

# LUBRICATION

OF AUTOMATIC SWITCHING EQUIPMENT



Technical  
bulletin

505

**AUTOMATIC ELECTRIC**

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS





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# LUBRICATION OF AUTOMATIC SWITCHING EQUIPMENT

## 1. INTRODUCTION

Strowger automatic systems are designed so that frequent lubrication of the switching equipment is unnecessary. However, this infrequent lubrication is important for the successful operation and economic maintenance of the system.

This bulletin outlines the general practices recommended by Automatic Electric Company for the lubrication of various components. These practices or procedures are standard and should be followed exactly. For lubrication instructions on components not covered in this bulletin, A. E. Co. has available "Standard Adjustment Sheets" which give in detail the lubrication procedures.

### 1.1 General Lubricating Considerations

A lubricant provides a film between the moving surfaces of machine parts in order to prevent damaging friction. In practice, it is only necessary to apply that amount of lubricant which can produce the desired film. Excessive lubrication is harmful to the equipment and should be avoided.

Whenever practicable, surfaces should be cleaned before the lubricant is applied. This practice is particularly applicable to surfaces which are normally exposed.

Lubricant containing graphite should not be added when the surface requiring the graphite lubricant appears to be sufficiently covered with graphite. If the existing graphite appears to be excessively dry, apply a small amount of spindle oil to the surface. If the graphite is caked or appears to contain grit, the surface should be thoroughly cleaned and relubricated with the graphite lubricant.

After switches or similar apparatus have been properly lubricated, they should be operated several times so that the lubricant will "work" into the bearings.

The determination of a proper lubricant for a particular kind of bearing or surface is dependent upon a number of factors. Among

these are size and type of bearing, speed of operation, and type of metal or alloy. Through exhaustive tests, A. E. Co. has found the lubricants best suited for any particular application. These tests were conducted at actual operating installations and at laboratories where conditions that are apt to be encountered were simulated.

### 1.2 Standard of Measurement for Application of Lubricants

In order to insure some control during a lubrication process, a standard quantity for applying a lubricant has been established. This standard of measurement assures that approximately the correct amount of lubricant will be applied. This measurement is defined as follows:

DIP - A dip is defined as that amount of oil retained in the bristles of a No. 4 artist's sable rigger brush after it has been dipped into a lubricant to a depth of 3/8" and then drawn across the edge of a container to remove any surplus oil.

### 1.3 Frequency of Lubrication

All lubricating operations on equipment in service should be performed regularly in accordance with the maintenance routines prescribed for the individual installation. Lubricating operations should follow the procedures specified on the lubrication charts and adjustment sheets which apply to the particular apparatus being considered.

## 2. TYPES OF LUBRICANTS AND THEIR USES

Exhaustive studies of equipment performance under all types of actual or simulated operating conditions have shown the lubricants described below to be the most suitable for the applications recommended here and in the lubrication charts and adjustment sheets.

The symbols that appear in front of the various lubricants below are used for identification purposes. They will appear in the lubrication

procedures and drawings contained in this bulletin. These symbols are standard in this bulletin only.



a. Watch oil (spec. 5228). This specification covers a highly refined grade of selected sperm or fishoil, bleached, chilled and filtered at a low temperature. This oil will not become gummy or corrode metal. Its most common use is for cleaning and lubricating rotary stepping switch bank contacts, wipers, and brushes.



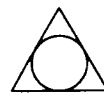
b. Spindle oil (spec. 5231). Spindle oil is a highly refined, non-blended, straight-run, neutral petroleum oil. It is free from any foreign materials sediment, suspended or dissolved matter. This oil is generally used, as indicated, on many of the switching components in automatic switchboards.



c. Graphite oil lubricant (spec. 5232 grade "C"). Graphite oil lubricant consists of a blended lubricating oil (spec. 5684) and deflocculated graphite (concentrated oil-dag). This mixture is used on rotary and Strowger switches. Specifically, the lubricant is used on the ratchets or ratcheted surfaces in these switches (ratchet wheels, Strowger switch shaft, etc.).



d. Low temperature oil-dag lubricant (spec. 5563). This is a mixture of deflocculated graphite and dibutylphthalate and is suitable for lubricating mechanisms which must operate at temperature ranging from -22° F to 122° F. It is commonly used on the ratchet wheels of minor switches.



e. Dashpot oil (spec. 5571). Dashpot oil is a straight-run, well refined petroleum oil of a water-like color. It is used in the dashpot of a dashpot relay and provides the required resistance to the pull of the plunger into the solenoid.



f. Standard dial lubricant (spec. 5660). This non-graphite lubricant is for mechanisms which may be required to operate at low temperatures. On some metals, this lubricant has a "noncreeping" characteristic which may be desirable. It is a mixture of a plastic or semi-solid petroleum, dibutylphthalate and a rust preventative. It is widely used on dials.



g. Blended lubricating oil (spec. 5684). This is essentially a mineral oil blended with an oil having a paraffine base. It is used on manual switchboard keys or similar keys and in certain gear boxes (pawl pin bearings and armature bearings of rotary switches).



h. Plastic petroleum (spec. 5694). This is a semi-solid petroleum suitable for certain bearings of rotary stepping switches such as wiper assembly bearings.



i. Low temperature lubricant (spec. 5717 grade "B"). This lubricant is used on type 52 paystation dials which may be subject to extremely low temperatures.

All of the oils and greases described in this bulletin can be supplied by A. E. Co. The lubricants are available in various size containers as indicated in section 3.

### 3. ORDERING LUBRICANTS

| Order No.  | Description                              | Amount            | Remarks   |
|------------|--|-------------------|---|
| H-78612-5  | Spindle oil (5231)                       | 2 oz.             | For lubricating bearing and bank contacts, switching units, and relays.             |
| H-78612-6  | Spindle oil (5231)                       | 4 oz.             |   |
| H-78612-9  | Graphite oil lubricant (5232-C)          | 2 oz.             | For lubricating rotary and minor switch ratchet wheels, and Strowger switch shafts. |
| H-78612-18 | Dashpot oil (5571)                       | $\frac{1}{2}$ oz. | For use in dashpot relays.  |
| H-78612-27 | Standard dial lubricant (5660)           | 2 oz.             | For lubricating dials.  |
| H-78612-28 | Low temperature oil-dag lubricant (5563) | 2 oz.             | For lubricating minor switch in low temperature operation.                          |
| H-78612-30 | Watch oil (5228)                         | 2 oz.             | For lubricating rotary switch wiper tips and brushes.                               |
| H-78612-31 | Blended lubricating oil (5684)           | 2 oz.             | For lubricating type 44 and 45 rotary switches.                                     |
| H-78612-47 | Plastic petroleum (5694)                 | 8 oz.             | For bearing stepping switches.  |
| H-78612-52 | Low temperature lubricant (5717-B)       | 2 oz.             | For type 52 paystation dials.   |



## 4. STROWGER SWITCH

### 4.1 Introduction

The Strowger switch is designed so that frequent and extensive lubrication is not essential. However, it may become necessary to lubricate it to insure successful operation and economic maintenance.

The frequency of lubrication will depend upon the local conditions which affect the switch. These conditions include traffic grading, dust, excessive humidity, and temperature. Under normal conditions, the switch should be lubricated every six months until a more appropriate interval of time is established to coincide with local conditions. It may also be found more suitable to lubricate some parts of the switch more frequently than others.

Strowger switches are the basic components of a Strowger system. Therefore, it is important that the following points in regard to the lubrication of a Strowger switch be carefully noted.

- a. The Strowger switch shall be lubricated with oil applied by means of a brush. In order to control the amount of oil deposited, one DIP of oil is defined as the amount retained by a No. 4 artist's sable rigger brush after being dipped into the oil to a depth of approximately 3/8" and then drawn across the edge of the container to remove the surplus oil. There should not be sufficient oil adhering to the brush to form a drop on the end of the bristles.
- b. The shaft of a Strowger switch should be cleaned with cotton tape before the lubricant is applied to the shaft bearing. To do this, the tape is wrapped once around the shaft and pulled from side to side in much the same way that a rag is employed for polishing shoes. The lower portion of the shaft is cleaned in this way while the shaft is at the normal position. The upper portion of the shaft is cleaned while the shaft is kept at the tenth level.
- c. During lubrication, additional graphite should not be placed in the rotary or vertical ratchet teeth when the surface is covered with graphite. When the graphite seems dry or slightly gummed, loosen with a small amount of spindle oil. If the graphite is caked or mixed with dirt, clean off thoroughly with a cloth and add fresh lubricant. NOTE: When removing old or excess lubricant, do not use turpentine, benzine or naptha. A solvent such as chlorothene is acceptable.

### 4.2 Lubrication Procedure for the Strowger Switch

Lift the shaft to its highest vertical position.

- a. Apply three dips of spindle oil (spec. 5231), spaced approximately 120° apart on the shaft circumference, to the following points:

**1** The upper part of each of the bearing surfaces of the shaft (see figure 1).

Allow the shaft to stand for at least five minutes before lowering it.

Remove the helical shaft spring. When removing this spring, observe the number of turns used to tension it so that after lubrication the spring can be returned to its original position.

- b. Apply one dip of spindle oil (spec. 5231) to:

**2** The shaft extension sleeve, just above the shaft spring bracket (see figure 1).

- c. Apply one dip of spindle oil (spec. 5231) to:

**3** The surface of the vertical pawl which is between the pawl bearing lugs and the bearing collars (see figures 1 and 2).

- d. Apply one dip of spindle oil (spec. 5231) to:

**4** The surface of the rotary pawl which is between the rotary pawl bearing lugs and the end of the armature (see figure 2).

- e. Apply one dip of spindle oil (spec. 5231) to:

**5** Each of the vertical armature bearings, at the angle formed by the outer surfaces of the two armature bearing lugs and the bearing pin (see figures 1 and 2).

- f. Apply one dip of spindle oil (spec. 5231) to:

**6** The double dog bearing pin, just above the upper bearing lug of the double dog (see figure 1).

- g. Apply one dip of spindle oil (spec. 5231) to:

**7** The double dog bearing pin at the angle formed by the pin and the upper surface of the lower bearing lug (see figure 2).

- h. Distribute one dip of spindle oil (spec. 5231) to the following points:

**8** The tip of the double dog release tooth (see figure 2).

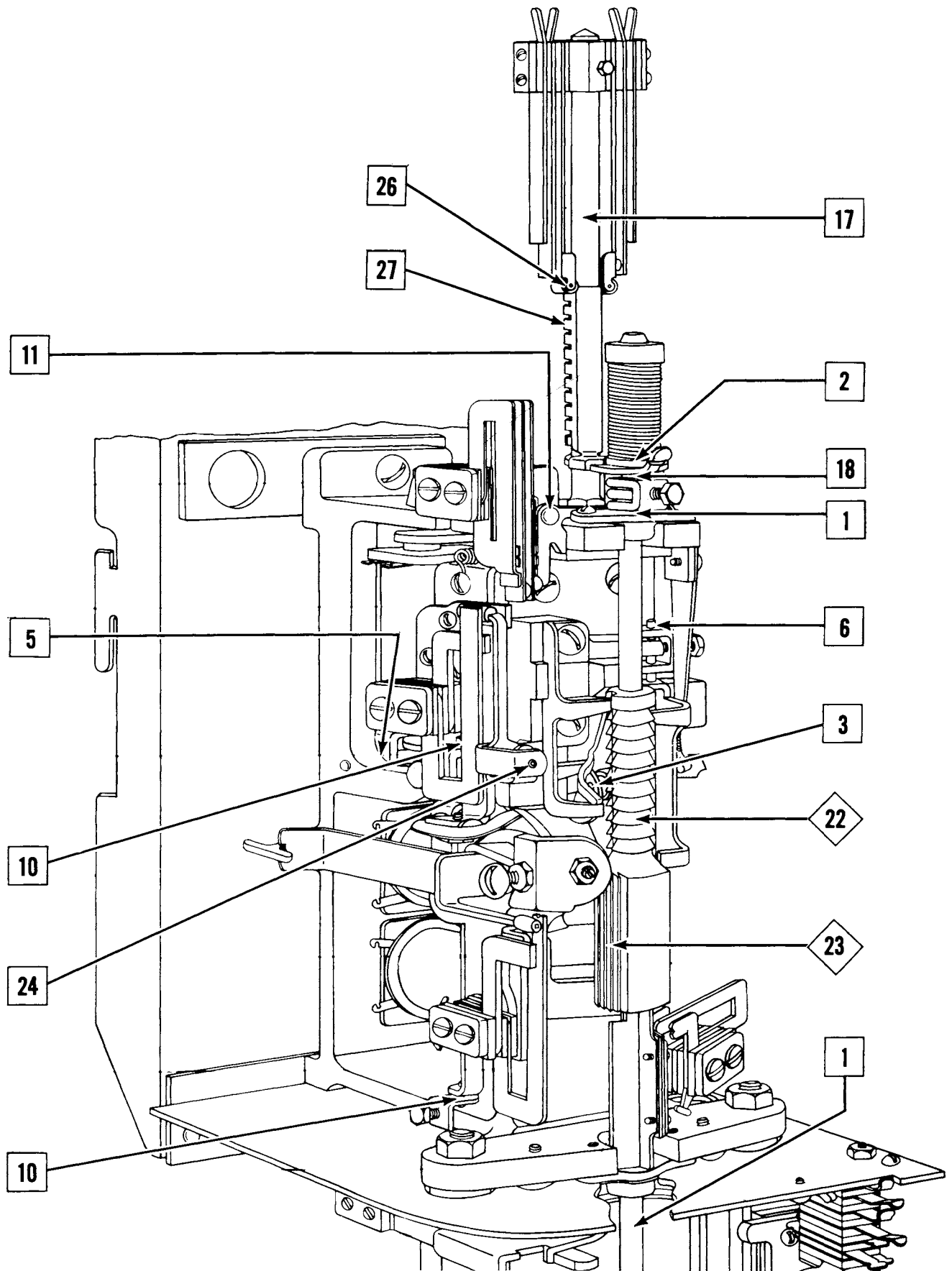


Figure 1. Strowger switch lubrication (left front view).

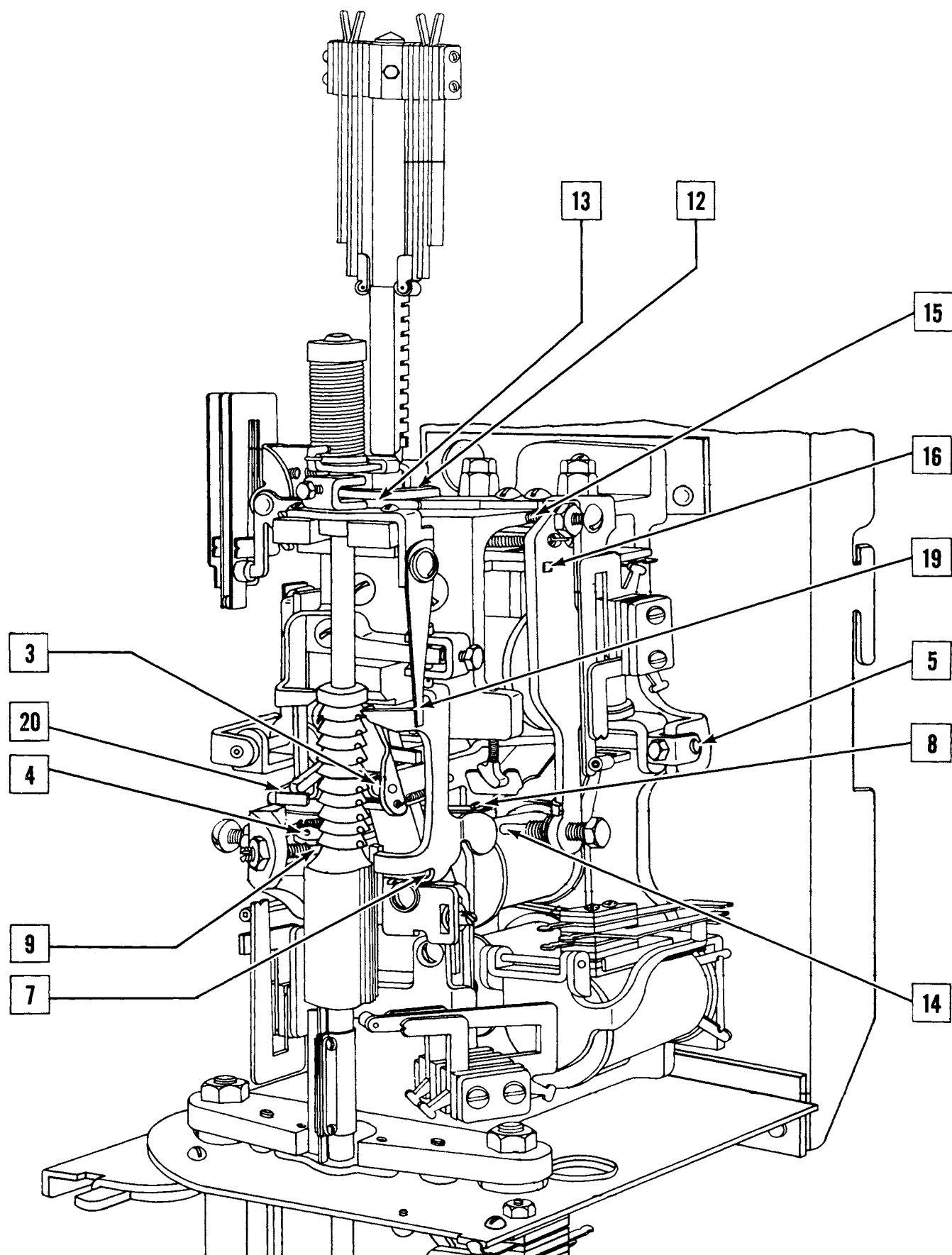


Figure 2. Strouger switch lubrication (right front view).

- 9** The tip of the rotary pawl guide (see figure 2).
- i. Apply one dip of spindle oil (spec. 5231) to:
- 10** Each of the rotary armature bearings at the angle formed by the outer surfaces of the two armature bearing lugs and the bearing pin (see figure 1).
- j. Distribute one dip of spindle oil (spec. 5231) to the following points:
- 11** The surface of the off-normal lever bearing above the rivet, at the angle formed by the lever and bracket (figure 1). CAUTION: Be careful not to put excess oil on bearing. Wipe all oil from the lever and buffer so that no oil is allowed on the springs and contacts. Check the contacts for oil and wash with chlorothene (allow to dry with contacts open).
- 12** The surface of the shaft spring bracket which contacts the normal pin (see figure 2).
- 13** The surface of the off-normal finger which contacts the normal pin (see figure 2).
- k. Distribute one dip of spindle oil (spec. 5231) to the following points:
- 14** The tip of the release armature pin (see figure 2).
- 15** The release armature backstop screw (see figure 2).
- 16** The release armature pivot points (see figure 2).
- l. Distribute one dip of spindle oil (spec. 5231) to the following points:
- 17** The surface of the normal post which contacts the shaft spring bracket (see figure 1).
- 18** The surface on the bottom of the spring bracket which contacts the normal pin clamp (see figure 1).
- m. Distribute one dip of spindle oil (spec. 5231) to the following points:
- 19** The surface of the double dog which contacts the double dog spring (see figure 2).
- 20** The surface of the vertical pawl guide which contacts the vertical pawl finger (see figure 2).
- Clean the lubrication brush thoroughly. Raise the shaft up one vertical step and in ten horizontal steps.
- n. Apply one dip of graphite oil lubricant grade "C" (spec. 5232) to:
- 21** The six upper teeth of the vertical hub at the points where the vertical pawl engages the teeth (not shown).
- Return the shaft to its normal position.
- o. Apply one dip of graphite oil lubricant grade "C" (spec. 5232) evenly to:
- 22** All the teeth in the vertical hub from the stationary dog groove to the notches on which the tip of the double dog rides (see figure 1).
- Raise the shaft manually to the first vertical level. Rotate the shaft slowly during application of the lubricant.
- p. Apply one dip of graphite oil lubricant grade "C" (spec. 5232) to:
- 23** All the teeth of the rotary hub, from the top of the hub to a point about 1/4" from the bottom of the hub. This lubrication should be done with downward strokes of the brush.
- #### 4.3 Lubrication Instructions for Specially Equipped Strowger Switches
- The following instructions are intended as a general guide for the lubrication of components which may be attached to a Strowger switch. These instructions are in addition to the standard lubrication procedure described above.
- ##### 4.3.1 Switches equipped with bell crank vertical interrupter springs.
- a. Distribute one dip of spindle oil (spec. 5231) to the following points:
- 24** The bell crank bearing pin at each bearing of the bell crank (see figure 1).
- 25** The armature, at the point where it engages the bell crank (not shown).
- ##### 4.3.2 Switches equipped with normal post springs.
- Distribute one dip of spindle oil (spec. 5231) to the following points:
- 26** The roller spring bearings (see figure 1).



- 27** The operating teeth on the edge of the cam which is contacted by the roller (see figure 1).

#### 4.3.3 Switches equipped with a side switch.

Distribute one dip of spindle oil (spec. 5231) to the following points:

- 28** The spider arm bearings (not shown).  
**29** The upper and lower escapement spring teeth (not shown).

### 5. ROTARY STEPPING SWITCHES

#### 5.1 Introduction

Connections in some automatic telephone systems and many control functions in industrial operations are accomplished by small, high-speed, multi-contact, single-motion (rotary), magnet-driven ratchet stepping devices (switches) in response to electrical control pulses. These rotary stepping switches are sturdily constructed selecting mechanisms requiring only minor field adjustments and maintenance.

Lubrication of these switches is a relatively simple but very important process. It should be remembered that although lubrication is necessary for efficient operation of the switches, excessive lubrication is as harmful as no lubrication. Excessive oil should not be allowed to remain on any surface.

This section discusses the lubrication procedures for the type 45 rotary switch, type 44 rotary switch, type 13 rotary line switch 25 point, type 26 rotary switch 11 point, minor switch and the O.C.S. relay.

#### 5.2 Type 45 Rotary Switch

##### 5.2.1 Introduction.

The type 45 rotary switch is a high-speed, heavy-duty, single-motion, magnet-driven stepping switch. It can be operated by remote-control pulses or by self-interruptions through its own interrupter springs. The wipers, with wiping tips formed at both ends (180° apart) are rotated in one direction over a semi-circular contact bank.

It is recommended that the type 45 rotary switch be lubricated at 50,000; 100,000; and 250,000 half-revolutions and after every 500,000 half-revolutions thereafter.

##### 5.2.2 Lubrication procedure for type 45 rotary switch (figure 3).

Clean the switch thoroughly before lubrication.

- a. Distribute one dip of blended lubricating oil (spec. 5684) to:

**1** Each end of the two yoke bearings.

- b. Apply one dip of blended lubricating oil (spec. 5684) to:

**2** The pawl bearing pin, where the pawl and the pawl bearing pin contact the armature.

- c. Distribute one dip of blended lubricating oil (spec. 5684) to the following points.

**3** The off-normal buffers.

**4** The interrupter spring buffers.

**5** The pawl spring mounting holes.

- d. Apply two dips of graphite oil lubricant grade "C" (spec. 5232) to:

**6** The ratchet teeth (rotate the wiper assembly during lubrication in order to distribute the lubricant evenly over all of the ratchet teeth).


- e. Distribute one dip of watch oil (spec. 5228) between:

**7** The wiper tips of three pairs of wiper springs. NOTE: Both ends of the wiper springs should be lubricated; therefore a three level wiper assembly would require two dips of oil, one for each end. Rotate the wipers after lubrication to distribute the oil over the entire bank.

To lubricate the brush springs (not shown), position the wiper assembly so that the wipers are setting on the 18th contact.

- f. Apply one dip of watch oil (spec. 5228) to:

**8** The insides of two wipers, at a point near the hub so that when rotated, the brushes will contact the lubricated portion of the wiper. When all the wipers have been lubricated in this manner, rotate the wiper assembly 180° and repeat the process. (Example: A six level switch will require six dips of lubricant.)

NOTE: During manufacture the wiper assembly bearings are lubricated. On switches having one to four levels, the undercut portion of the wiper shaft is completely filled with (spec. 5694) grease , and a small portion of grease is applied to the end of the shaft opposite the mounting hub before the

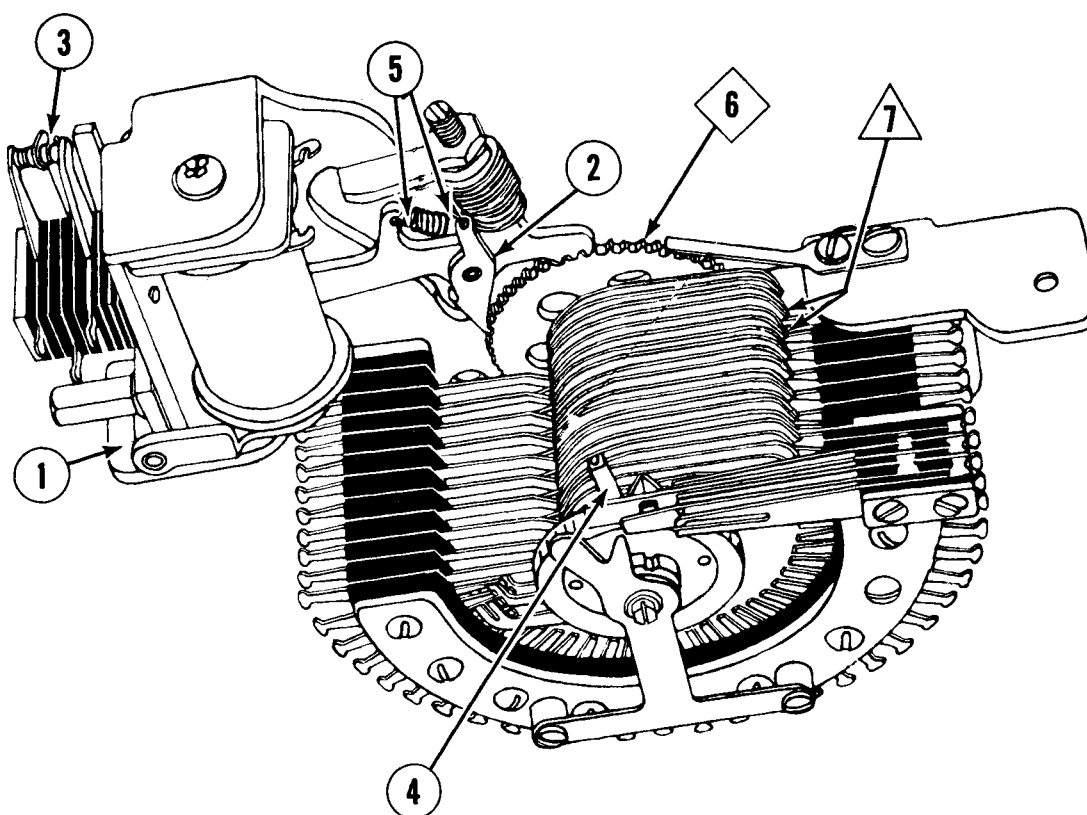


Figure 3. Type 45 rotary switch lubrication.

shaft is assembled to the hub. On switches having more than four levels, the center of the wiper hub, which has been hollowed out larger than the shaft diameter to form a reservoir for lubricant, is completely filled with (spec. 5694) grease  $\triangle$  before the shaft is assembled to the hub. This lubrication is good for the life of the switch and needs replacing only when replacing the wiper assembly.

### 5.3 Type 44 Rotary Switch

#### 5.3.1 Introduction.

The type 44 rotary switch is a stepping switch whose operating magnet may be remotely controlled, or whose wipers may be stepped automatically over the bank contacts by interrupting the magnet circuit through a pair of interrupter springs actuated by the armature. The switch has triple-ended wipers which are rotated in one direction only over a bank of contacts arranged in an arc of a circle. The contact bank has 10 points, and may have from one to six levels.

It is recommended that the type 44 rotary switch be lubricated at 50,000; 100,000; and 250,000 third-revolutions and after every 500,000 third-revolutions thereafter.

#### 5.3.2 Lubrication procedure for type 44 rotary switch (figure 4).

Clean the switch thoroughly before lubrication.

a. Distribute one dip of blended lubricating oil (spec. 5684) to:

① Each of the yoke bearings.

b. Apply one dip of blended lubricating oil (spec. 5684) to:

② The pawl bearing, where the pawl and pawl bearing pin contact the armature.

c. Distribute, evenly, one dip of blended lubricating oil (spec. 5684) to the following points:

③ The interrupter spring buffers.

- ④ The off-normal lobes of the indicator wheel.
- ⑤ The pawl spring mounting holes.

Clean lubrication brush.

- d. Apply two dips of graphite oil lubricant grade "C" (spec. 5232) to:

- ⑥ The ratchet teeth, while the wiper assembly is rotating.

Clean lubrication brush.

- e. Distribute one dip of watch oil (spec. 5228) to:

- ⑦ Every six pair of wiper tips. (Example: A two-level wiper assembly would require one dip of lubricant. A four-level wiper assembly would require two dips of lubricant. A six-level wiper assembly would require three dips.) NOTE: After lubrication, rotate the wipers in order to distribute the oil on the banks.

To lubricate the brush springs, position the wipers on the first contact and lubricate as follows:

- f. Apply one dip of watch oil (spec. 5228) to:

- ⑧ Every three pair of wipers, at some point which will contact the brush spring. (Example: A two-level wiper assembly would require two dips of lubricant. A four-level wiper assembly would require four dips of lubricant. A six-level wiper assembly would require six dips of lubricant.)

- g. If the switch is disassembled, proceed as follows:

- ⑨ Fill the undercut portion of the wiper shaft with plastic petroleum grease (spec. 5694). Apply a small amount of grease to the end of the shaft opposite the mounting hub before the shaft is assembled into the hub.

NOTE: Wiper shafts are lubricated for the life of the wiper assembly. Relubricate the shaft only when replacing wiper assemblies.

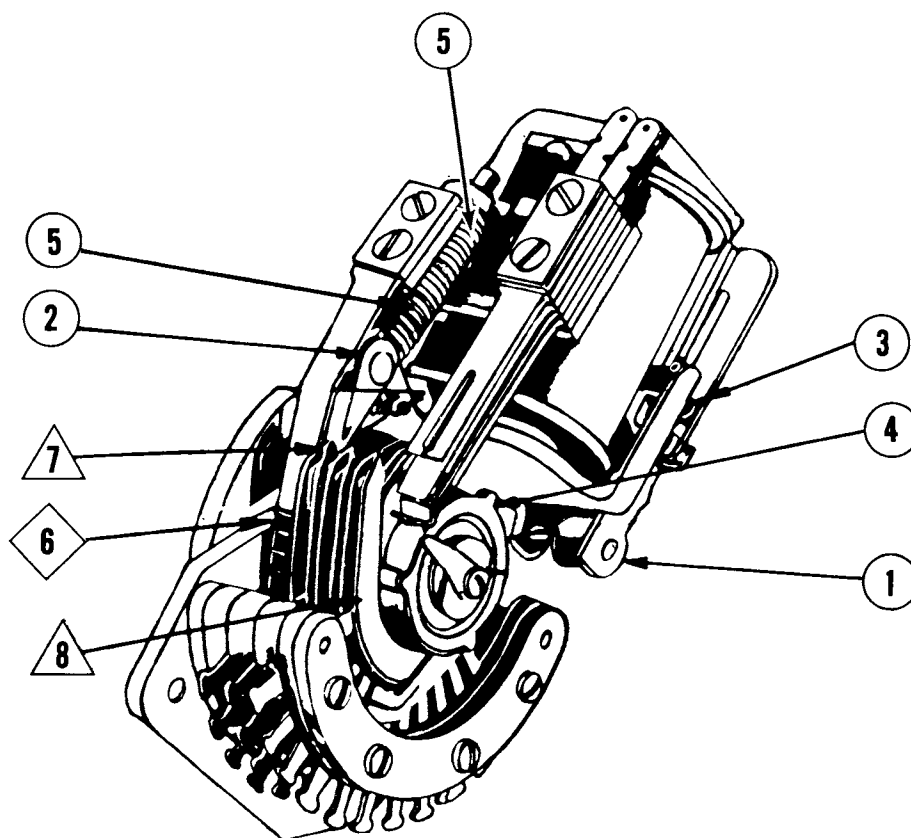


Figure 4. Type 44 rotary switch lubrication.



## 5.4 Type 13 Rotary Line Switch - 25 Point

### 5.4.1 Introduction.

The type 13 rotary line switch is a high speed, heavy duty, single motion, magnet driven stepping device (switch). The wiper assembly can be operated self-interrupted through its interrupter springs or by remote controlled pulses. This switch has no off-normal springs. The bank assembly is a semi-circular structure of from one to six levels. Each level consists of 25 bank contacts.

It is recommended that the type 13 be lubricated at 50,000; 100,000; and 250,000 half-revolutions and after every 500,000 half-revolutions thereafter.

### 5.4.2 Lubrication procedure for type 13 rotary switch (figure 5).

a. Apply one dip of spindle oil (spec. 5231) to:

**1** Each of the four armature bearings (one dip to each bearing).

b. Apply one dip of spindle oil (spec. 5231) to:

**2** The pawl bearing.

c. Apply two dips of graphite oil lubricant grade "C" (spec. 5232) evenly to:

**3** The ratchet teeth. During lubrication, rotate the wiper assembly in order to distribute the lubricant over the ratchet teeth.

d. Distribute one dip of watch oil (spec. 5228) between:

**4** Three pairs of wiper tips. (Example: A three-level wiper assembly would require two dips of lubricant. A six-level wiper assembly would require four dips of lubricant.) NOTE: After lubrication, rotate the wipers in order to distribute the oil on the banks.

The lubrication of the bearing pin during manufacture is usually sufficient for the life of the switch. If excessive friction is noted:

e. Apply one dip of spindle oil (spec. 5231) between:

**5** The frame and the wiper assembly shaft at each end.

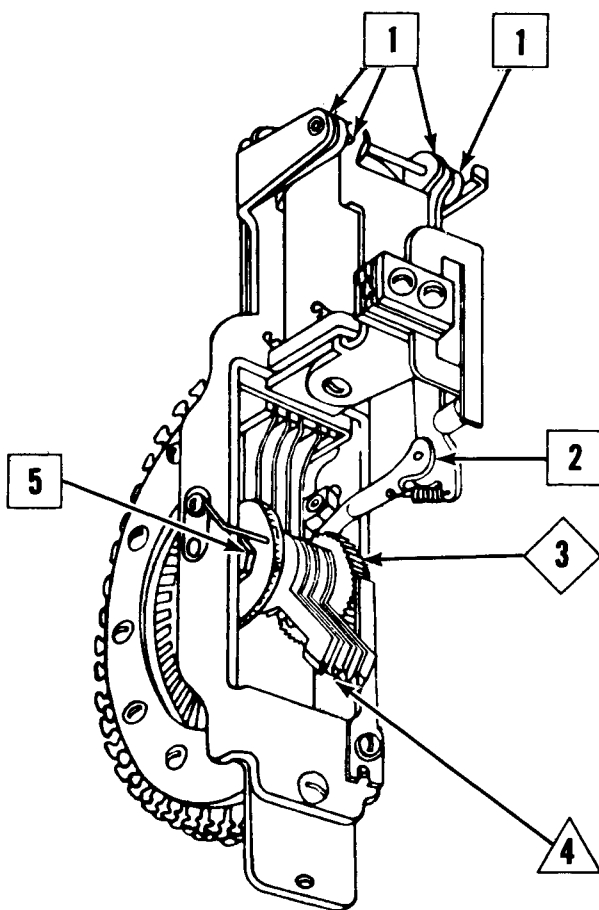


Figure 5. Type 13 rotary switch lubrication.

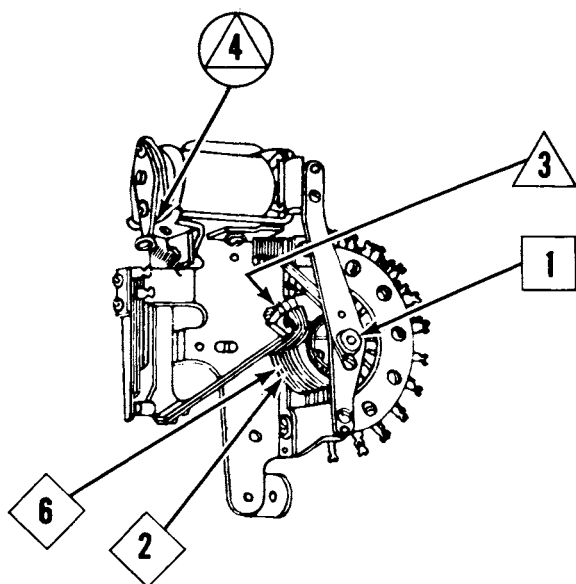


Figure 6. Type 26 rotary switch lubrication.

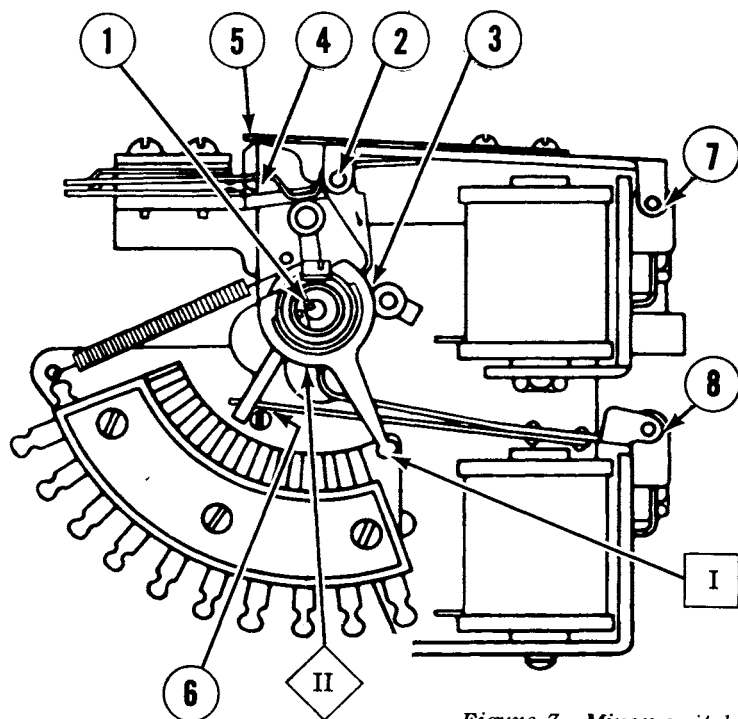


Figure 7. Minor switch.

## 5.5 Type 26 Rotary Switch - 11 Point

### 5.5.1 Introduction.

The type 26 rotary switch is a relatively high speed, heavy duty, single motion, magnet driven, stepping device (switch). It can be operated self-interrupted through its interrupter springs or by remote controlled pulses. This switch has off-normal springs. The bank is a semi-circular structure with either three or four levels of eleven contacts each.

### 5.5.2 Lubrication procedure for the type 26 rotary switch (figure 6).

Clean switch thoroughly.

- a. Apply one dip of spindle oil (spec. 5231) to:

**1** Each of the wiper assembly bearings.

- b. Distribute one dip of graphite oil lubricant grade "C" (spec. 5232) to:

**2** The ratchet teeth, while the wiper assembly is rotating.

- c. Distribute one dip of watch oil (spec. 5228) between:

**3** Every three pair of wiper tips. (Example: A three-level wiper assembly would require two dips of lubricant.)  
NOTE: After lubrication, rotate the wipers in order to distribute the oil on the banks.

- d. Apply sparingly some plastic petroleum grease (spec. 5694) to:

**4** The entire length of the armature bearing surface. This is done preferably with a brush.

## 5.6 Minor Switch

### 5.6.1 Introduction.

The minor switch is a remote controlled reset type rotary selector switch. Its bank assembly consists of one to three levels depending on circuit requirements. Each level has two sets of contacts. The upper set consists of 10 separate contacts while the bottom surface is usually a solid segment (a contact common). Each level is associated with a pair of wipers.

The minor switch should be lubricated at 50,000; 100,000; and 250,000 operations and after every 500,000 operations thereafter; or every six months, whichever is shorter.

NOTE: The following lubrication procedures are for switches which are used in ordinary temperatures. If the switch will be subjected to -20° F and lower, use the following lubricants:

- a. Low temperature lubricant (spec. 5563) in place of graphite oil lubricant grade "C" (spec. 5232).
- b. Standard dial lubricant (spec. 5660) in place of blended lubricating oil (spec. 5684).

### 5.6.2 Lubrication procedure for the minor switch (figure 7).

For maintenance purposes, the following procedure should be followed. Wipe the parts to be lubricated as clean as possible.

#### a. Apply spindle oil (spec. 5231) to:

- I** The wiper tips. NOTE: This lubricant should be applied by immersing a sheet of paper or thin fibre in the spindle oil, withdrawing it and at the same time wiping off all excess oil, then passing the sheet between the wiper tips of each pair.

#### b. Apply one dip of graphite oil lubricant grade "C" (spec. 5232) to:

- II** The ratchet teeth.

If the switch has been disassembled, the following procedure should be followed. Wipe the parts to be lubricated as clean as possible.

#### c. Distribute one dip of blended lubricating oil (spec. 5684) to the following points in the order named:

- ① The shaft bearings, before the wiper assembly is assembled to the shaft.
- ② The pawl bearing.
- ③ The pawl stop, at the point where it is engaged by the pawl.
- ④ The pawl guide arm bearing surface on the frame.
- ⑤ The rotary armature spring bearing surface on the frame.
- ⑥ The release armature spring bearing surface on the normal stop pin.

#### d. Distribute one dip of blended lubricating oil (spec. 5684) to the following points in the order named:

- ⑦ The rotary armature bearing pin, where it touches the bearing yoke.
- ⑧ The release armature bearing pin, where it touches the bearing yoke.

## 5.7 O.C.S. Relay

### 5.7.1 Introduction.

The O.C.S. relay is a shock-resistant relay which can be used for cam-switching, for alternate on-off operations, or as a "stepper." The stepping mechanism used in the O.C.S. is

the same as that used in the type 44 rotary switch. Stepping is high-speed, accurate and dependable. It can be driven self-interrupted to produce a time cycle or for "homing."

The O.C.S. relay should be lubricated before putting into service, after 30,000 revolutions or three months (whichever is first), after 150,000 revolutions or six months (whichever is first), and after each additional 150,000 revolutions or six months (whichever is the most frequent).

### 5.7.2 Lubrication procedure for the O.C.S. relay (figure 8).

Clean relay thoroughly before lubrication.

#### a. Apply one dip of blended lubricating oil (spec. 5684) to:

- ① The shaft, at the point indicated. NOTE: During lubrication, take up the shaft play, in the direction which provides the most space between the parts at the point lubricated.

#### b. Apply one dip of blended lubricating oil (spec. 5684) to:

- ② The shaft, at a point between the ratchet and the frame (not shown). NOTE: During lubrication, take up the shaft play in the direction which provides the most space between the parts at the point lubricated.

Press on the pawl pin so that the pawl is pushed away from the armature.

#### c. Distribute one dip of blended lubricating oil (spec. 5684) to the following points:

- ③ Between the pawl and the armature.

Press against the pawl so that the head of the pawl pin is pushed away from the armature.

- ④ Between the head of the pawl pin and the armature.
- ⑤ The coils of the pawl spring (not shown).
- ⑥ The coils of the driving spring.
- ⑦ The holes in the armature and pawl, where the pawl spring is engaged (not shown).

Move the armature as far in the direction of point ⑧ as possible.

#### d. Distribute one dip of blended lubricating oil (spec. 5684) to the following points:



- ⑧ Between the armature and the yoke.
- ⑨ Around the pin, where it passes through the yoke.

Move the armature as far in the direction of point ⑩ as possible.

- ⑩ Between the armature and the yoke.
  - ⑪ Around the pin, where it passes through the yoke.
- e. Distribute a thin coat of blended lubricating oil (spec. 5684) to the following points:
- ⑫ Two-thirds of the circumference of every fibre cam. NOTE: There must

not be sufficient lubricant on any of the cams to "pile up" behind the operating portion of the springs as the cams are rotated.

- ⑬ The end of the interrupter spring buffer, where it strikes the armature.

Clean the lubrication brush thoroughly.

- f. Distribute two dips of graphite lubricating oil grade "C" (spec. 5232) to:

- ⑭ The surface of the teeth and the ratchet between the teeth.

Wipe the lubricant from all parts and surfaces not intended to be lubricated.

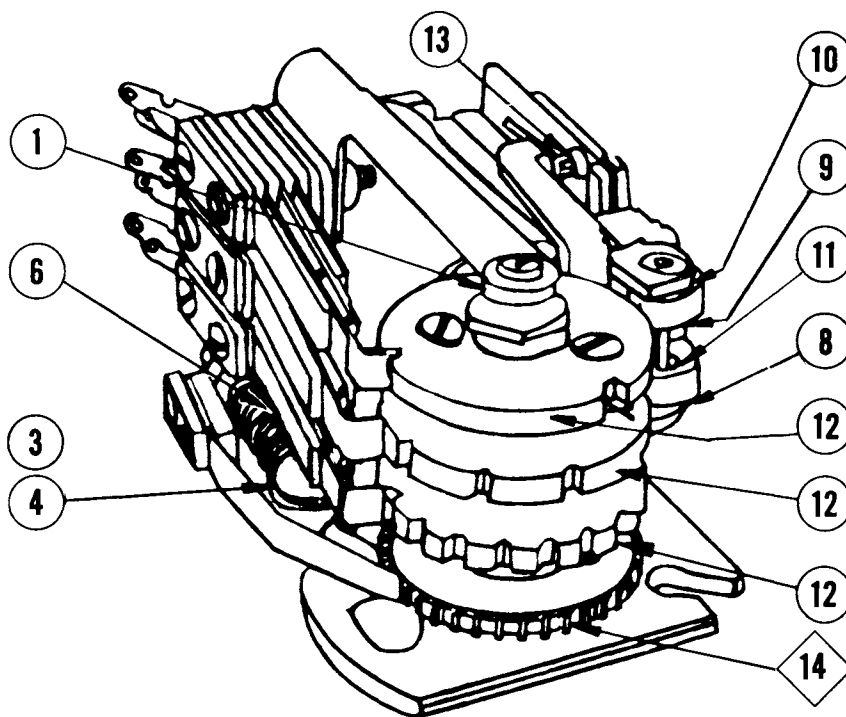


Figure 8. O.C.S. relay lubrication.

## 6. DIALS

### 6.1 Lubrication Procedure for Dials (figure 9)

Before lubricating the dial, remove the dial escutcheon, using dial escutcheon tool H-26917. Remove the finger plate mounting screw, and take off the finger plate. Remove the shaft assembly by taking off the main spring. Wipe all exposed parts as clean as possible before lubricating.

a. Distribute one dip of standard dial lubricant (spec. 5660) to the following points:

**1** The end of the pinion shaft, where the shaft bears in the finger stop.

**2** The shaft, where the shaft bears in the pinion shaft bearing bridge both above and below the bridge, and on the teeth and body of the pinion shaft from the finger stop to the worm gear.

**3** Apply the remainder of this dip over the face of the pawl stop arm on the finger stop in order to protect against rust.

b. Distribute one dip of standard dial lubricant (spec. 5660) to the following points:

**4** Around the junction between the main bearing and the main gear. NOTE: This point must be lubricated before the main gear is mounted.

**5** Over the top of the main gear.

**6** Apply the remainder of this dip evenly over the ratchet teeth.

c. Apply one dip of standard dial lubrication (spec. 5660) to:

**7** Between at least two-thirds of the main gear teeth.

d. Distribute one dip of standard dial lubricant (spec. 5660) to the following points:

**8** Around the governor shaft at the point where it enters the governor cup bearing.

**9** Around the governor shaft at the point where it enters the rear bearing screw.

**10** Apply the remainder of this dip over the worm and:

**11** The exposed length of the governor. This is to provide rust protection.

e. Distribute one dip of standard dial lubricant (spec. 5660) to the following points:

**12** The exposed end of the main bearing.

**13** The edge of the cam.

**14** Between at least two-thirds of the teeth of the worm gear.

**15** The ends of the governor buffers.

**16** **17** The two spring buffers. NOTE: Do not lubricate buffers made of hard rubber.

Before continuing the lubrication process, remove the fibre washer and the lift washer from the shaft assembly and wipe each piece clean.

f. Distribute one dip of standard dial lubricant (spec. 5660) to the following points:

**18** Around the head of the pin.

**19** Between the pawl and the pawl plate.

Over the length of the shaft.

**20** Both sides of the lift washer.

**21** Both sides of the fibre washer.

**22** Both sides of the stainless steel washer.

**23** On the pawl spring anchor pin where the pawl spring rides.

**24** In the pawl spring anchor hole in the pawl.

**25** Through the coils of the pawl spring.

Reassemble the dial.

g. Apply one dip of standard dial lubricant (spec. 5660) to the following point:

**26** Between the coils of the main spring.

If the dial is equipped with S.A.T.T. spotter springs, lubricate as follows:

h. Distribute one dip of standard dial lubricant (spec. 5660) to the following points:

**27** Between each side of the spotter pawl, and the washers mounted on the same pin.

**28** The edge of the S.A.T.T. cam.

After lubrication, wipe any lubricant from parts and surfaces not intended to be lubricated.

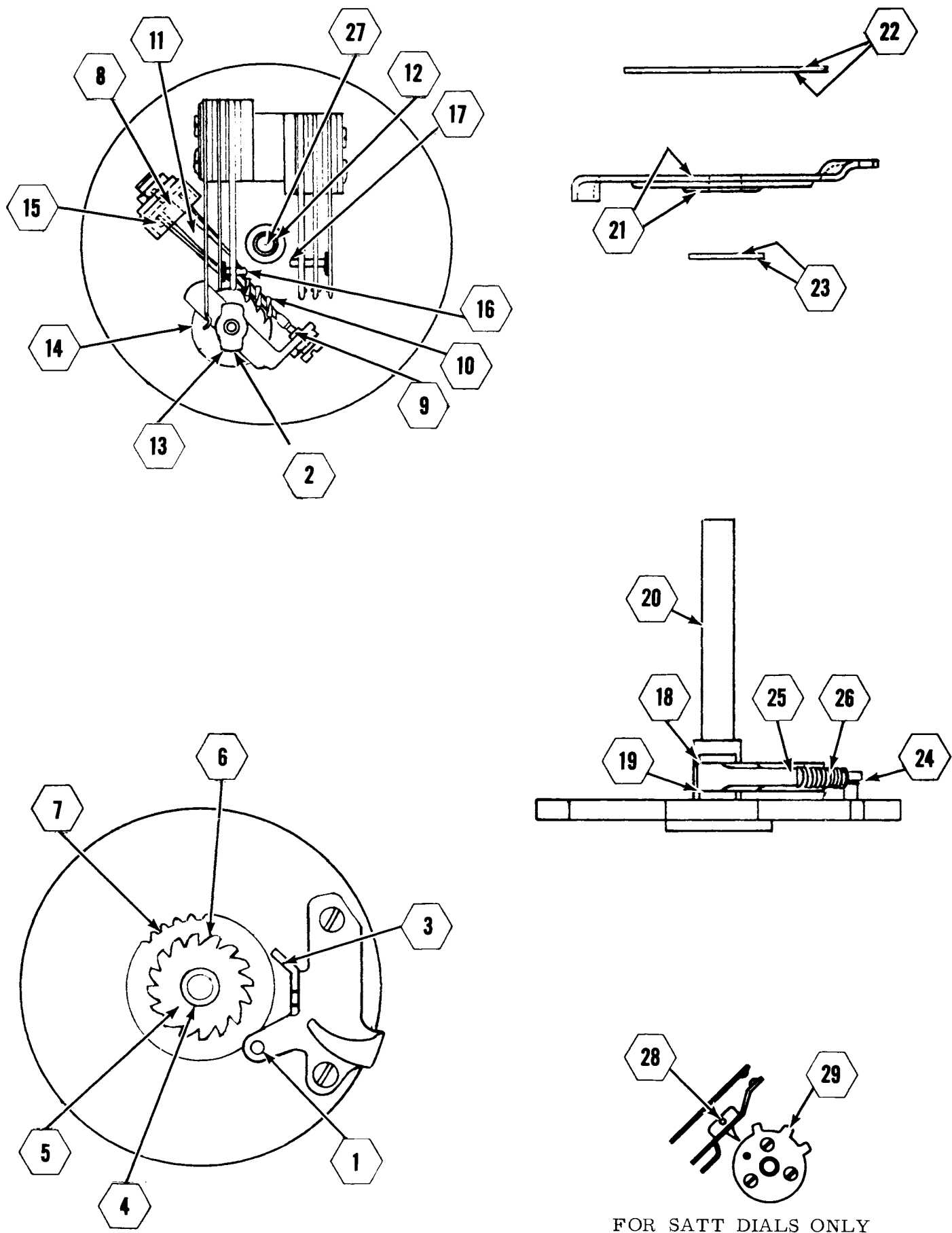


Figure 9. Telephone dial lubrication.



## 6.2 Special Instructions for Type 52 Paystation Dials

Adjust the type 52 paystation dial as per A-807. Dial speed is set at 9-1/2 to 10-1/2 pulses per second. Omit paragraph C-1 (of A-807) and substitute the following:

- a. Restoring spring shall have 1-1/3 turns for tension with the dial in the normal position.
- b. Lubricate dial with low temperature lubricant (spec. 5717) grade "B" instead of standard dial lubricant (spec. 5660).

## 7. RELAYS

### 7.1 Lubrication Procedure for Class "A" Relays (figure 10)

When a Class "A" relay has a heavy duty armature bearing or it is to be operated as much as one million times per year, lubrication of the bearings, as described below, becomes necessary. If the relay is normally exposed to excessive amount of dust, lubrication should not be attempted.

Heavy duty standard ratio armatures have a heavy cast yoke instead of the standard formed yoke.

If lubrication is considered necessary, follow the procedure described below:

- a. Distribute one dip of spindle oil (spec. 5231) to the following points:

- 1 On the bearing pin where it passes through the ear on the yoke.
- 2 Between the ears on the armature and the ears on the yoke.

### 7.2 Lubrication Procedure for Class "B" and "C" Relays (figure 10)

Type 57, 57A or 58A relays have a heavy duty bearing which is coated with spec. 5694 grease before assembly. If the yoke is removed for any reason, the bearing surface should be cleaned and coated with fresh grease before reassembly. Under normal conditions no other maintenance lubrication is necessary. However, relays which have a high frequency of operation or are exposed to severe dust conditions should be examined periodically. If lubrication is considered necessary, follow the procedure described below.

- a. Distribute one dip of spindle oil (spec. 5231) sparingly to:

- 1 The inside edges of the yoke.

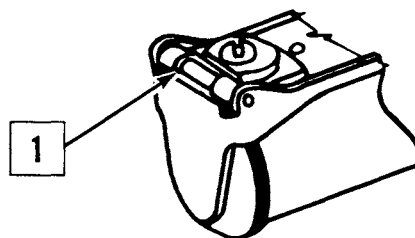
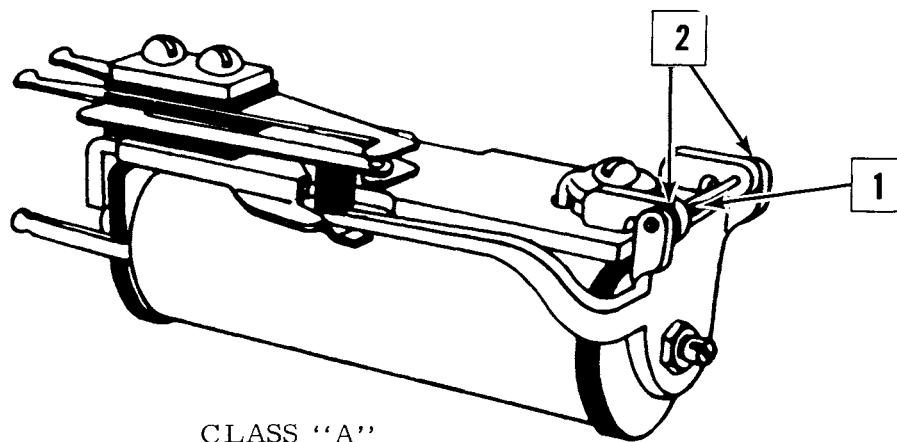


Figure 10. Lubrication for class A, B, and C relays.

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