

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 practices recommended by Automatic Electric Company for the lubrication of various components; these practices are standard. For instructions on components not covered in this bulletin, A. E. Co. has available Standard Adjustment Sheets which give lubrication procedures in detail. Bank cleaning and lubrication is covered in Technical Bulletin 506.

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 may be 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)	½ 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.

LUBRICATION INSTRUCTIONS
FOR
STROWGER TWO-MOTION SWITCHES

LUB 1

The Strowger Two-motion Switch

The Strowger two-motion switch is the basic component of a Strowger step-by-step telephone system. The Strowger switch is designed so that frequent and extensive lubrication is not essential. It may become necessary, however, to lubricate the switch to insure economical operation.

The frequency of lubrication depends on local conditions which affect the switch. These include grading, dust, high humidity, and temperature. Under normal conditions, the switch should be lubricated every six months until a better interval is established. It may also be found more suitable to lubricate some parts of the switch more frequently than others. See Technical Bulletin 506 for bank cleaning and lubrication.

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.
- 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 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 naphtha. A solvent such as chloroethene is acceptable.

Lubricant Measure

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

DIP - A dip is 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.

Lubricants

The following lubricants are recommended for use with the Strowger switch:

 a. Spindle oil (spec. 5231). Spindle oil is a highly refined, nonblended, 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. Order H-78612-5, spindle oil (spec. 5231), 2 oz.

 b. Graphite oil lubricant (spec. 5232 grade "C"). Graphite oil lubricant consists of a blended lubricating oil (spec. 5684) and deflocculated graphite (concentrated oiltag). The lubricant is used on the ratchets or ratcheted surfaces in these switches (ratchet wheels, Strowger switch shaft, etc.). Order H-78612-9, graphite oil lubricant (spec. 5232-C), 2 oz.

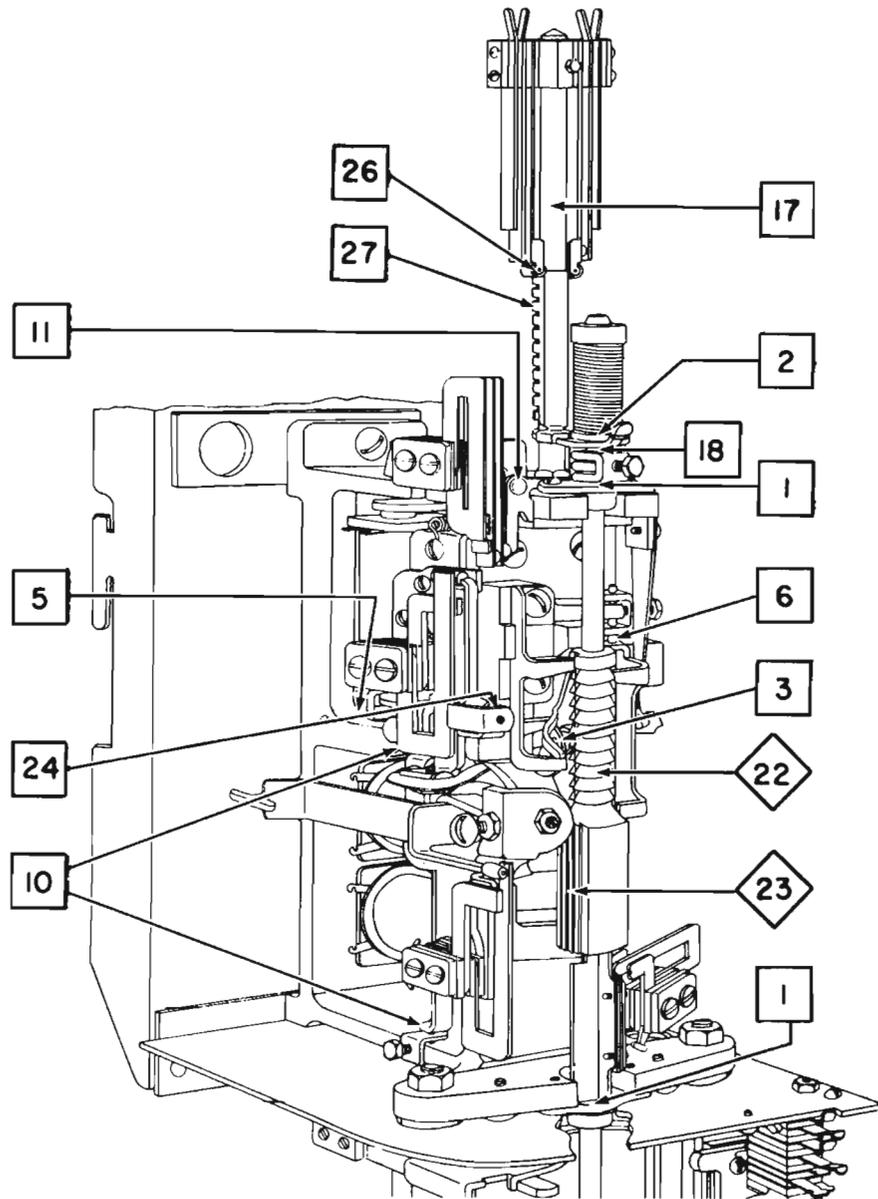


Figure 1. Strowger switch lubrication (left front view).

Procedure

Clean the switch thoroughly and lubricate following steps a. through p. below. In addition:

- (1) If the switch is equipped with bell crank vertical interrupter springs, follow step p.
- (2) If the switch is equipped with normal post springs, follow step r.
- (3) If the switch is equipped with a side switch, follow step s.

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 to:

2

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

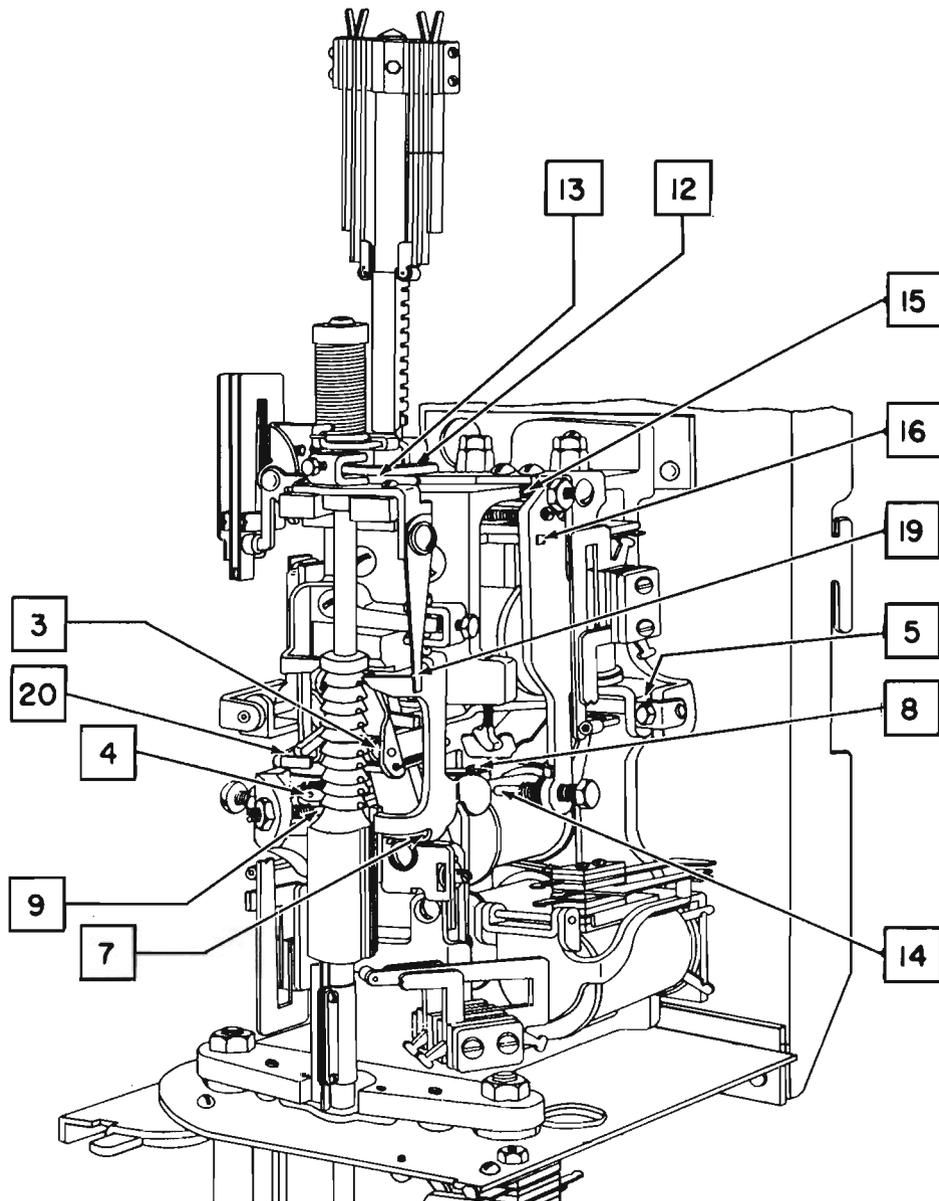


Figure 2. Strowger switch lubrication (right front view).

c. Apply one dip of spindle oil 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 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 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 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 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 to the following points:

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

9 The tip of the rotary pawl guide (see figure 2).

i. Apply one dip of spindle oil 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 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 to the following points:

14 The surface on the double dog which contacts 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 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 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 one vertical step and rotate 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" 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" 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.

Switches equipped with bell crank vertical interrupter springs.

q. Distribute one dip of spindle oil 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).

Switches equipped with normal post springs.

r. Distribute one dip of spindle oil 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).

Switches equipped with a side switch.

s. Distribute one dip of spindle oil between the following points:

28 The spider arm bearings (not shown).

29 The upper and lower escapement spring teeth (not shown).

LUBRICATION INSTRUCTIONS
FOR
THE TYPE 13 ROTARY SWITCH

LUB-2

The Type 13 Rotary Lineswitch

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-interruptedly 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.

Lubricant Measure

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

DIP - A dip is 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.

Types of Lubricants

The following lubricants are recommended for lubrication of the type 13 rotary switch:



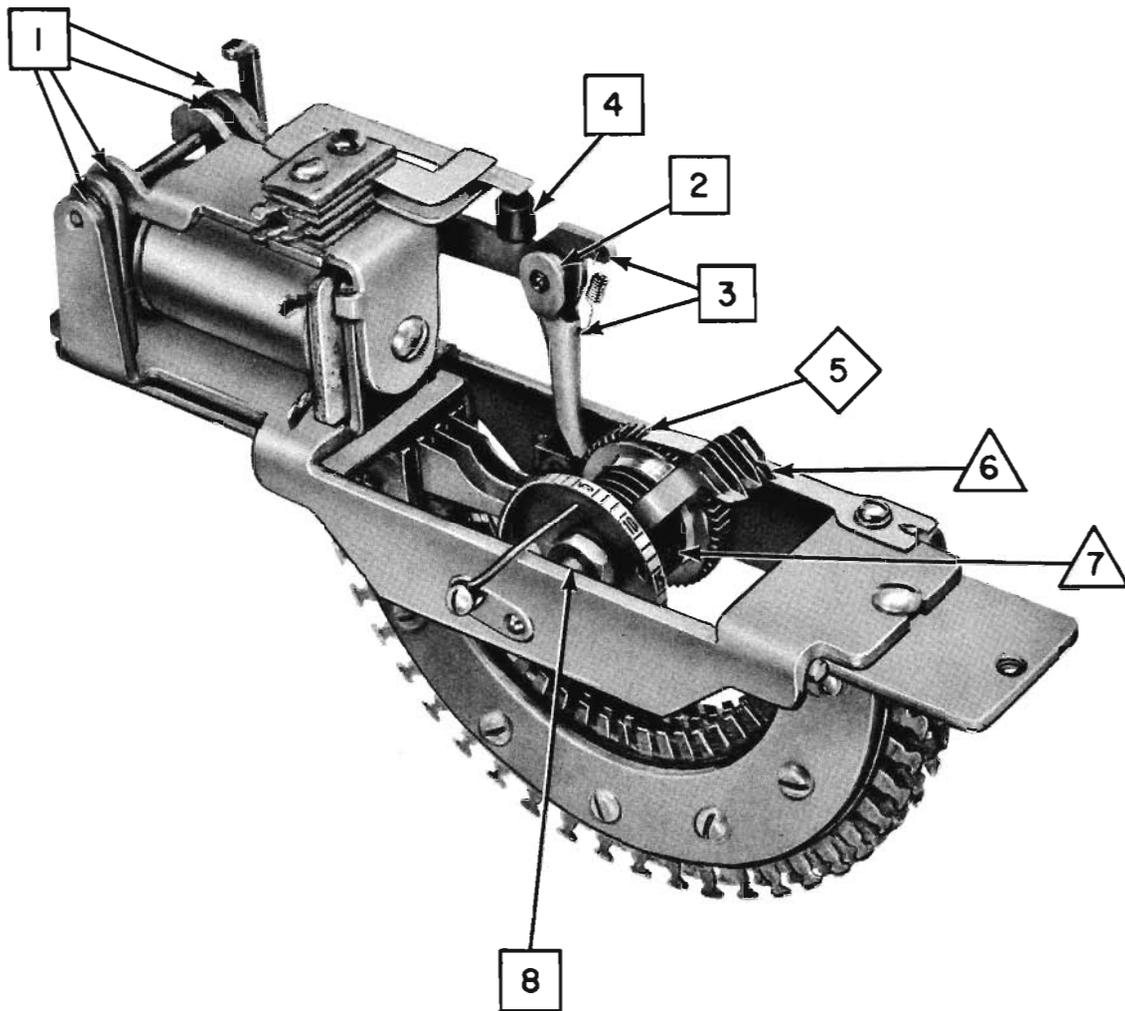
a. Spindle oil (spec. 5231). This is a highly refined, straight run, neutral petroleum oil. It is free from any foreign materials, sediment, suspended or dissolved matter. Order H-78612-5, spindle oil (spec. 5231), 2 oz; or H-78612-6, spindle oil (spec. 5231), 4 oz.



b. Watch oil (spec. 5228). This is a highly refined grade of selected fish or sperm oil, bleached, chilled and lifiered at low temperature. This oil will not become gummy or corrode metal. It is used for cleaning and lubricating stepping switch bank contacts, wipers and brushes. Order H-78612-30, watch oil (spec. 5228), 2 oz.



c. Graphite oil lubricant (spec. 5232-C). Graphite oil consists of a blended lubricating oil (spec. 5684) and a deflocculated graphite (concentrated oildag). This lubricant is used on ratchets and ratcheted surfaces of rotary stepping switches. Order H-78612-9, graphite oil (spec. 5232-C), 2 oz.



Procedure

Clean the switch thoroughly and lubricate following steps a. through e. below:

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

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

b. Distribute one dip of spindle oil among:

2 The pawl bearing.

3 The pawl spring mounting holes and coils.

4 The interrupter spring buffers.

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

5 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:

6 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.

7 The insides of two wipers at a point near the hub is that when rotated, the lubricated part of the wipers will contact the brushes.

The lubrication of the (wiper shaft) 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:

8 The frame and the wiper assembly shaft at each end.

LUBRICATION INSTRUCTIONS

FOR

THE MINOR SWITCH

LUB-3

The Minor Switch

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 every 500,000 operations thereafter; or every six months, whichever is shorter.

Lubricant Measure

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

DIP - A dip is 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.

Types of Lubricants

The following lubricants are recommended for lubrication of the type 13 rotary switch:

 a. Spindle oil (spec. 5231). This is a highly refined, straight run, neutral petroleum

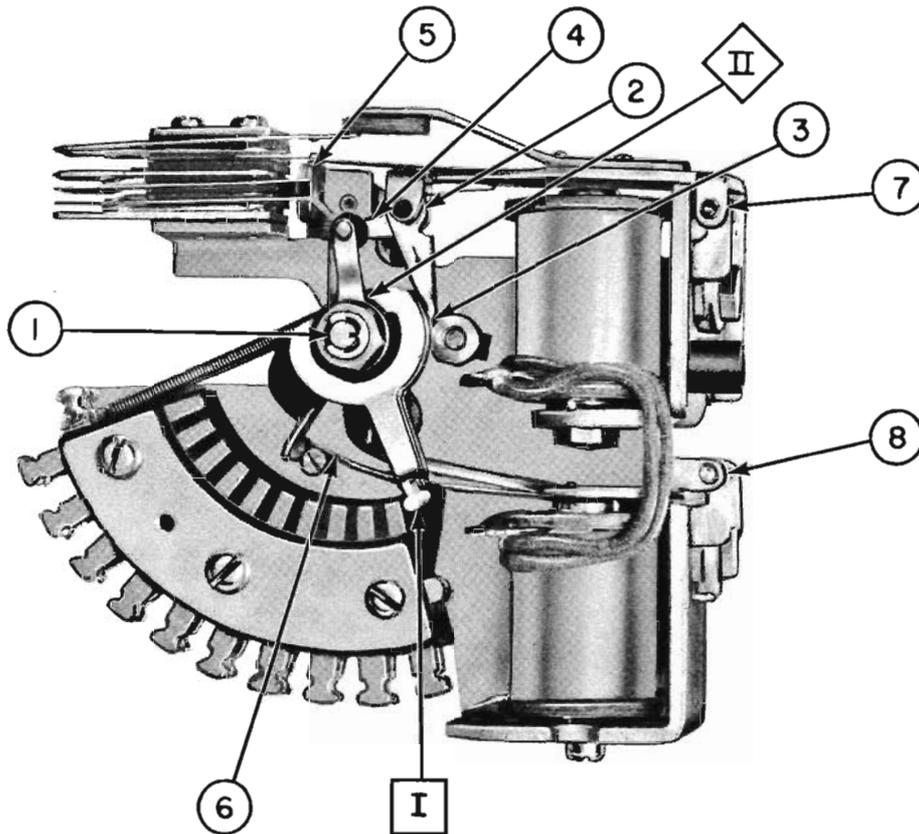
oil. It is free from any foreign materials, sediment, suspended or dissolved matter. Order H-78612-5, spindle oil (spec. 5231), 2 oz; or H-78612-6, spindle oil (spec. 5231), 4 oz.

 b. Graphite oil lubricant (spec. 5232-C). Graphite oil consists of a blended lubricating oil (spec. 5684) and a deflocculated graphite (concentrated oil). This lubricant is used on ratchets or ratcheted surfaces of rotary stepping switches. Order H-78612-9, graphite oil lubricant (spec. 5232-C), 2 oz.

 c. Blended lubricating oil (spec. 5684). This is essentially a mineral oil blended with an oil having a paraffine base. It is used on armature bearings and pawl pin bearings. Order H-78612-31, blended lubricating oil (spec. 5684), 2 oz.

 d. Low-temperature oiltag lubricant (spec. 5563). This is a mixture of deflocculated graphite and dibutylphthalate and is suitable for lubricating mechanisms which must operate at temperatures ranging from -22° F to 122° F. It is commonly used on the ratchet wheels of minor switches. Order H-78612-28, low-temperature oiltag lubricant (spec. 5563), 2 oz.

 e. Standard dial lubricant (spec. 5660). This is a mixture of a plastic or semi-solid petroleum, dibutylphthalate and a rust preventative, and is used on mechanisms which may be required to operate at low temperatures. Order H-78612-27, standard dial lubricant (spec. 5660), 2 oz.



Procedure

Clean the switch thoroughly and lubricate following steps a. and b. or c. and d., below:

NOTE: If the switch will be subjected to -20 F and lower, use the following lubricants:

 Low-temperature lubricant (spec. 5563) in place of graphite oil lubricant grade "C" (spec. 5232).

 Standard dial lubricant (spec. 5660) in place of blended lubricating oil (spec. 5684).

For maintenance purposes, the following procedure should be followed:

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

 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:

 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) among the following points in the order named:

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

d. Distribute one dip of blended lubricating oil between the following points in the order named:

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

LUBRICATION INSTRUCTIONS FOR DIALS

LUB-4

These instructions are applicable to type 51 and type 52 dials, dials equipped with SATT spotter springs, and type 52 paystation dials.

Lubricant Measure

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

DIP - A dip is 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.

Types of Lubricants

The following types of lubricants are recommended for use with dials:

 a. Standard dial lubricant (spec. 5660). This is a mixture of a plastic or semisolid petroleum, dibutylphthalate, and a rust preventative. This lubricant is used on mechanisms which may be required to operate at low temperatures; it is widely used on dials. Order H-78612-27, standard dial lubricant (spec. 5660), 2 oz.



b. Low-temperature lubricant (spec. 5717-B). This lubricant is used on type 52 paystation dials which may be subject to extremely low temperatures. Order H-78612-52, low-temperature lubricant (spec. 5717-B), 2 oz.

Procedure

Before lubricating the dial, remove the dial escutcheon using dial escutcheon tool H-26917. Remove the finger plate mounting screw and the finger plate. Remove the main spring assembly. Wipe all exposed parts thoroughly to remove old oil and dirt. Lubricate the dial following steps a. through g. below. If the dial is equipped with SATT spotter springs perform step h.

NOTE: For type 52 dials used in paystations, and other dials as necessary, only when the dials are in service under extreme low temperature conditions (below approximately -20° F) substitute low-temperature lubricant (spec. 5717-B) for standard dial lubricant at the following points:

Step d.   

Step e.  

At all other points in steps a. through g. standard dial lubricant should be used.

a. Distribute one dip of standard dial lubricant (spec. 5660) among 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 among 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 to:

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

d. Distribute one dip of standard dial lubricant among 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 among 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 The two spring buffers. NOTE: Do not lubricate buffers made of hard rubber.

⑰

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 among the following points:

⑱ Around the head of the pin.

⑲ Between the pawl and the pawl plate.

⑳ Over the length of the shaft.

㉑ Both sides of the lift washer.

㉒ Both sides of the fibre washer.

㉓ Both sides of the stainless steel washer.

㉔ On the pawl spring anchor pin where the pawl spring rides.

㉕ In the pawl spring anchor hole in the pawl.

㉖ Through the coils of the pawl spring.

Reassemble the dial.

g. Apply one dip of standard dial lubricant to the following point:

㉗ Between the coils of the main spring.

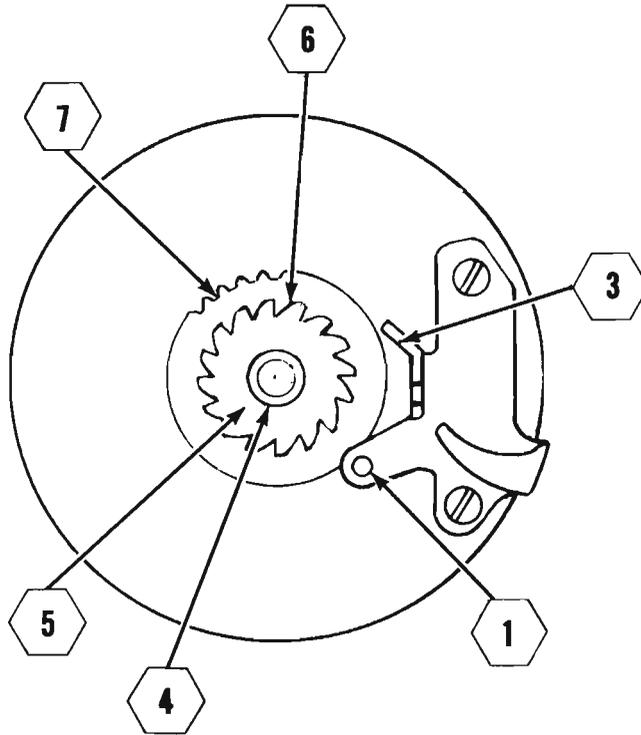
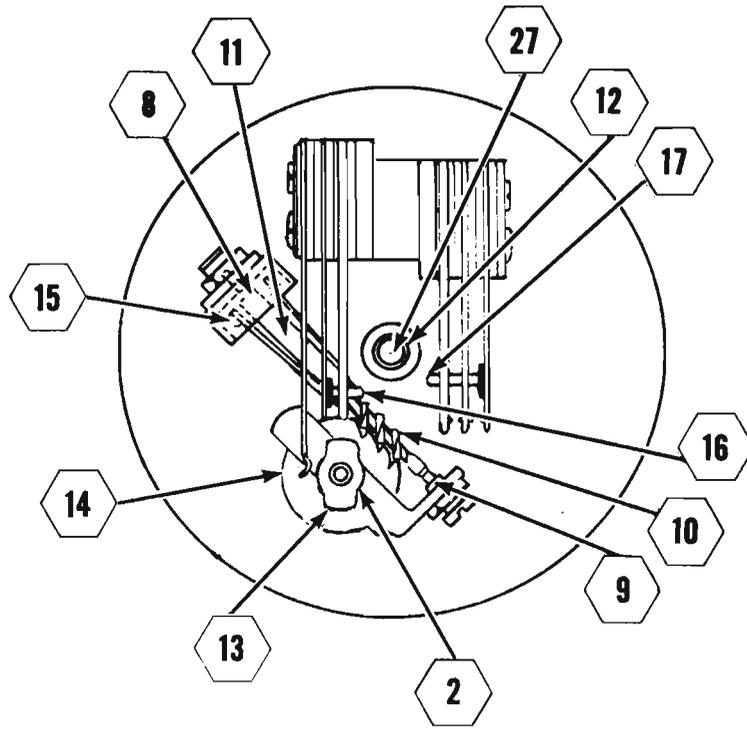
If the dial is equipped with SATT spotter springs, lubricate as follows:

h. Distribute one dip of standard dial lubricant between the following points:

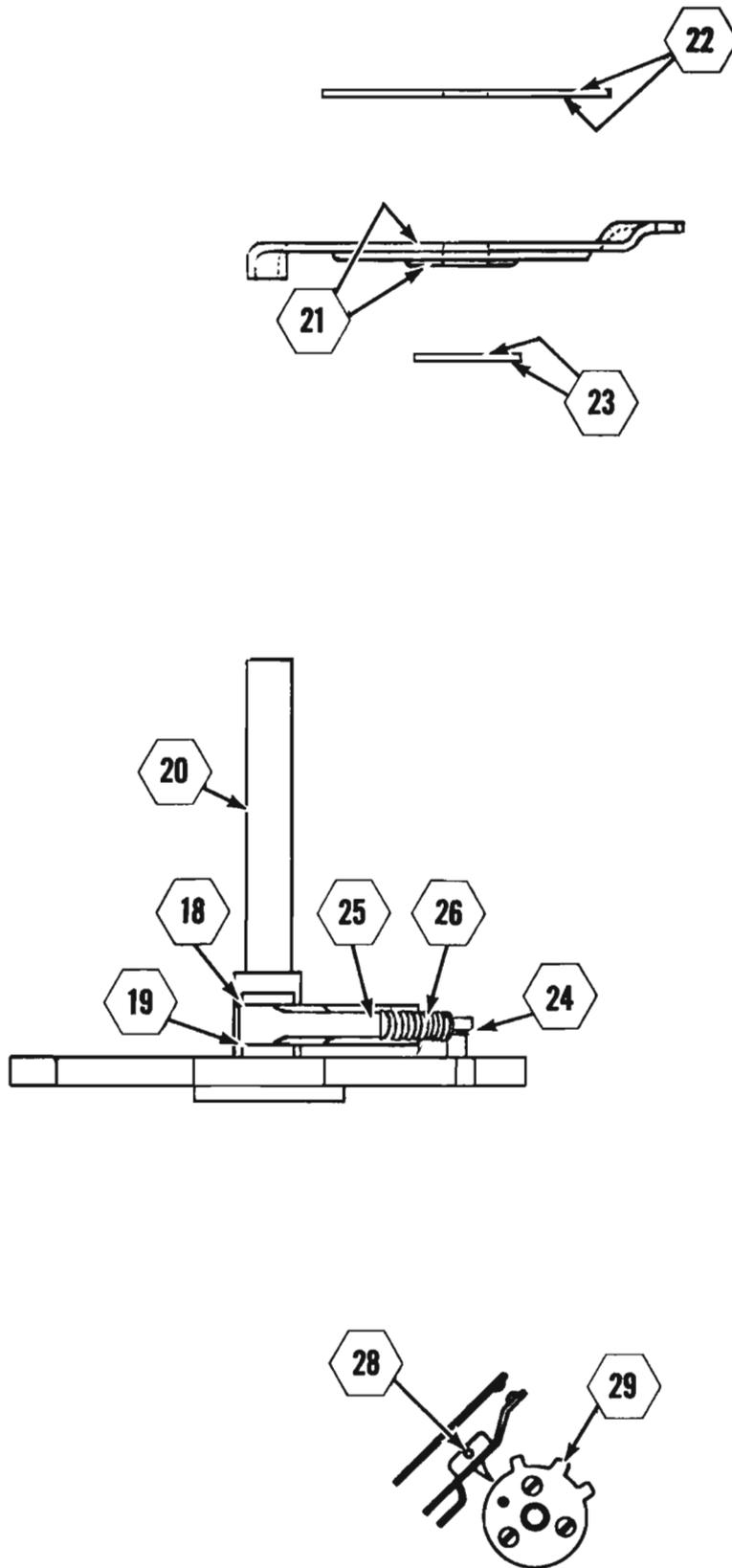
㉘ Between each side of the spotter pawl, and the washers mounted on the same pin.

㉙ The edge of the SATT cam.

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



Dial lubrication.



FOR SATT DIALS ONLY

Dial lubrication.

LUBRICATION INSTRUCTIONS
FOR
RELAYS - CLASS A, B, C AND E

LUB-6

Class "A" Relay

When a Class "A" (standard telephone type) relay has a heavy duty armature yoke or if it is to be operated as much as one million times per year, lubrication of the bearings, as described below, becomes necessary. (Heavy duty armature assemblies have a heavy cast yoke instead of the standard stamped yoke.) If the relay is normally exposed to excessive amount of dust, lubrication should not be attempted.

**Class "B", Class "C"
and Class "E" Relays**

Class "B" (type 57 or type 57A) or Class "C" (type 58A) and Class "E" 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.

Lubricant Measure

In order to insure some control during lubrication, a standard quantity for applying

lubricant has been established. This standard measure assures that approximately the correct amount of lubricant will be applied. This measure is defined as follows:

DIP - A dip is 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.

Lubricants

The following lubricants are recommended for use with Class "A", "B" and "C" relays:



a. Spindle oil (spec. 5231). This is a highly refined, straight run, neutral petroleum oil. It is free from any foreign materials, sediment, or suspended or dissolved matter. Order H-78612-5, spindle oil (spec. 5231), 2 oz.



b. Plastic petroleum (spec. 5694). This is a semi-solid petroleum suitable for certain bearings, such as wiper assembly bearings, of rotary stepping switches. Order H-78612-47, plastic petroleum (spec. 5694), 8 oz.

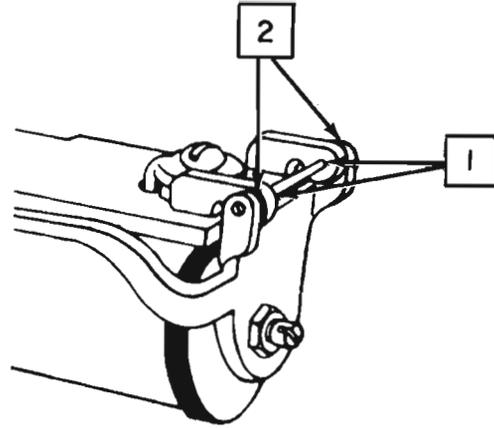
Procedure

Clean the relay thoroughly and lubricate as follows:

Distribute one dip of spindle oil (spec. 5231) between 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.

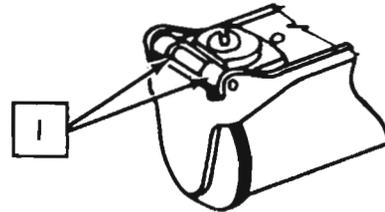


Procedure

Clean the relay thoroughly and lubricate as follows:

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

1 The inside edges of the yoke.



LUBRICATION INSTRUCTIONS
FOR
THE PLUNGER LINESWITCH

LUB-7

Plunger Lineswitches

Plunger lineswitches are commonly used in PAX systems to connect the calling line to the common equipment. It is recommended that the plunger lineswitch be inspected every six months and lubricated if necessary.

Lubricant Measure

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

DIP - A dip is 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.

Lubricants

The following lubricant is recommended for use with plunger lineswitches.

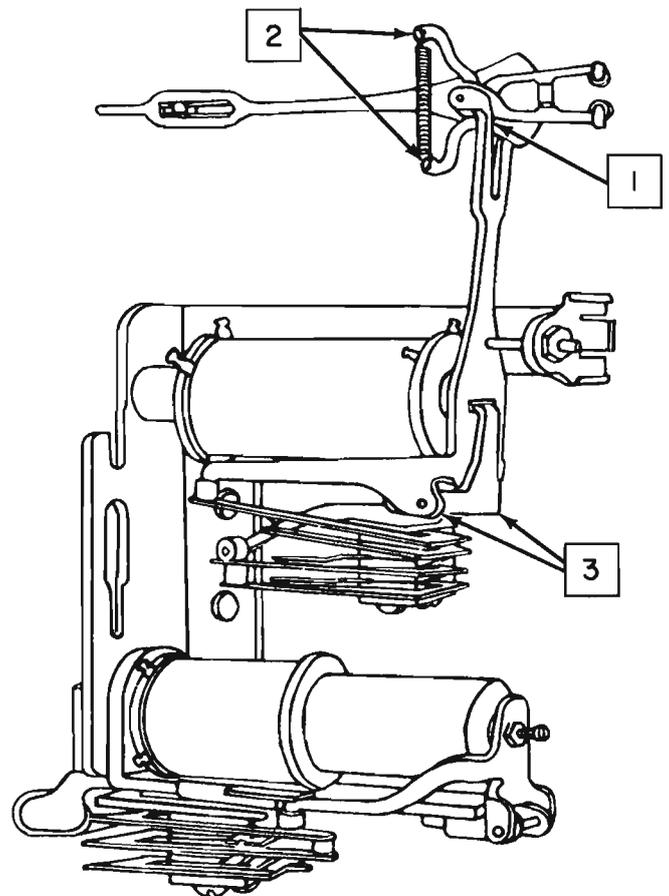
Spindle oil (spec. 5231). This is a highly refined straight-run, neutral petroleum oil. It is free from any foreign materials, sediment or suspended or dissolved matter. Order H-78612-5, spindle oil, (spec. 5231), 2 oz.

Procedure

Clean the switch thoroughly and lubricate following steps a. and b. below:

a. Distribute one dip of spindle oil (spec. 5231) between:

1 The restoring arm bearings. Apply oil between the plunger hub and each restoring arm, and between the restoring arms.



Plunger lineswitch lubrication.

2 The restoring spring mounting holes (both sides of each restoring arm).

b. Apply one dip of spindle oil to:

3 The plunger armature bearing pin. Apply oil between the plunger armature and the yoke (both ends) and between the bridge cut-off armature and the yoke (both ends).

LUBRICATION INSTRUCTIONS
FOR
THE MASTER SWITCH

LUB-8

Master Switches

Master switches are commonly used in PAX systems to preselect an idle trunk for use by a plunger lineswitch. It is recommended that master switches be inspected once a year and lubricated if necessary.

Lubricant Measure

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

DIP - A dip is 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.

Lubricants

The following lubricants are recommended for use with master switches:

a. Spindle oil (spec. 5231). This is a highly refined, straight-run, neutral petroleum oil. It is free from any foreign materials, sediment or suspended or dissolved matter. Order H-78612-5, spindle oil (spec. 5231), 2 oz.

 b. Graphite oil lubricant (spec. 5232-C). This consists of a mixture of blended lubricating oil and deflocculated graphite (concentrated oildag). Order H-78612-9, graphite oil lubricant, (spec. 5232-C), 2 oz.

Procedure

Clean the switch thoroughly and lubricate following steps a. through e. below:

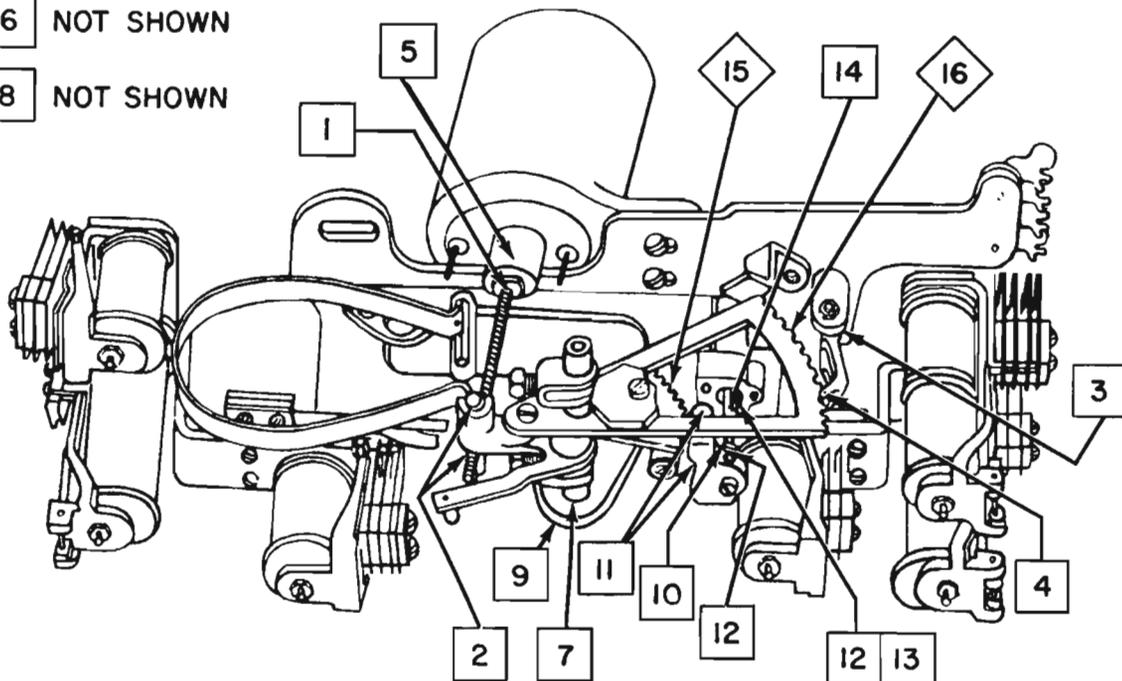
a. Distribute one dip of spindle oil (spec. 5231) among:

- 1 The threaded plunger rod where it enters the solenoid plunger.
- 2 Around both ends of the plunger arm bearing pin where it enters the bearing.
- 3 Around the locking arm pivots where they engage the locking arm on each end.
- 4 Around the locking arm roller bearing pin at both ends of the roller.

b. Apply one dip of spindle oil evenly over:

- 5 The exposed portion of the solenoid plunger with the switch at normal (solenoid plunger extended).

6 NOT SHOWN
8 NOT SHOWN



c. Distribute one dip of spindle oil among:

6 The two bearings of each plunger guide shaft between the shaft collar and the frame, with any play taken up toward the switch (not shown).

7 Around the shaft where it passes through the frame at a point nearest the switch.

8 Around the shaft where it passes through the frame opposite the collar, with any play taken up away from the switch.

9 Around the shaft where it passes through the frame at a point opposite the switch.

d. Distribute one dip of spindle oil among:

10 Over the governor worm.

11 Around each end of the lantern pinion bearings with any play taken up away from the end being lubricated.

12 Each end of the governor shaft at the junction between the shaft and the bearing.

13 The governor buffers.

14 The governor shaft.

e. Distribute one dip of graphite oil lubricant (spec. 5232-C) between:

15 The operating surfaces of the driving segment teeth.

16 The operating surfaces of the locking segment teeth.

LUBRICATION INSTRUCTIONS
FOR
THE TYPE 45 ROTARY SWITCH

LUB-11

The Type 45 Rotary Switch

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 semicircular contact bank.

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

NOTE: For low-temperature lubrication instructions contact Automatic Electric Company, Northlake, Illinois.

Lubricant Measure

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

DIP - A dip is 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.

Types of Lubricants

The lubricants below are recommended for lubrication of the type 45 rotary switch:

○ a. Blended lubricating oil (spec. 5684). This is essentially a mineral oil blended with an oil having a paraffine base. It is used on pawl pin bearings and armature bearings. Order H-78612-31, blended lubricating oil (spec. 5684), 2 oz.

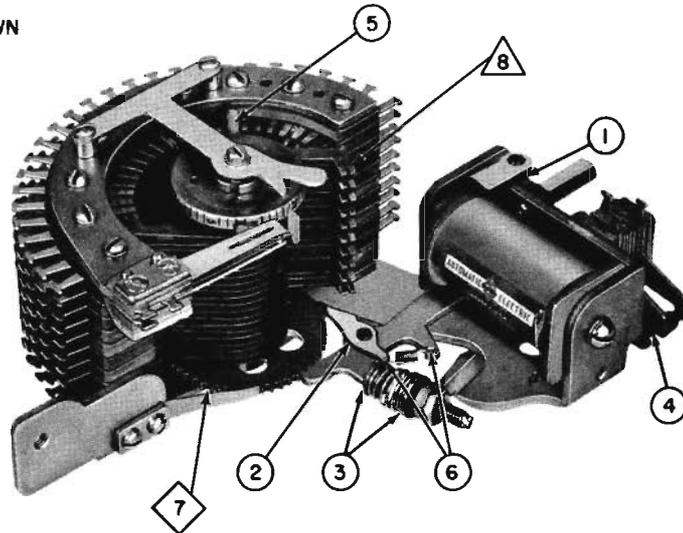
△ b. Watch oil (spec. 5228). This is a highly refined grade of selected sperm or fish oil, bleached, chilled and filtered at low temperature. This oil will not become gummy or corrode metal. It is used for cleaning and lubricating stepping switch bank contacts, wipers and brushes. Order H-78612-30, watch oil (spec. 5228), 2 oz.

◇ c. Graphite oil lubricant (spec. 5232-C). Graphite oil consists of a blended lubricating oil (spec. 5684) and a deflocculated graphite (concentrated oil-dag). This lubricant is used on ratchets or ratcheted surfaces of rotary stepping switches. Order H-78612-9, graphite oil lubricant (spec. 5232-C), 2 oz.

⊠ d. Plastic petroleum (spec. 5694). This is a semi-solid petroleum suitable for certain bearings, such as wiper assembly bearings, of rotary stepping switches. Order H-78612-47, plastic petroleum (spec. 5694), 8 oz.

△ 9 NOT SHOWN

⊠ 10 NOT SHOWN



Procedure

Clean the switch thoroughly and lubricate following steps a. through g. below:

NOTE: For low-temperature lubrication instructions contact Automatic Electric Co., Northlake, Illinois.

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

① Each end of the two yoke bearings.

b. Apply one dip of blended lubricating oil 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 among:

③ The driving spring coils and seats.

④ The interrupter spring buffers.

⑤ The off-normal bushings. NOTE: Do not lubricate nylon bushings.

⑥ The pawl spring mounting holes and coils. Clean the lubricating brush.

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

⑦ 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:

△ 8 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.

f. To lubricate the brush springs (not shown), position the wiper assembly so that the wipers are resting on the 18th bank contact. Apply one dip of watch oil to:

△ 9 The insides of two wipers, at a point near the hub so that when rotated the lubricated portion of the wiper will contact the brushes. When all of the wipers have been lubricated in this manner, rotate the wiper assembly 180° and repeat the process. For example, a six-level switch will require six dips of lubricant.

g. If the switch is disassembled:

⊠ 10 On switches of one to four levels, fill the undercut portion of the shaft with plastic petroleum (spec. 5694). Apply a small amount of the grease to the end of the shaft opposite the mounting hub before the shaft is assembled into the hub. On switches of more than four levels, fill the entire wiper hub with grease. NOTE: Wiper shafts are lubricated for the life of the wiper assembly. Relubricate the shaft only when replacing wiper assemblies.

LUBRICATION INSTRUCTIONS
FOR
THE TYPE 26 ROTARY SWITCH

LUB-14

The Type 26 Rotary Switch

The type 26 rotary switch is a relatively high speed, heavy duty, single motion, magnet driven, stepping switch. It can be operated self-interruptedly 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.

Lubricant Measure

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

DIP - A dip is 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.

Types of Lubricants

The following lubricants are recommended for lubrication of the type 26 rotary switch:



a. Spindle oil (spec. 5231). This is a highly refined, straight run, neutral petroleum oil. It is free from any foreign materials, sediment, suspended or dissolved matter. Order H-78612-5, spindle oil (spec. 5231), 2 oz; or H-78612-6, spindle oil (spec. 5231), 4 oz.



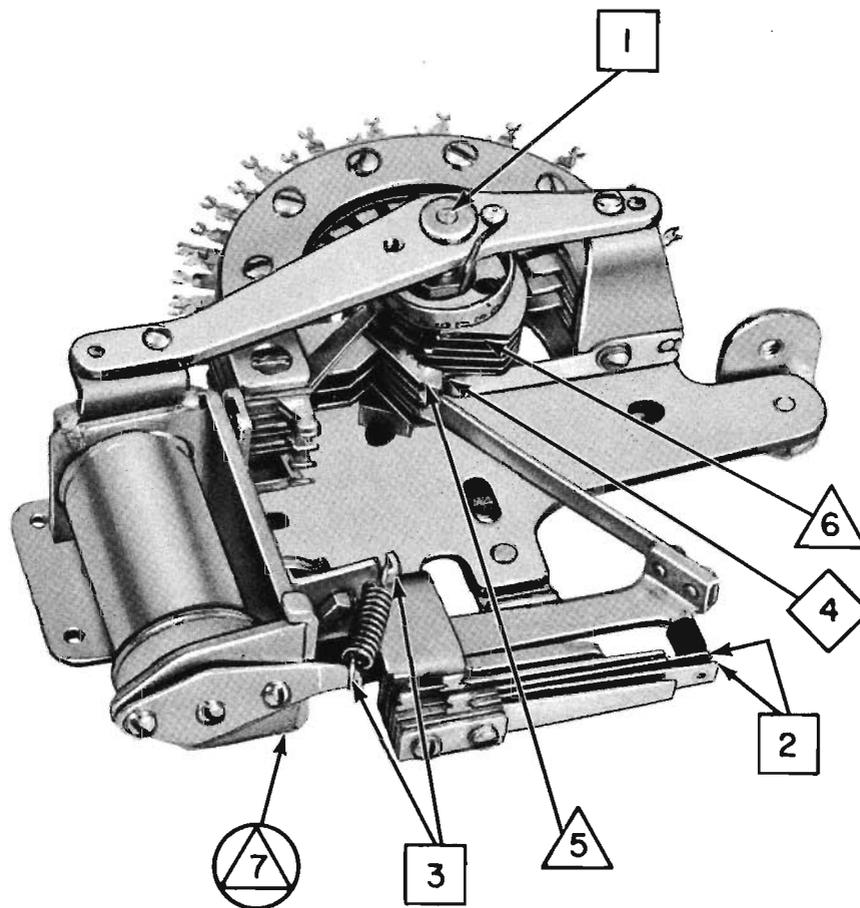
b. Graphite oil lubricant (spec. 5232-C). Graphite oil consists of a blended lubricating oil (spec. 5684) and deflocculated graphite (concentrated oil-dag). This lubricant is used on ratchets or ratcheted surfaces of rotary stepping switches. Order H-78612-9, graphite oil lubricant (spec. 5232-C), 2 oz.



c. Watch oil (spec. 5228). This is a highly refined grade of selected fish or sperm oil, bleached, chilled and filtered at low temperature. This oil will not become gummy or corrode metal. It is used for cleaning and lubricating stepping switch bank contacts, wipers and brushes. Order H-78612-30, watch oil (spec. 5228), 2 oz.



d. Plastic petroleum (spec. 5694). This is a semi-solid petroleum suitable for certain bearings, such as wiper assembly bearings, of rotary stepping switches. Order H-78612-47, plastic petroleum (spec. 5694), 8 oz.



Procedure

Clean the switch thoroughly and lubricate following steps a. through e. below:

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

1 Each of the wiper assembly bearings.

2 The interrupter spring buffers, and the armature bushings.

3 The driving spring mounts and coils.

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

4 The ratchet teeth, while the wiper assembly is rotating.

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

5 Every three pairs 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 one dip of watch oil to:

6 The insides of two wipers, at a point near the hub so that when rotated, the lubricated part of the wipers will contact the brushes.

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

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

LUBRICATION INSTRUCTIONS
FOR
THE TYPE 40 AND TYPE 44 ROTARY SWITCHES

LUB-15

The Type 40 and Type 44 Rotary Switches

The type 40 and type 44 rotary switches are stepping switches whose operating magnets may be remotely controlled, or whose wipers may be stepped automatically over the bank contacts by interrupting the magnet circuit through armature operated interrupter springs. The switches have triple-ended wipers which are rotated in one direction only, over a bank of contacts arranged in an arc of a circle. The contact banks have 10 points or 11 points, and may have from one to six levels.

It is recommended that the type 40 and type 44 rotary switches be lubricated at 50,000, 100,000, and 250,000 third-revolutions; and every 500,000 third-revolutions thereafter.

NOTE: For low-temperature lubrication instructions contact Automatic Electric Co., Northlake, Illinois.

Lubricant Measure

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

DIP - A dip is 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.

Types of Lubricants

The following lubricants are recommended for lubrication of the type 40 and type 44 rotary switches:

 a. Blended lubricating oil (spec. 5684). This is essentially a mineral oil blended with an oil having a paraffine base. It is used on pawl pin bearings and armature bearings. Order H-78612-31, blended lubricating oil (spec. 5684), 2 oz.

 b. Watch oil (spec. 5228). This is a highly refined grade of selected fish or sperm oil, bleached, chilled and filtered at low temperature. This oil will not become gummy or corrode metal. It is used for cleaning and lubricating stepping switch bank contacts, wipers and brushes. Order H-78612-30, watch oil (spec. 5228), 2 oz.

 c. Graphite oil lubricant (spec. 5232-C). Graphite oil consists of a blended lubricating oil (spec. 5684) and a deflocculated graphite (concentrated oil)dag. This lubricant is used on ratchets or ratcheted surfaces of rotary stepping switches. Order H-78612-9, graphite oil lubricant (spec. 5232-C), 2 oz.

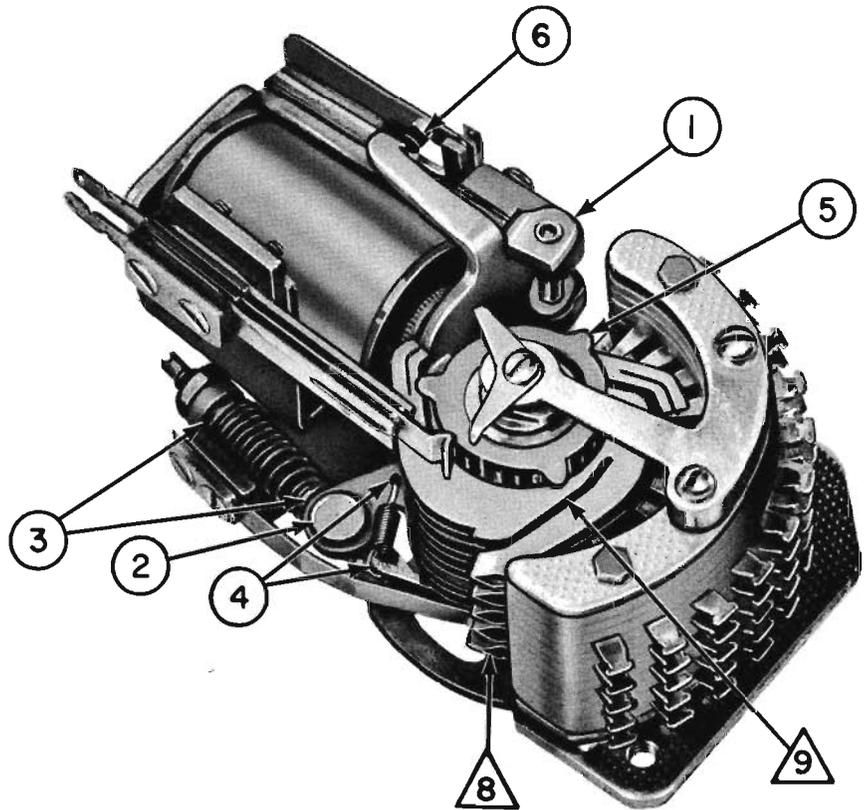
 d. Plastic petroleum (spec. 5694). This is a semi-solid petroleum suitable for certain bearings, such as wiper assembly bearings, of rotary stepping switches. Order H-78612-47, plastic petroleum (spec. 5694), 8 oz.

Procedure

Clean the switch thoroughly and lubricate following steps a. through g. below:

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

 Each of the yoke bearings.



◇ 7 NOT SHOWN

△ 10 NOT SHOWN

b. Apply one dip of blended lubricating oil to:

② The pawl bearing pin, where the pawl and pawl bearing pin contact the armature (on both sides of the armature).

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

③ The driving spring seats and coils.

④ The pawl spring mounting holes and coils.

⑤ The off-normal cam lobes of the indicator wheel.

⑥ The interrupter spring buffers.

Clean lubrication brush.

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

◇ 7 The ratchet teeth, while the wiper assembly is rotating.

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

△ 8 Every six pairs 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 to:

△ 9 Every three pairs of wipers, at some point near the hub 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:

△ 10 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.

LUBRICATION INSTRUCTIONS

FOR

THE OCS RELAY

LUB-17

The OCS Relay

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

The OCS 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).

NOTE: For low-temperature lubrication instructions contact Automatic Electric Co., Northlake, Illinois.

Lubricant Measure

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

DIP - A dip is 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.

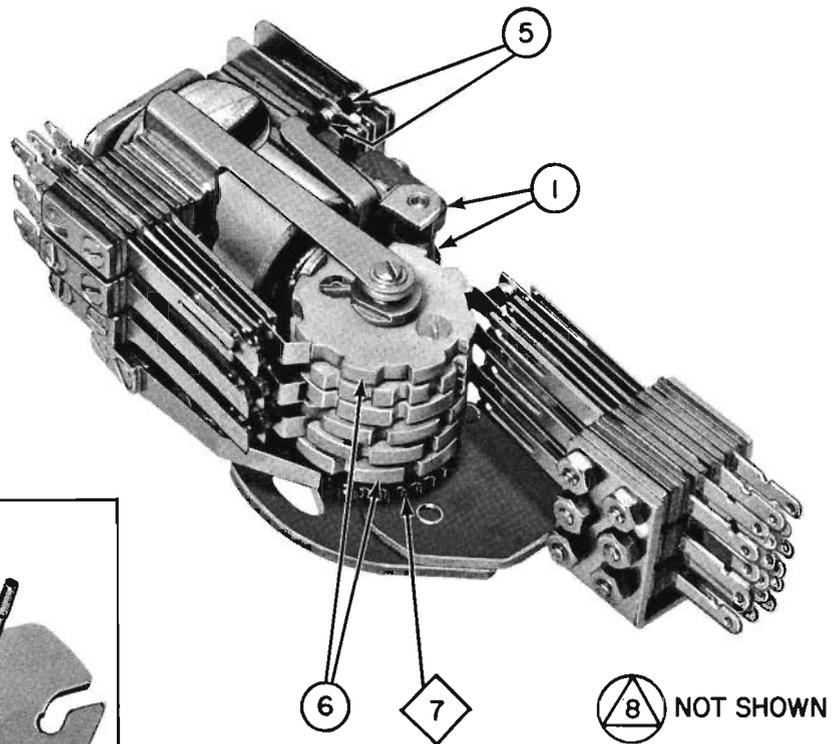
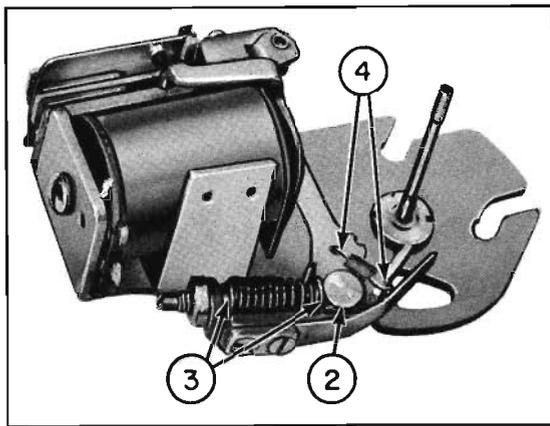
Types of Lubricants

The following lubricants are recommended for lubrication of the OCS relay:

 a. Blended lubricating oil (spec. 5684). This is essentially a mineral oil blended with an oil having a paraffine base. It is used on pawl pin bearings and armature bearings. Order H-78612-31, blended lubricating oil (spec. 5684), 2 oz.

 b. Graphite oil lubricant (spec. 5232-C). Graphite oil consists of a blended lubricating oil (spec. 5684) and a deflocculated graphite (concentrated oil-dag). This lubricant is used on ratchets and ratcheted surfaces of rotary stepping switches. Order H-78612-9, graphite oil lubricant (spec. 5232-C), 2 oz.

 c. Plastic petroleum (spec. 5694). This is a semi-solid petroleum suitable for certain bearings, such as wiper assembly bearings, of rotary stepping switches. Order H-78612-47, plastic petroleum (spec. 5694), 8 oz.



Procedure

Clean the relay thoroughly and lubricate following steps a. through f. below:

NOTE: For low-temperature lubrication instructions contact Automatic Electric Co., Northlake, Illinois.

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

① Each of the yoke bearings (4 places).

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 to the following points:

③ The driving spring seats and coils.

④ The pawl spring mounting holes and coils.

⑤ The interrupter spring buffers.

d. Distribute a thin coat of blended lubricating oil to the following points:

⑥ On 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.

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

⑦ The ratchet teeth, while the wiper assembly is rotating.

f. If the switch is disassembled, proceed as follows:

⑧ 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.

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

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