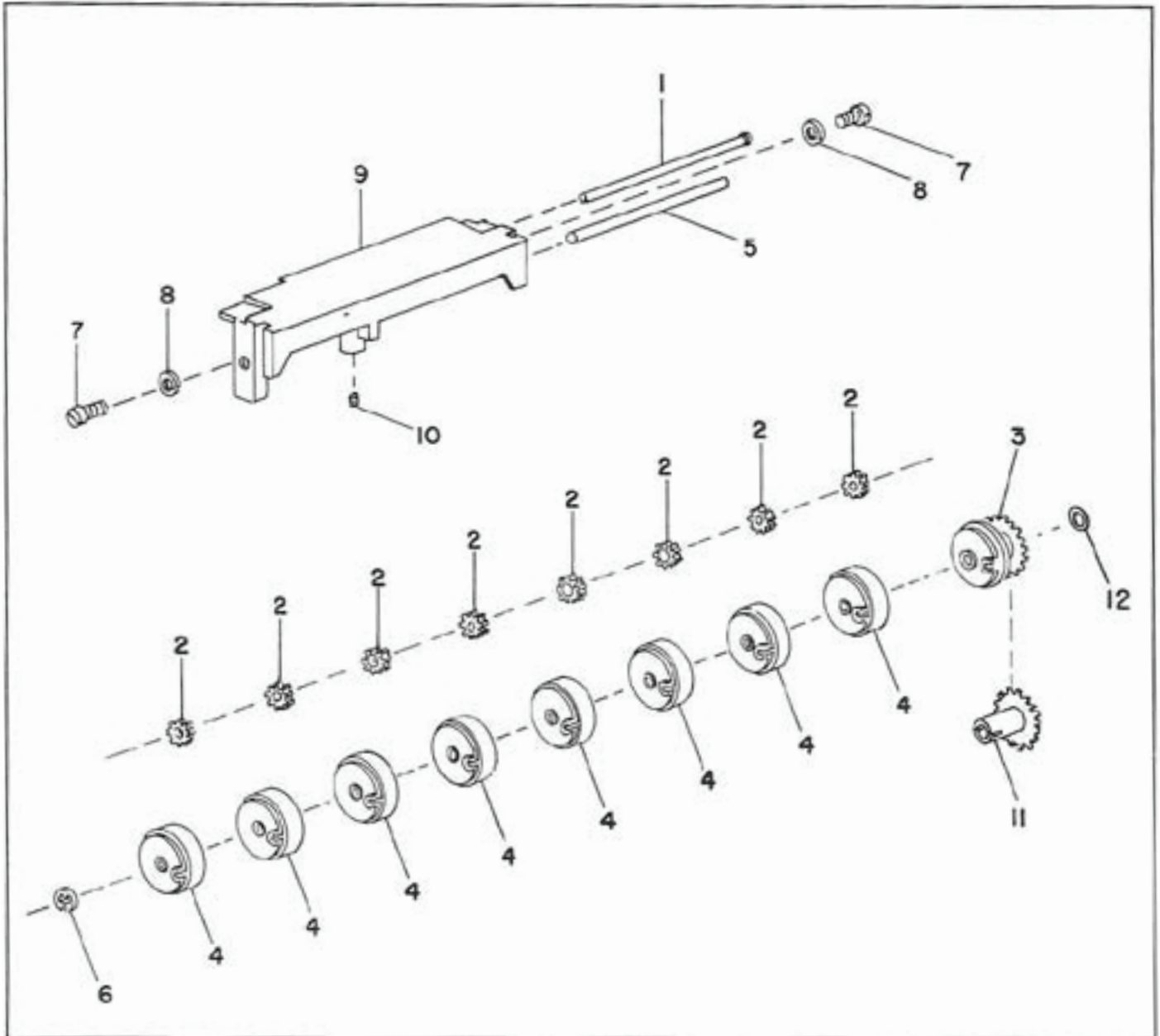
On Registers with "units" type No. 1 register wheel, a 1:1 drive gear assembly (11) replaces the 10:1 drive gear assembly (3), and only seven pinions (2) are used.

- c. Seat shaft (5) in the center post of bracket (9). Insert retaining ring (6) between the left-hand wheel and the center post.
- d. Preset totalizer wheels to the original reading (prior to disassembly), and secure the wheels in line with a strip of adhesive (masking) tape.
- e. Thread pinion shaft (1) through the outside lug on the right-hand side of the bracket (9). As the shaft advances, mount an 8-tooth pinion (2) on the shaft in such a way that the 4-tooth side of the 8-tooth pinion meshes with the 2-tooth gear on the drive gear assembly (3). Also, in meshing the pinion with the 20-tooth gear on the No. 1 wheel, make certain that a wide tooth of the pinion will mesh with a tooth space at the center of a numeral (not between numerals).

#### CAUTION

If the 20-tooth gear and the 8-tooth pinion are improperly meshed, the numerals will not align with the totalizer window on the register mask.

- f. Install the remaining 8-tooth pinions (2) in the same manner.
- g. Adjust end-play of totalizer wheels by turning set screw (10) to shift the shaft until wheels begin to not turn freely, then loosen setscrew approximately  $\frac{3}{4}$  turn until they just begin to turn freely.
- h. Check the alignment of the wheels to see that none are rotated by half a numeral. Also inspect to see that the wheels (numerals) are clean. Then set the totalizer aside in a clean container until ready for final assembly.



- |                               |                   |                               |
|-------------------------------|-------------------|-------------------------------|
| 1. Pinion shaft               | 5. Wheel shaft    | 9. Bracket                    |
| 2. Pinion (bronze)            | 6. Retaining ring | 10. Setscrew                  |
| 3. Drive gear assembly (10:1) | 7. Screw          | 11. Drive gear assembly (1:1) |
| 4. Totalizer wheel            | 8. Lock washer    | 12. Thrust washer.            |

**Figure 6-19. Totalizer assembly.**

## 6-91. Reassembly

6-92. Before reassembling the register unit, remove any burrs from the shutter pivot pins (fig. 6-13) on the left and right side plates (2 and 20, fig. 6-14).

6-93. Referring to figure 6-14, hold bevel gear and clutch assembly (12) in its bearing on right side-plate (20). Mount drive unit bracket (11) on the plate, and secure it temporarily with two screws (3) and lock washers (4).

6-94. Align numerals of the register wheels (5) to read 0000-0, and hold in a straight row with a strip of adhesive (masking) tape.

6-95. Insert sleeve (6) into hub of gear and clutch of the No. 1 register wheel (5).

6-96. Assemble the shaft (7) and 8-tooth pinions (8) by mounting four pinions on shaft, with the 8-tooth sides of the pinions facing the stop pin end of the shaft. Then mount thrust washer (9), and gear (10) with the hub of the gear toward the end of the shaft.

6-97. Assemble the register wheels (5), shaft (7) and 8-tooth pinions (8), and gear (10) together, meshing gear (10) with the gear and clutch on the No. 1 wheel, and meshing the 8-tooth pinions with the 20-tooth gears of the register wheels so that the wide teeth of the pinions will mate with the tooth spaces next to the centers of the numerals on the wheels. Then, while holding the components assembled, mount them in their proper places on the right side plate (20).

6-98. Mount the left side plate (2) over the free ends of shafts. Secure plate to drive unit bracket (11) with two screws (3) and lock washers (4).

6-99. Referring to figure 6-12, install totalizer assembly (1) on the register unit, and secure with screws (2) and lock washers (3), inserting the left side screw in *second* hole below top edge of the left side plate, and right side screw in first hole below top edge of the right side plate.

### Note

On Printer model Registers, also install ticket punch lever guide (4).

6-101. Referring to figure 6-12, install the reset mechanism components as follows:

- a. Mount holdout plate and reset gear assembly (21) on left end of wheel shaft, with the holdout plate on the inside. Follow this with washer (24), and secure temporarily with *left-hand* threaded nut (22) and special *left-hand* lock washer (23).
- b. Push the projecting right-hand end of wheel shaft to the left (against spring pressure). While shaft

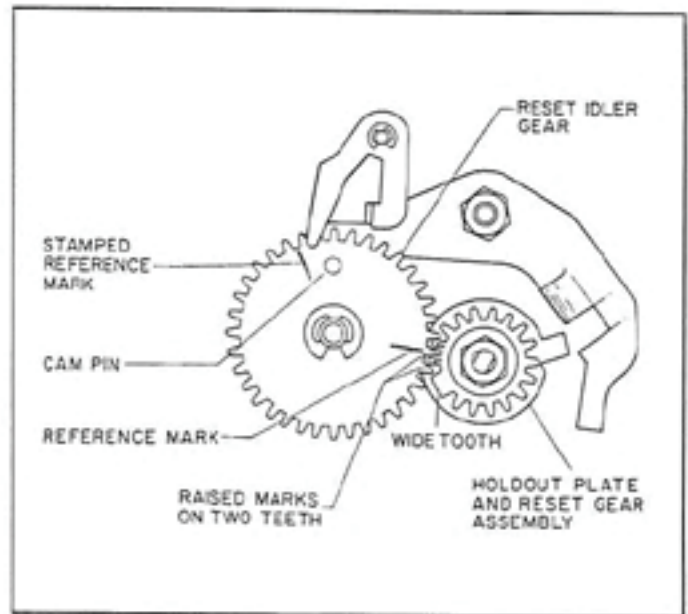


Figure 6-20. Reset Gear Synchronization

is depressed, rotate the gear (21) counter-clockwise (viewed from left hand side of the register unit), until shaft comes to a stop. The register wheels must register 0000-0.

### Note

If the wheels do not read 0000-0, rotate by hand the register wheels that do not, until they do.

- c. Note position of tab on holdout plate, which should be approximately in a "2-o'clock" position, when the register stands upright. (See figure 6-20.) If tab is not in this position, remove the gear, and without turning the shaft rotate the gear 180 degrees, and replace it on the shaft.
- d. Mount reset idler gear (25, fig. 6-12) on its shaft with its cam facing inward, and mesh the idler with the teeth of holdout plate and reset gear assembly (21) so that reference marks align as shown in figure 6-20. Secure the idler with its retaining ring (26).
- e. Secure gear (21, fig. 6-12) by tightening *left-hand* nut (22). Use reset gear holding tool (fig. 6-1) to hold the gear while tightening the nut. If tool is not available, use a nonmetallic strip to wedge the gear. Do not use any tool which might damage the teeth.
- f. Check operation of the register wheels and reset gearing by rotating gear (21). Make certain that holdout plate tab, and the fixed cam over which it rides, are properly lubricated with grease.
- g. Mount reset stop lever spring (17, fig. 6-12), lever (16), and eccentric (20) on pivot shaft so that the cam lever arm rides between the gear and the holdout plate on reset idler gear assembly (25). (See figure 6-12.) Secure the eccentric (20) temporarily with nut (18) and lock washer (19).



- h. Hook inner end of lever spring (17) over top of left side plate. Hook outer end over top of reset lever (16).
- i. Place spring (14) on upper stepped stud, with its long arm inside. Then mount reset stop lever latch (13) on the stud, with its offset (shorter) arm engaging lug on lever (16). Secure with retaining ring (15), and hook spring (14) over the offset arm. Snap long arm of spring onto lower lug on lever (16).
- j. Check lever and latch operating by pushing the forward leg of lever (16) down until latch (13) engages and holds it latched. Then trip the latch, and note that the lever (16) releases.

6-102. Referring to figure 6-12, install the shutter mechanism as follows:

- a. Place shutter crank (10), with link (9) attached, in position in the yoke mounting on the left side plate, being careful that the link points *upward* in the space between the left-hand register wheel and the left side plate. Insert pin (12) from the back, and secure it with retaining ring (11).
- b. Spread (if necessary) the arms of the shutter (7, fig. 6-12) until their span is about 1/4-inch wider than the distance between the side plates. (This will provide a light spring load on the pivots).

**Note.**

When engaging the left-hand arm with the link, make certain that the shutter arm and link are *above* the crank arm.

- c. Slide left arm of the shutter (7) through link (9) on shutter crank (10), and guide the ends of the arms to their positions on the pivot pins. Then press the arms over the pivots with a screwdriver.
- d. Using a thin, chisel-point tool, burr the shutter pivots to hold the arms of the shutter in place (See figure 6-13)/
- e. Hook the shutter spring over the right hand arm. Then swing the shutter on its pivots, and check that it moves freely and provides a uniform clearance over the register wheels. The shutter must drop by its own weight when register is upright.
- f. Attach crank spring (8, fig. 6-12) to crank (10) and to the stud on the left side plate. The shutter must swing freely against a positive spring load, when the crank spring is attached.

6-103. Mount register wheel indicator (5) on right side plate, using screw (6) and lock washers (27), and adjust position of index pointer by moving indicator on its elongated mounting holes.

6-104. Temporarily install the reset shaft assembly (or print unit assembly, as applicable) as described in paragraph 6-218, "FINAL ASSEMBLY," and operate the reset shaft. Note that the reset mechanism operates properly to return the register wheels to 0000-0.

**Note**

The reset shaft tool (figure 6-8) can be installed and used in place of the reset shaft assembly or print unit assembly for adjustments.

6-105. Check, and if necessary adjust, the position of the reset stop lever (16, figure 6-12) as follows:

- a. Rotate the eccentric cam (20) until the right end of the reset stop lever (16) reaches its furthest point down and to the front of the left side plate.
- b. While holding this condition operate the reset mechanism as described in paragraph 6-226g.
- c. If the reset mechanism does not function properly, readjust the stop position of the reset stop lever (16) by rotating its eccentric hub (20) and recheck.
- d. While holding the eccentric (20) so that it does not rotate, tighten the nut (18).

6-106. Re-examine the register unit to see that:

- a. All screws are tight.
- b. All springs are properly hooked.
- c. All retaining rings are firmly seated.
- d. All gears are properly greased and operate freely without binding.
- e. Split shafts are spread.
- f. Shutter operates freely.
- g. All indicating surfaces are clean.

6-107. Cover the register unit and set it aside unit ready for final assembly

## **6-108. RESET SHAFT ASSEMBLY OVERHAUL**

### **6-109. Inspection Before Disassembly**

6-110. Inspect the reset shaft assembly for damage to the reset gear, loose knob pins, bent reset knob return arm, weak spring, and worn bushings. Check that the reset gear rotates freely about the shaft in one direction, and that it will turn no more than one turn in the opposite direction before hitting a stop.

### **6-111. Disassembly**

6-112. Disassembly of the reset shaft assembly is obvious from figure 6-21, and consists of taking out reset knob pins (4) and pin (5) to remove the reset shaft brackets (2) and reset gear assembly (3).

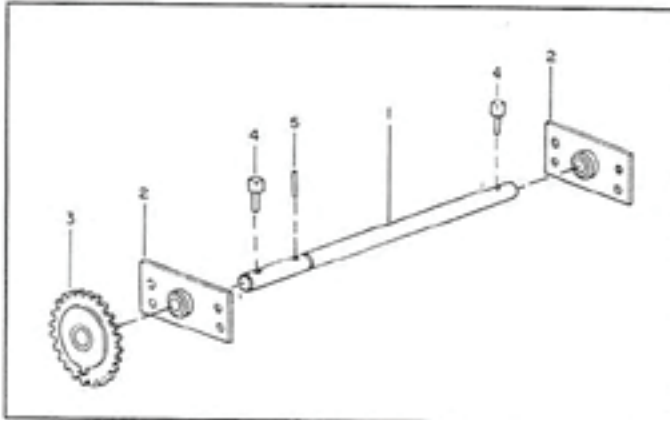
### **6-113. Repair**

6-114. Repair of the reset shaft assembly is limited to replacement of defective parts.

### **6-115. Reassembly**

6-116. Reassemble the reset shaft assembly as follows:

- a. Mount the reset gear assembly (3, fig. 6-21) on the shaft (1) so that the reference-marked face of the gear



- |                        |                   |
|------------------------|-------------------|
| 1. Reset shaft         | 4. Reset knob pin |
| 2. Reset shaft bracket | 5. Reset gear pin |
| 3. Reset gear assembly |                   |

**Figure 6-21. Reset Shaft Disassembly**

faces outward, and secure it with pin (5).

- b. Apply a light coating of grease to the bearing surfaces of the shaft, and mount both reset shaft brackets (2) on the shaft so that their bushings face toward the gear.
- c. Insert knob pins (4) into the counterboard holes in the shaft, seal the pins firmly and squarely (sides of head parallel to the shaft), and crimp the smaller ends of the pins slightly to prevent them from working loose.

### 6-117. PRINT UNIT OVERHAUL

#### Note

The overhaul instructions for the zero-start type print units and the totalizer type print units are similar, and are therefore presented in a combined procedure. However, as differences occur, they are covered by suitable instructions.

### 6-118. Inspection before Disassembly

6-119. Examine the print unit visually for missing retaining rings, loose or missing screws, disconnected or weak springs, worn or damaged gears, bent or broken parts, and other evidence of malfunction. Pay particular attention to the interlock washer (6 fig. 6-24) on the right hand end of the reset shaft. Also check the reset gear to see that it rotates freely about the shaft in one direction and will turn no more than one turn in the opposite direction before hitting a stop.

6-120. Install the reset knob and rotate the reset shaft in both directions, checking to see that the mechanism operates without jamming or binding. Note also that the cams operate the ticket punch, ticket slide, and the hammer lift lever.

6-121. Next rotate the reset knob fully clockwise (as

viewed from the right-hand end of the shaft). Note that the ticket punch lowers, causing the pin to project through the ticket slide. Note also the reading of the serial number print wheels (and on zero-start print unit the reading of the quantity print wheels, which should be 00000).

6-122. Rotate the input gear (serial number device cam) in one direction, and note that the quantity wheels advance freely and smoothly, Rotate it in the opposite direction, and check that the ratchet mechanism of the No. 1 quantity wheel prevents reverse rotation of the wheels while permitting the gearing to rotate backwards. Note also that the No. 1 serial number print wheel has advanced by one-hand graduation.

6-123. Operate the reset knob counter-clockwise and note that the ticket punch clears the ticket slide, and that the No. 1 serial number print wheel has completed its advancement to the next full number.

### 6-124. Disassembly

6-125. Referring to figure 6-22, remove the ticket side and hammer as follows:

- a. Unhook hammer retaining spring (3) from hammer lift lever (2) and hammer (1).
- b. Remove retaining rings (7) and pins (5 and 6), and lift out lever (2), ticket punch actuating lever (4), and hammer assembly (1).
- c. Remove retaining ring (10), and extract slide retaining pin (9) located between the ticket slide (8) and print frame assembly (13).
- d. Remove one retaining ring (12), withdraw ticket slide retaining shaft (11), and lift ticket slide off print frame (13).

6-126. Take out yoke spring. (14, fig. 6-22).

6-127. Referring to figure 6-23, remove retaining ring (3) and shaft (2), and lift out serial number device cam assembly (1).

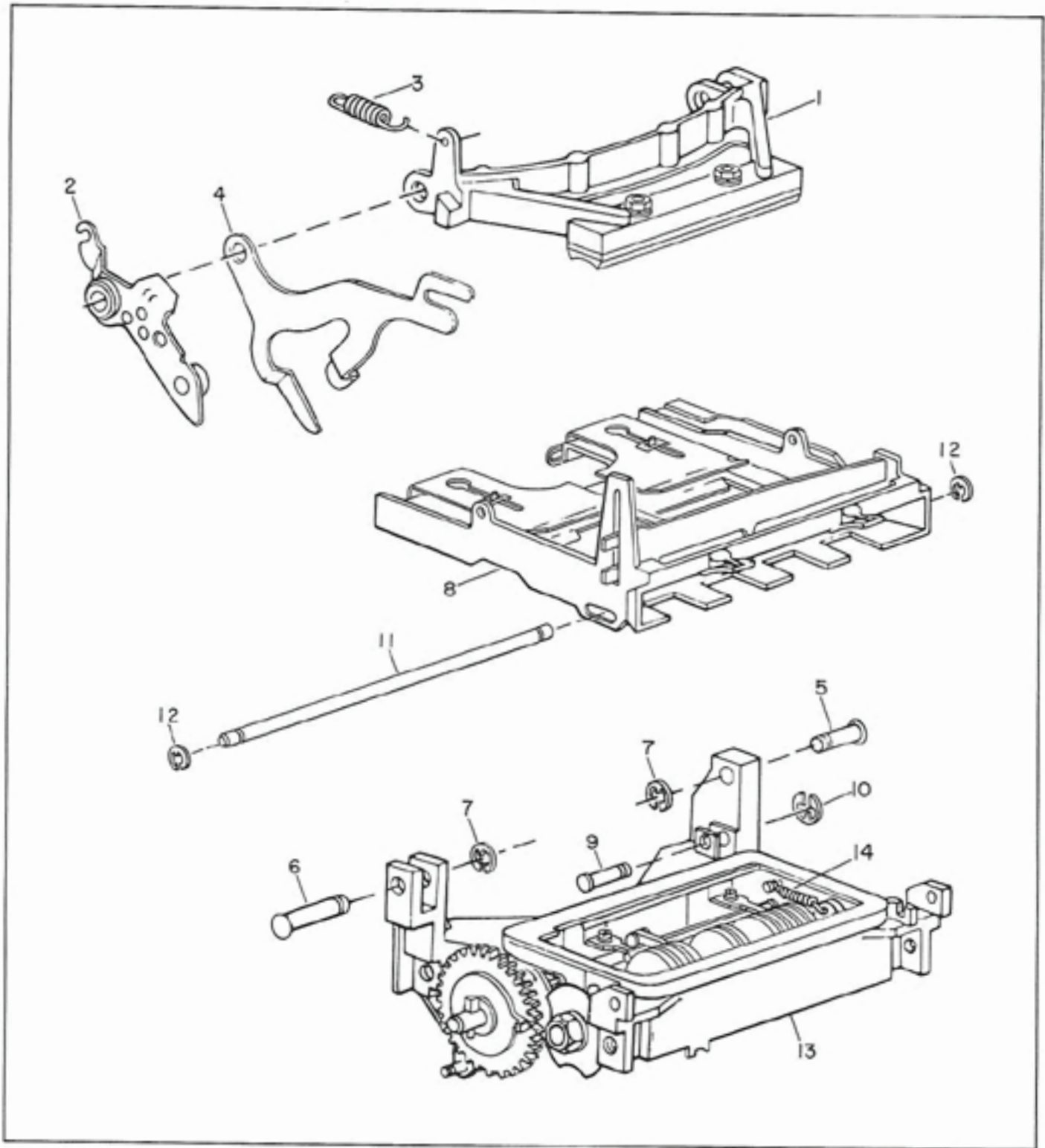
6-128. Disconnect spring (5) from No. 1 serial print wheel retaining pawl (4). Also free short end of spring to relieve spring tension.

6-129. Remove three retaining ring (6) from pinions shaft (7), and work shaft out through brackets on print frame. As the shaft is withdrawn, catch pinions (8), (4), and spring (5).

6-130. Place the unit face up, and referring to figure 6-24, take out two screws (3), lock washers (4), and shaft retainers (2). Lift out serial number device shaft assembly (1).

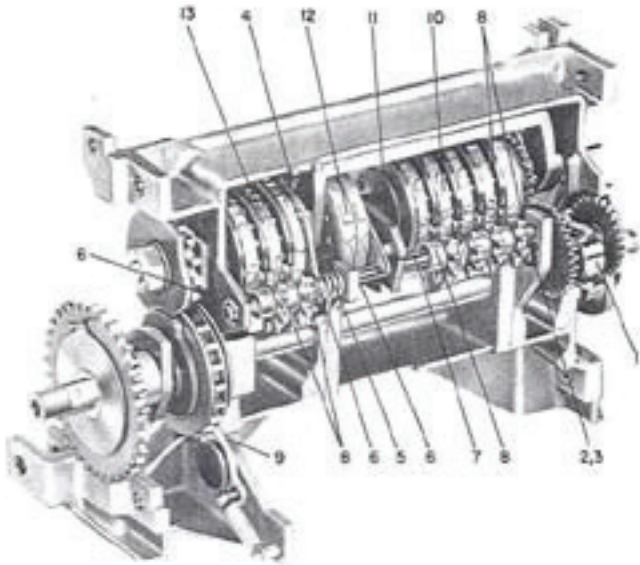
6-131. Disconnect spring to release the full-stroke pawl (9, fig. 6-23) on print frame.

6-132. Drive out reset knob pin (5, fig. 6-24), and remove interlock washer (6) from reset shaft (11). Also remove



- |                                 |                               |                                  |
|---------------------------------|-------------------------------|----------------------------------|
| 1. Hammer assembly              | 6. Pin (long)                 | 11. Ticket slide retaining shaft |
| 2. Hammer lift lever            | 7. Retaining ring             | 12. Retaining ring               |
| 3. Hammer retaining spring      | 8. Ticket slide assembly      | 13. Print frame (assembled)      |
| 4. Ticket punch actuating lever | 9. Ticket slide retaining pin | 14. Yoke sprint                  |
| 5. Pin (short)                  | 10. Retaining ring            |                                  |

**Figure 6-22. Print Unit Disassembly (1st Stage)**



- |                                      |                                |
|--------------------------------------|--------------------------------|
| 1. Serial number decide cam assembly | 8. Pinion, 10-tooth            |
| 2. Shaft                             | 9. Full-stroke pawl            |
| 3. Retaining ring                    | 10. Quantity print wheels      |
| 4. Retaining pawl                    | 11. Adjusting plate            |
| 5. Pawl retaining spring             | 12. Identifying print wheels   |
| 6. Retaining ring                    | 13. Serial number print wheels |
| 7. Pinion shaft                      |                                |

**Figure 6-23. Print Unit Disassembly (2nd Stage)**

retaining ring (7), shim (8), and ticket slide actuating cam (9).

6-133. Withdraw the reset shaft (11) and the wheel shaft (12), and remove the two bushings (10).

**Note**

Shafts (11 and 12) of zero-start type print units are joined by associated gearing and plates, and therefore must be withdrawn together. (On totalizer type print units, the shafts are removed separately).

**CAUTION**

The shaft assemblies (11 and 12) of zero-start type units are aligned in fixtures for precise timing and cam settings. Do not remove the gear and cam assemblies which are positioned on the shafts at time of factory assembly. If these parts become loose or damaged, replace the complete shaft assembly.

5-134. Lift out print wheels (14, 17, and 19), adjusting plate assembly (16), print wheel spacer (15), washer (21), yoke (18), and bushing (20).

**6-135. Repair**

6-136. Inspect the print frame assembly (13, fig. 6-24) for cracks, broken lugs and stripped threads (do not mistake

flash marks or parting lines for casting cracks); check that the full-stroke pawl (9, fig 6-23) at the side of print frame is securely pinned and moves freely; check pawl for wear at point of engagement; check bushings for excessive wear.

6-137. On the serial number device yoke assembly (18, fig. 6-24) check captive pawls, springs, and bushings for wear and damage.

6-138. Examine the print wheels for wear or damage to the type, to the bearing surfaces, and to the gears. Also check the individual wheels as follows:

- a. *Quantity print wheels.* On zero-start print units, check that the ratchet between the cup (which bears the type face) and the gear operates properly. Also check the freedom and spring action of the ratchet pawl that protrudes into the hub to engage the wheel shaft.
- b. *Serial number print wheels.* Examine the ratchet wheel and star wheel portions of the No. 1 serial number print wheel for wear and galling.
- c. *Identifying print wheel.* Check that forked arm is securely staked to wheel hub. Also check that detents between the two wheels, and between the outer wheel and the forked arm, index and hold properly.

6-139. Inspect the wheel shaft assembly for wear, nicks and other damage. Also check to see that the groove in the shaft is sharp. Remove minor nicks or scratches with a fine abrasive stone or cloth. However, if damage is excessive, replace the complete wheel shaft and gear assembly.

**Note**

The wheel shaft assembly for the zero-start type print unit has the groove, but the wheel shaft assembly for the totalizer type print units does not.

6-140. Inspect the ticket slide for cracks or other damage. Check elongated holes for wear or damage.

6-141. Examine the hammer cushion for wear or pitting; replace cushion, if surface is uneven or damaged.

6-142. Inspect hammer lift lever assembly for loose riveting or taking. Also check that the cam roller turns freely.

**6-143. Reassembly**

6-144. As the parts of the print unit are reassembled, apply a light coat of grease to all shafts, gear teeth, ratchet wheels, and other bearing surfaces. Distribute the grease evenly over the entire contact surfaces.

6-145. Referring to figure 6-24, install reset shaft bushings (10) into print frame (13).



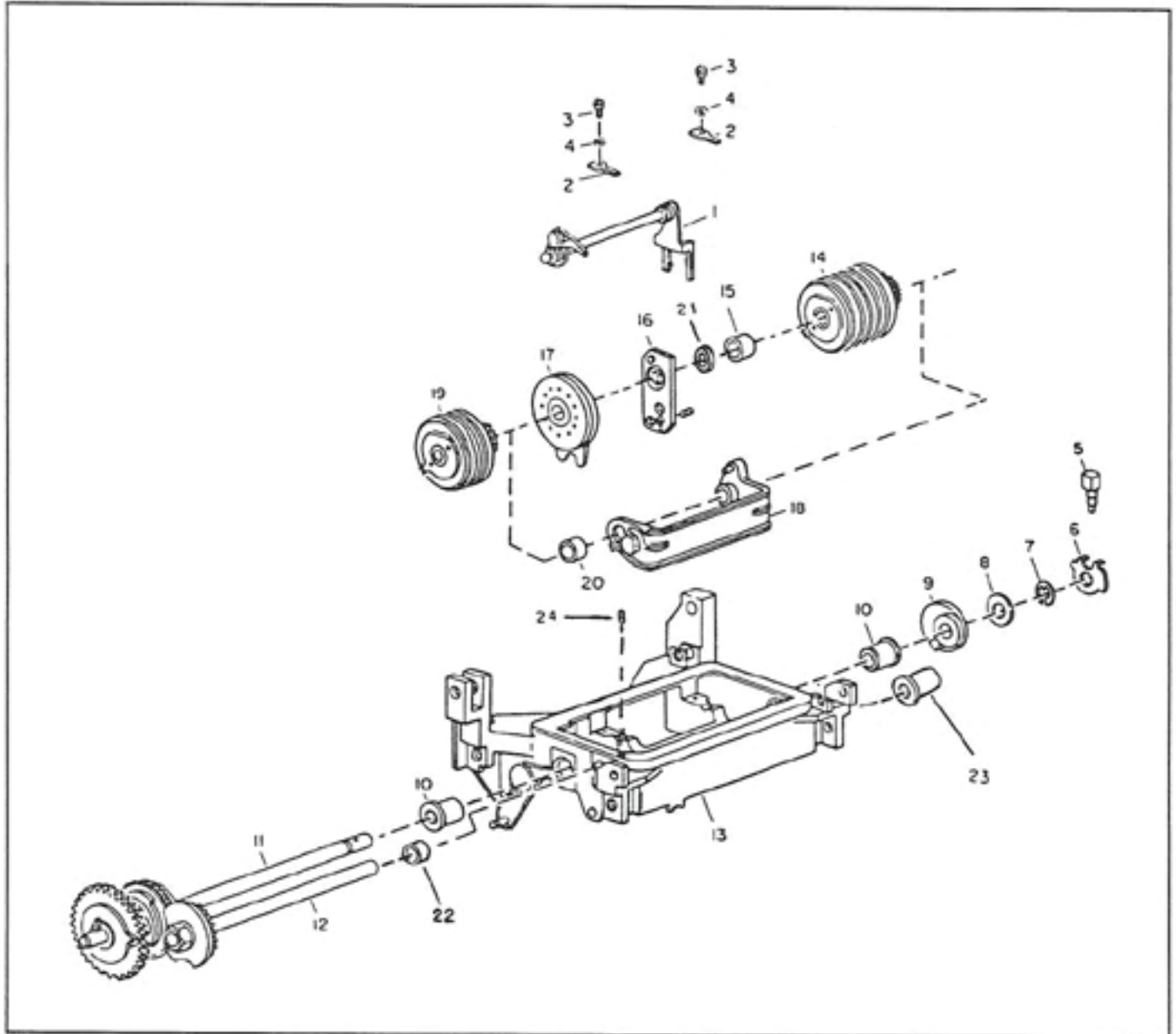
6-146. Install yoke bushing (20) in yoke (18), inserting chamfered end in recess. Place yoke (18) inside the print frame so the two pins, projecting from the end of the yoke, slide into the elongated holes in the right side of the print frame.

6-147. Insert the bullet-nose of print wheel assembly tool (fig 6-4) into print frame and yoke bearings at the right side of the print frame. Raise the ratchet pawl on the yoke

against its spring, and advance the rod until it projects about one-half inch inside the yoke bearing.

6-148. Position No. 1 (right-hand) print wheel on the rod with its 10-tooth ratchet wheel toward the right. Engage ratchet wheel with its mating pawl, and push the rod further through the print wheel.

6-149. Assemble the remaining quantity print wheels in the



- 1. Serial number device shaft assembly
- 2. Shaft retainer
- 3. Screw
- 4. Lock washer
- 5. Reset knob pin
- 6. Interlock washer
- 7. Retaining ring
- 8. Shim (as required)

- 9. Ticket slide actuating cam
- 10. Reset shaft bushing
- 11. Reset shaft assembly
- 12. Wheel shaft assembly (zero-start type)
- 13. Print frame
- 14. Quantity print wheels
- 15. Print wheel spacer
- 16. Adjusting plate assembly

- 17. Identifying print wheels.
- 18. Serial number device yoke assembly
- 19. Serial number print wheels
- 20. Yoke bushing
- 21. Washer (as required)
- 22. Bushing
- 23. Flanged bushing
- 24. Set screw

**Figure 6-24. Print Unit Disassembly (3rd Stage)**

same manner, making certain that all numerals read in the same direction as No. 1 print wheel.

6-150. Mount the print wheel spacer (15, fig. 6-24), and washer (21), if required, end-play adjusting plate (16), and identifying print wheels (17) on the assembly rod, positioning them so that the point of the setscrew in the adjusting plate bears against the forked arm of the identifying print wheels.

#### Note

The print wheel spacer (15, figure 6-34) is used in the zero-start type print unit, but is replaced by a print wheel in the totalizer type print unit.

6-151. Continue advancing the assembly rod through the yoke bushing (20) and the serial number print wheels (19), making certain that the pawl on yoke (18) properly engages the ratchet wheel on the No. 1 serial number print wheel.

6-152. Check rotation of zero-start print wheels and spring action of pawls on ratchet wheels. Wheels must rotate freely: pawls must engage in index properly.

5-153. From the left side of print frame (13, fig. 6-24), insert wheel shaft assembly (12) and reset shaft assembly (11). On zero-start print units make certain that the timing gears on the shaft are so intermeshed that the locking segment on the reset shaft mates with either half-moon cutout of the locking disc on the wheel shaft. (Refer to paragraph 2-97).

#### Note

Before seating the shafts of zero-start units, hold the full-stroke pawl (9, fig., 6-23) on print frame clear of the full-stroke ratchet wheel on the reset shaft, using tape or other means.

6-154. Check that the reset shaft bushings (10, fig. 6-24) are seated properly in the print frame (13). Then mount the ticket slide actuating cam (9) onto the right end of reset shaft (11) so that its hub faces the print frame. Follow the cam with shim (8) and retaining ring (7). Do not install the interlock washer (6) or knob pint (5) at this time.

#### Note

The shim (8) compensates for manufacturing tolerances. If original parts are replaced. The required shim thickness may change. Use a shim that will provide the recommended end-play of 0.005 to 0.010 inch.

6-155. Check the freedom of operation of shaft and gear assemblies by rotating the reset shaft in both directions through the limits of its travel. (On zero-start units, the

reset shaft will turn about  $2^{3/4}$  revolutions between travel limits.

6-156. On zero-start type print units only, perform the following additional operations:

- a. With the full-stroke pawl still disengaged from the reset shaft ratchet wheel, rotate the reset shaft ratchet wheel, rotate the reset shaft fully counterclockwise (as viewed from left or reset-gear end of the shaft). Then rotate the shaft clockwise about  $5/8$  turn, engage the full-stroke pawl (9, fig. 6-23) with the deep notch in the full-stroke ratchet wheel, and reconnect the full-stroke pawl spring.

#### Note

With the full-stroke pawl engaged with the deep notch, the locking disc on the end of the wheel shaft (12, fig. 6-24) will be positioned so that one half-moon cutout will be facing upward while the other cutout engages the locking segment on the reset shaft (11).

- b. With the shafts end in these relative positions, rotate the quantity print wheels backwards by hand, and check to see that they read 00000 (as viewed from the top side of the unit).

6-157. Mount the interlock washer (6, fig. 6-24) on the reset shaft with the prongs of the washer facing outward. Without turning the shaft, rotate the ticket slide actuating cam (9) and the interlock washer on the shaft fully clockwise as viewed from the right. With the cam and washer in this position, install the reset knob pin (5) between the prongs of the interlock washer and into the counterbored hole in the shaft. Seat the pin firmly and squarely between the prongs.

6-158. Adjust end play of the print wheels by turning the setscrew in the adjusting plate assembly (16, figure 6-24) until the wheels stop turning freely, then loosen setscrew approximately  $1/4$  turn until they just begin to turn freely.

6-159. With the assembly upside-down, refer to figure 6-23 and install the 10-tooth pinions and shaft as follows:

- a. Insert grooved end of pinion shaft (7, fig. 6-23) part way through bearing holes in bracket from which serial number device cam (1) was removed.
- b. Rotate No. 1 quantity print wheel so that its 2-tooth gear points toward the pinion shaft.
- c. While holding the No. 1 wheel in this position, rotate the wheel at its left until the numerals align with those of the No. 1 wheel. Then install a 10-tooth pinion (8) on the shaft so that the hub of the pinion is to the left, and so that one of the wide teeth of the 10-tooth pinion will mesh with the 20-tooth gear on the No. 2 wheel at the tooth space adjustment to the center of the numeral.

- d. Align the remaining intermediate quantity print wheels, and install the remaining 10-tooth pinions in the same manner.
- e. Continue to thread the pinion shaft through the brackets, the adjusting plate (11, fig. 6-23), the cutout in fork of identifying print wheels (12), and the central bracket of the print frame.
- f. As the pinion shaft is pushed through the central bracket, mount pawl retaining spring (5) and pawl (4), followed by the two remaining 10-tooth pinions (8). Make certain when meshing the pinions with the 2-tooth and 20-tooth gears of all print wheels that the numerals of the wheels align with each other, and that the wide teeth of the 10-tooth pinions will mesh with tooth spaces (of the 20-tooth gear) adjacent to center of numerals on the wheels.
- g. Secure pinion shaft with three retaining rings (6) at the locations shown in figure 6-23.
- h. Anchor the straight end of spring (5) against the print frame, and snap the hooked end behind pawl (4).
- i. Check the operation of the assembly by installing the reset knob, and rotating the reset shaft clockwise (viewed from the right). All numerals must align with the characters on the identifying print wheels. If the numerals do not line up, take out the pinion shaft assembly, check for assembly errors, and reassemble.
- j. Check the alignment of the numerals on the zero-start quantity print wheels at a position other than zero. This is done by manually ratcheting each wheel at least one number from zero.

6-160. Referring to figure 6-24, install serial number devices shaft assembly (1) through the top of the print frame, so that the ratchet pawl on this shaft engages the ratchet wheel on the No. 1 serial print wheel. Secure shaft with shaft retainers (2), and screws and lock washers (3 and 4)

6-161. Hook yoke spring (14, fig. 6-22) in place.

6-162. Install cam assembly (1, fig. 6-23), and insert shaft and retaining ring (2 and 3).

6-163. Check the operating of the print wheels, gearing, and social number device shaft (1, fig. 6-24) by rotating cam assembly (1, fig. 6-21).

6-164. Mount the ticket slide assembly (8, fig. 6-22) on the print frame, and insert retaining shaft (11) and retaining pin (9).

#### Note

It may be helpful to rotate reset shaft (11, fig. 6-24). To align the elongated notes in the ticket slide frame with the associated hole in the print frame to insert the retaining shaft.

6-165. Attach hammer assembly (1, fig. 6-22) to the right-hand end of the print frame, using short pin (5) and retaining ring (7).

6-166. Engage the ticket punch actuating lever (4, fig. 6-22) with the cam on the reset shaft, and position its pivot hole between the left-hand end of the hammer (1) and the print frame (13). Position the hammer lift lever (2) between the two right-hand pivot lugs, and secure the hammer, actuating lever, and lift lever with long pin (6) and retaining ring (7).

6-167. Install hammer retaining spring (3) between the hammer (1) and hammer lift lever (2).

6-168. Check the over-all operation of the assembled print unit (as described in paragraph 6-118) before assembling onto the register unit. If the print unit fails to operate properly, disassemble and check for improper assembly, or for defects.

#### Note

If the hammer cushion was replaced or moved, its alignment must be readjusted during final assembly of the Register (after hammer springs have been attached).

### 6-169. PRESET UNIT OVERHAUL

6-170. Preset Units, though similar in function and construction, are nevertheless sufficiently different to warrant separate overhaul instructions. (Refer to "DESCRIPTION." Section 2). Therefore the overhaul is covered in two individual procedures:

- a. Preset (Lever-Operated) Unit Overhaul (par. 6-171) which covers both fork-type and pin-type mechanisms.
- b. Preset (Gear-Drive) Unit Overhaul (par. 6-192).

#### 6-171. Preset (Lever-Operated) Unit Overhaul

#### 6-172. Inspection Before Disassembly

6-173. Examine the Preset unit (fig. 6-25) visually for missing retaining rings, loose or missing screws, stripped threads, weak or disconnected springs, worn or damaged ratchet wheels and pawls, bent or broken parts, and for other evidence of malfunction.

#### Note

Many operating troubles are caused solely by retaining rings that have dropped off their shafts because they were not seated properly.

6-174. Referring to figure 6-26, check the operating of the tripping mechanism as follows:

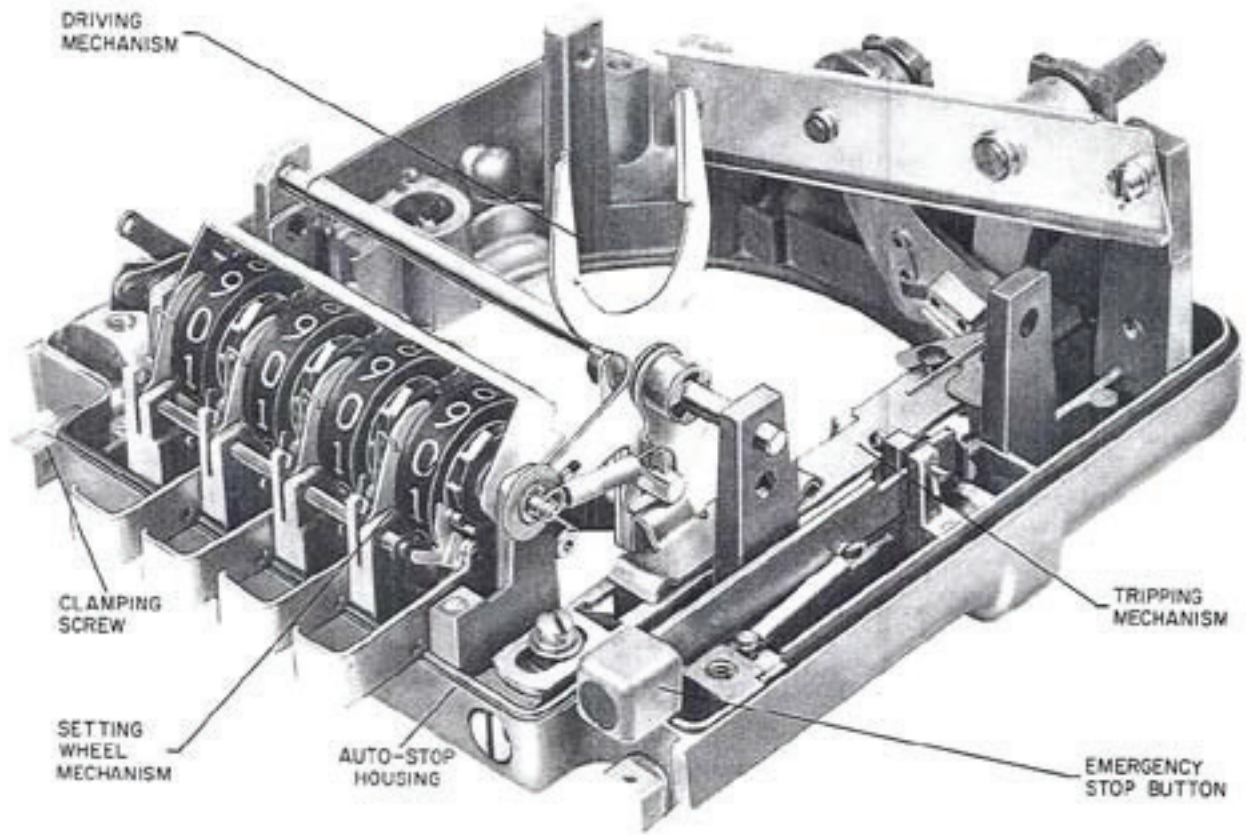
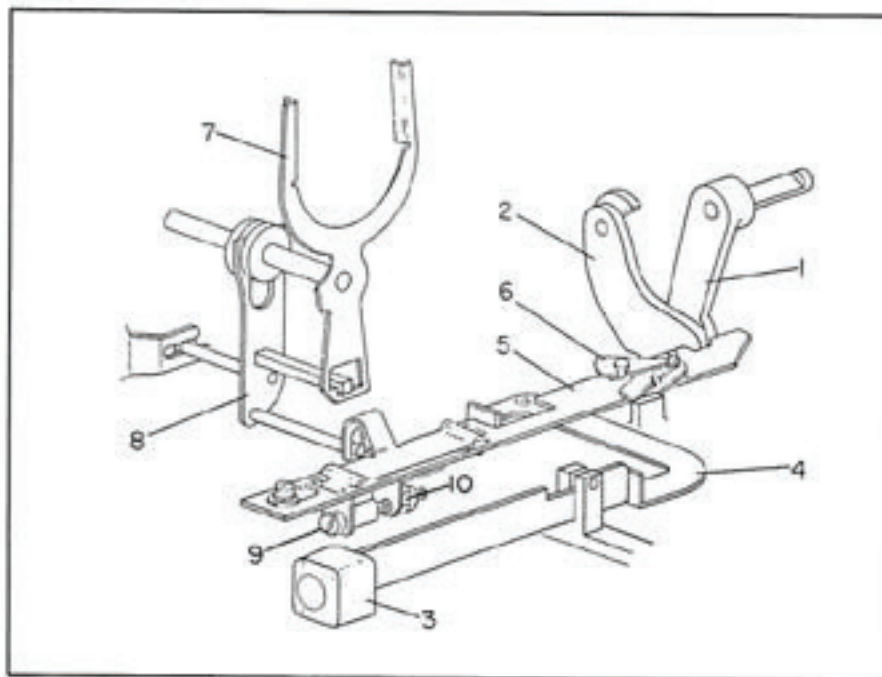


Figure 6-25. Preset Unit, Lever-Operated (Fork-Type)



- |                         |                               |                    |
|-------------------------|-------------------------------|--------------------|
| 1. Trip lever           | 5. Trip slide                 | 9. Adjusting screw |
| 2. Trip latch           | 6. Trip slide retaining lever | 10. Stop nut       |
| 3. Emergency stop lever | 7. Operating lever            |                    |
| 4. Crank                | 8. Trip link                  |                    |

Figure 6-26. Tripping Mechanism, Lever-Operated Preset Unit



- a. Set a reading other than zero (0005) into the Preset setting wheels.
- b. Latch the trip lever (1) up with the trip latch (2). Then press the emergency stop lever (3), and note that the crank (4) shifts the trip slide (5) against the spring pressure on trip slide retaining lever (6), and that latch (2) releases lever (1).
- c. Latch the trip lever up again, and operate the trip slide (5) by hand. Note that the slide moves freely and that the lever (1) releases.

**Note**

On double-trip units, note also that the slide releases the trip latch (2) in two steps.

- d. Latch the trip lever up. Then move the operating lever (7) back and forth, and note as the setting wheels read "0000," that the trip link (8) couples the operating lever to the trip slide (5), and that the slide operates to release the trip latch.

times and note that the setting wheels (7) advance one-tenth revolution each time. Note particularly that the keys slide freely and return easily, and that the ratchet pawl on each setting key engages the ratchet on the wheel properly. Note also that the wheel stop pawls (3) hold the wheels at their indexed positions.

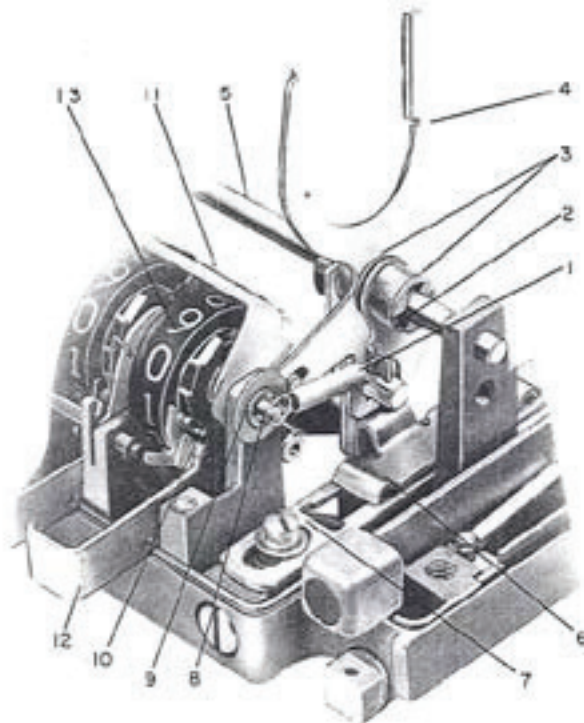
- b. Manipulate the operating lever (4, fig. 6-27), and note that the feed pawl bracket assembly (11) operates smoothly. Also check the action of the feed pawls by noting that operating of the bracket assembly moves the No. 1 setting wheel (13) only, until the No. 1 wheel reads "0." Note also that the bracket assembly moves each of the remaining wheels only when the wheel to its *right* reads "0."
- c. Rotate and hold the bail mechanism cam assembly (6, fig. 6-23) so that it lifts the feed pawls; then manipulate the operating lever, and note that the setting wheels (7) do not move.

6-175. Check the setting wheel mechanism as follows:

- a. Operate all setting keys (1, fig. 6-28) several

**6-176. Disassembly**

6-177. Disassembly of the preset unit should be confirmed to the defective area; that is, to the driving mecha-



- |                          |                                |
|--------------------------|--------------------------------|
| 1. Brake lever spring    | 8. Retaining ring              |
| 2. Brake lever           | 8. Shim                        |
| 3. Retaining ring        | 10. Spacer                     |
| 4. Operating lever       | 11. Feed pawl bracket assembly |
| 5. Shaft                 | 12. Setting key                |
| 6. Trip slide            | 13. No. 1 setting wheel        |
| 7. Slide retaining screw |                                |

**Figure 6-27. Lever-Operated Preset Unit Disassembly (1st Stage)**

nism, to the wheel mechanism, or to the tripping mechanism. The procedures are covered separately in the following numbered paragraphs.

**6-178. Driving Mechanism.** Referring to figure 6-17, remove the driving mechanism as follows:

- a. Unhook spring (1) from brake lever (2).
- b. Remove three retaining rings (3).
- c. Slide out shaft (5) to the right, and lift out the brake lever and (fork or pin type) operating lever assembly (4).

**Note**

Disengaging of the operating lever from the trip slide (6) and from the roller bracket assembly may be simplified by removing the slide retaining screw (7) and washers to loosen the trip slide (6).

**6-179. Setting Wheel Mechanism.** Referring to figure 6-28, disassemble the setting wheel mechanism as follows:

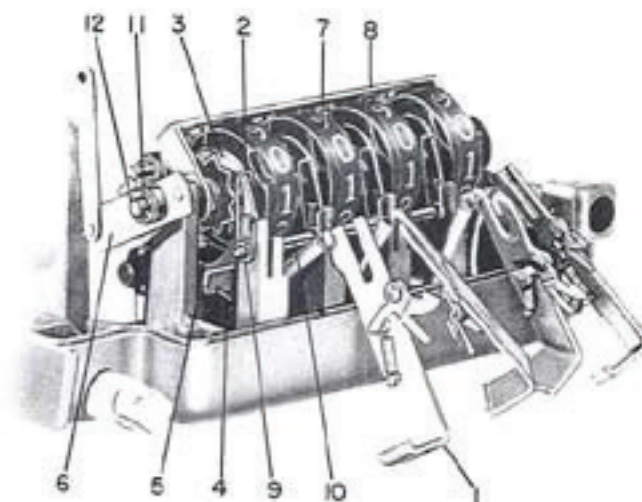
- a. Release the setting keys (1), and allow them to hang by their springs.
- b. Unhook the long ends of the stop pawl springs (2) from the wheel stop pawls (3) and their short ends from the posts. Swing the stop pawls out in front of the unit.
- c. Unhook the spring (4) from the roller bracket assembly and from the frame.
- d. Remove retaining ring (8, fig. 6-27) and shim (9).
- e. Remove retaining ring (11, figure 6-28), and bail mechanism cam assembly (6) from wheel shaft (12).
- f. Remove retaining ring (5, fig. 6-28). Then slide out the wheel shaft and remove setting wheels (7) feed pawl bracket assembly (8), and spacer (10, fig. 6-25).

**CAUTION**

When removing the setting wheels, take note of their positions (and tag them) so that they are returned to their original places at reassembly.

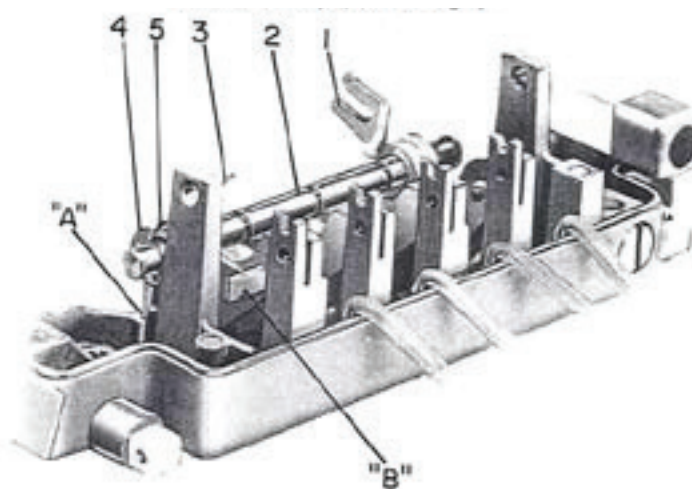
- g. If necessary, take out the roller bracket assembly (1, fig. 6-29) by removing three retaining rings (4), the roller bracket spring (3), shaft (2), and spacer (5).
- h. If necessary, remove the stop pawls (3, fig. 6-28) and springs (2) by taking out one retaining ring (9) and the stop pawl shaft (10).

**6-180. Tripping Mechanism.** Removal of the tripping mechanism components is obvious upon inspection. The trip side (6, fig. 6-27) is held by one fillister-head screw (7), a lock washer, and a brass flat washer. To



- |                                |                               |
|--------------------------------|-------------------------------|
| 1. Setting key                 | 7. Setting wheel              |
| 2. Stop pawl spring            | 8. Feed pawl bracket assembly |
| 3. Wheel stop pawl             | 9. Retaining ring             |
| 4. Roller bracket spring       | 10. Stop pawl shaft           |
| 5. Retaining ring              | 11. Retaining ring            |
| 6. Bail mechanism cam assembly | 12. Wheel shaft               |

**Figure 6-28. Lever-Operated Preset Unit Disassembly (2nd Stage)**



- |                            |                   |
|----------------------------|-------------------|
| 1. Roller bracket assembly | 4. Retaining ring |
| 2. Roller bracket shaft    | 5. Spacer         |
| 3. Roller bracket spring   |                   |

**Figure 6-29. Lever-Operated Preset Unit Disassembly (3rd Stage)**

remove the slide (6) without dismantling the driving mechanism, take out the screw (7), lift the front end of the slide, pull it forward to clear the guide plate at the other end, and rotate it clockwise to clear the pins on the operating lever (4).

**CAUTION**

Do not disturb the setting of the adjusting screw (9, fig. 6-25) on the bottom of the trip slide, unless the release point of the mechanism is to be changed.

## 6-181. Repair

6-182. Examine the preset base casting for worn bearing surfaces, stripped threads, loose pins, and cracks. (Do not mistake parting lines or “flash” from the dies as cracks).

**6-183. Tripping Mechanism.** Check that the stop nut (10, fig. 6-26) on the trip slide (5) holds the adjusting screw (9) firmly. Also check that the trip slice retaining lever (6) operates freely) and that the spring is in good condition. Inspect the trip latch (2) to see that it will swing freely and will release the trip lever (1) properly.

**6-184. Driving Mechanism.** Examine the (fork or pin type) operating lever assembly for loose or worn pins. Pay particular attention to the “step” that actuates the square pin on the trip link, and to the slot that engages the pin of the feed pawl bracket assembly. Examine the bearing surfaces of the operating lever and the brake lever, and check that the levers rotate smoothly on their shaft. Note also that the trip link slides freely on the hub of the operating lever.

**6-185. Setting Wheel Mechanism.** Inspect the setting wheel faces for damage and discoloration. Examine the ratchet, cam, and bearing surfaces of the wheels for wear. Inspect the feed pawls to be sure that their contact surfaces are flat and smooth, that the pawls move freely on their shafts, and that they are staked securely to the brass finger (tie bar). If any defect is found in the feed pawl bracket assembly (8, fig. 6-28), *do not* attempt to repair it; replace the complete assembly with a new one

## Note

The feed pawl bracket assembly is a precision adjusted unit and cannot be successfully repaired without special equipment.

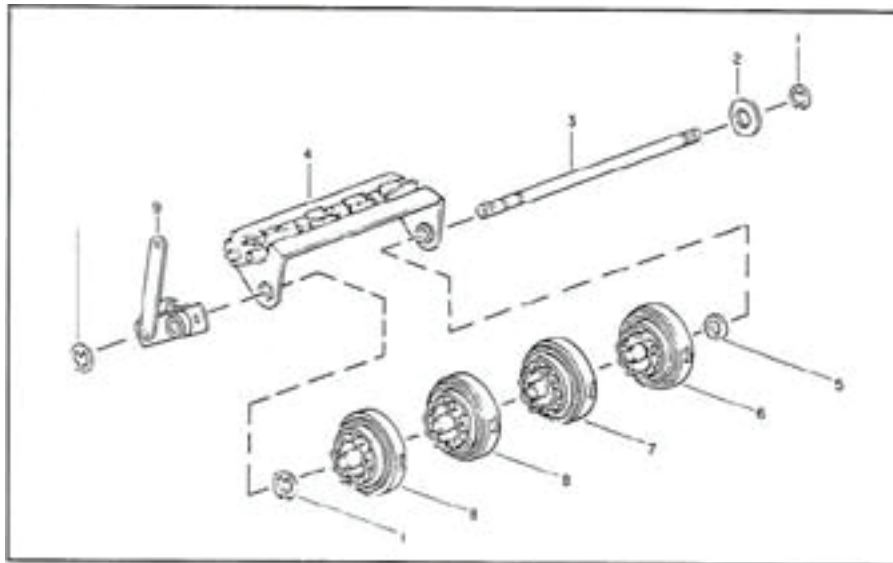
## 6-186. Reassembly

6-187. Referring to figure 6-29, install the roller bracket assembly as follows:

- a. Position the roller bracket (1) in the base. Apply a light coating of grease to the bearing surfaces of the shaft (2), and insert the shaft so that the end with the wide setting-key groove is at the right-hand side. Install spacer (5) on shaft (2) on outside of left mounting post. Then secure the shaft with a retaining ring (4) on the outside of each of its mounting posts.
- b. Mount the roller bracket spring (3) loosely on the left end of the shaft, and secure it with retaining ring (4). *Do not* hook the spring under the roller bracket (B, fig. 6-29) until after the setting wheels have been installed.

6-188. Install the setting wheels as follows:

- a. Check to see that the wheel stop pawls (3, fig. 6-28) are swung out in front of the unit.
- b. Mount a retaining ring (1, fig. 6-30) in the second groove of the two-grooved end of the wheel shaft (3). Then mount shim (2) inside the retaining ring.
- c. Slide the shaft (3) through the right-hand post of the preset base, and through the right-hand bushing of the feed pawl bracket assembly (4) and through spacer (5).



- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Retaining ring             | 6. No. 1 setting wheel         |
| 2. Shim                       | 7. No. 2 setting wheel         |
| 3. Wheel shaft                | 8. No. 3 and 4 setting wheels  |
| 4. Feed pawl bracket assembly | 9. Bail mechanism cam assembly |
| 5. Spacer                     |                                |

**Figure 6-30. Setting Wheel Assembly, Lever-Operated Preset Unit**



- d. Position the No. 1 setting wheel (6) between the No. 1 feed pawl and the first intermediate feed pawl on the feed pawl bracket assembly (4), and advance the shaft.

**CAUTION**

The setting wheels are not interchangeable. Therefore make certain to install them in their original positions.

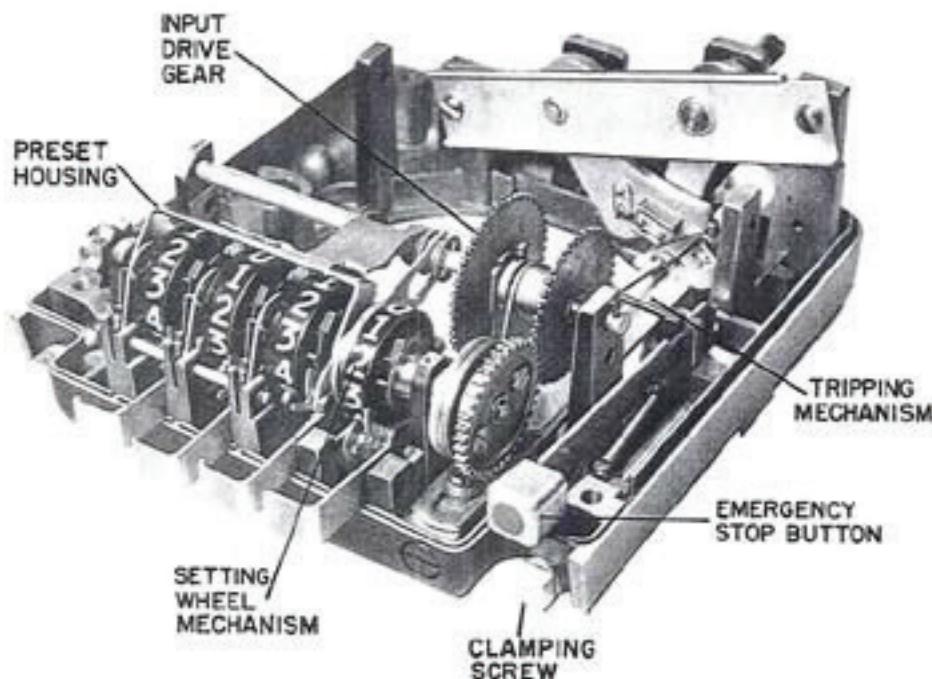
- e. Install the remaining wheels in the same manner, and advance the shaft through the left-hand arm of the feed pawl bracket, and then through the left-hand post of the base.
- f. Install a retaining ring (1) between the left-hand setting wheel and the feed pawl bracket.
- g. Mount bail mechanism cam assembly (9) on the left end of the shaft with its cam facing in and secure it with retaining ring (1). (The cam must engage projecting pin on feed pawl bracket assembly).
- h. Position wheel stop pawls (3, fig. 6-28) on their star wheels (on setting wheels), and hook the short ends of springs (2) into the cutouts on the tops of their posts. (See figure 6-28). Then hook the long ends of the springs over the stop pawls.
- i. Check the freedom of the wheels and the feed pawl bracket by swinging the bracket between its normal operating limits. Also note that the wheels rotate properly and index correctly.
- j. Position and hold the bail mechanism cam assembly (6, fig. 6-28) so that it raises the bail on

the feed pawl bracket assembly. Then operate the bracket, and note that the wheels *do not* rotate.

- k. Hook the end of the roller bracket spring (3, fig. 6-29) under the roller bracket at "B." Make certain that the other end of the spring is seated in the base at "A."
- l. Check that the springs which hold the setting keys (1, fig. 6-28) to the base have not been damaged, then reinstall the keys in operating position, with pawls engaging the ratchet wheels. Check that keys operate freely, and index the wheels properly.

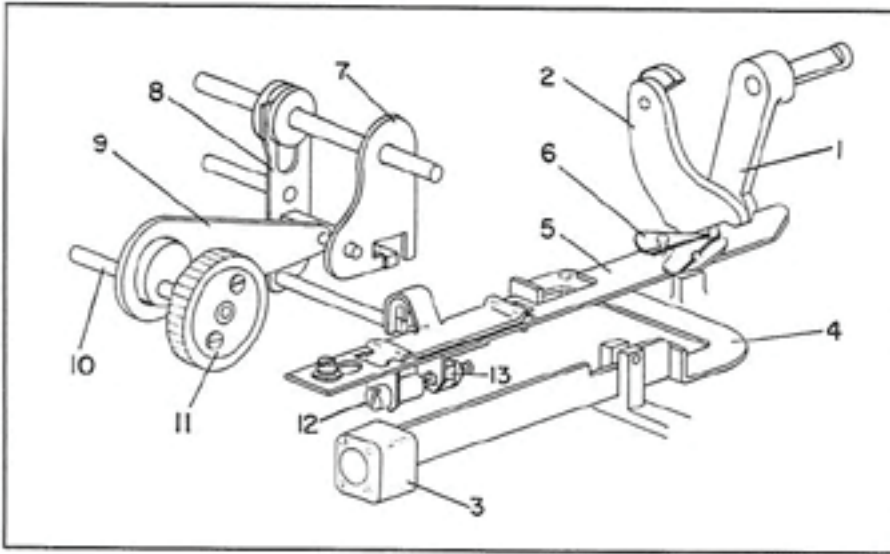
6-189. Referring to figure 6-27, install the driving mechanism as follows:

- a. Apply a finger coating of grease to bearing surfaces of the operating lever (4), brake lever (2), with its long arm projecting to the right, behind the post.
- c. Mount operating lever (4) so that its arm projects forward to engage the pin on feed pawl bracket assembly (11); so that the flat head pin on its trip link engages the fork slot on roller bracket assembly; and so that the stud at the bottom of the trip link engages the fork on the trip slide (6). Push the shaft (5) to the left until its stepped end engages the left post.
- d. Install three retaining rings (3) in the shaft (one on each side of the levers, and one between).
- e. Connect spring (1) between the brake lever (2) and the shaft of the wheel mechanism.



**Figure 6-31. Preset Unit, Gear-Drive**





- |                         |                               |                     |
|-------------------------|-------------------------------|---------------------|
| 1. Trip lever           | 6. Trip slide retaining lever | 11. Drive gear      |
| 2. Trip latch           | 7. Operating lever            | 12. Adjusting screw |
| 3. Emergency stop lever | 8. Trip link                  | 13. Stop Nut        |
| 4. Crank                | 9. Trip cam and lever unit    |                     |
| 5. Trip slide           | 10. Setting wheel shaft       |                     |

**Figure 6-32. Tripping Mechanism, Gear-Drive Preset Unit**

f. Manipulate the operating lever (4), and check that the feed pawl bracket (11) rotates the setting wheels.

6-190. Reassembly of the tripping mechanism (fig. 6-26), if removed, is obvious upon inspection. When reassembling, however, apply grease to all contact and bearing surfaces of the trip lever (1), trip latch (2), and trip slide (5). After making sure that the fork on the slide (5) is engaged with this pin on the trip link (5) secure the slide with its fillister-head screw, lock washer, and flat brass washer.

6-190. Reassembly of the tripping mechanism (fig. 6-26), if removed, is obvious upon inspection. When reassembling, however, apply grease to all contact and bearing surfaces of the trip lever (1), trip latch (2), and trip slide (5). After making sure that the fork on the slide (5) is engages with the pin on the trip link (8), secure the slide with its fillister-head screw, lock washer, and flat brass washer.

6-191. Recheck the over-all operation of preset mechanism in accordance with the inspection procedure given in paragraph 6-172.

### 6-192. Preset (Gear-Drive) Unit Overhaul

### 6-193. Inspection Before Disassembly

6-194. Examine the preset unit (fig. 6-31) visually for missing retaining rings, loose or missing screws, stripped threads, weak or disconnected springs, worn gears, worn or damaged ratchet wheels or pawls, bent or broken parts, and other evidence of malfunction. Having located the defect, disassemble and repair only that portion of the unit. However, before reinstalling the unit in the Register, check the functioning and lubrication of the rest of the unit.

6-195. Referring to figure 6-32, check the operation of the tripping mechanism as follows:

- Set a reading other than zero (0005) into preset setting wheels.
- Latch the trip lever (1) up with the trip latch (2). The operate the emergency stop lever (3), and note that the crank(4) shifts the trip slide (5) against the spring pressure on the trip slide retaining lever (6), and that latch (2) releases lever (1).
- Latch the trip lever up again, and operate the trip slide (5) by hand. Note that the slide moves freely and that the trip lever (1) releases.

#### Note

On double-trip units, note also that the slide (5) releases the trip latch (2) in two steps.

- Rotate the drive gear (11, fig. 6-32) counterclockwise (as viewed from the right-hand end of the shaft), and note that as the setting wheels approach "0000," that the trip link (8) couples the operating lever (7) to the trip slide (5), and that the slide moves toward the rear of the unit, allowing the trip latch (2) to drop.

6-196. Check the setting wheel mechanism as follows:

- Operate all setting keys several times, and note that the wheels advance one-tenth revolution each time. Note particularly that the key slides freely and returns easily, and that the ratchet pawl engages properly. Note also that the stop pawls hold the wheels at their indexed positions.

#### Note

The No. 1 setting key is not intended to "work" easily. A stronger spring has been used; the greater force required to operate the key is intended to ensure a full stroke of the key.

- Rotate the drive gearing in both directions and check

that the ratchet in the drive gear (11, fig. 6-32) permits rotation of the No. 1 setting wheel only in one direction. Also check that the feed pawls rotate each of the setting wheels only when the wheel to its right reads "0."

### 6-197. Disassembly

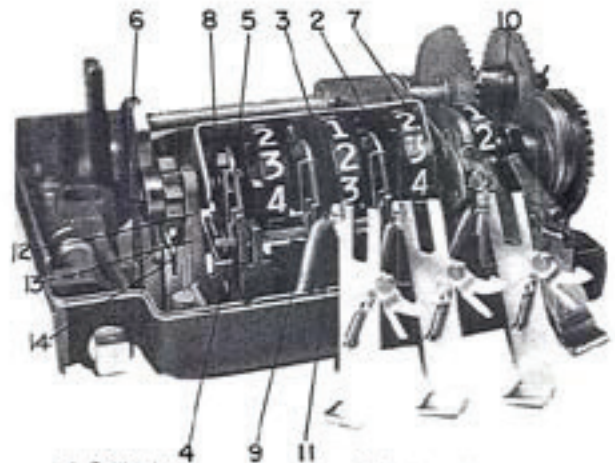
6-198. Disassembly of the preset unit should be confined to the defective area, that is, to the setting wheel mechanism, or to the tripping mechanism. The procedures are covered separately in the following numbered paragraphs.

**6-199. Setting Wheel Mechanism.** Referring to figure 6-33, disassemble the setting wheel mechanism and its drive gearing as follows:

#### Note

When removing the parts take particular notice of the positions of the bail, and the manner in which the trip link is coupled with the trip slide and roller bracket.

- a. Remove four retaining rings (4) from idler gear shaft (3), withdraw shaft from the right, and lift out the bail (2), slide roller (5), the intermediate gearing and trip operating lever assembly (1), and the trip link (6).



- |                               |                            |
|-------------------------------|----------------------------|
| 1. Setting key                | 9. Stop pawl shaft         |
| 2. Stop pawl spring           | 10. Retaining ring         |
| 3. Wheel stop pawl            | 11. Key spring             |
| 4. Roller bracket spring      | 12. Star wheel assembly    |
| 5. Retaining ring             | 13. Star wheel pawl        |
| 6. Wheel shaft                | 14. Star wheel pawl spring |
| 7. Setting wheels             |                            |
| 8. Feed pawl bracket assembly |                            |

**Figure 6-34. Gear-Drive Preset Unit Disassembly (2nd Stage)**

- b. Remove retaining ring (7) and shims (8), and take off the drive ratchet and gear assembly \*(9) and the trip cam and lever unit assembly (10).

#### Note

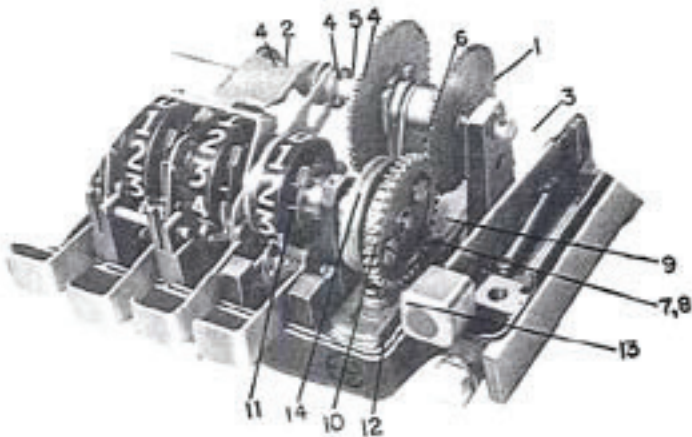
The trip cam and lever unit assembly (10, fig. 6-33) is coupled to the No. 1 setting wheel (11) in a definite relationship; the must not be rotated with respect to each other on the shaft. Coupling is by means of slots in the hubs of the trip cam and lever unit assembly and the No. 1 wheel. These slots engage rollpins in the shaft.

- c. Pull out the setting keys (1, fig. (6-34), and allow them to hang by their springs.

#### Note.

Release of the setting keys (1), though helpful in facilitating the removal of the wheels, is not absolutely necessary.

- d. Unhook the long ends of the springs (2) from each of the wheel stop pawls (3) and their short ends from the posts.
- e. Unhook the spring (4) from the roller bracket assembly and from the frame preset base.
- f. Unhook star wheel pawl spring (14) from star wheel pawl (13).
- g. Loosen setscrew in star wheel assembly (12) from wheel shaft (6).



- |   |                                      |
|---|--------------------------------------|
| 1. Intermediate gearing and trip operating lever assembly | 9. Drive ratchet and gear assembly   |
| 2. Bail   | 10. Trip cam and lever unit assembly |
| 3. Idler gear shaft                                       | 11. No. 1 setting wheel              |
| 4. Retaining ring   | 12. Trip slide                       |
| 5. Slide roller   | 13. Slide retaining screw            |
| 6. Trip link  | 14. Set screw                        |
| 7. Retaining ring   |                                      |
| 8. Shim   |                                      |

**Figure 6-33. Gear Drive Preset Unit Disassembly (1st Stage)**

- h. Loosen setscrew (14, fig. 6-33) in top of right side post on preset base.
- i. Remove retaining ring (5). Then slide out wheel shaft (6) from the right-hand end, and remove the setting wheels (7), and the feed pawl spacer (between the No. 2 setting wheel and the right hand arm of the feed pawl bracket assembly).

**CAUTION**

When removing the setting wheels, take note of their positions (and tag them) so that they are returned to their original places.

- j. If necessary, take out the roller bracket assembly (1, fig. 6-35) by removing four retaining rings, (8), spacer (9), and roller bracket spring (3).
- k. If necessary, remove the wheel stop pawls (3, fig. 6-34) and springs (2) by taking out one retaining ring (10) and stop pawl shaft (9).

**6-200. Tripping Mechanism.** Removal of the tripping mechanism components is obvious upon inspection. The trip slide (12, fig. 6-33) is held by one fillister-head screw (13), a lock washer, and a brass flat washer. To remove the slide without dismantling the entire driving mechanism, first remove parts (7,8, 9, and 10) as described in paragraph 6-199. Then unhook the slide spring, take out the screw (13), lift the front end of the trip slide (12), pull it forward to clear the guide plate at the other end, and rotate it clockwise to clear the pin on the operating lever.

**CAUTION**

Do not disturb the setting of the adjusting

screw (12, fig. 6-32) on the bottom of the trip slide, unless the release point of the trip mechanism is to be changed.

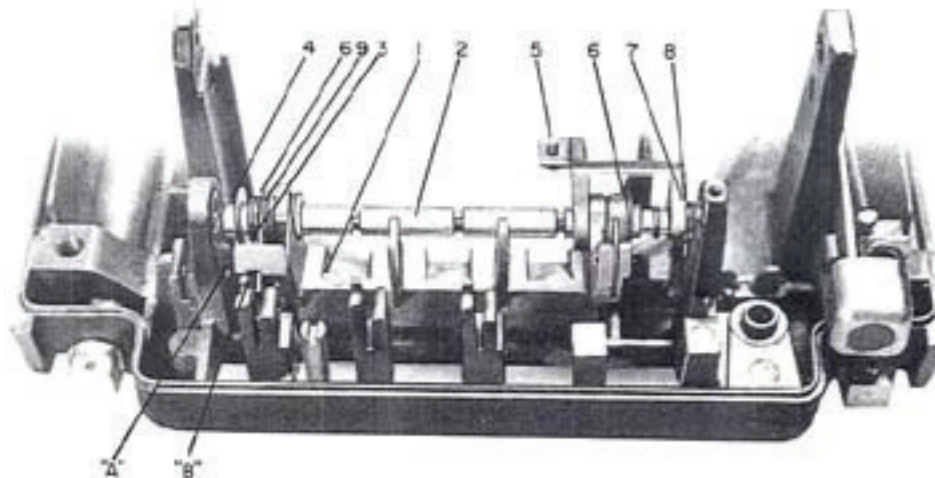
**6-201. Repair**

6-202. Examine the preset base casting for worn bearing surfaces, stripped threads, loose pins, and cracks. (Do not mistake parting lines or “flash” from the dies as cracks).

**6-203. Tripping mechanism.** Check that the stop nut (13, fig. 6-32) on the underside of the trip slide (5) holds the adjusting screw firmly. Also check that the trip slide retaining lever (6) operates freely and that the spring is in good condition. Examine the shaft of the trip lever (1) to see that its attaching flats are not rounded. Inspect the trip latch (2) to see that it will swing freely and will release the trip lever properly.

**6-204. Driving Mechanism.** Examine the intermediate gearing and trip operating lever (1, fig. 6-33) for worn gear teeth and loose staking, and for signs of wear or binding of the lever. Pay particular attention to the “step” that actuates the square pin on the trip link (6). Check the trip link for worn or loose pins. Note also that the link slides freely in the slot in the gear hub. Also examine the gear teeth and ratchet wheel of the drive ratchet and gear assembly (9).

**6-205. Setting Wheel Mechanism.** Inspect the setting wheel faces for damage and discoloration. Examine the ratchet, cam, and bearing surfaces of the setting wheels



- |                            |                        |
|----------------------------|------------------------|
| 1. Roller bracket assembly | 6. Retaining ring      |
| 2. Roller bracket shaft    | 7. Bail bracket spring |
| 3. Roller bracket spring   | 8. Retaining ring      |
| 4. Retaining ring          | 9. Spacer              |
| 5. Bail bracket assembly   |                        |

**Figure 6-35. Gear-Drive Preset Unit Disassembly (3rd Stage)**

for wear. Check that the cam slide of the No. 1 setting wheel is straight, that its cam studs and bracket actuating pin are tight, and that the cam slide moves freely between the wheel and the washer (shroud). Inspect the feed pawls to be sure that their contact surfaces are flat and smooth, that the pawls move freely on their shafts, and that they are staked securely to the brass finger (tie bar) if any defect is found in the feed pawl bracket assembly (8, fig. 6-34), *do not* attempt to repair it; replace the complete assembly with a new one.

**Note**

The feed pawl bracket assembly is a precision adjusted unit and cannot be successfully repaired without special equipment.

**6-206. Reassembly**

6-207. If the roller bracket assembly has been removed, refer to figure 6-35 and install it as follows:

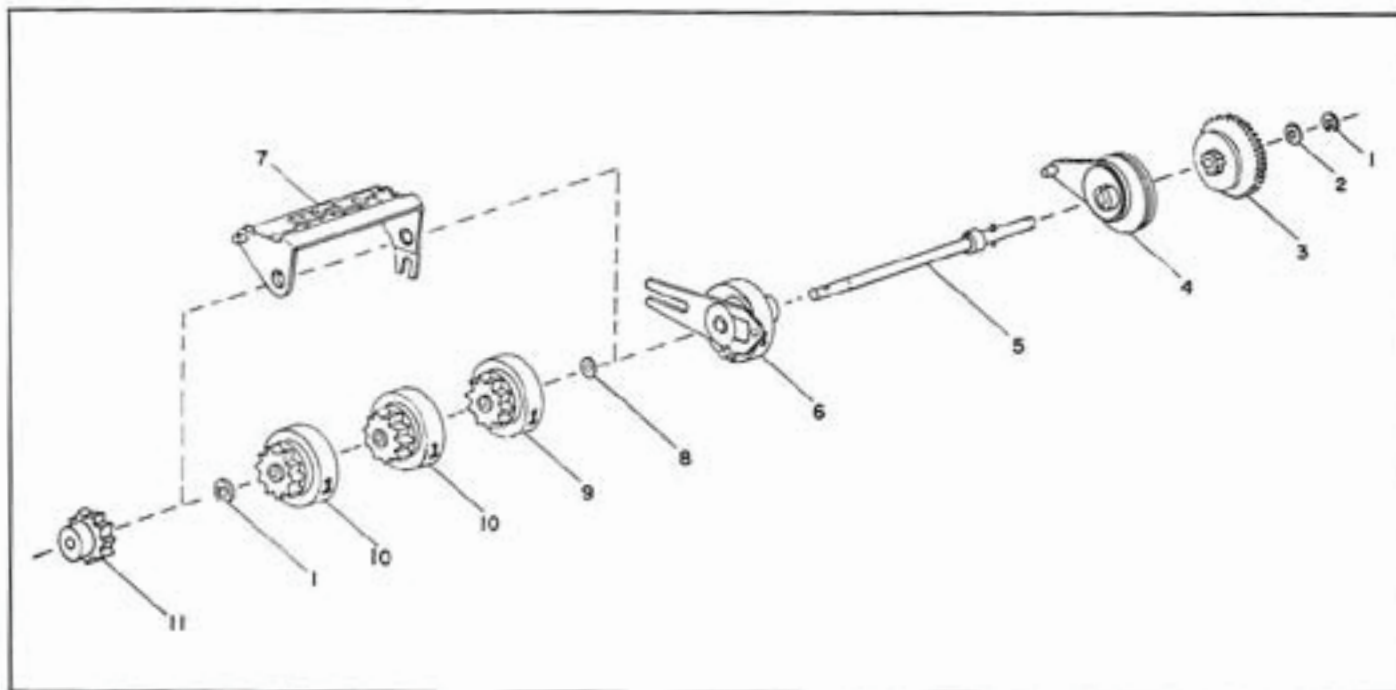
- a. Position the roller bracket assembly (1) and bail bracket assembly (5) in the base. Insert shaft (2) with the wide-grooved end to the right, install spacer (9) on shaft (2) on outside of left mounting post, and secure with retaining rings (6).
- b. Mount bail bracket spring (7) and retaining ring (8)

on the right-hand end of the shaft, installing the straight end of the spring in the hole near the base of the drive shaft support bracket. Hook the other end of the spring under the bail bracket (5).

- c. Mount the roller bracket spring (3) loosely on the left end of the shaft, and secure it with retaining ring (4). *Do not* hook the spring under the roller bracket (at "B," fig. 6-35) until after the setting wheels have been installed.

6-208. Install the setting wheels as follows:

- a. Check to see that the wheel stop pawls (3, fig. 6-34) are swung out in front of the unit. Check also that the star wheel pawl (13, fig. 6-34) is swung back and down.
- b. Referring to figure 6-36, insert wheel shaft (5) from the right through the support bracket and through the No. 1 setting wheel (6). (The cam slide of the No. 1 wheel must be on the left and its forked end must point toward the rear).
- c. Advance the shaft (5) slightly, and position the right-hand arm of the feed pawl bracket assembly (7) on the shaft. Engage the forked end of the bracket arm with the pin on the cam slide of the No. 1 setting wheel (6).



- |                                     |                                |
|-------------------------------------|--------------------------------|
| 1. Retaining ring                   | bly)                           |
| 2. Shim                             | 6. No. 1 setting wheel         |
| 3. Drive ratchet and gear assembly  | 7. Feed pawl bracket assembly  |
| 4. Trip cam and lever unit assembly | 8. Spacer                      |
| 5. Wheel (drive shaft assembly)     | 9. No. 2 setting wheel         |
|                                     | 10. No. 3 and 4 setting wheels |
|                                     | 11. Star wheel assembly preset |

Figure 6-36. Setting Wheel Assembly, Gear-Drive Preset Unit



- d. Mount spacer (8) and No. 2 setting wheel (9) on the shaft, making certain to position the No. 2 setting wheel (9) on the shaft, making certain to position the No. 2 wheel between the No. 1 feed pawl and the first intermediate feed pawl.

### CAUTION

The setting wheels are not interchangeable. Therefore make certain to install them in their original positions.

- e. Install the remaining wheels in the same manner, and advance the shaft through the left-hand arm of the feed pawl bracket, and then through the left-hand post of the base.
- f. Install retaining ring (1) between the left-hand setting wheel (10) and the feed pawl bracket (7).
- g. Position stop pawls (3, fig. 6-32) on their star wheels, and hook the short ends of springs (2) into the cutouts on the tops of their posts. Then hook the long ends of the springs over the stop pawls.
- h. Check the freedom of the wheels and feed pawl bracket by holding the cam slide (on the No. 1 wheel) and rotating the No. 1 wheel through several revolutions. Also note that the wheels rotate properly and index correctly.
- i. Hook the end of the roller bracket spring (3, fig. 6-33) under the roller bracket at "B." Make certain that the other end of the spring is seated in the base at "A."
- j. Check that the key springs (11, fig. 6-32) have not been damaged, then reinstall the keys in operating position, with pawls engaging the ratchet wheels. Check that keys operate freely, and index the wheels properly.
- k. Rotate the No. 1 setting wheel until it indexes at "9." Then mount the trip cam and lever unit assembly (10, fig. 6-31), making certain that when its hub engages the rollpin on the shaft, the lever is cammed fully toward the rear of the unit.
- l. Mount the drive ratchet and gear assembly (9, fig. 6-3) on the shaft, and install the shims (8) and retaining ring (7).

### Note

It may be necessary to hold the shaft toward the right to provide sufficient clearance for installing the retaining ring.

- m. Install the star wheel assembly (12, figure 6-34) on the wheel shaft (6) and tighten the setscrew against the hole in the wheel shaft (6).
- n. Hook star wheel pawl spring (14, fig. 6-34) under the star wheel pawl (13) that bears up against the star wheel assembly (12).
- o. Rotate the gear of the drive ratchet and gear assembly (9) in each direction. In one direction, the ratchet must engage to drive the setting wheels; in the opposite direction, the setting wheels must not move.

6-209. Referring to figure 6-33, install the driving mechanism as follows:

- a. Apply a finger coating of grease to the bearing surfaces of intermediate gear and trip operating lever assembly (1), bail (2), slider roller (5), and idler gear shaft (3).
- b. Assemble the trip link (6) onto the intermediate gearing and trip operating lever assembly (1) so that the square pin on the trip link engages the slot in the lever. Then couple the studs on the trip link (6) to the forked arm of the roller bracket assembly, and to the trip slide (12), if the slide is in place. Also couple the pin on the trip cam and lever unit (9, fig. 6-32) with the hole in the operating lever (7). Then insert stepped end of shaft (3, fig. 6-33) into the right-hand post of the housing, and through the hub of the gear.
- c. Mount the slide roller (5, fig. 6-33) in the slotted end of the cam slide on the No. 1 setting wheel (11), and advance the shaft through the roller.
- d. Mount the bail (2) on the shaft so that the shorter and thicker portion of the bail is toward the right. The bail should be forward of the bail bracket assembly (5, fig. 6-35).
- e. Seat the shaft in the left-hand post, and install the four retaining rings (4, fig. 6-33), one to the left of the gear assembly (1), one on each side of the bail (2) and slide roller (5), and one between. Check that the bail is above (forward of) the bail bracket assembly (5, fig. 6-35).
- f. Operate the No. 1 setting key, and observe that the bail bracket assembly depresses the bail sufficiently to raise the feed pawls and thus prevent rotation of the Nos. 2, 3, and 4 setting wheels during the setting of the No. 1 wheel. Adjust the setscrew in the bail bracket assembly as required.
- g. Rotate the intermediate gearing (1, fig. 6-33) in both directions, and check for binding.

6-210. Reassembly of the ripping mechanism (fig. 6-32), if removed, is obvious upon inspection. When reassembling, however, apply grease to all contact and bearing surfaces of the trip lever (1), trip latch (2), and trip slide (5). Secure the slide with its fillister-head screw, lock washer, and flat brass washer.

6-211. Recheck the over-all operation of the preset mechanism in accordance with the inspection procedure given in paragraph 6-193.

### 6-212. HOUSING OVERHAUL

6-213. Overhaul of the housing (fig. 6-9) is limited to visual inspection of the cover, front housing, and register shroud (wrap-around) for damage, and the replacement of parts.

6-214. Inspect the front housing windows for looseness, clouding, and other defects. Inspect the castings for

cracks, stripped threads, and broken or bent lugs. (Do not mistake parting lines or “flash” from the dies as cracks). Examine the instruction plates to see that they are legible and securely attached. Inspect the register shroud (wrap around) to see that its edges and holes are not kinked, crimped, or damaged in any way as to impair sealing of the Register.

6-215. Replace any worn or damaged parts. (The replacement of parts should be obvious upon examination).

6-216. Repaint the register housing as necessary.

6-217. Clean register mask with water and a mild detergent. Due to clouding or discoloration, it may become necessary to replace the register mask. To replace the mask, first remove the front housing from the register base, then remove the ten fasteners, stiffener bar, and ticket guide from the front housing. Replace the gasket and mask, and reassemble.

### CAUTION

Do not use an abrasive-type or commercial spray-type window cleaner, or any solvent or thinner which might soften the plastic window.

### 6-218. FINAL ASSEMBLY

6-219. The reassembly procedures for 800 Series Registers are essentially the same, and consist principally of mounting the register unit on the preset unit, then mounting the reset shaft assembly or the print unit on the register unit, and finally enclosing these assemblies in the housing. (See figure 6-37). The procedures, though similar, differ slightly according to the model of Register, because of differences in construction and function of the subassemblies. However, the differences in procedure (where they exist) are pointed out at the proper time.

### 6-220. Register Unit Installation

6-221. Reassembly of the register unit on the preset unit differs according to the type of driving mechanism used in the preset unit; that is, fork-type operating lever drive, pin-type operating lever drive, or gear-type drive.

### 6-222. Fork-type drive

- a. Position the register unit on the preset unit so that the cam on the No. 1 register wheel engages the fork-type operating lever of the preset unit.
- b. Secure the register unit to the two rear posts and to the left-hand front post of the base with the three short fillister-head screws (13, fig. 6-11) and lock washers (15). Install the spacer (16) between the register unit (17) and the front right-hand post, and

secure it with the long fillister-head screw (14) and lock washer (15).

- c. Check that the cam portion of the bail mechanism cam assembly on the preset unit is toward the rear, and that its link (9, fig. 6-11) is pointing upward. Then couple the link to the shutter of the register unit with the link pin (11), and secure the pin with the retaining ring (12).

### 6-223. Pin-type drive

- a. Position the preset (pin-type) operating lever so that the feed pawl bracket assembly is as far to the rear as possible.
- b. Hold the shutter of the register unit in its raised (closed) position, and rotate the No. 1 register wheel until the cam follower link on the No. 1 wheel extends down as far as possible.
- c. Hook the cam follow link to the operating lever, and then position the register unit on the base.
- d. Secure the register unit to the two rear posts and to the left-hand front post of the base, with the three short fillister-head screws (13, fig. 6-11) and lock washers (15). Install the spacer (16) between the register unit (17) and the front right-hand post, and secure it with the long fillister-head screw (14) and lock washer (15).
- e. Check that the cam portion of the bail mechanism cam assembly on the preset unit is toward the rear, and that its link (9, fig. 6-11) is pointing upward. Then couple the link pin (11), and secure the pin with the retaining ring (12).

### 6-224. Gear type drive

- a. Position the register unit on the preset unit, and secure it to the two rear posts with two short fillister-head screws (13, fig. 6-11) and lock washers (15). Do not tighten these screws until the gearing has been synchronized properly.
- b. Install the reset shaft assembly or the print unit as described in paragraph 6-225 or 6-227 (as applicable), and reset the register wheels to zero.
- c. Hold the front end of the register unit up to disengage the gearing between the preset mechanism and the register unit. Then, while holding the gearing disengaged, very slowly rotate the drive ratchet and gear assembly (9, fig. 6-33) clockwise (as viewed from the right-hand side) until a click of the ratchet pawl is heard. Then apply a slight reverse (counterclockwise) pressure to the gear to seat the pawl, being careful not to rotate the No. 1 setting wheel. Drop the front of the register unit in place.
- d. Secure the register unit to the front left-hand post with the short fillister-head screw (13, fig. 6-11) and lock washer (15). Install the spacer (16) between

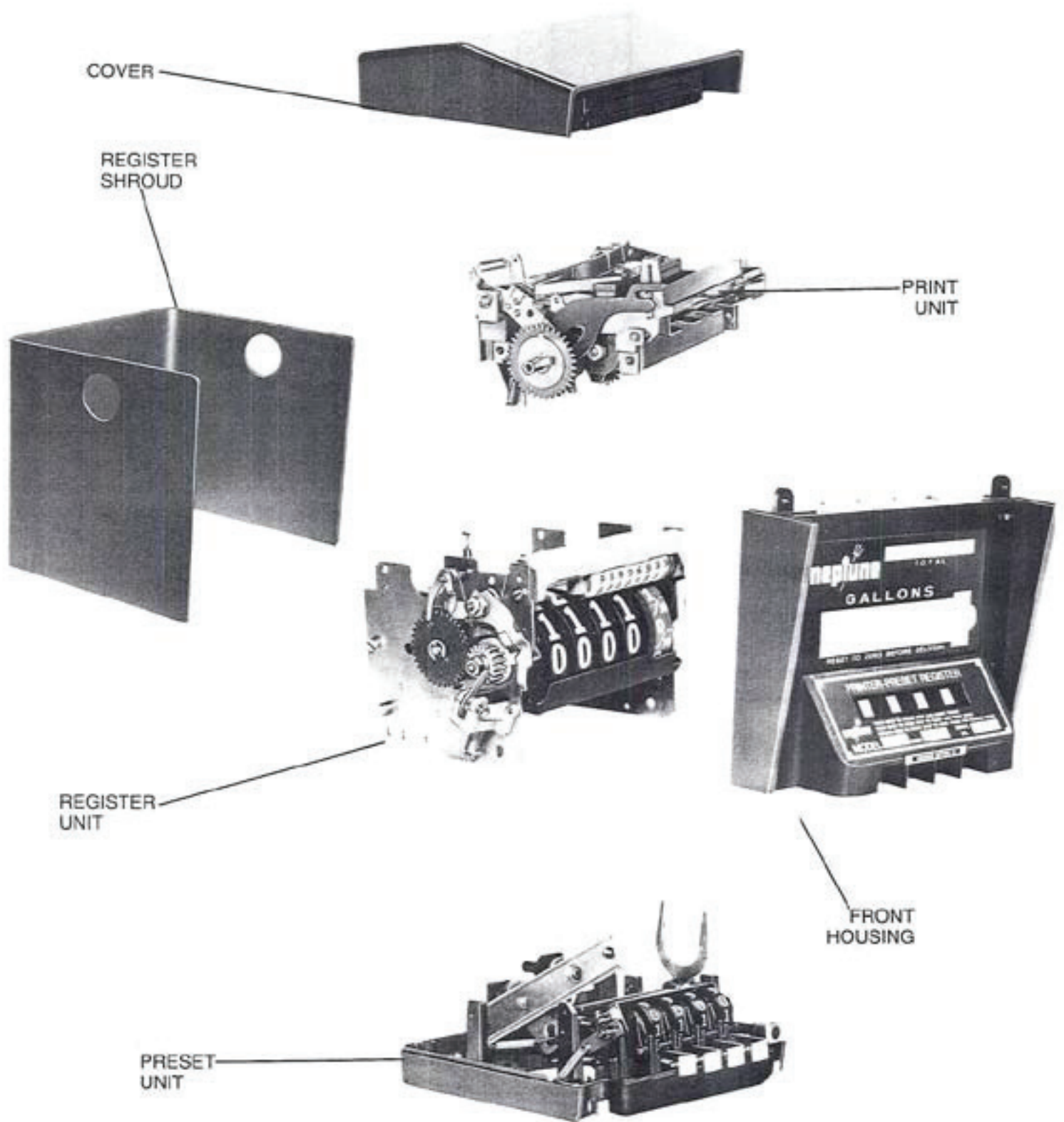


Figure 6-37. Register (Model 834) Reassembly

- the register unit and the front right-hand post, and secure it with the longer fillister-head screw (14) and lock washer (15).
- e. Check the synchronization of the gearing by rotating the No. 1 register wheel, and noting that the No. 1 preset setting wheel begins to rotate before the No. 1 register wheel has moved half-way to the next indication.
  - f. Reset the register unit, and recheck the synchronization. If the setting wheel fails to move as described in e above, repeat the procedure.

**Note**

If difficulty is encountered in making this adjustment, the gear of the drive ratchet and gear assembly (9, fig. 6-33) can be rotated on its hub after loosening the two flat head screws. This adjustment.

**6-225. Reset Shaft Assembly Installation**

6-226. Referring to figure 6-38, reassemble the reset shaft assembly on the register unit as follows:

- a. Attach the left-hand reset shaft bracket (2) to the *outside* surface of the left side plate, using reset knob return arm stud (7), screw (10), lock washers (9), and nuts (8).
- c. Slide the reset shaft (1) and gear toward the right to mesh the reset gear assembly (3) with the reset idler gear assembly, making certain that the reference mark on the gear aligns with the corresponding reference mark on the idler. (See

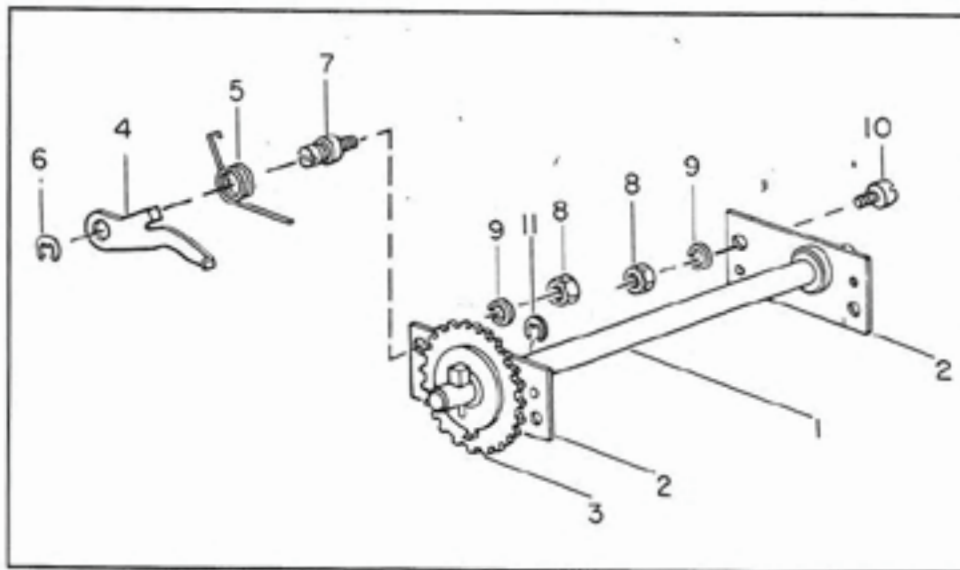
figure 6-39).

- d. Attach the right-hand bracket (2, fig. 6-38) to the *inside* surface of the right side plate, using screws (10), lock washers (9), and nuts (8). Insert and seat retaining ring (11).
- e. Mount the reset knob return spring (5) on the stud (7) with the hooked end of the spring toward the bracket. Follow with reset knob return arm (4) and retaining ring (6).
- f. Hook the straight end of the spring into the notch of the arm, and then the hooked end over the right side plate of the register unit.
- g. Temporarily mount the reset knob on the reset shaft, and operate the reset mechanism, rotating the shaft clockwise (as viewed from the right). Note that the register wheels return to zero, that the mechanism functions without binding, and that upon release of the knob, the reset knob return arm rotates the reset gear to trip the reset stop lever latch.
- h. Apply a generous coating of grease to all gear teeth of the reset mechanism.

**6-227. Print Unit Installation**

6-228. Install the print unit as follows:

- a. Making certain that the scribe-marked tooth on the reset gear meshes with the reference-marked tooth (next to the cam stud) on the reset idler, position the print unit on the register unit. (See figure 6-39).



- |                          |                               |                    |
|--------------------------|-------------------------------|--------------------|
| 1. Reset shaft           | 5. Reset knob return spring   | 8. Nut             |
| 2. Reset shaft bracket   | 6. Retaining ring             | 9. Lock washer     |
| 3. Reset gear assembly   | 7. Reset knob return arm stud | 10. Screw          |
| 4. Reset knob return arm |                               | 11. Retaining ring |

**Figure 6-38. Reset Shaft Assembly**



- b. Referring to figure 6-11, insert and tighten the four fillister-head screws (6) and lock washers (7).
- c. Mount the ticket punch lever guide (4, fig. 6-11) on the register unit, securing it with the totalizer mounting screw (5).
- d. Hook the long end of the hammer lift lever, locating the upper end at the spring between the hammer lift lever and the reset gear. Attach the spring link (3) to the other end of the spring, and hook it over the anchor stud at the bottom rear corner of the left side plate.
- e. Insert a ticket in the print unit, and print it (in and out). Remove the ticket, and check that the figures are clear and complete. If the figures are not clear and complete, loosen the hammer cushion attaching nuts, and realign the cushion over the print wheels. (Refer to paragraph 3-19).
- f. Check also that the print unit prints in the correct location on the ticket. If not, reposition the ticket guides and ticket stops, as required. (Refer to paragraph 3-19).

### 6-229. Register Wheel End Play Adjustment

6-230. After mounting the register unit on the preset unit or base and then mounting the reset shaft assembly or the print unit on the register unit, the end play of the reg-

- ister wheels (5, fig. 6-14) must be adjusted as follows:
  - a. Insert end play gauge (fig. 6-3) between the right side of the sleeve (6, fig. 6-14) and the left side of the adjacent bushing assembly (21) on the right side plate (20).
  - b. If the thinner end of the gauge, (.010), (fig. 6-3) cannot be inserted so that it will move freely up and down by its weight alone, use the side plate bushing adjustment tool (out) (fig. 6-7) to lightly lap the right side of the bushing assembly (21, fig. 6-14) and thereby cause the bushing assembly sleeve to move out and increase the end play.
  - c. If the thicket end of the gauge, (.014), (fig. 6-3) can be inserted so that it will move up and down by its weight alone, use the side plate adjustment tool (in) (fig. 6-6) to lightly tap the right side of the bushing assembly (21, fig. 6-14) and thereby cause the bushing assembly sleeve to move in and decrease the end play.
  - d. Alternately repeat b. and c. until the end play gauge (fig. 6-3) can be inserted on the thin end and it will move freely up and down by its weight alone, and then it can be inserted on the thick end and it will *not* move freely up and down by its weight alone.

#### Note

After adjusting end play check to see that the

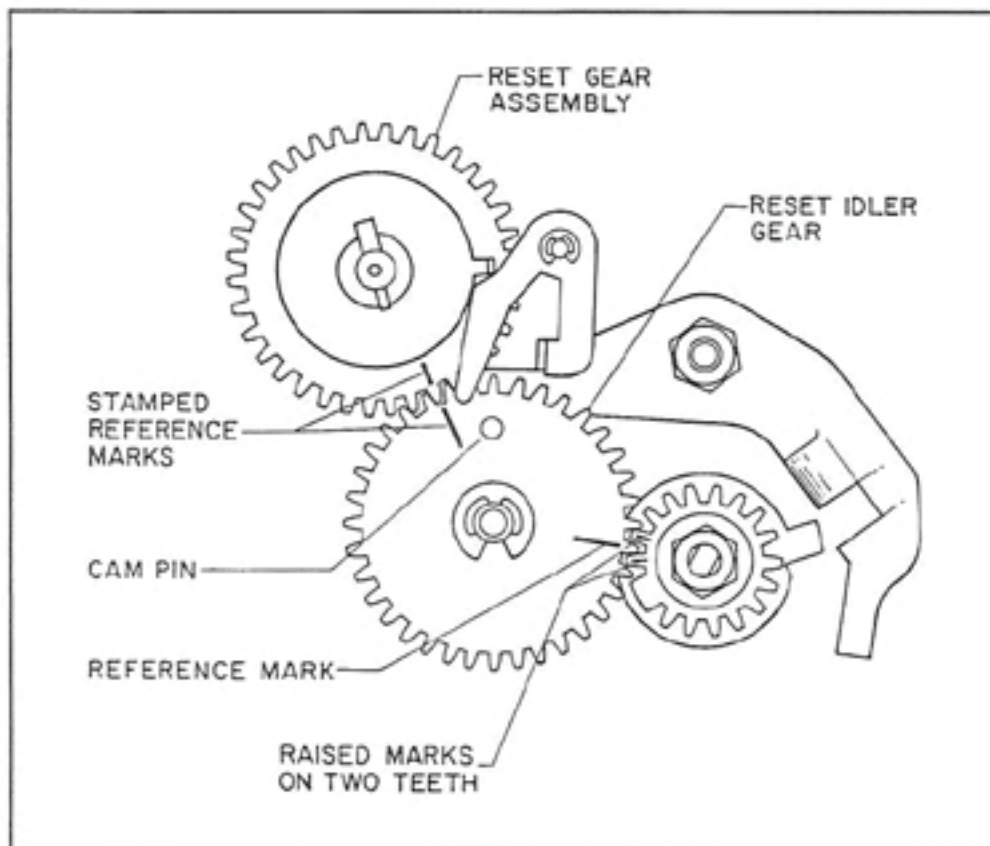


Figure 6-39. Reset Gear Synchronization

input drive gear of the No. 1 register wheel (fig. 2-12) aligns properly with the ratchet wheel and gear assembly (15, fig. 6-14). If it does not, it will be necessary to shift the bushing assembly sleeve in the left side plate and then readjust the end play.

#### 6-231. Housing Installation

6-232. Before replacing the housing, perform the following steps as a final check on the assembly.

- a. Perform the operational checks described under paragraph 6-7, as applicable.
- b. Visually check that all attaching screws are tight, and that all retaining rings are fully seated.
- c. Check that all springs are properly hooked.

6-233. Install the housing as follows:

- a. On Registers which include a preset unit mount the felt washer on the trip lever shaft, (On non preset models, this does not apply). Also position the setting keys in their guide slots.
- b. Set the two front-housing attaching screws (12, fig. 6-9) and lock washers (13) in the lugs at the base of the front housing. Then mount the assembly on the base (15) making certain that the setting key are properly located. Then, using T-wrench (fig. 6-2), tighten the front housing attaching screws (13, fig. 5-9).
- c. Check the operation of the setting keys.
- d. Mount the register shroud (wrap-around) in the groove in the base and the front housing.
- e. Replace the cover, and secure it with the special screws (3, fig. 6-9) in the front, and the two fillister-head screws (2) and lock washers (4) in the rear.
- f. Mount the felt washer (8) and washer retainer (7) on the reset knob (5) and secure the reset knob (5) to the shaft with the fillister-head screw (9) and lock washer (9).
- g. Install hole plug (6) in register shroud (14).

6-234. Repeat the procedures described in "Inspection Before Disassembly" (par. 6-3). Do not seal the Register until it has been installed on the flowmeter and calibrated in accordance with paragraph 3-20. Then lockwire the cover screws (3) and the register clamping screws, and seal with an authorized seal.

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