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ORDNANCE PAMPHLET 1189

TARGET BEARING TRANSMITTER MARK 8

DESCRIPTION AND INSTRUCTIONS FOR USE
INCLUDING PARTS CATALOG



U. S. DEPARTMENT OF ORDNANCE PUBLICATION

27 SEPTEMBER 1944

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NAVY DEPARTMENT
BUREAU OF ORDNANCE
WASHINGTON 25, D. C.

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27 September 1944

ORDNANCE PAMPHLET 1189

**TARGET BEARING TRANSMITTER MARK 8 — DESCRIPTION AND INSTRUCTIONS
FOR USE — INCLUDING PARTS CATALOG**

1. Ordnance Pamphlet 1189 describes the construction, installation, operation, and maintenance of the Target Bearing Transmitter Mark 8.
2. This publication is to be used by operating personnel during instruction and on duty, maintenance personnel ashore and afloat, personnel of installing activities, inspectors, and officers of the Bureau of Ordnance.
3. This pamphlet does not supersede any existing publication.
4. This publication is RESTRICTED and should be handled in accordance with Article 76, U. S. Navy Regulations, 1920.



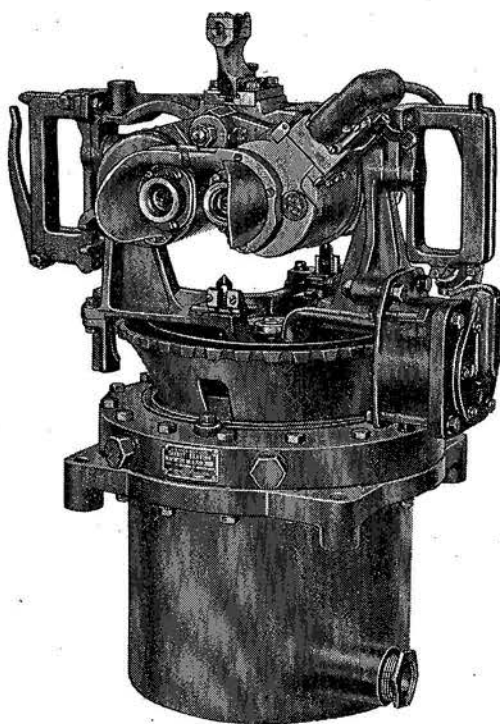
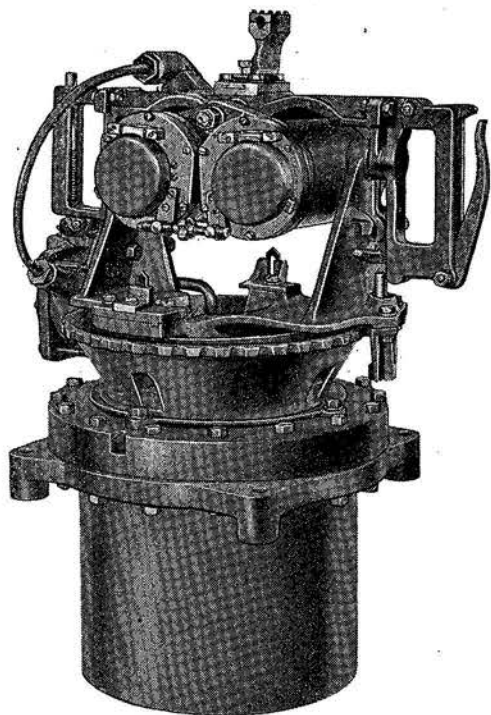
G. F. HUSSEY, JR.
Rear Admiral, U. S. Navy
Chief of the Bureau of Ordnance

CONTENTS

	PAGE
INTRODUCTION	7
DESCRIPTION	9
General Description	9
Table of References	9
Dimensions	9
Principal Parts	9
Standby Features	11
Detailed Description	12
Telescope and Reticle Lamp	12
Cradle and Grips	13
Base and Cover	16
Chassis	16
Brush Holder Assemblies	17
Main Shaft	19
Wiring	19
INSTALLATION	21
Installation on submarine	21
Wiring	22
Checks after Installation	23
OPERATION	25
Operating Instructions	25
Normal Operation	25
Standby Operation	26
Auxiliary Binocular	26
Luminous Sights	27
Dial	28
MAINTENANCE	29
Shipboard	29
Inspection	29
Maintenance	29
Pressure-Proof Telescope	29
Reticle Lamp	29
Latch Lever	29
Leakage	30
Switch	30
Painting	30
Lubrication	30
Submarine Tender or Submarine Base	31
Inspection	31
Maintenance	31

CONTENTS

	PAGE
Telescope	31
Reticle Lamp	31
Right Hand Grip	31
Switch Assembly	31
Left Hand Grip	31
Luminous Sights	32
Cover	32
Shaft Seal Assembly	32
Synchro Generators	35
Chassis	36
Main Shaft	37
Brush Holders	38
Lubrication	38
DISASSEMBLY, REPAIR AND REASSEMBLY	39
Tools Required	39
Telescope and Reticle Lamp	40
Cradle, Grips, and Cradle Bracket	41
Right Hand Grip	41
Left Hand Grip	42
Latch Plunger	43
Cradle	43
Binocular Holder Assembly	44
Luminous Sight (Front) Assembly	45
Luminous Sight (Rear) Assembly	46
Switch Assembly	47
Base and Cover Assembly	51
Cover	51
Dial and Dial Guard	51
Synchro Generators	52
Brush Holders	54
Chassis	56
Main Shaft Assembly	58
Shaft Seal Assembly and Base	60
Storage	62
Test Procedure	62
CATALOG	64
Introduction	64
How to Use the Catalog Section	64
Index to Illustrations	65
Numerical List of Parts	90



Frontispiece.—Target Bearing Transmitter Mk 8

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INTRODUCTION

What it is

It is a synchro type transmitter.

Where it is Used

It is designed for mounting on the open bridge forward or aft of the periscopes on submarines. It is designed to be pressure-proof.

What it Does

It (a) mounts either a pressure-proof telescope or an auxiliary binocular (b) indicates relative bearing on a dial which may be read in daylight or semi-darkness and (c) transmits relative bearing at one and 36 speeds electrically to other parts of the submarine.

How it is Used

The operator sights on a target by rotating the top part of the instrument, which carries the sighting elements, with respect to the base by means of handles. The operator sights through the pressure-proof telescope; over the open sight leaves which are located just under the pressure-proof telescope; or through an auxiliary binocular temporarily mounted. The position of the telescope in azimuth, with respect to the bow of the boat, indicates relative target bearing when the telescope is sighted on a target.

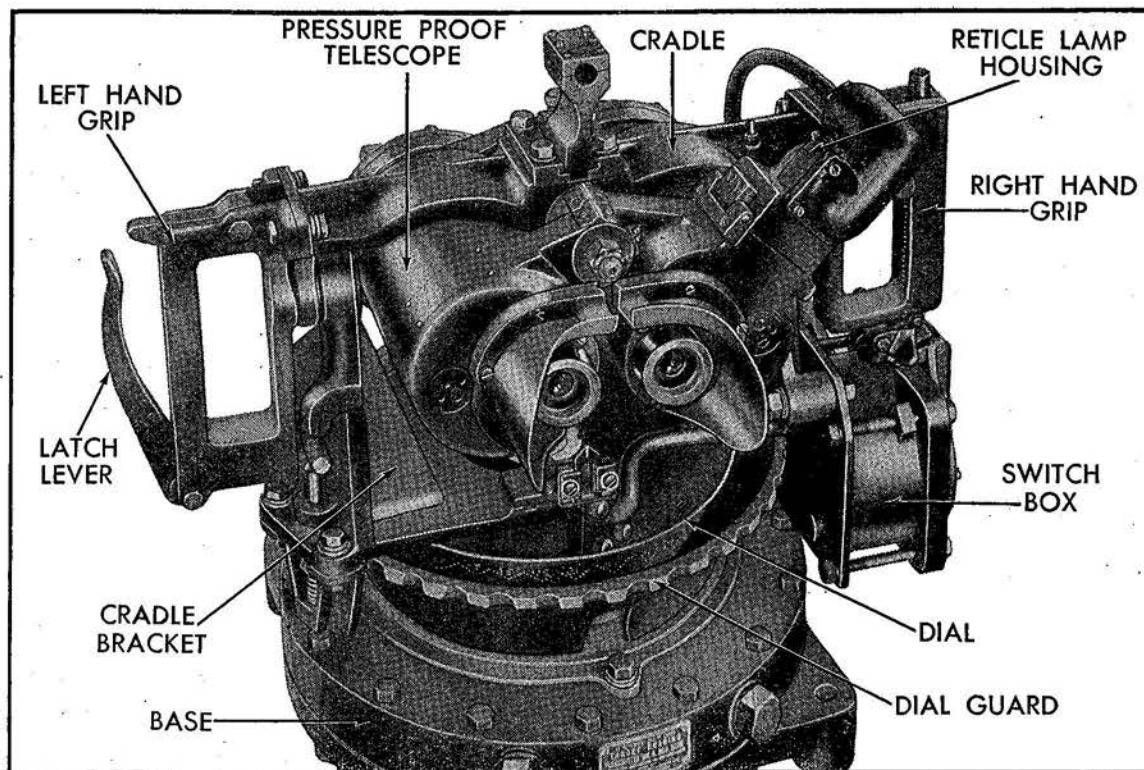


Figure 1.—Cradle and Telescope

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GENERAL DESCRIPTION

Table of References

Target Bearing Transmitter Mk 8

General Arrangement Outline	BUOrd Dwg. 375523
List of Drawings	BuOrd Sk.o. 109056
Synchro Generator Mk 1 (Type 5G)	NAVORD OS671
Switch	BuOrd Dwg. 422275-1
Fuse, Midget Type M1	Navy Spec. 17F2
Transformer	BuOrd Dwg. 422275-2
Telescope (Pressure-proof) Mark 90 Mod. O	BuOrd Dwg. 415245
Methods of Drying and Charging Optical Instruments	Navord OD2847
Reticle Lamp, Navy Type TB-11	BuShips Dwg. 9-S-4222-L
Terminal Tube Size G	BuShips Dwg. 9-S-5235L
Terminal Tube Size B	BuShips 9000-S6202-73187

Dimensions

The instrument is 20.20 inches long, 13.50 inches wide, and 26.20 inches high. Without the telescope it weighs 225 pounds. Telescope Mk 90 Mod O is 11 inches long, 11.50 inches wide, and 6.50 inches high. It weighs 35-1/2 pounds.

Principal Parts (Figure 1 and Figure 2)

The Target Bearing Transmitter Mk 8 consists of a cradle and cradle bracket in which is secured a pressure-proof telescope. Attached to the right side of the cradle is the right-hand grip containing a thumb button for the mark signal circuit. The button makes contact through a linkage with a switch contained in the switch box located beneath the right-hand grip. The connection for the reticle lamp in the telescope is made through this switch box, which contains a small transformer for the lamp circuit. Attached to the left side of the cradle is the left hand grip. This grip contains a double acting latch lever which locks the cradle in elevation through a series of notches in the cradle bracket and in rotation through a plunger contacting a series of notches

in the dial guard. A catch is provided in the left hand grip which is hooked over the latch lever to make it inoperative permitting rotation of the cradle.

The cradle bracket is attached to the main shaft by means of a key and lock nut. The main shaft is hollow and contains three wires from the switch box to three collector rings. Attached to the main shaft are two gears, each of which rotates a type 5G Synchro Generator Mk 1, one at one speed and the other at 36 speed. Contained in the base is a shaft seal assembly which surrounds the main shaft and prevents entrance of water to the internal mechanism. Mounted on the base are a dial guard and a dial which is graduated in degrees. Bolted to the base is a chassis which contains the support bearings for the main shaft, attachment for the synchro generators, three brush holders, and a terminal board for the wiring from the synchro generators. Attached to the base is a cover which contains a terminal tube through which passes a cable containing all wires to the instrument. The cover has four holes used for mounting the instrument.

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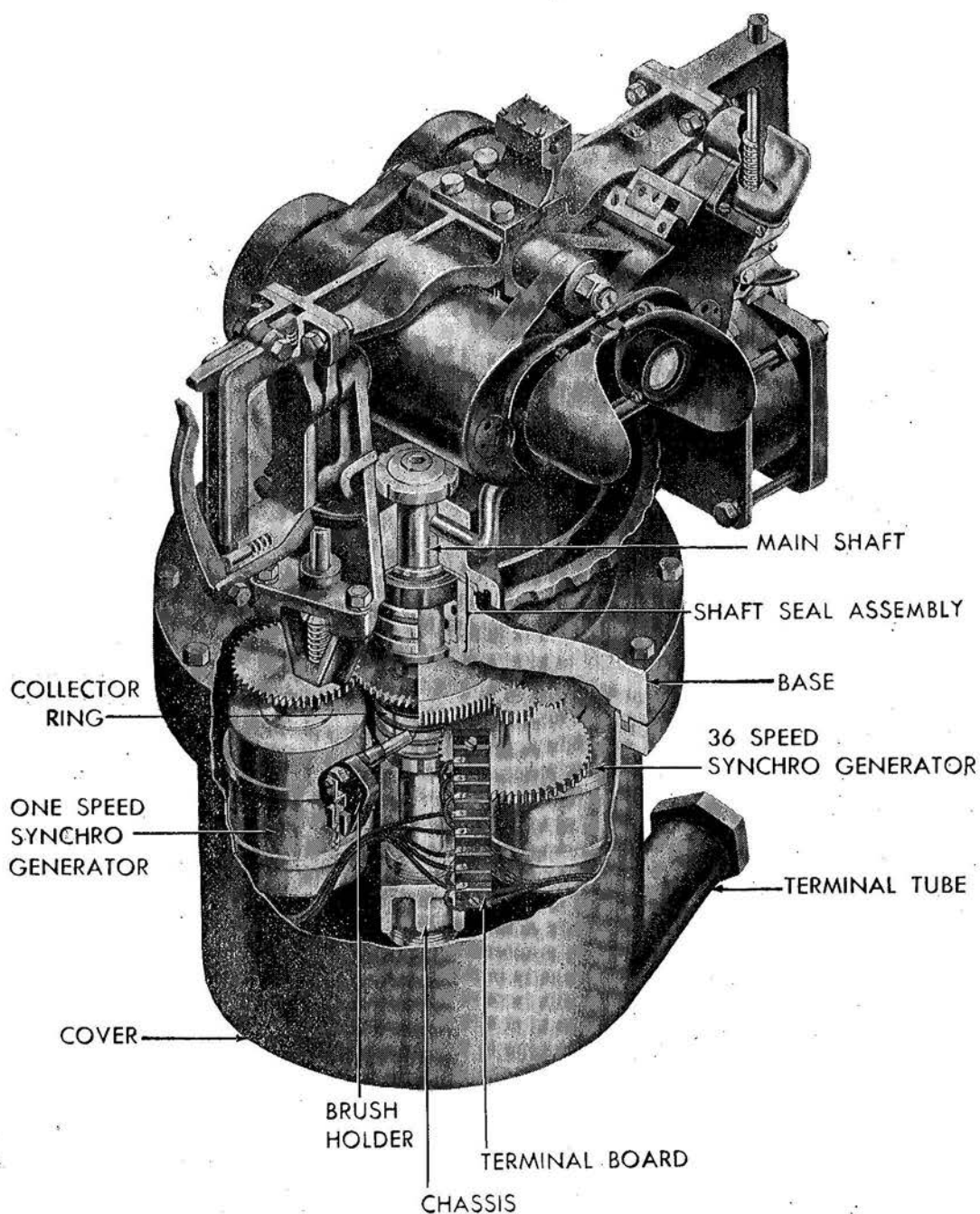


Figure 2.—Cut Away View of Instrument

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Standby Features (Figure 3)

In case the telescope becomes defective, sight leaves are provided on the cradle bracket for lining up the target bearing transmitter with the target. These sight leaves are provided with luminous lines which facilitate operation at night. There is also provided a dial graduated in degrees which is made visible for night operation by means of a luminous capsule placed behind the dial and so

situated that it is convenient for the observer to read the dial.

There is also provided on the top of the cradle a slide to which an auxiliary binocular in a binocular holder can be attached to the target bearing transmitter. This provision has been made so that if the pressure-proof telescope becomes defective and cannot be repaired at sea, the auxiliary binocular can be used with the instrument.

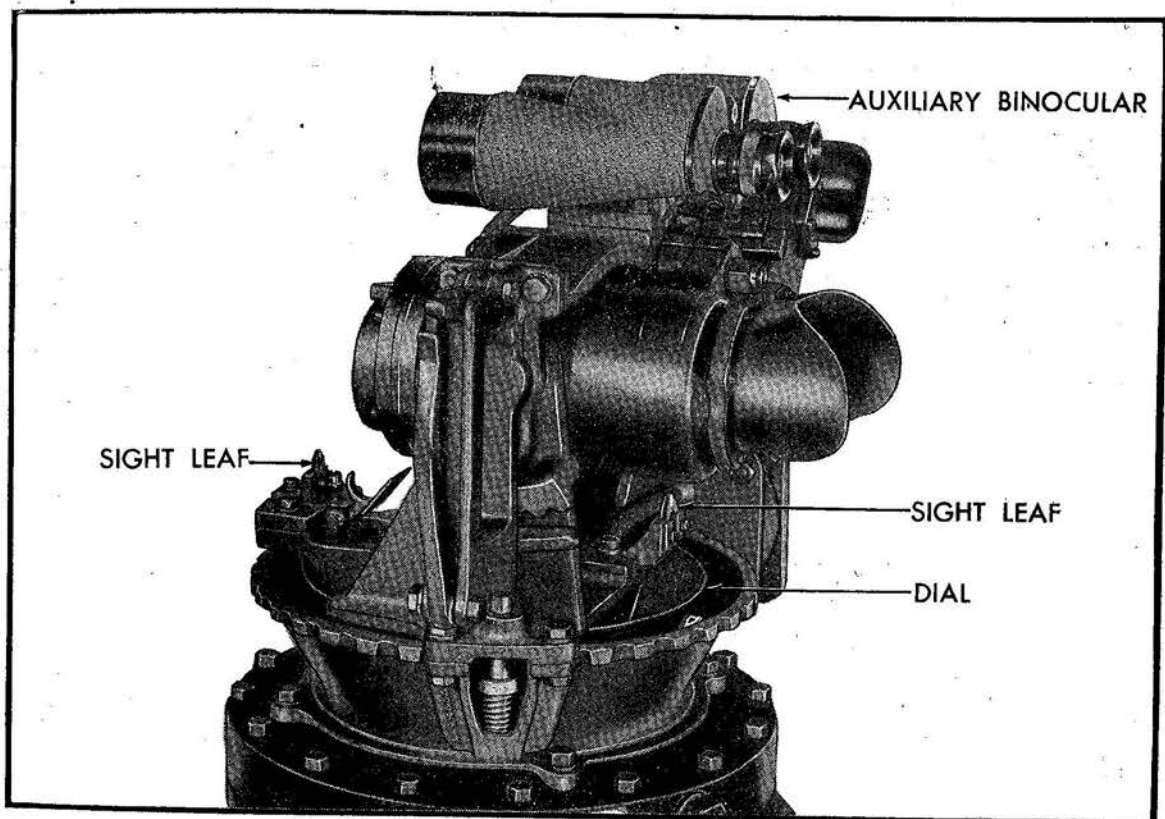


Figure 3.—Standby Features

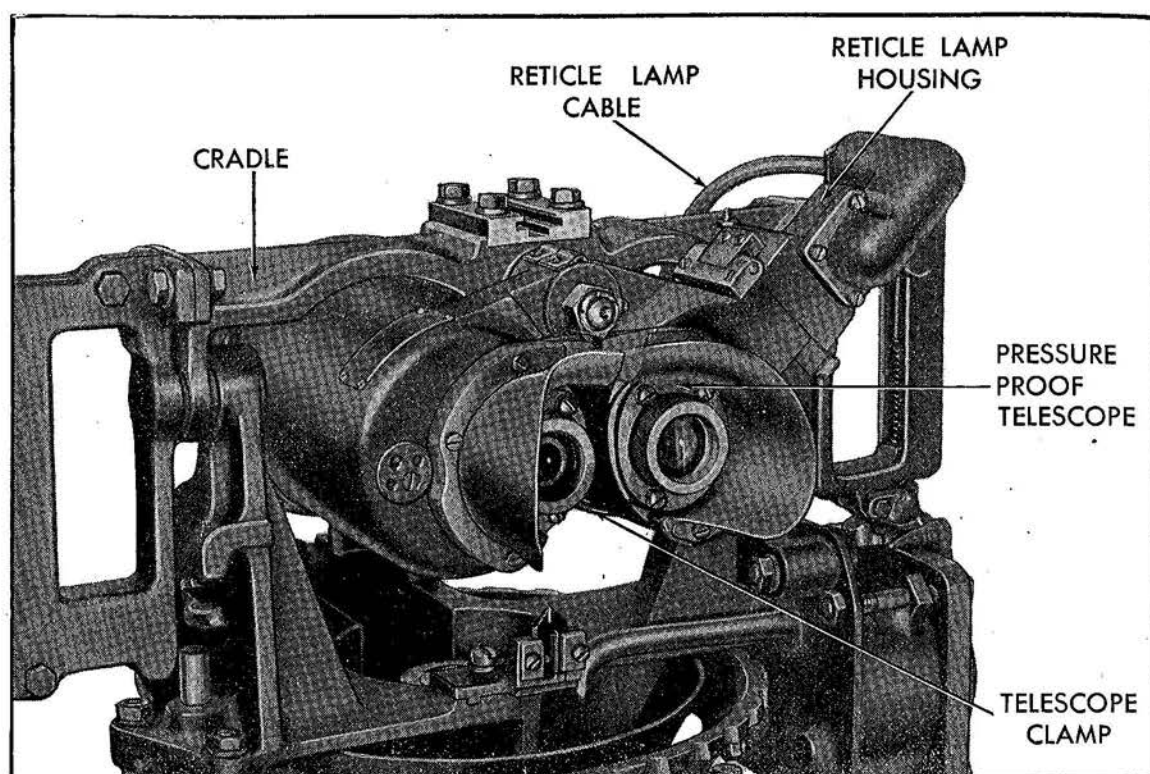


Figure 4.—Telescope and Reticle Lamp

DETAILED DESCRIPTION

Telescope and Reticle Lamp (Figure 4)

The Telescope Mk 90 Mod 0 is permanently mounted and is not a hand held instrument. It has a magnification of seven diameters and has an objective free aperture of 50 millimeters. This gives an exit pupil of 7 millimeters diameter which makes the telescope useful as a night glass. The true field of view is $6^{\circ} 45'$, which is equivalent to 353 feet at 100 yards.

In the right body of the telescope is a cross line pattern consisting of a vertical line and a short horizontal line intersecting at the center of the field. For daytime use the lines appear dark with a light background, while at night the reticle can be illuminated and appears as red lines against a dark background. The level of reticle illumination

may be controlled to suit conditions or may be completely extinguished, as desired, by an adjustable diaphragm located convenient to the right hand grip of the instrument.

The pressure-proof telescope is normally left attached to the cradle at all times. The right body is fastened by means of a clamp to the cradle and the left body is adjustable, giving an interpupillary distance of 56 to 74 millimeters. The screw for adjusting the interpupillary distance is located in front of the telescope. A reticle lamp house attached to the right body of the telescope is so constructed that the lamp may be replaced if necessary. The reticle lamp house is hinged to the telescope so that the two windows providing the path for the light are accessible for cleaning. The lamp is a 0.25 amp., 6-8 volt, Navy type TB-11, bayonet base and has current supplied by

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a transformer located within the switch housing.

A flexible cable connects the reticle lamp to the switch housing going through a terminal tube in both instruments.

For standby operation a 7 x 50 standard Navy binocular should be used. A binocular holder is supplied for permanent attachment to the auxiliary binocular. A snap lock, provided within the auxiliary binocular holder, fastens it to the top part of the cradle. The auxiliary binocular is not used when the pressure-proof telescope is in operation. It may be found expedient to remove the pressure-proof telescope, remove the reticle lamp housing taping it to the cradle bracket and mount the auxiliary binocular mount slide on the underneath side of the cradle after which the auxiliary binocular may be placed in the position of the pressure-proof telescope.

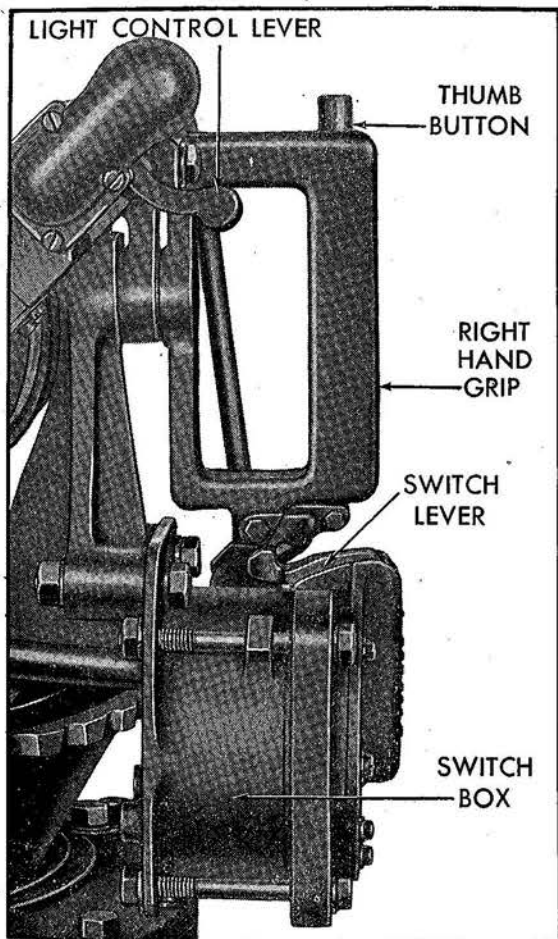


Figure 5.—Right Hand Grip

Cradle and Grips

The right and left hand grips provide the pivots for and the means for holding together the cradle and cradle bracket. The cradle, grips, and telescope may be elevated 20° and depressed 20° with respect to the target bearing transmitter. The cradle, telescope, etc., may be rotated in azimuth indefinitely with respect to the base.

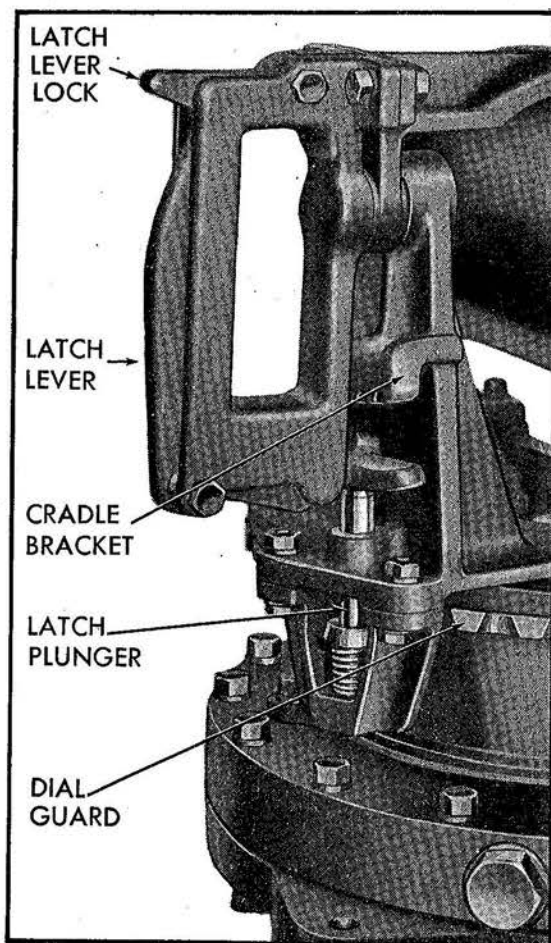


Figure 6.—Left Hand Grip

The right hand grip (Figure 5) contains a thumb button which, by means of a plunger, contacts a lever in the switch box, actuating a small switch for signal purposes. The plunger is returned by a spring located within the grip. The left hand grip (Figure 6) contains a latch lever which in normal operation of the target bearing transmitter

is locked in inoperative position by means of the latch lever lock located on the left hand grip. The latch lever, when released by lifting the latch lever lock, is forced by spring pressure into one of a series of notches on the cradle bracket, preventing rotation of the cradle in elevation. At the same time a latch plunger is released which, by means of spring pressure, forces a tapered collar into one of a series of scallops located on the dial guard, preventing further rotation in azimuth.

Attached to the cradle bracket and located beneath the right hand grip is a switch box assembly (Figure 7). When the switch lever, operated by the push button on the right hand grip, is depressed, the copper diaphragm is flexed sufficiently to permit a small lever on the inside of the switch box to actuate a switch. A rubber gasket and cover ring surrounding the copper diaphragm prevent entrance of water.

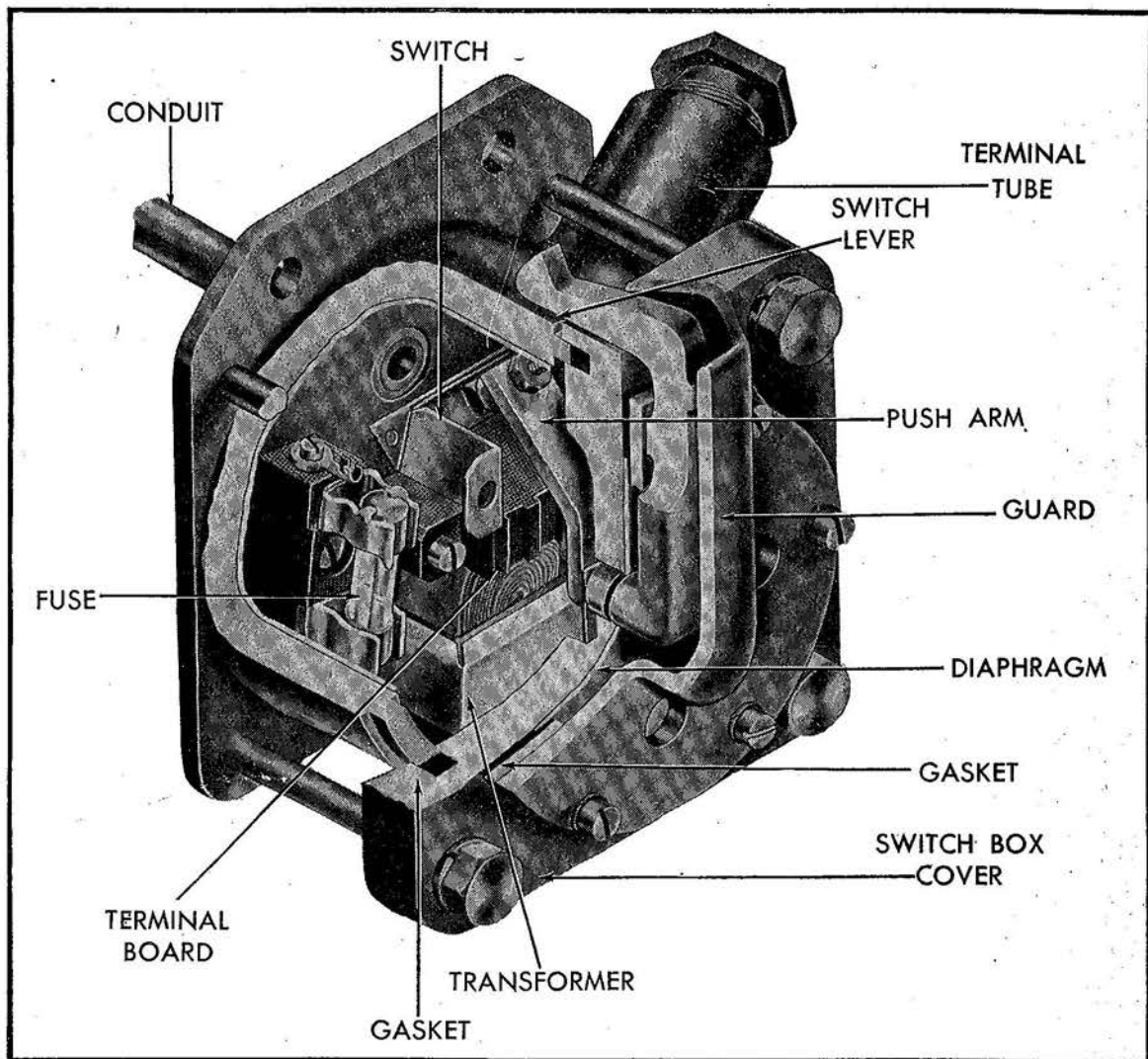


Figure 7.—Cut Away View of Switch Box

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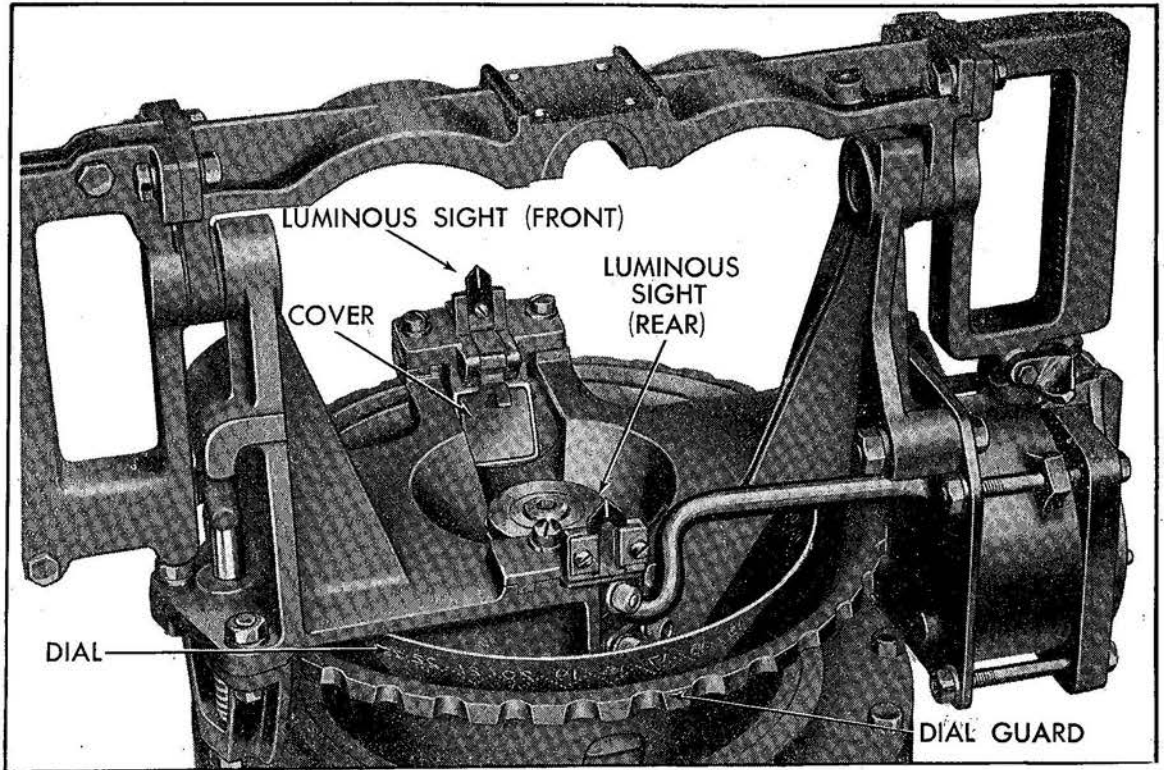


Figure 8.—Luminous Sights and Dial

Upon release of the switch lever, the copper diaphragm returns the lever to its inoperative position, breaking the connection within the switch which also contains a small spring return for the switch plunger. On later units, an auxiliary spring helps return the diaphragm to its central position. A guard is provided surrounding the switch lever. Located within the switch box is a terminal board for connection of wires and also a small block to which is attached two clips for a fuse. The fuse is in series with the transformer which supplies current for the reticle lamp. Three wires run through a conduit into the main shaft to three

collector rings provided for electrical connection purposes.

Attached to the front of the cradle bracket is a luminous sight assembly (Figure 8). This consists of a transparent plastic pointer with a luminous line. Part of this assembly is a luminous capsule which rotates in back of the dial, illuminating the numbers and graduations on the dial. A transparent plastic window containing a luminous line and also a cover for protection of these items are a part of this assembly. The cover is raised whenever the dial is used. A transparent plastic pointer with a luminous line is also attached to the rear of the cradle bracket.

Base and Cover

The base consists of a circular piece of steel 13 inches in diameter and approximately 2.5 inches thick. Contained within the base is a shaft seal assembly (Figure 9) consisting of a seal with a garter spring and two "O" ring seals. A pin in the upper bearing which contains the two "O" ring seals prevents rotation in the base. A grease fitting which is provided in the base is connected to a passage for the purpose of forcing grease to the garter spring seal.

Attached to the top of the base are a dial and dial guard which are located in their proper positions by means of dowel pins. Bolted to the base by means of 16 bolts and nuts is a cover providing protection from damage and sea water to the internal mechanism. A large rubber gasket located in a groove in the cover provides the seal between the base and cover. The cover contains four 17/32-inch diameter holes for mounting purposes.

Chassis (Figure 10)

The chassis is a bronze casting bolted to the base by means of five bolts. Dowel pins locate the chassis with respect to the base. The chassis provides the lower bearing for the main shaft and is provided with thrust bearings for the support of the shaft. The chassis contains a gear cluster consisting of a shaft and two gears positioned by

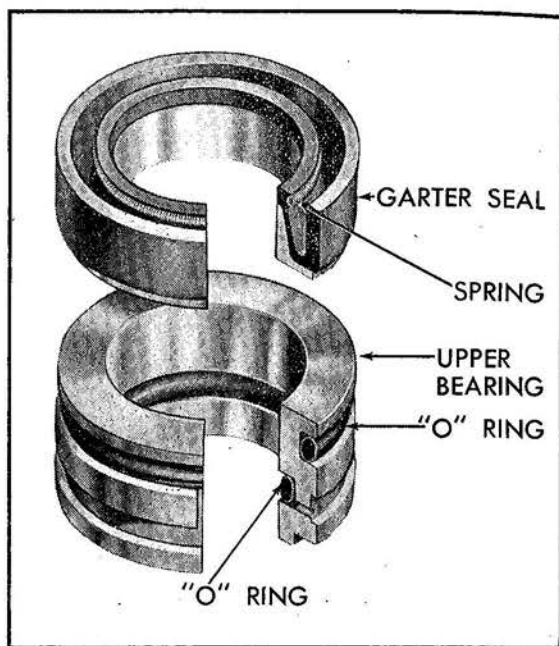


Figure 9.—Shaft Seal Assembly

means of a collar and pin, which serves as a gear train for the 36 speed synchro generator. Bolted to the chassis is a terminal block for connecting the leads to the synchro generators. A drain tube is provided, which takes any water which may have entered past the shaft seal and spilled over the shield and conveys it into the inside portion of the cover away from the electrical equipment.

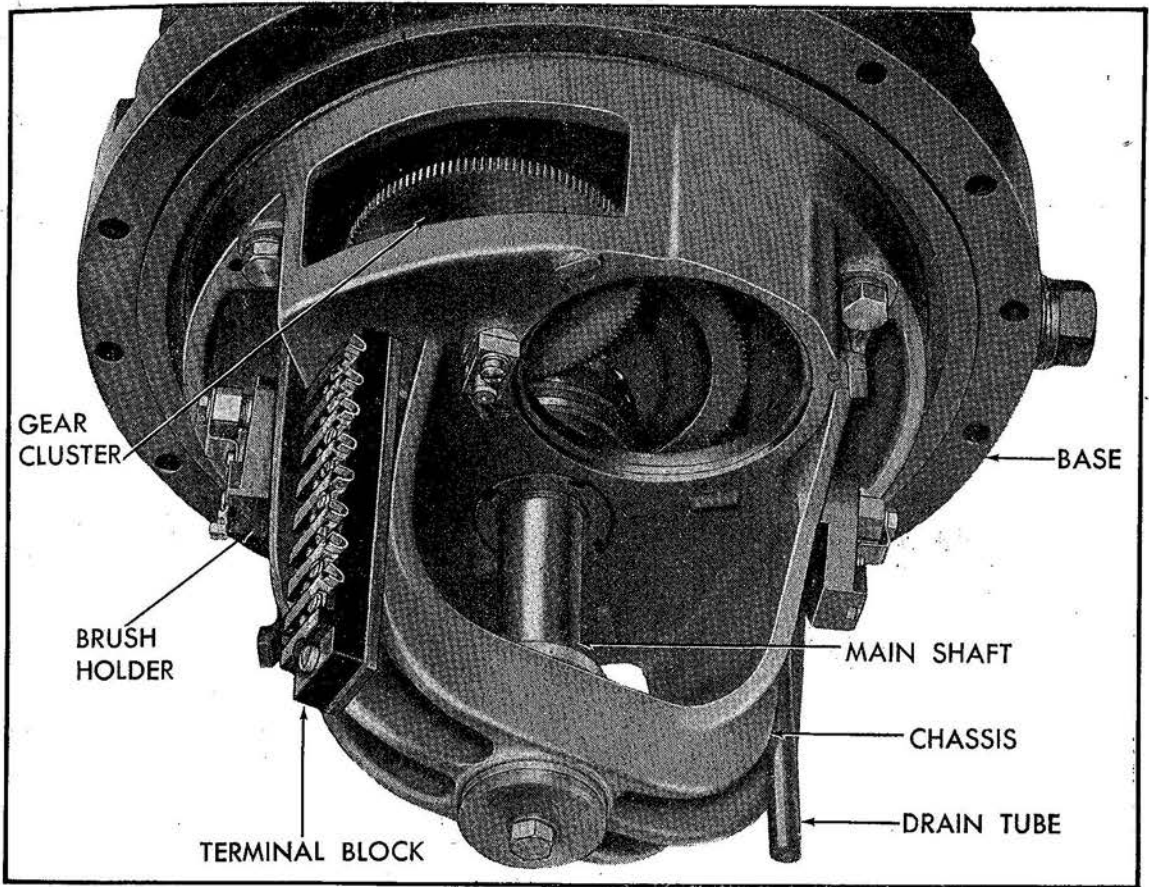


Figure 10.—Chassis, Main Shaft, and Base

Brush Holder Assemblies (Fig. 11)

There are three brush holder assemblies, each fastened to the chassis by means of two screws. Each brush contacts a collector ring fastened to the main shaft. Each brush holder assembly consists of a plastic piece with a tube through which a brush slides. The brush is kept in contact with the collector ring by means of an internal spring.

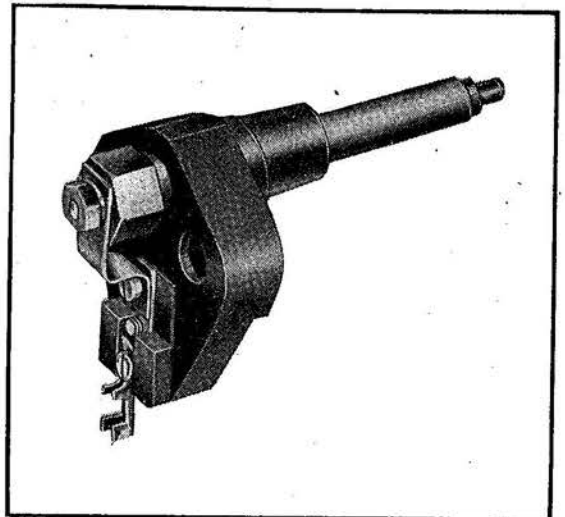


Figure 11.—Brush Holder

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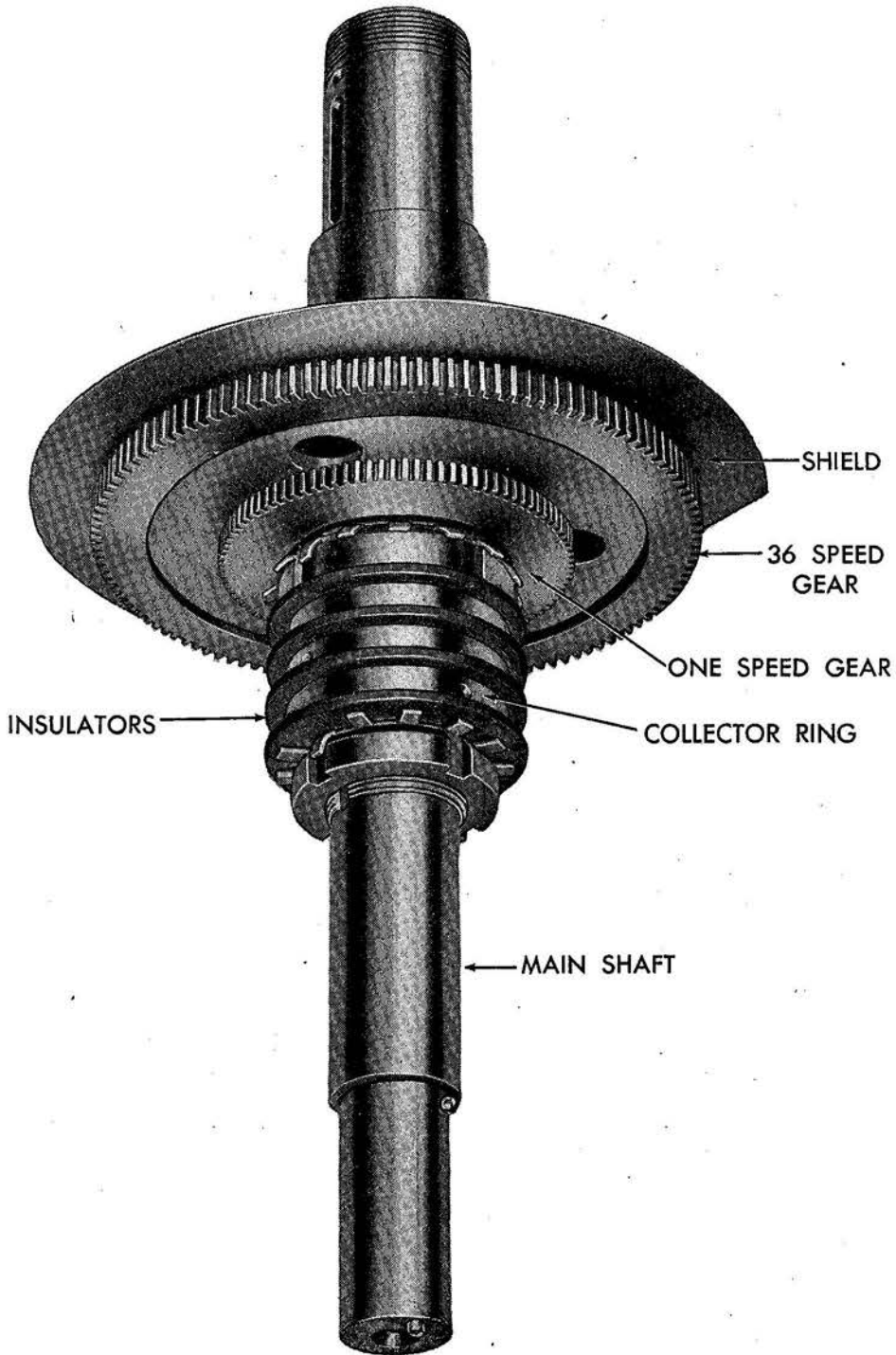


Figure 12.—Main Shaft Assembly

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Main Shaft (Figure 12)

The main shaft extends through the shaft seal assembly and has fastened to its upper end the cradle bracket by means of a key, lock washer, and nut. The lower end of the main shaft rotates in a bushing in the chassis. The shaft is prevented from endwise movement by a step upon the shaft and by a bolt with washer at the lower end. An upper bearing is provided in the base which also contains two grooves for the "O" ring seals.

Mounted below the shield are two gears which are kept from rotating upon the shaft by a key. They are held in position against a shoulder on the shaft by a lock washer and nut. These gears drive the synchro generators.

Located below the gears are three collector rings connected through drilled holes in the shaft to the wires from the switch box (Figure 13). The wires are soldered directly to the slip rings. Electrical insulation is provided by insulators upon which the collector rings are mounted. A key in the shaft prevents the support pieces from rotating. The collector rings are held in position against a shoulder on the shaft by means of a lock washer and nut.

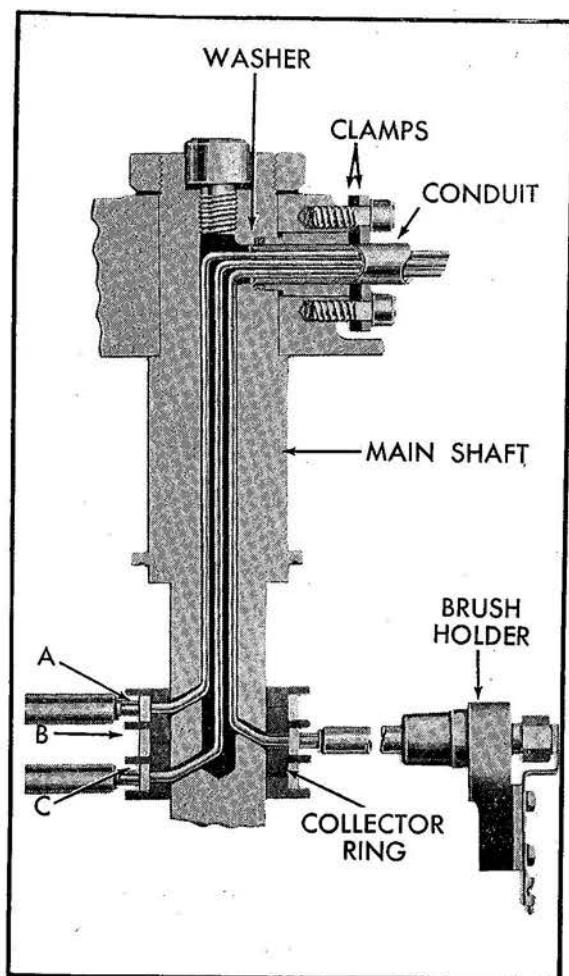


Figure 13.—Cut Away View of Main Shaft with Wiring

Wiring

The wires for the synchro generators run to a terminal block fastened to the chassis, and the wires to the collector rings run directly to the brush holders. The cable used is 14-wire flexible type. Eleven wires are active and three are spares. For the wiring diagram, see Figure 14.

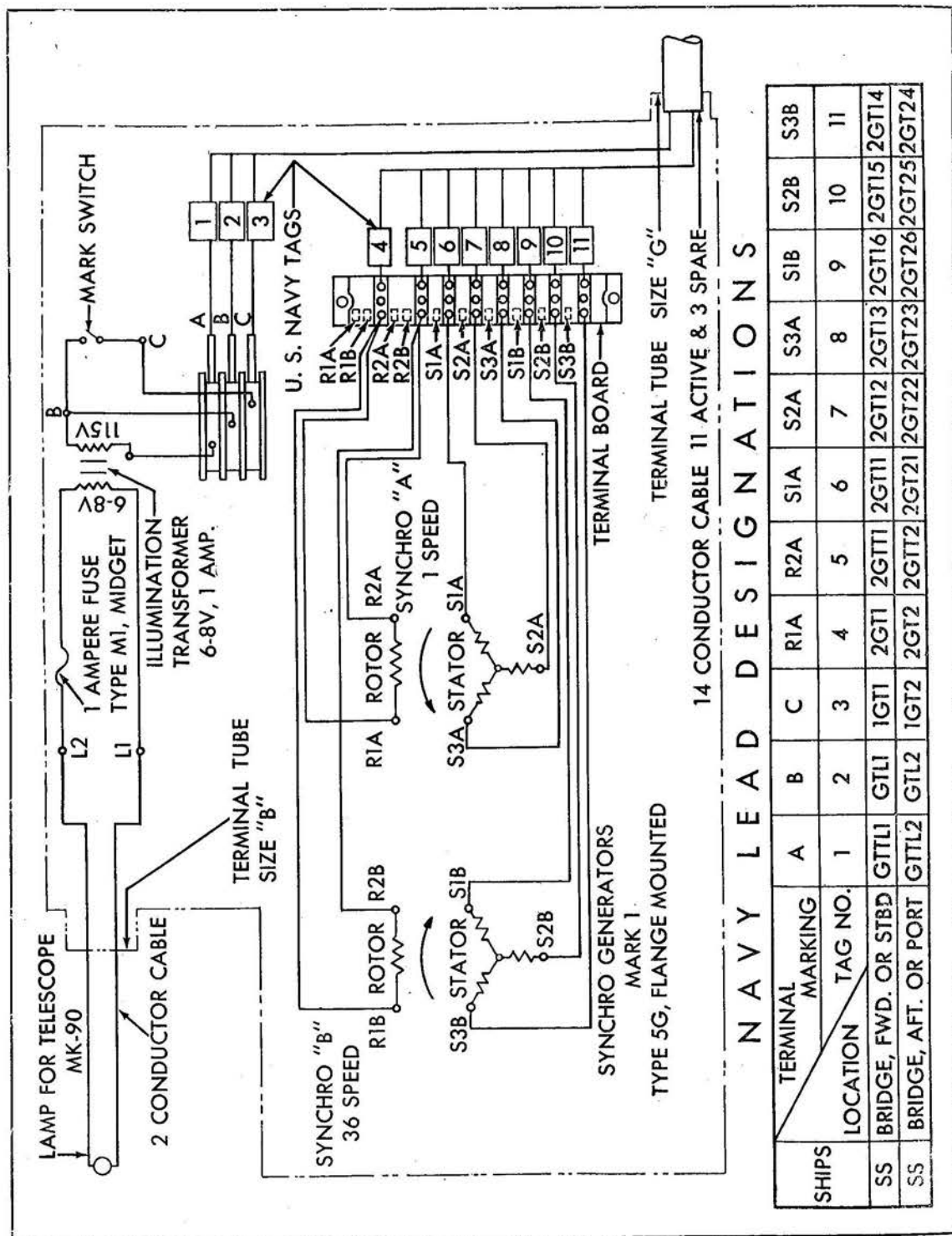


Figure 14.—Wiring Diagram

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INSTALLATION ON SUBMARINE BRIDGE

The pressure-proof telescope may be attached to the instrument when received, or it may be shipped separately and assembled to the target bearing transmitter at place of installation.

If the pressure-proof telescope is shipped separately, the following procedure is used to install the telescope on the instrument.

1. Remove the nut and washer from the end of the telescope strap.

2. Remove the four bolts that hold the cradle cap to the cradle.

3. Remove the two screws holding one of the interpupillary adjusting screw brackets to the telescope (see Figure 15).

4. Remove the two screws holding the rear interpupillary gage to the telescope (see Figure 15).

NOTE: This is necessary to prevent damage to the interpupillary scale pointer when the two bodies are spread apart.

5. Open the two bodies sufficiently to permit insertion of the cradle cap.

NOTE: Telescope strap must be around right body of the telescope.

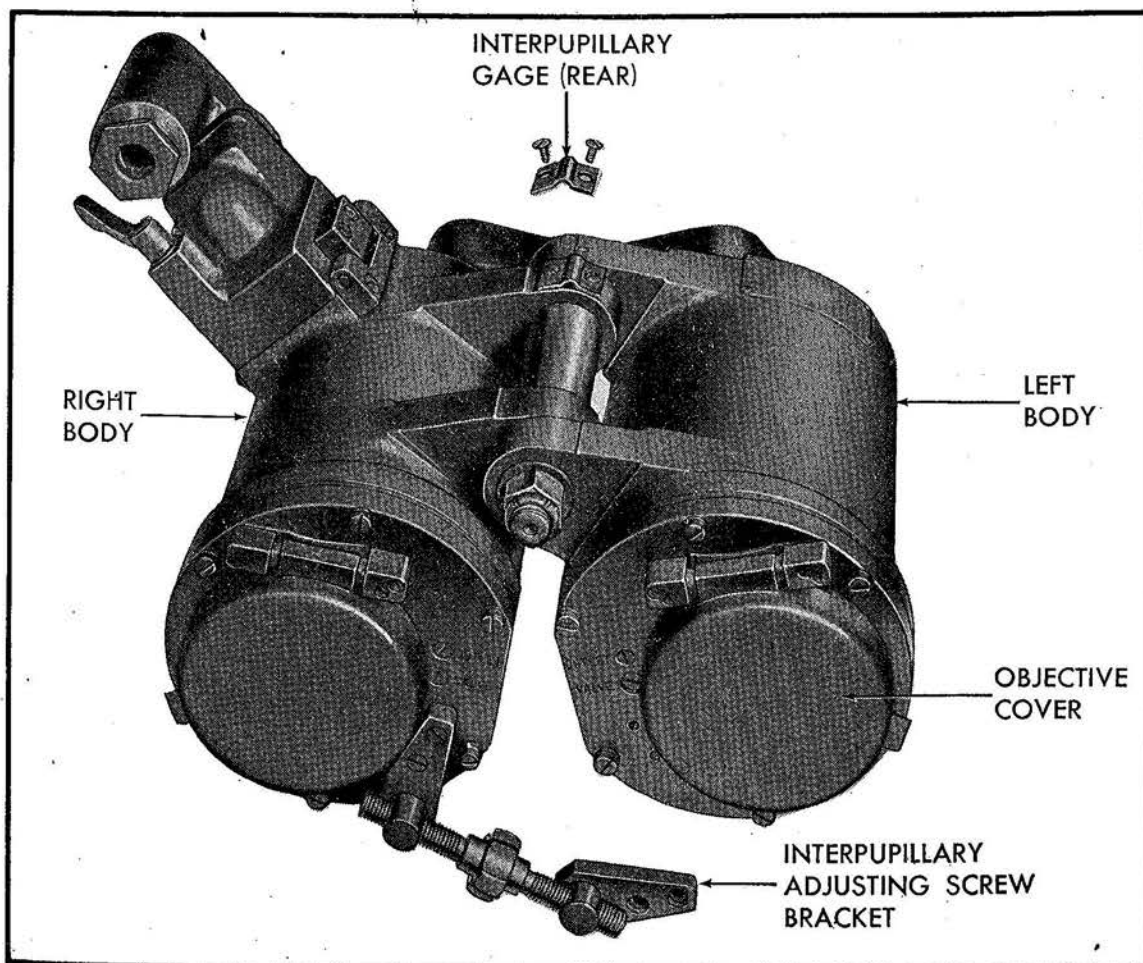


Figure 15.—Telescope Prepared for Installation

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6. Close the bodies together and replace the interpupillary adjusting screw bracket and the interpupillary gage.

7. Insert the telescope into its place on the instrument and insert the four bolts with washers that clamp the cradle cap to the cradle.

8. Insert the threaded end of the telescope clamp into its hole in the cradle and fasten with lock washer and nut.

9. Hold the right body of the telescope up to its pad on the cradle and tighten the nut on the telescope strap.

Set the hand grips on zero position and release the latch lever so that the instrument is locked against rotation. Sight through the telescope upon a predetermined object on the bow of the submarine, turning the target bearing transmitter until the cross hairs in the right body line up correctly on this sighting point.

NOTE: The hand grips must remain in locked position to prevent rotation in azimuth.

Clamp the target bearing transmitter in this position with a large clamp, and drill two holes for the taper pins. Ream taper pin holes and insert two Number 4 Standard taper pins. Mark the holes for the four attaching bolts. Drill the four holes and insert the four attaching bolts and any spacers necessary in order to position the instrument at the correct height. Check the alignment of the instrument through the telescope upon the

predetermined sighting point and, if necessary, relocate.

When installing the target bearing transmitter in the aft position on the submarine bridge, the same method is used as when installing the fore position, with the exception that the hand grips are set upon 180° instead of 0°.

WIRING

When the instrument is received in the assembled condition and the hand grips are placed upon the zero position, the terminal tube on the cover is to the right. It may be found advantageous on certain submarine installations to have this terminal tube in a different position with respect to the bridge mounting. In order to do this, the cover will have to be removed from the base and rotated a desired amount, after which the bolts and nuts, with accompanying washers, are reinserted and tightened. A 14-conductor flexible cable is used. Eleven wires are active and three are spares. The 16 bolts and nuts holding the cover to the base are removed. Lift the base and attached parts free of the cover and lay it on its side on the submarine bridge. Insert the cable through the terminal tube in the cover, with approximately 15 inches of cable extending inside the cover, or sufficient to make connections to the electrical fittings within the instrument. Vulcanize the rubber washer in the proper place on the cable. Tighten the gland nut on the gland ring which provides the seal between the cable and cover. Connect the synchro leads to their corresponding screws on the terminal board attached to the chassis, and connect the wires to their respective brush holders. Reassemble the base and the attached parts to the cover, carefully coiling the excess cable within the bottom of the cover. Reinsert the 16 bolts, washers, and nuts holding the base to the cover; and tighten with a torque wrench. Torque is not to exceed 25 foot-pounds. Figure 14 shows the wiring diagram. See also figure 13 for the designation of the three collector rings.

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The reticle lamp will have to be wired to the switch box. Remove the reticle lamp housing from the pressure-proof telescope and disassemble the component parts (see Figure 16).

NOTE: Discard the short length of cable furnished by the manufacturer.

Insert a two conductor flexible cable into the lamp housing with vulcanized rubber washer in place and connect to the reticle lamp base. Reassemble and replace the reticle lamp housing on the telescope and tighten the terminal tube gland nut. Remove the cover of the switch box and insert the cable into the terminal tube leaving enough slack so that the hand grips can operate throughout their entire range in elevation. Another gland ring will have to be vulcanized in place. For complete instructions, see Bureau of Ships Drawing Number 9000-S6202-73187. Connect the wires from the cable to the terminal block of the switch box. Replace the switch box cover. Tighten the attaching bolts. Tighten the gland nut on the terminal tube of the switch box.

CHECKS AFTER INSTALLATION

Check the electrical instruments in the submarine while operating the target bearing transmitter to see that the synchro repeaters are operating satisfactorily and wired correctly. It may be necessary to disassemble the target bearing transmitter in order to make proper connections.

Check the operation of the reticle lamp. If any trouble exists, correct it. See Maintenance, page 29.

Check the operation of the switch by depressing the thumb button on the right hand grip to see

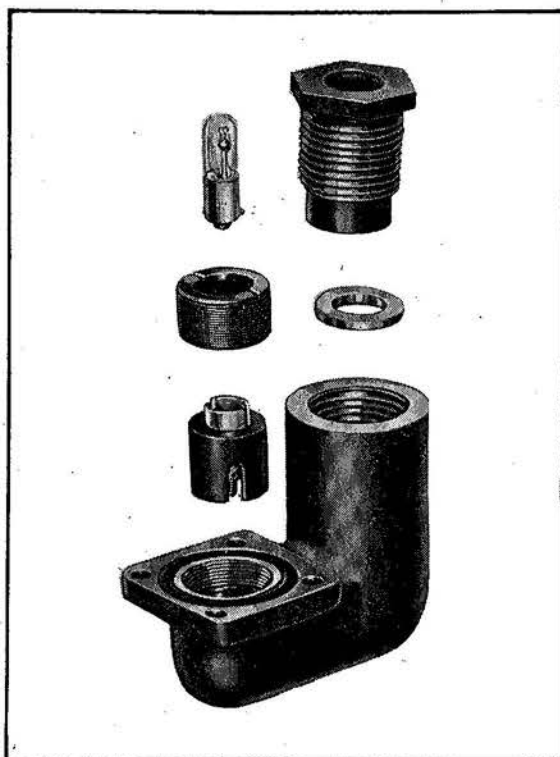


Figure 16.—Reticle Lamp Housing Parts

that it operates properly. If any trouble exists, correct it. See Maintenance, page 30.

Check the attaching bolts between the base and cover to see that they are tight.

Check the six screws that attach the guard to the switch box for tightness.

Check the tightness of the four screws that hold the conduit from the switch box to the cradle bracket.

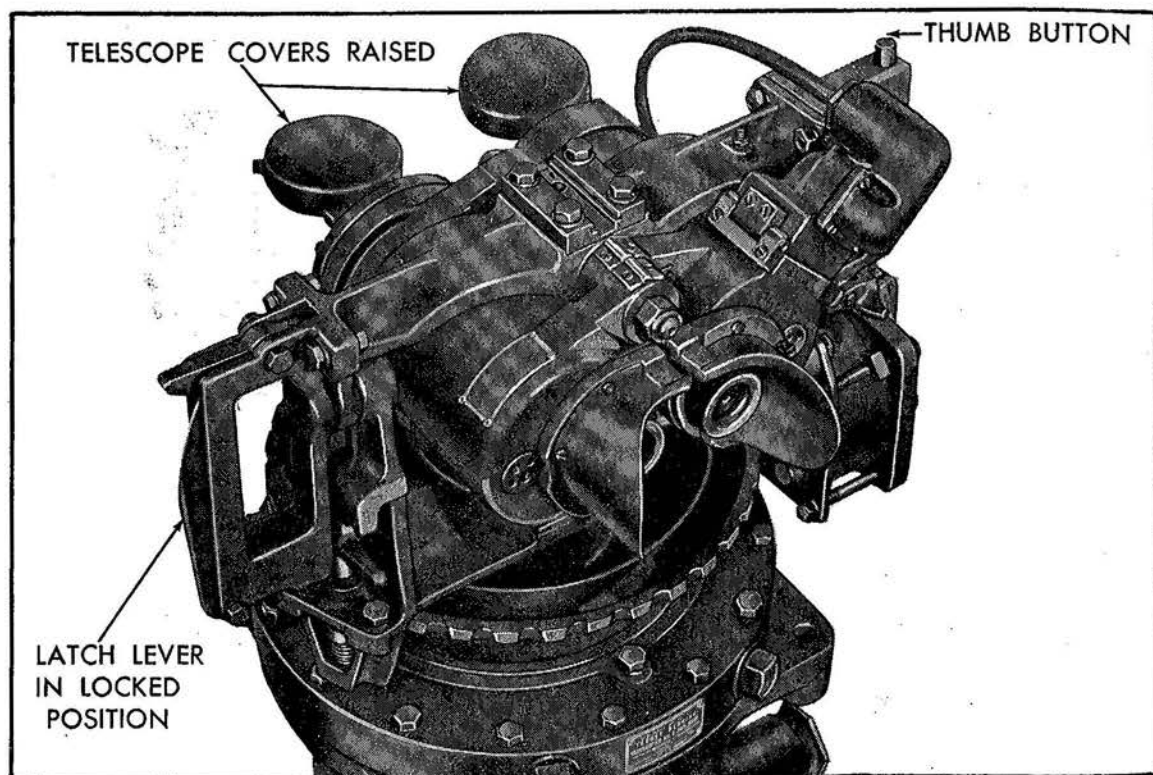


Figure 17.—Instrument Prepared for Use

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OPERATING INSTRUCTIONS

Normal Operation

The operator unlocks the Target Bearing Transmitter Mk 8 by pushing in the latch lever on the left hand grip until it is locked by the latch lever lock (Figure 17). The operator raises the telescope covers. Then by grasping hand grips, the operator can rotate the top part of the instrument in both azimuth and elevation. The instrument is lined up on the target, and the operator indicates that he is on the target by depressing the thumb button located in the right hand grip.

NOTE: It may be necessary to adjust the interpupillary distance of the telescope to suit the operator by means of the interpupillary adjusting screw. A light control lever is provided adjacent to the right hand grip for the reticle lamp, which can be used to regulate the intensity of the reticle or cut it out completely. Water may be trapped between the reticle lamp housing and the telescope body. The water can be released and the two windows cleaned by opening the snap lock at the base of the reticle lamp housing and swinging it upward.

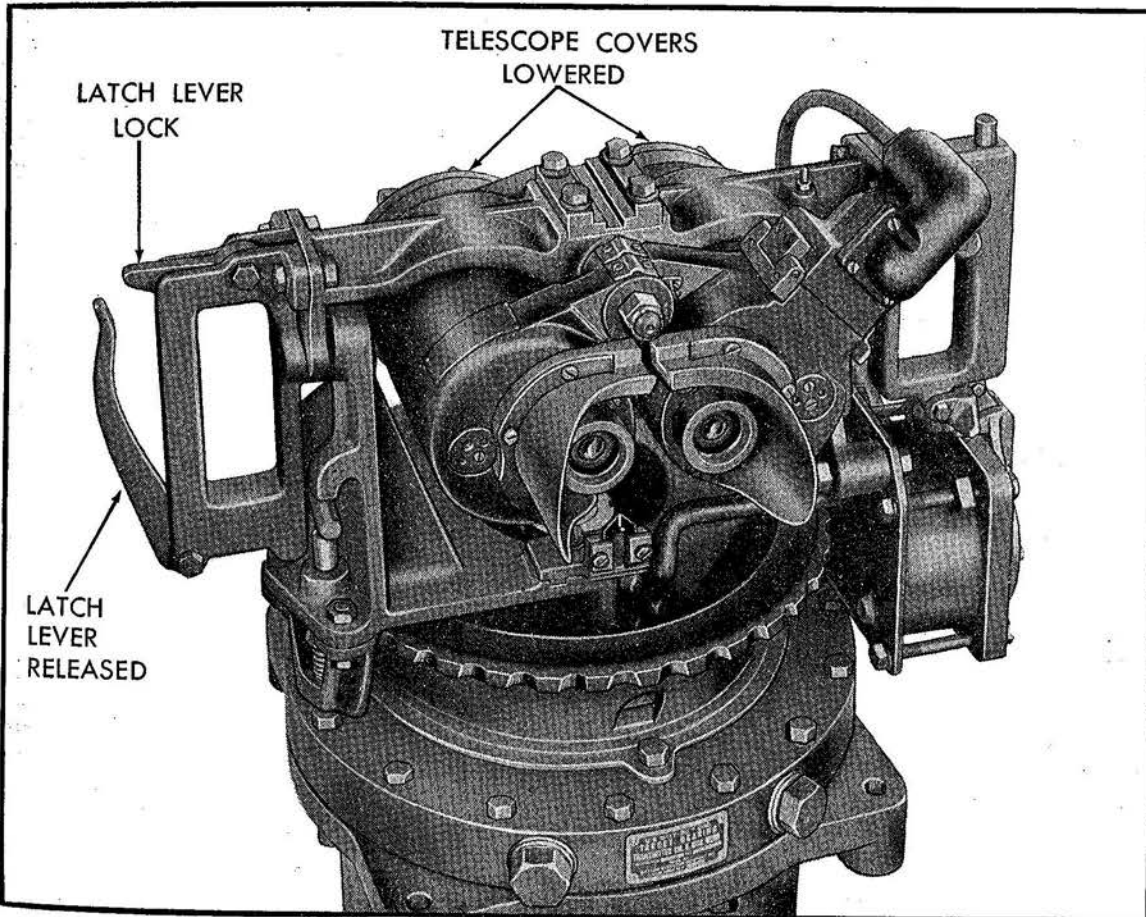


Figure 18.—Instrument Prepared for Submerging

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Before submerging or when securing the instrument, the operator should raise the latch lever on the left hand grip which releases the latch lever, locking the instrument in rotation and elevation. The covers on the front of the telescope should be lowered (see Figure 18). No further precautions need be taken before submerging.

Standby Operation

Auxiliary Binocular (Figure 19)

The auxiliary binocular is placed in position by inserting the auxiliary binocular holder with binocular attached into the grooved slot provided on top of the cradle. A snap lock seats in a depression in the slide. Using an auxiliary binocular, the grips and the rest of the instrument are used in the conventional manner.

If prolonged use of the auxiliary binocular is found necessary, it may be found advantageous to detach the reticle lamp housing from the pres-

sure-proof telescope. This will prevent the flexible cable from being broken. Do not remove cable from the terminal tubes. Tape the cable and lamp housing to the cradle. Remove the pressure-proof telescope. Interchange the positions of the slide and pivot on the cradle. Insert the auxiliary binocular into the slide, which now rests on the lower portion of the cradle. Place the auxiliary binocular in a position relative to that position where the pressure-proof telescope was located (see Figure 20). It will be necessary to remove the auxiliary binocular before submerging. To remove the auxiliary binocular from engagement with the slide on the cradle, pull the plunger operating knob. Then the auxiliary binocular with its auxiliary binocular support may be removed as a unit.

NOTE: It is always necessary to remove the auxiliary binocular before submerging.

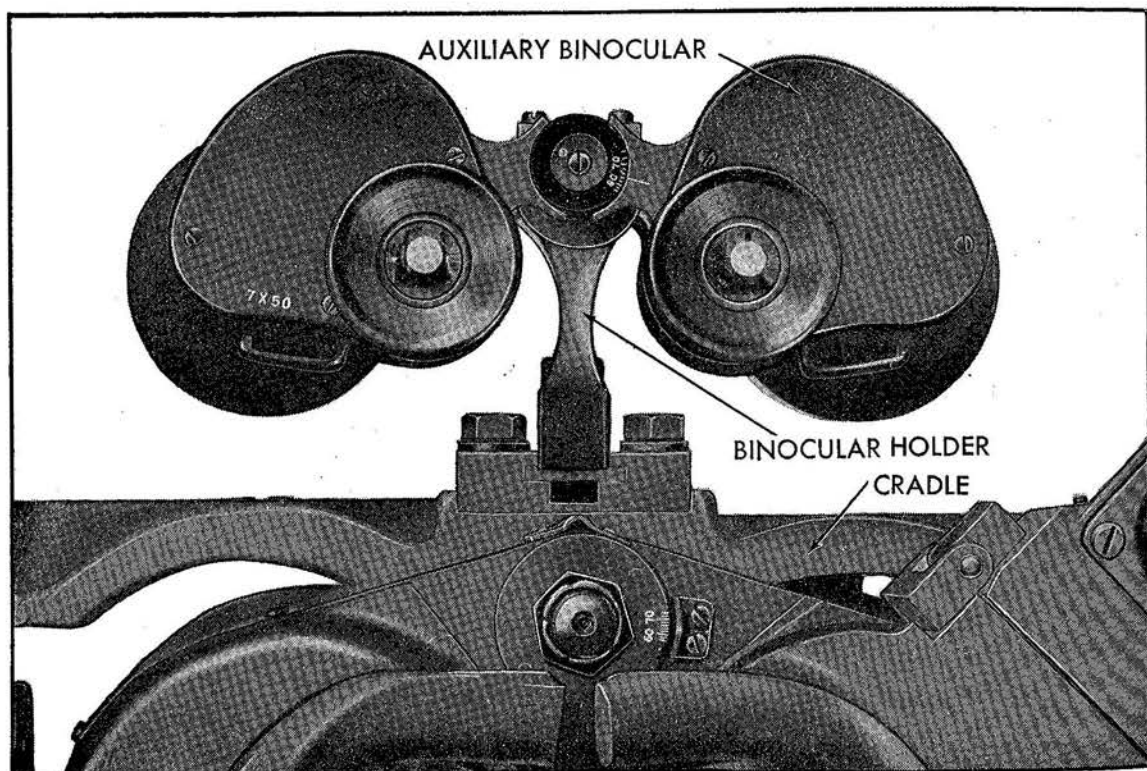


Figure 19.—Auxiliary Binocular on Instrument

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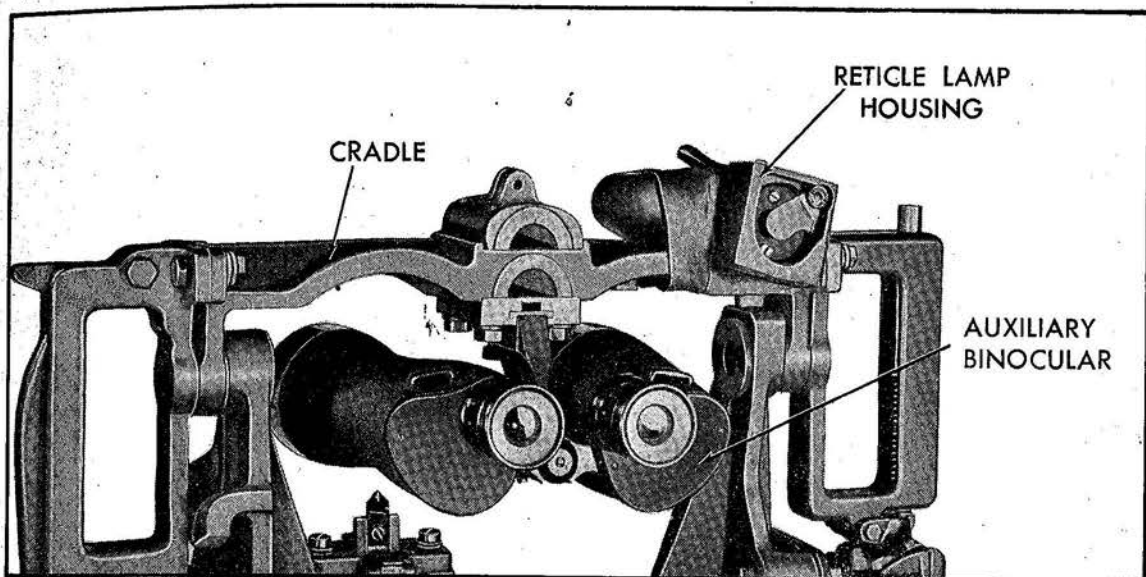


Figure 20.—Auxiliary Binocular in Place of Pressure-Proof Telescope

Luminous Sights

Front and rear luminous sights are mounted upon the cradle bracket. To use them, the operator sights along the two sights until he is lined up on the target.

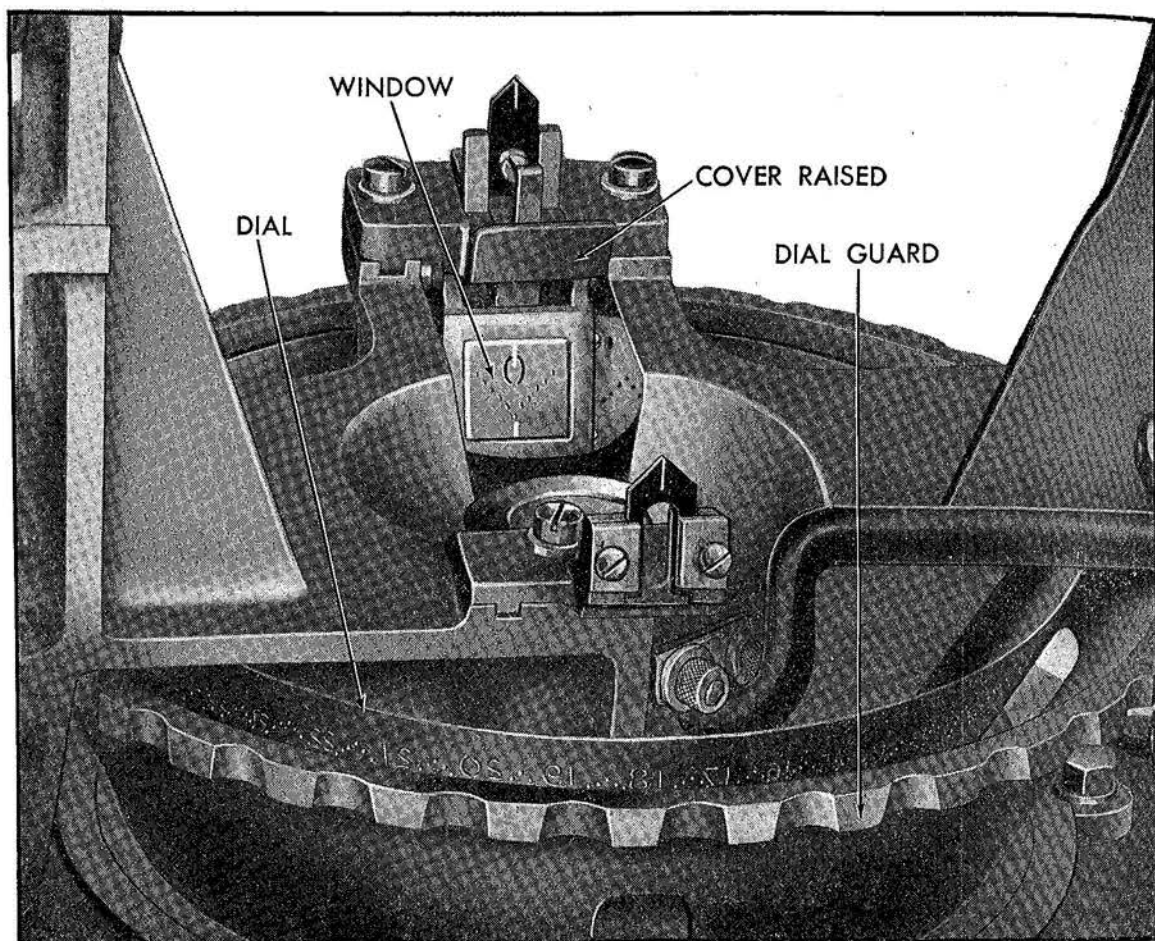


Figure 21.—Dial and Window

Dial (Figure 21)

A dial is provided which is mounted upon the base. A luminous capsule, carried by the cradle brackets, rotates between the dial and dial guard. A transparent window with inserted luminous lines, placed in front of the dial, facilitates night operation. A snap cover is provided to protect the luminous material from sunlight, which causes it

to deteriorate. When using the dial, it will be necessary to raise the protecting cover, after which the degrees may be read through the transparent window. The numerals are given on the dial for each ten degrees, and the small holes provide one-degree readings. The holes are so placed in the dial that the upper points indicate five-degree divisions and the down points indicate ten-degree divisions.

MAINTENANCE

Shipboard Inspection

With the electrical current on, look through the telescope to see that water has not leaked in and that the reticle lamp is operating. Unlock the left hand grip. Rotate the hand grips through their range in azimuth and elevation to see that they operate properly. Depress the thumb switch in the right hand grip to see that the mark signal circuit is working properly. Check with repeaters to ascertain that the synchro generators and repeaters are performing satisfactorily. Place the instrument on zero position. Release the lock on the left hand grip and check to see if the synchro repeaters read zero.

Maintenance

In general, if the Target Bearing Transmitter Mk 8 becomes defective while the submarine is at sea, it will not be disassembled for repairs. However, there are a few items which may be serviced at sea, which are as follows:

Pressure-Proof Telescope

For maintenance of air pressure, follow instructions given in NAVORD OD 2847.

In case the cover glasses become broken or one of the bodies develops a leak, the following procedure should be followed to prevent the sea water from corroding the internal parts of the telescope beyond repair. Remove the lamp housing from the telescope and tape it to the cradle or cradle bracket. Remove the pressure-proof telescope from the cradle. Remove the broken cover glass or take out one of the air valves. Rinse out the body two or three times with fresh water to remove all traces of salt water. Fill the body with fuel oil. This will prevent any further corrosion of the parts until it can be turned over to the repair shop for cleaning and overhaul.

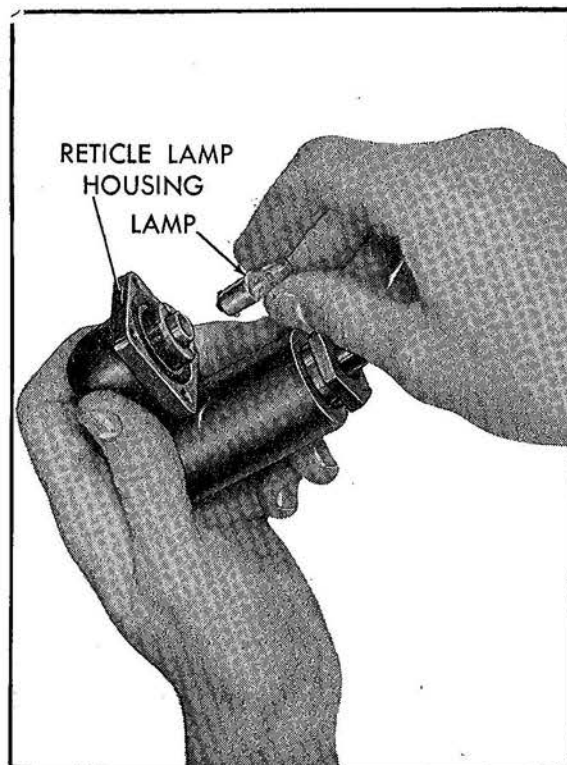


Figure 22.—Replacement of Reticle Lamp

Reticle Lamp (Figure 22)

If the reticle lamp in the pressure-proof telescope burns out, it is replaced by the following procedure: Remove the four screws that hold the reticle lamp bracket to the reticle lamp housing. The reticle lamp and its holder may be removed as a unit. Replace the reticle lamp and reassemble the parts.

Latch Lever

It may be found that the locking notches on both the dial guard and the cradle bracket have become corroded and do not allow their respective mating parts to seat satisfactorily, permitting slippage. It will be necessary to clean out the notches with a file, knife, or emery cloth. After cleaning, check mating of the locking parts with the notches to see that they fit properly.

Leakage

If leakage is evident, the 16 bolts holding the cover to the base should be tightened. The six screws holding the cover to the switch box should be tightened. The four socket head screws locking the conduit from the switch box to the cradle bracket should be tightened. It is a wise precaution at the same time to check the tightness of the gland nuts on the terminal tubes.

NOTE: Minor water leakage will not injure the instrument, inasmuch as a shield below the main shaft seals deflects the water away from the synchro generators and sufficient space is provided in the bottom of the cover for water to collect.

Switch (Figure 23)

The switch may become inoperative because the switch operating screw does not sufficiently depress the plunger in the switch. Remove the cover

of the switch box and adjust the switch operating screw so that there is at least 0.020 inch movement of the plunger after tripping the switch. After re-adjusting the switch, replace the cover of the switch box and tighten the four attaching bolts.

Painting

All exposed parts should be repainted with paint No. 39 in accordance with Ordnance Standard No. 52.

Lubrication

It should be unnecessary to use any lubrication on the outside of the instrument. If it becomes necessary to lubricate the grip pivots, it should be done lightly to avoid leaving a slick when the boat submerges.

NOTE: It may be found necessary to lubricate the interpupillary adjusting screw with a non-slicking grease.

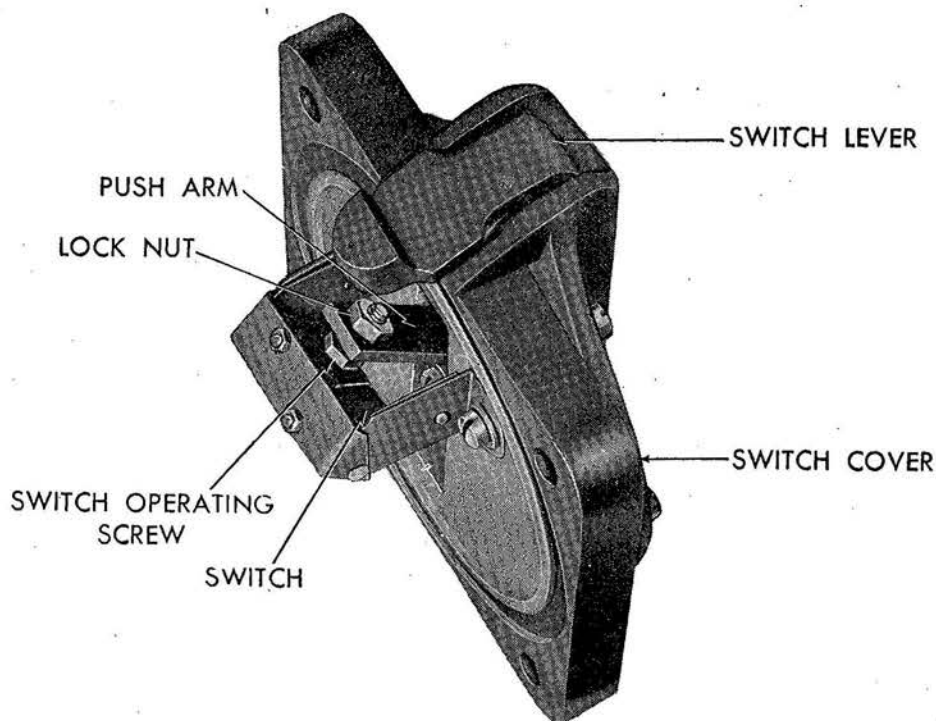


Figure 23.—Switch and Operating Parts

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SUBMARINE TENDER OR SUBMARINE BASE

Inspection

Inspection by submarine tender or submarine base covers the items under *Inspection on Board Submarine* as previously given, plus the following:

Inspect all metal parts for defects or cracks.

Inspect the springs in the right and left hand grips for freedom of action and permanent set.

With the instrument locked at zero reading and the electrical current on, see that synchro repeaters match. See *Maintenance*, page 35, for correction of difficulty.

Inspect cradle and cradle bracket and upper parts for freedom of rotation.

Check the thumb switch in the right hand grip for proper operation, and see that the switch properly operates the mark signal.

Inspect the cables leading to the terminal tubes on the cover and switch housing to see that they are in good condition and satisfactory for further service.

Inspect the pressure-proof telescope for proper operation, and see that the interpupillary adjustment is in operating condition.

Check the two glass windows through which the light from the reticle lamp enters the telescope to see that they do not need replacement.

Maintenance

Telescope

If the pressure-proof telescope becomes defective repair shall be performed by an optical shop. A 300-pound external hydrostatic pressure test is required after repairs have been completed.

Reticle Lamp

The reticle lamp is replaced by removing the four screws that hold the reticle lamp bracket to the reticle lamp housing. The reticle lamp and its

holder may be removed as a unit. Replace the reticle lamp and reassemble the parts.

Right Hand Grip

Check the operation of the thumb button switch for freedom of action and proper return upon release. It may be necessary to replace the spring within this assembly in order to have it operate satisfactorily. See the section on *Disassembly, Repair, and Reassembly*, page 41.

Switch Assembly

The transformer contained within the switch assembly may become defective. If this condition is present, replace the transformer in accordance with instructions under *Disassembly Repair, and Reassembly*, page 47. The sealing gasket between the switch box and the switch box cover may not seal properly; in this case replace the seal. The copper diaphragm to which the switch lever is attached may become bent, deformed, or ruptured, in which case it should be replaced. Also the rubber seal placed next to the copper diaphragm may become defective, in which case it must be replaced. See *Maintenance on Board Submarine* for adjustment of the switch operating screw. The switch itself, after repeated operation, may become defective, in which case it should be replaced and the leads again soldered to the lugs on the new switch.

Left Hand Grip

The latch lever on the left hand grip may not operate satisfactorily, in which case inspect the springs for breakage and permanent set. If necessary, replace these springs in accordance with instructions given under *Disassembly, Repair, and Reassembly*, page 42. Inspect the locking notches in both elevation and azimuth for proper seating in accordance with *Latch Lever, Maintenance on Board Submarine*, page 29.

Inspect the locking plunger for freedom of operation and proper return by the spring. Replace spring if found defective.

Luminous Sights

If either of the luminous sights has been broken, replace. The powder contained in the luminous line of the pointer may lose considerable brilliancy and may have to be replaced. The luminous capsule and plastic window with luminous line may also have to be replaced because of the loss in brilliancy of the powder. See *Disassembly, Repair, and Reassembly*, page 45, for replacement of these items. If the cover over the plastic window has been lost or damaged, replace.

Cover

If the seal between the base and cover becomes defective it must be replaced.

NOTE: This rubber gasket does not have to be shellacked in place.

Early units are equipped with a drain plug in the bottom of the cover which should not be removed. Later units do not have a drain plug.

SHAFT SEAL ASSEMBLY

The main shaft seal assembly must be replaced at the time of major overhaul of the submarine, or if leakage occurs it will have to be replaced before this. See special note under *Storage*, page 62, which pertains to the main shaft seals. If it is necessary to replace the main shaft seals, the following procedure should be followed:

1. Remove cover of switch box assembly.
2. Unfasten the three wires that go through the conduit.
3. Unsolder clips on ends of these wires.
4. Remove the four socket head screws locking the conduit to the cradle bracket and remove the two clamping plates.
5. Unfasten bolts that hold switch box assembly to cradle bracket.
6. Remove switch box assembly from cradle bracket, pulling the wires through the conduit. (See Figure 24).

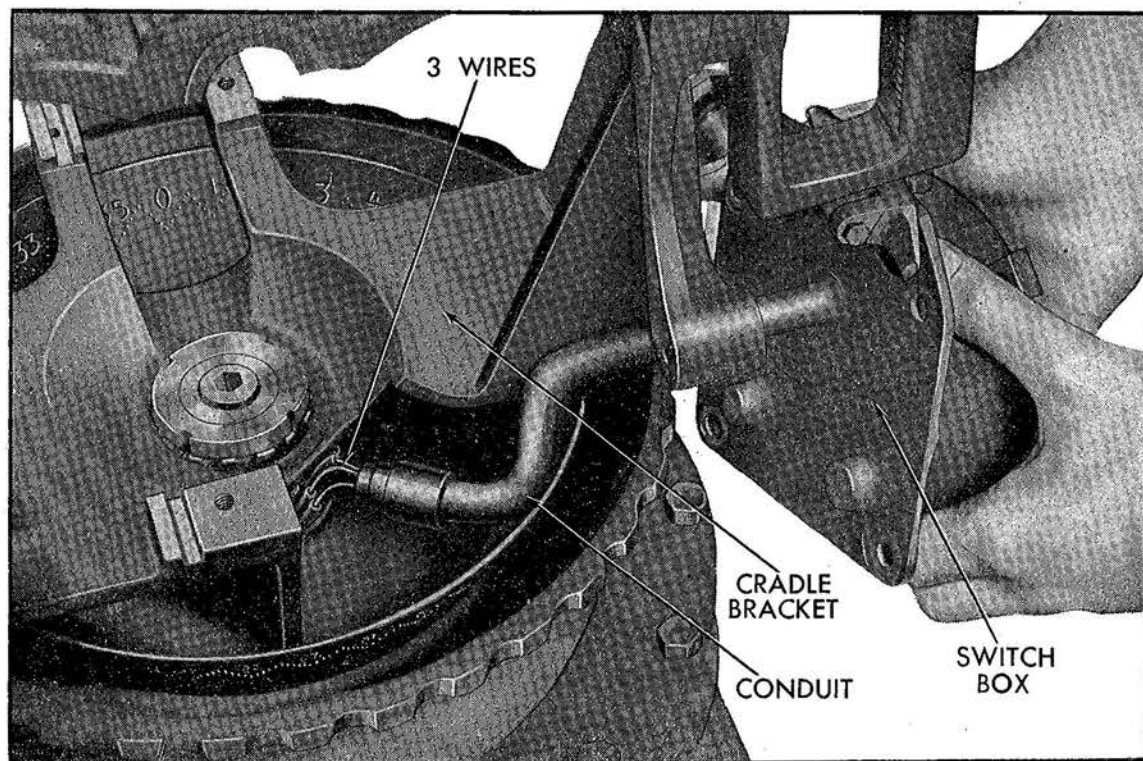


Figure 24.—Removal of Switch Box

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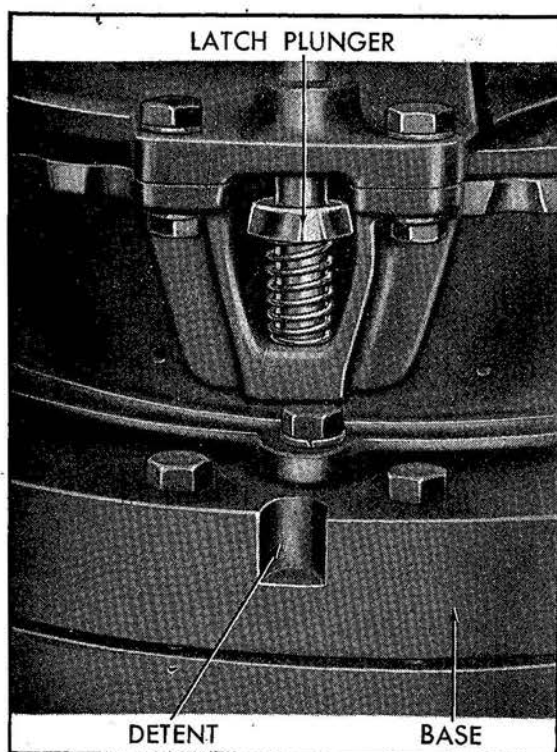


Figure 25.—Removal of Latch Plunger

7. Turn the cradle and grips until the latch plunger bracket is opposite the detent in the base, and remove the latch plunger bracket and latch plunger from engagement with the cradle bracket. (See Figure 25.)

8. Remove luminous sights.

9. Remove lock nut and washer on main shaft.

10. Remove cradle bracket and attached parts from engagements with the main shaft. Remove the key in the main shaft that locks the cradle bracket to the shaft.

11. Remove the 16 bolts and nuts with washers holding the cover to the base.

12. Disconnect wiring from the cable to terminal board and to the three brush holders.

13. Remove the three brush holders from the chassis.

14. Remove the bolts and washers from lower end of main shaft.

15. Remove the five bolts holding chassis to base.

16. Remove chassis from engagement with the base.

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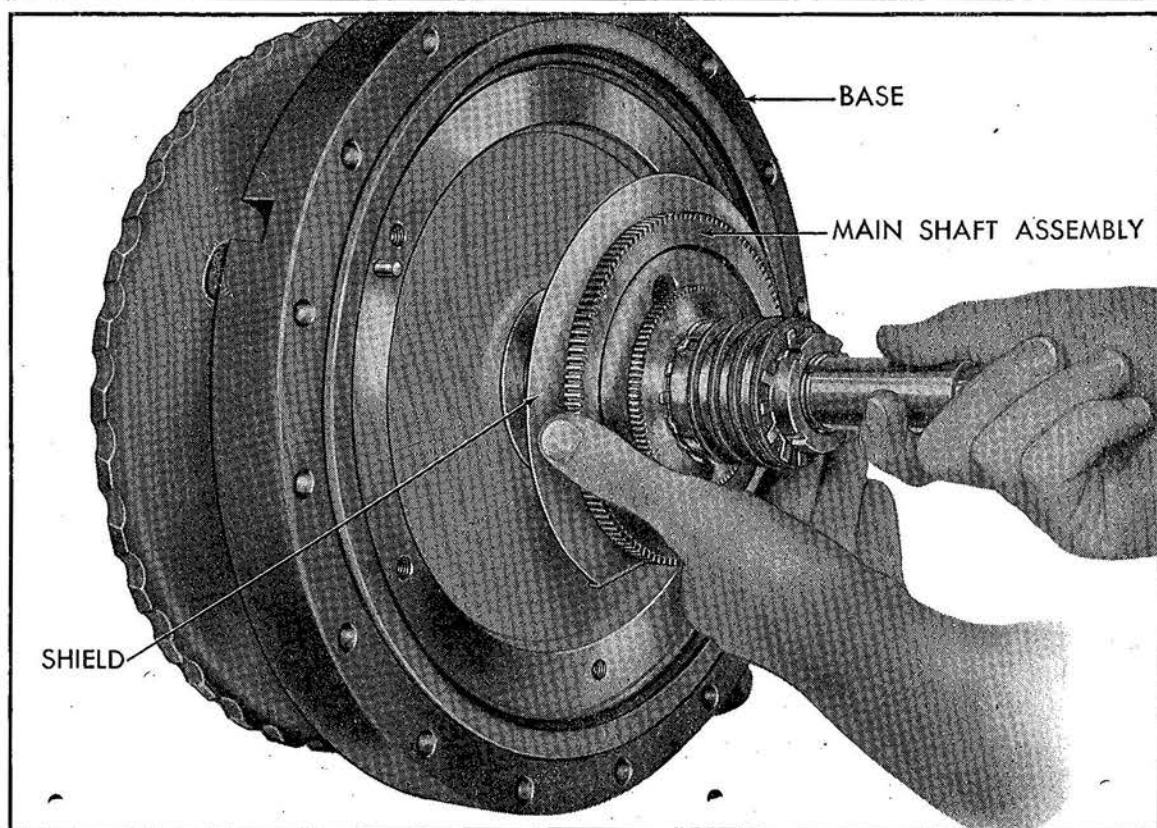


Figure 26.—Removal of Main Shaft

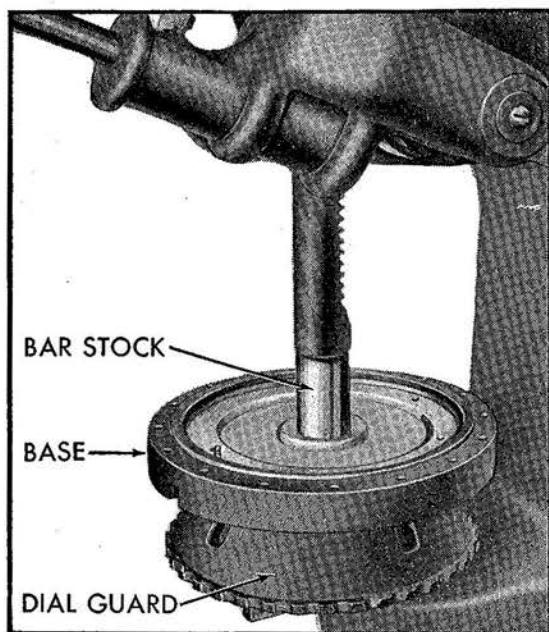


Figure 27.—Removal of Shaft Seal Assembly

17. Withdraw main shaft with gear cluster and shield from engagement with the base. (See Figure 26.)

18. Remove the four screws holding the seal cover to the base and remove the seal cover.

19. With an arbor press, push out the shaft seal assembly. (See Figure 27.)

20. Remove spring on garter seal.

21. Remove both "O" ring packings from the shaft bearing.

22. Inspect the "O" ring grooves for burrs, as well as the support for the garter seal.

23. Inspect the main shaft for corrosion at the place where the "O" ring and garter seal packings operate. If corroded, replace the shaft.

24. Install new "O" ring packing as well as a new garter seal packing, replacing garter seal spring.

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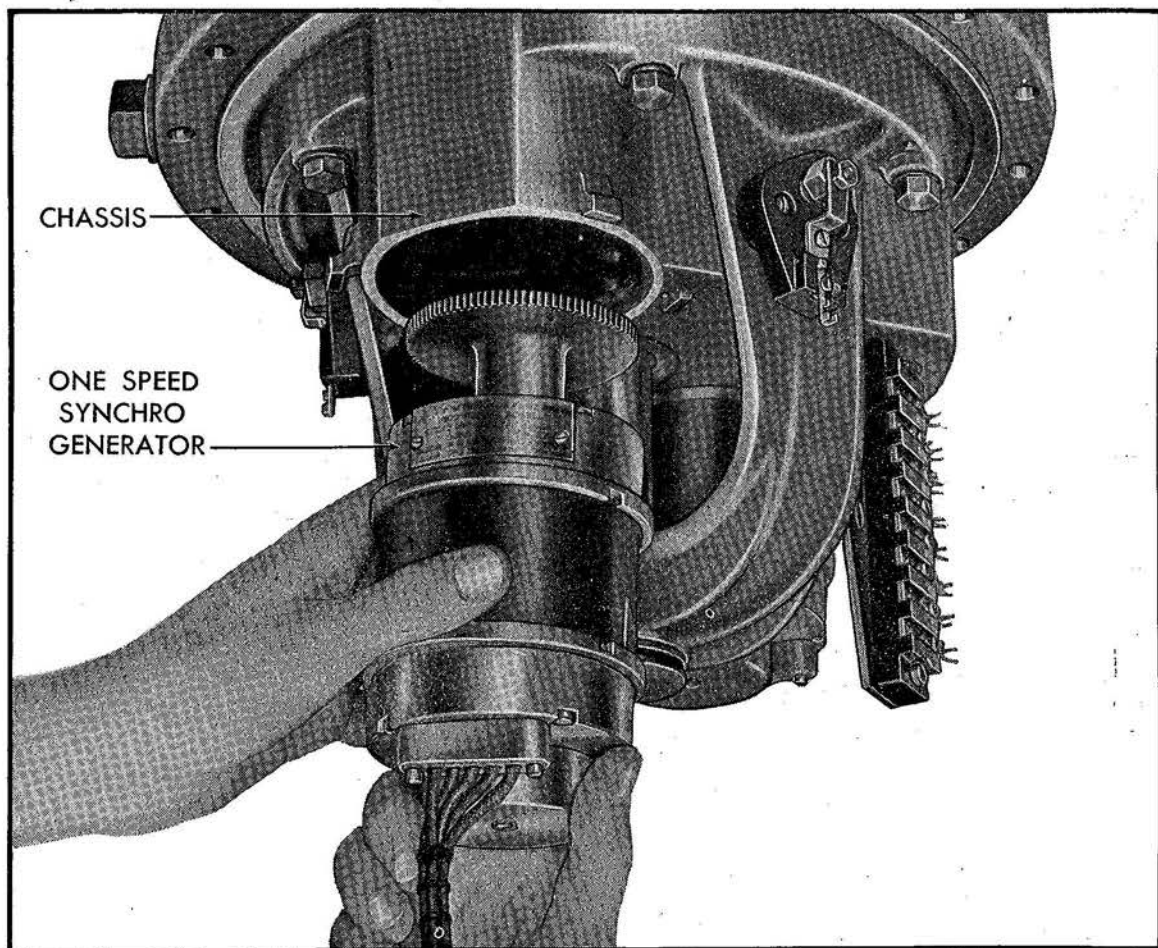


Figure 28.—Insertion of Synchro Generator into Chassis

25. Reassemble parts of the Target Bearing Transmitter Mk 8 in the reverse order in which they were disassembled.

26. Fill the main shaft seal cavities with grease, using a pressure gun in accordance with the section on *Lubrication*.

Synchro Generators

The Type 5G Synchro Generators Mk 1 are held in place by means of four clamps with accompanying screws and washers. Each synchro generator has five leads, which are attached to the terminal board fastened to the chassis. Information on synchro generators is covered by the Ord-

nance Specification 671. If the synchro generators are removed or the chassis disassembled from the base, it will be necessary to go through the following procedure upon reassembly:

Lock the hand grips in the zero position. Apply electric current to the synchro generators. This will bring them to electrical zero as described in Ordnance Specification 671. Insert each synchro generator into its proper position (see Figure 28).

NOTE: The gear on the end of the generator shaft must not be rotated when meshing the gears. Otherwise the synchro generator will not remain on electrical zero.

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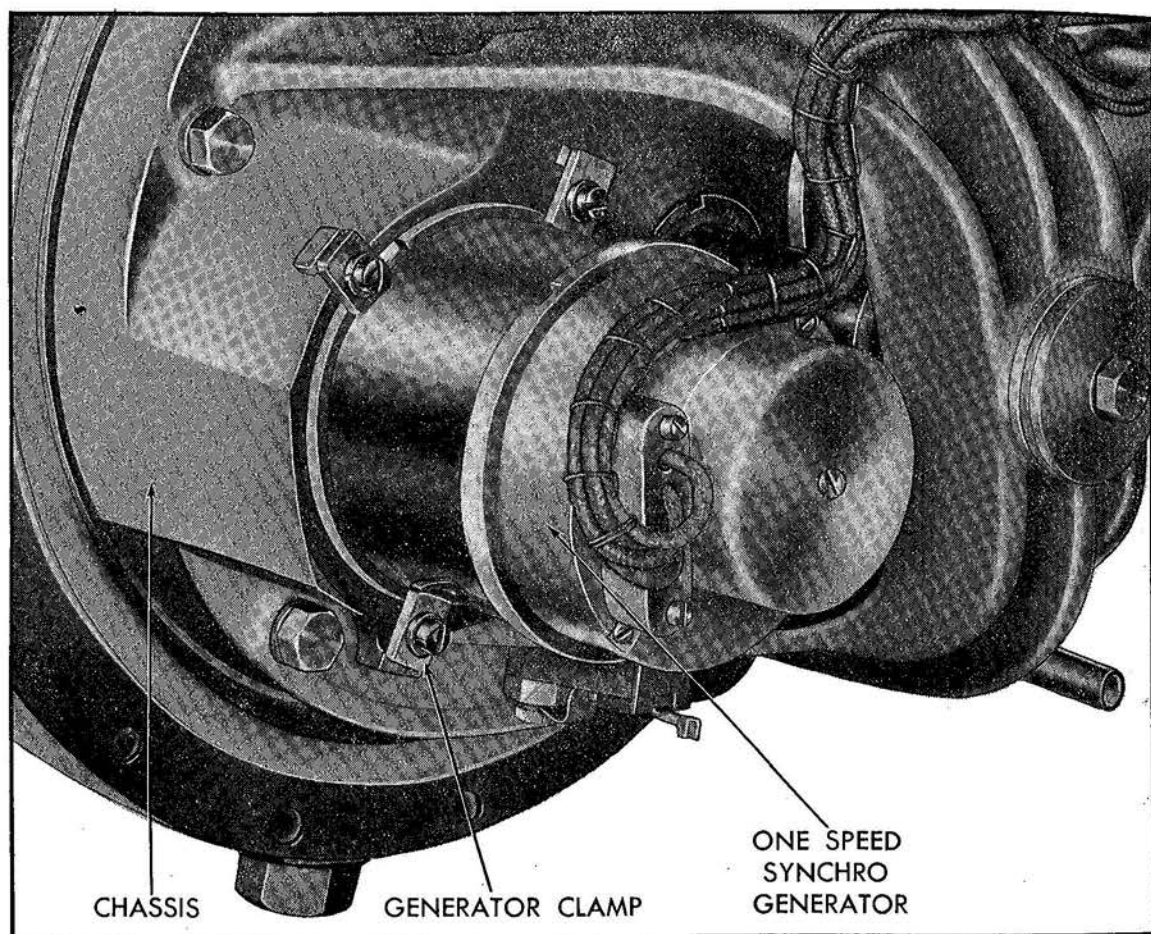


Figure 29.—Synchro Generator Clamps

Lock each synchro generator in place by means of four generator clamps with accompanying lock washers and screws (see Figure 29).

If the above procedure is done correctly, the instrument, upon being connected with the synchro receivers, will register zero reading with the hand grips locked in the zero position. If the synchro receivers do not register zero, correction can be made by rotating slightly the synchro generators in their mountings until the synchro receivers read zero.

Chassis

If there is too much backlash between the cluster gear and the gear on the main shaft, it will be necessary to install new gears in order to eliminate this difficulty. If the bushing in the chassis in which the main shaft rotates becomes worn excessively, it will have to be replaced. Care must be used in removing the bushing or replacing the same, inasmuch as the material of the bushing is soft and easily damaged.

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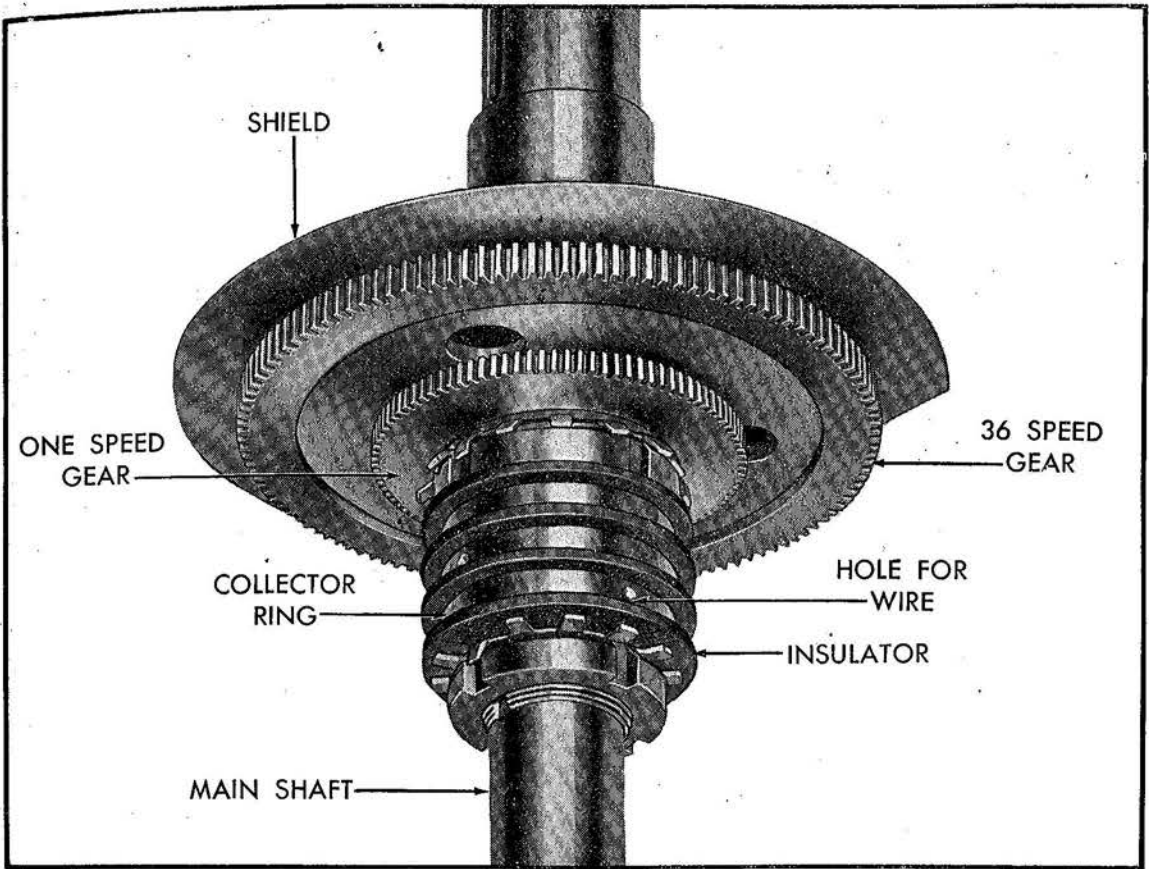


Figure 30.—Main Shaft Assembly

Main Shaft

The main shaft has mounted upon it three collector rings which are connected to wires leading through the hole in the main shaft. The collector rings are separated from each other by means of insulators. If the collector rings become defective, it will be necessary to replace the collector rings as well as the connecting wires which are soldered to them (see Figure 30). Mounted above the slip rings are two gears for driving the one-speed and 36-speed synchro generators. If these gears become worn, it will be necessary to replace the gears. See section on *Disassembly, Repair, and Reassembly*, page 58, for disassembling the parts that make up

the main shaft assembly. If the main shaft becomes corroded or damaged in service, it will be necessary to replace the shaft. It is a wise precaution, when reassembling the parts into the main shaft, that new copper gasket be used where the conduit from the switch box enters. Later units are equipped with an "O" ring seal instead of the copper gasket.

NOTE: If disassembly of the main shaft is not required, do not remove the cap screw at the top of the main shaft. If screw is removed, reassemble using litharge and glycerine to seal screw against leakage.

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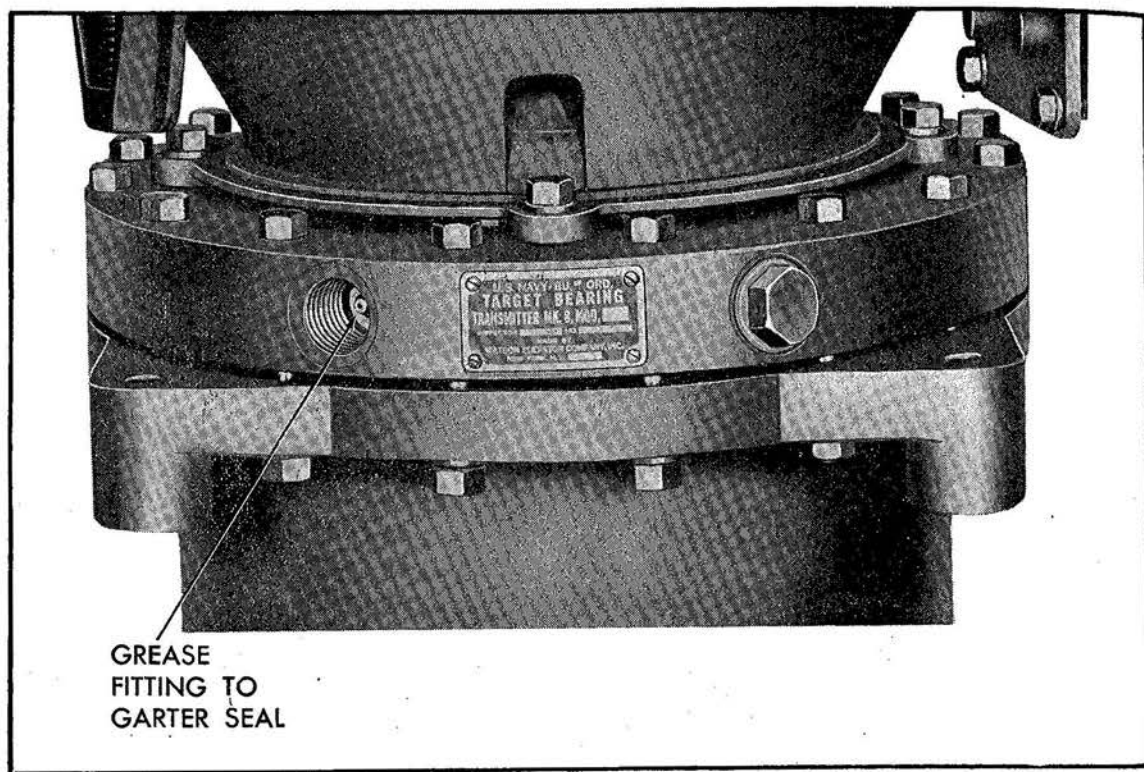


Figure 31.—Grease Fitting to Garter Seal

Brush Holders

There are three brush holders provided, consisting of a plastic insulator supporting a tube through which a brush slides. The brush is kept in contact with the collector rings by means of an internal spring. If this spring should become broken, it will be necessary to replace it. If the brush tip becomes worn, it will be necessary to replace the tip, brush, wire, spring, and fitting.

Lubrication

A grease fitting (Figure 31) is provided under-

neath the plug in the base through which grease, in accordance with Navy Specification 14-L-5 Type A, may be forced with a pressure gun. Grease needs to be replenished at four-month intervals.

NOTE: On early units, a second grease fitting was provided to the right of the name plate. The fitting has been replaced by a pipe plug, sealed with glycerine and litharge, which should not be removed. Later units do not have this second opening.

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DISASSEMBLY, REPAIR, AND REASSEMBLY

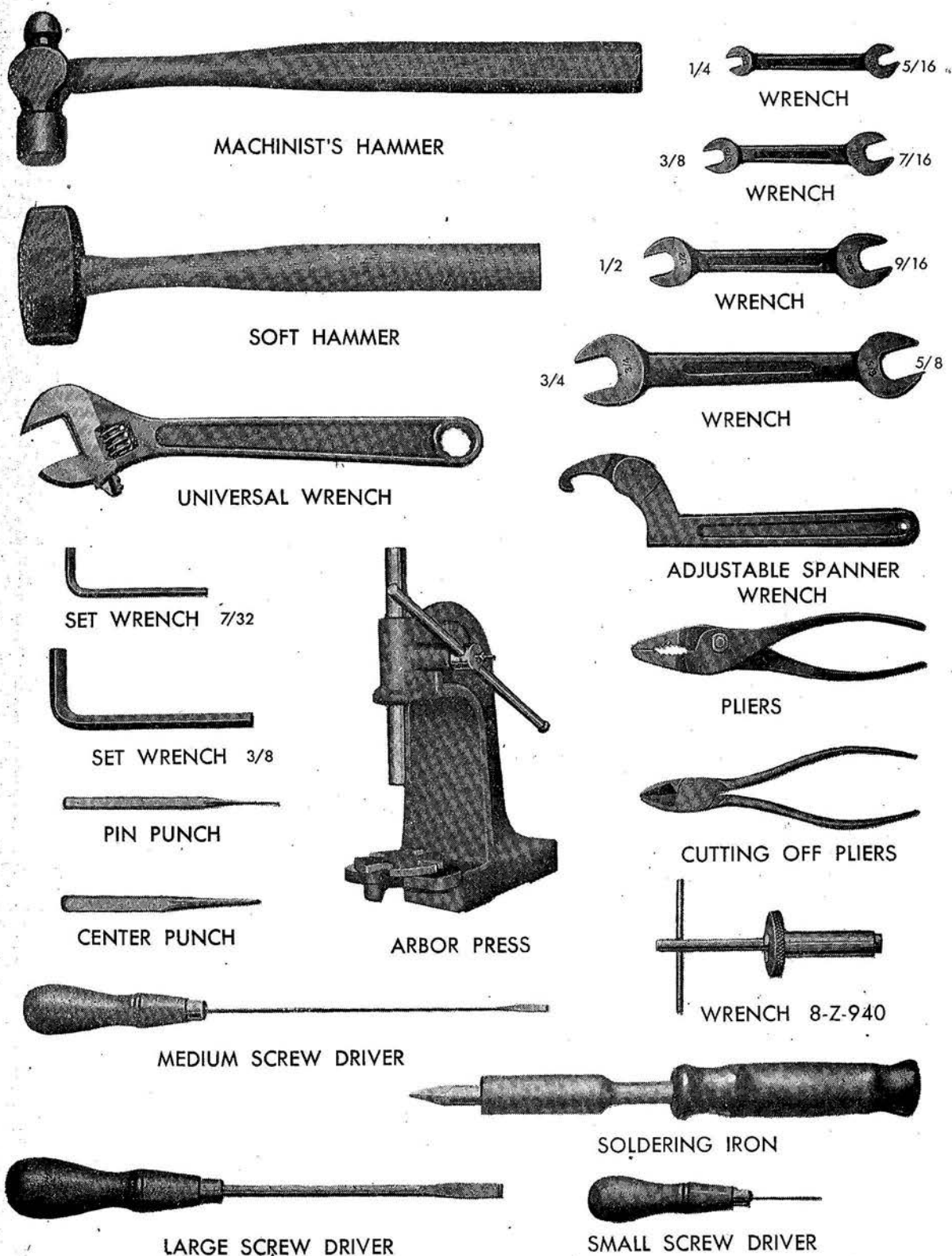


Figure 32.—Tools Required

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TELESCOPE AND RETICLE LAMP

Disassembly

The telescope is removed by unclamping the right body held by the telescope strap and removing the four bolts (Figure 33) holding the cradle cap which clamps the pivot of the telescope.

NOTE: Neither of the terminal tubes for the reticle lamp cable should be disturbed unless the special equipment required to replace the seal is at hand.

Repair

Repairs other than minor ones shall be performed by an optical shop.

Reassembly

Reassembly is accomplished by reversing the procedure for disassembly. Special precautions must be taken in replacing the gland nuts on the terminal tubes to insure that the connections are pressure-proof.

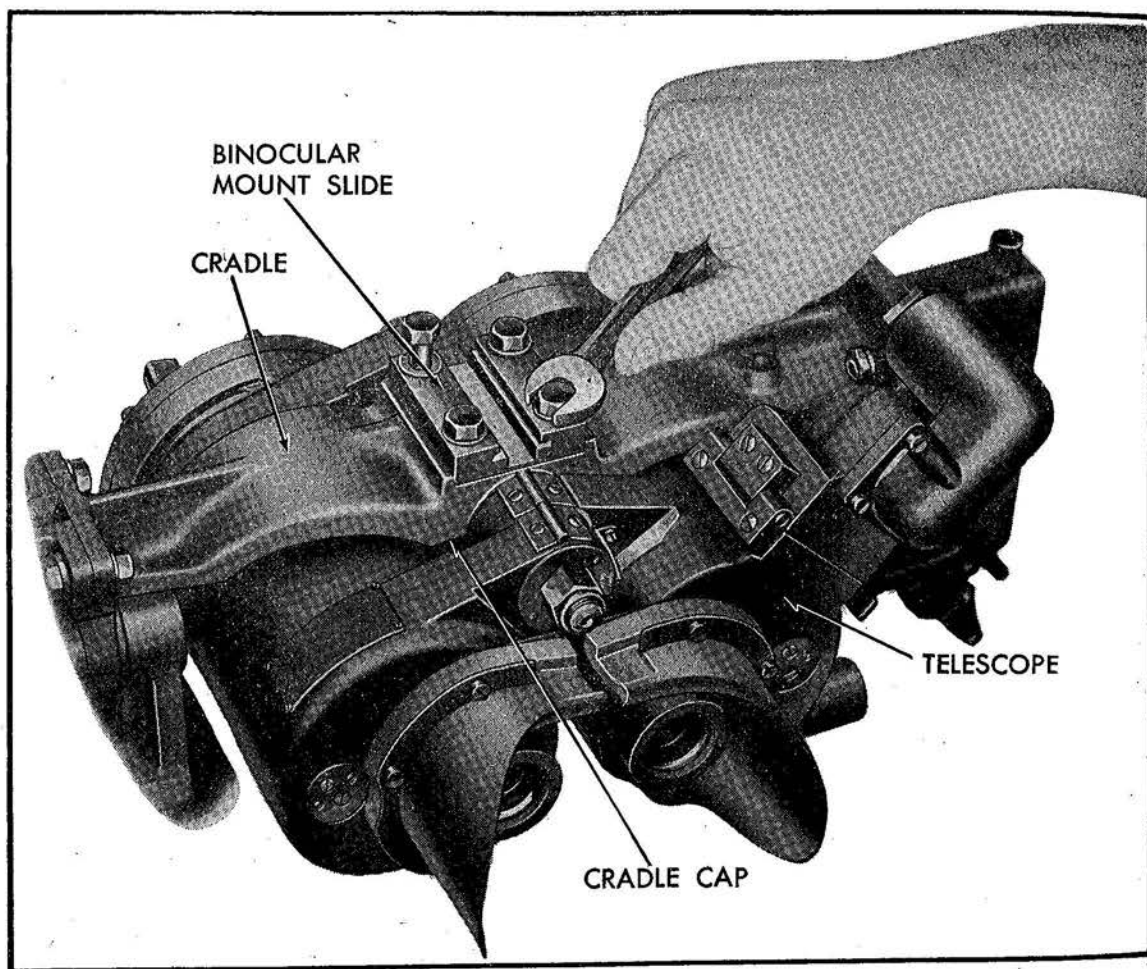


Figure 33.—Removal of Telescope

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CRADLE, GRIPS, AND CRADLE BRACKET

Right Hand Grip

Disassembly—Remove the two bolts and nuts with accompanying washers that connect the right hand grip to the cradle. For disassembly of the right hand grip, see Figure 34.

Repair—If any of the parts in the right hand grip are defective, it will be necessary to replace them. If the switch plunger spring has taken a permanent set, it must be replaced. The original free length was 2.25 inches.

Reassembly—Reassemble the right hand grip in accordance with the sequence given in Figure 35. It will be necessary to lock the rivet in place by means of a center punch upon reassembly. Fasten the right hand grip to the cradle by means of two bolts and nuts with accompanying washers. After reassembly, check the operation of the switch plunger to see that all parts operate freely.

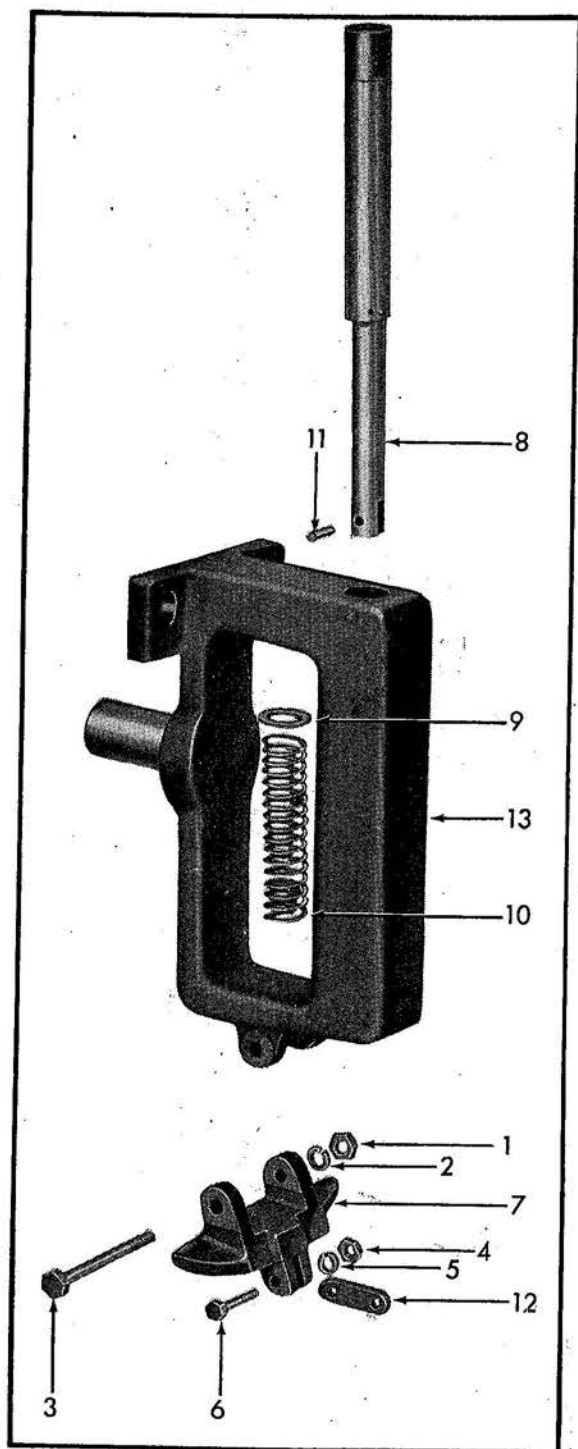


Figure 34.—Sequence of Disassembly of Right Hand Grip

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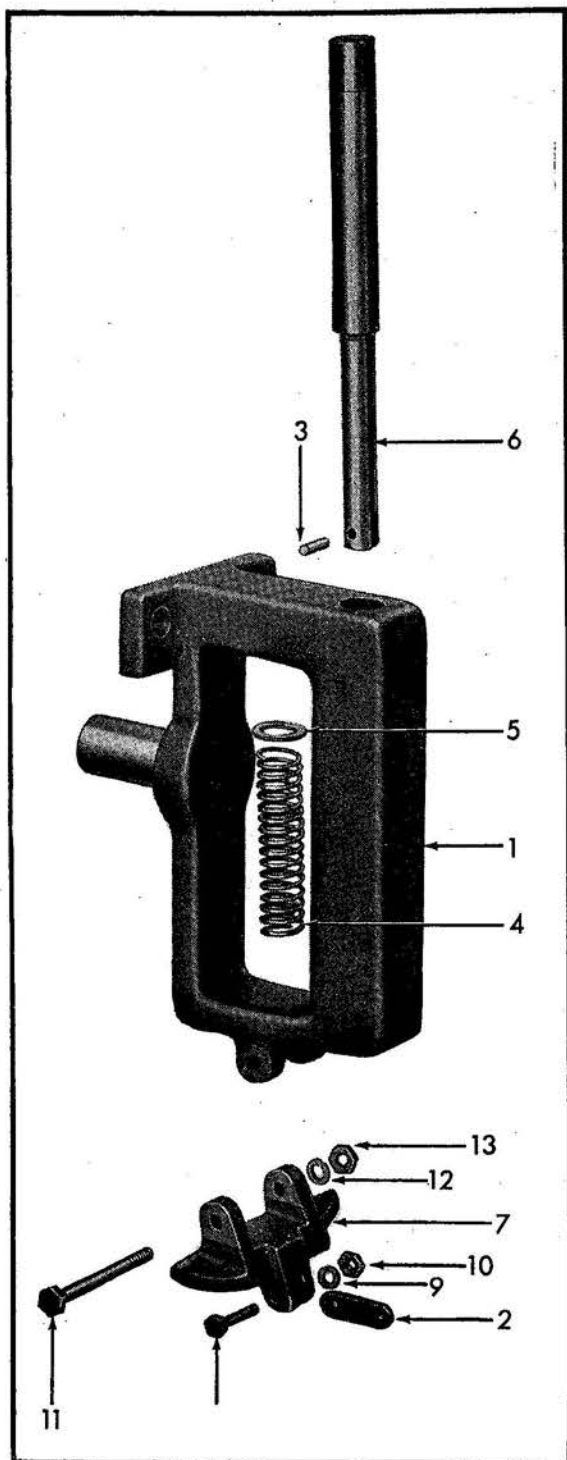


Figure 35.—Sequence of Reassembly of Right Hand Grip

Left Hand Grip

Disassembly—Remove the left hand grip from attachment with the cradle by removing the two nuts which clamp it to the cradle. Disassemble the left hand grip in accordance with the sequence given in Figure 36.

Repair—Any defective parts of the left hand grip must be replaced. If either of the two springs has taken a permanent set, it must be replaced.

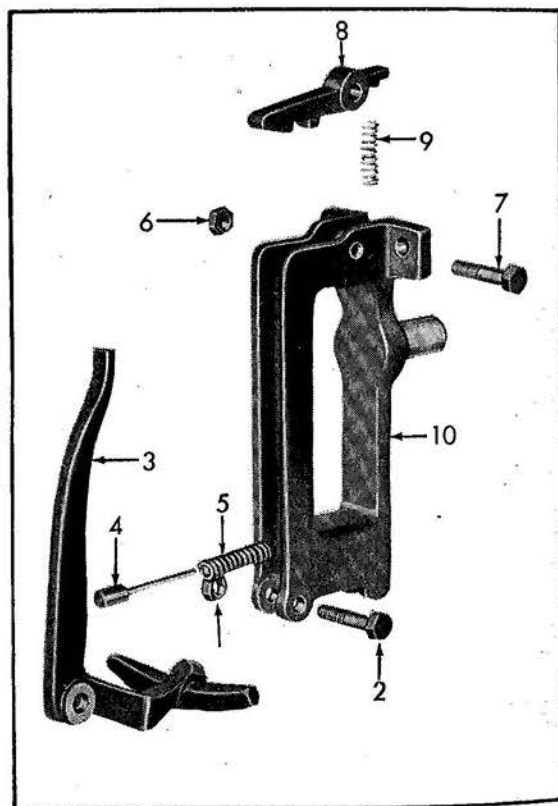


Figure 36.—Sequence of Disassembly of Left Hand Grip

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The original free length of the latch lever lock spring was 1.125 inches. The original free length of the latch lever spring was 1.562 inches.

Reassembly—Reassemble the right hand grip in accordance with the sequence given in Figure 37. Attach the left hand grip to the cradle by means of the two bolts and nuts with accompanying washers. Check freedom of action of the left hand grip operating parts after reassembly.

Latch Plunger

Disassembly—Swing the cradle bracket by means of the hand grips until the latch plunger is over the detent located in the base. Remove the latch plunger bracket from the cradle bracket by removing the two bolts and nuts with accompanying washers which hold it in place. Depress the latch plunger into the depression in the base, so that it can be removed from the cradle bracket.

Repair—Any defective parts of the latch plunger assembly must be replaced. The original free length of latch plunger spring was 1.70 inches. If the spring has taken a permanent set, replace.

Reassembly—Reassemble the latch plunger assembly, reversing the procedure of disassembly.

Cradle

Disassembly—To remove the cradle from engagement with the cradle bracket, it is necessary to remove both the right and left hand grips which provide the shafts that connect the parts.

Repair—If the cradle is defective or has been damaged, it will be necessary to replace it.

Reassembly—Reassemble in the reverse order of disassembling.

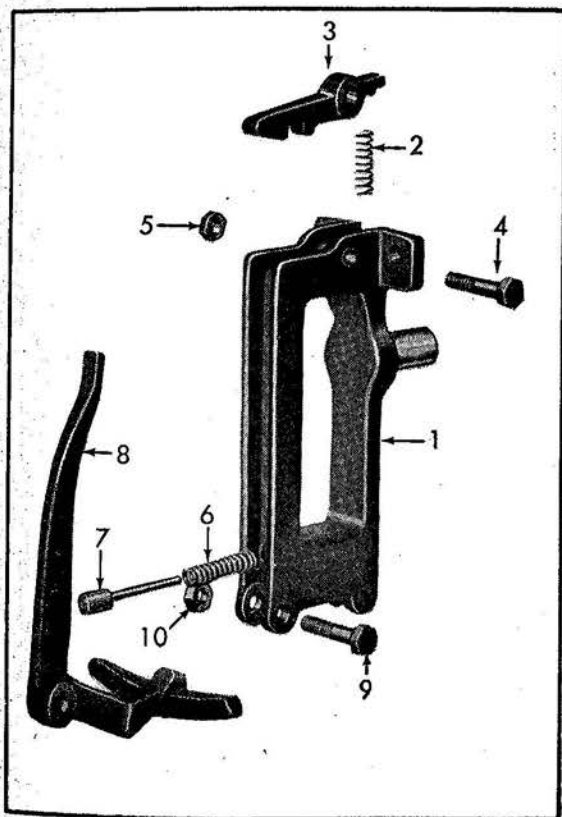


Figure 37.—Sequence of Reassembly of Left Hand Grip

Binocular Holder Assembly

Disassembly—The binocular holder assembly is removed from engagement with the binocular mount slide by pulling up on the knurled knob. Then the binocular holder assembly may be pulled out. Disassemble the binocular holder assembly in accordance with the sequence given in Figure 38.

Repair—Any of the items in the binocular sup-

port assembly which are defective must be replaced. The original free length of the engaging pin spring is 0.500 inch. If this spring has taken a permanent set, it must be replaced, as well as any other defective parts in the binocular support assembly.

Reassembly—Reassemble the binocular support assembly in accordance with the sequence given in Figure 39.

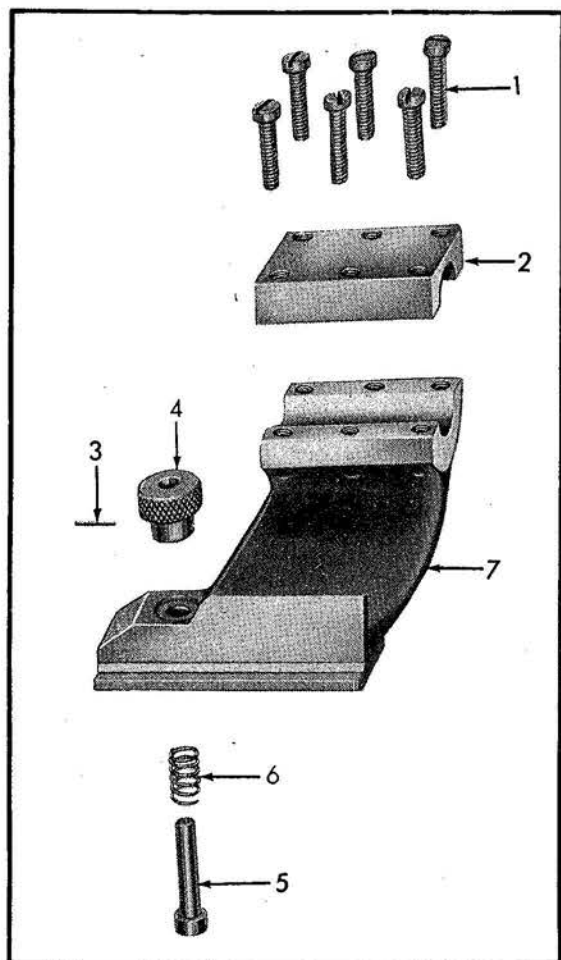


Figure 38.—Sequence of Disassembly of Binocular Holder Assembly

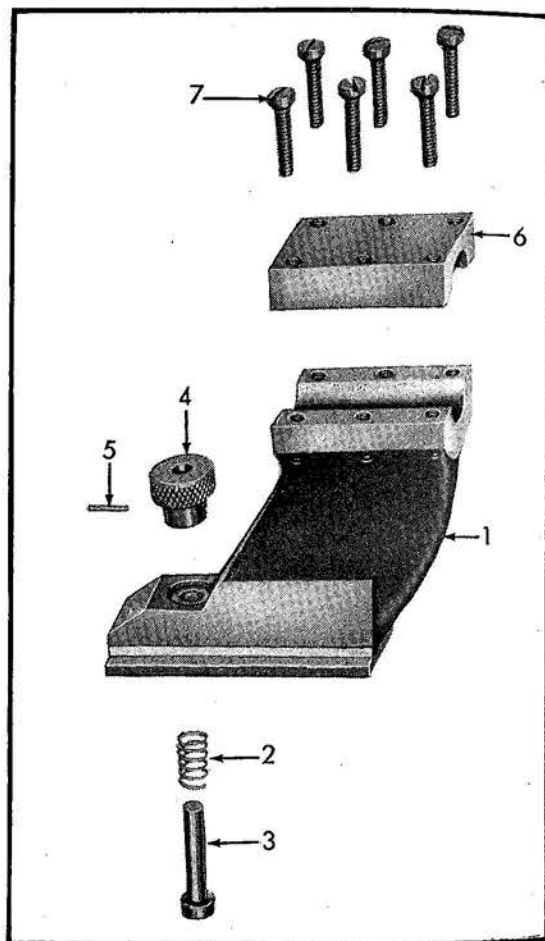


Figure 39.—Sequence of Reassembly of Binocular Holder Assembly

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Luminous Sight (Front) Assembly

Disassembly—The front luminous sight assembly is removed from the cradle bracket by removing the two screws and washers which lock the parts together. Disassemble the front luminous sight assembly in accordance with the sequence given in Figure 40.

Repair—Any of the metal parts of the assembly which are damaged must be replaced. The plastic pointer, luminous capsule, and window may have

to be replaced at intervals, because the luminosity of the luminous powder contained within these parts deteriorates.

Reassembly—Reassemble the front luminous sight assembly in accordance with the sequence given in Figure 41. Reattach the front luminous sight to the cradle bracket by means of the two screws and lock washers.

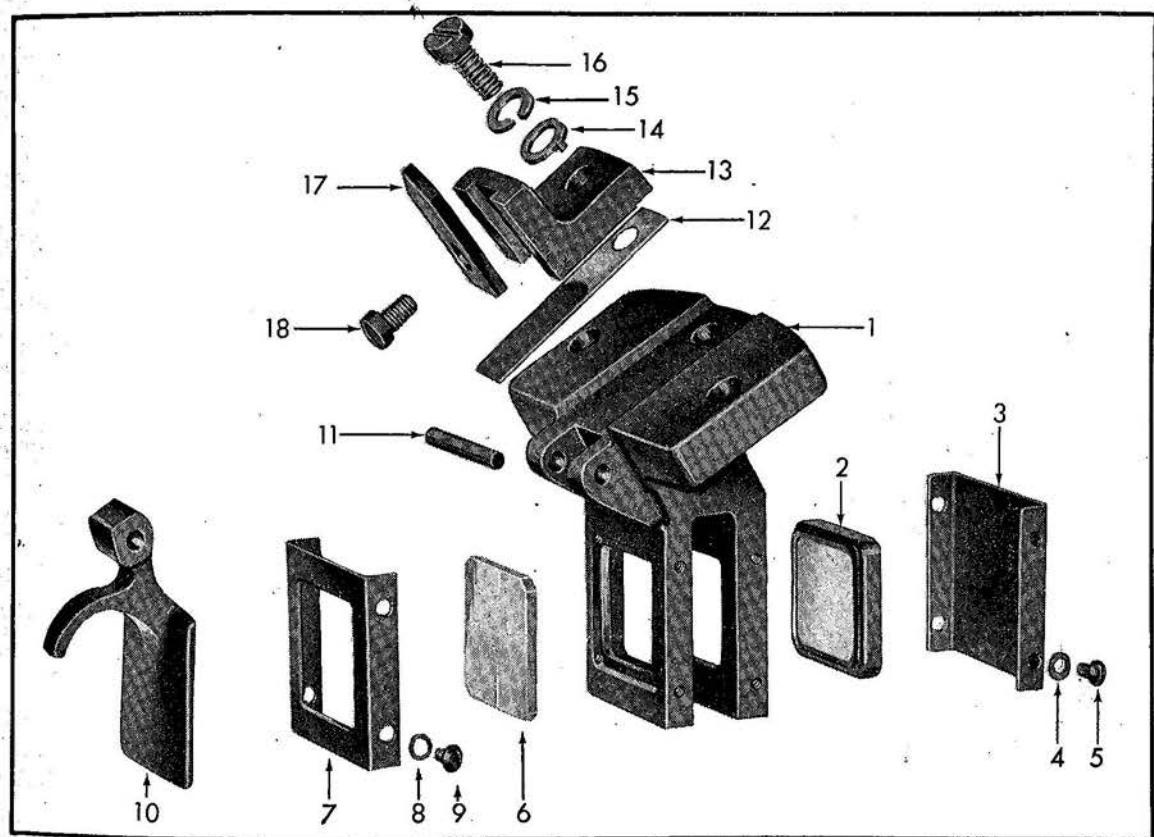


Figure 40.—Sequence of Disassembly of Front Luminous Sight

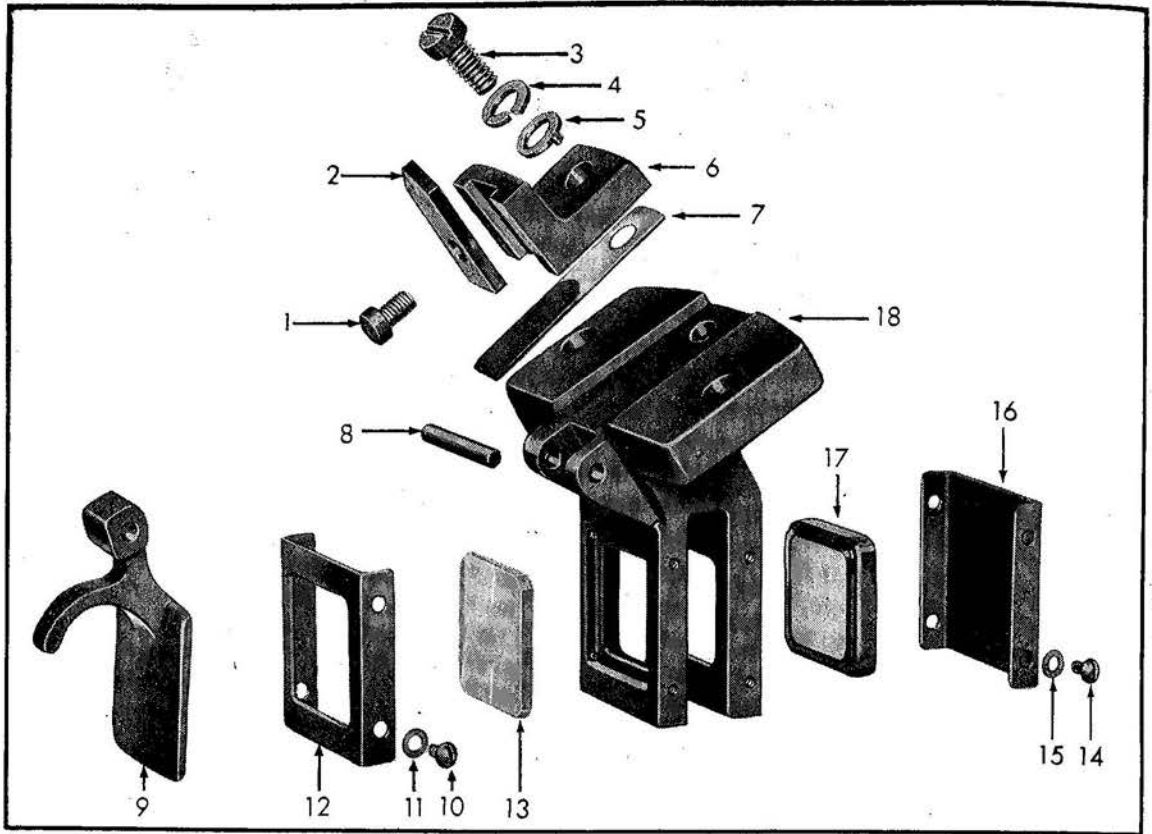


Figure 41.—Sequence of Reassembly of Front Luminous Sight

Luminous Sight (Rear) Assembly

Disassembly—Remove the rear luminous sight assembly by removing the screw and lock washer which hold it to the cradle bracket. Disassemble the rear luminous sight assembly in accordance with the sequence given in Figure 42.

Repair—All damaged parts must be renewed, and at intervals the luminous sight itself must be replaced, because the luminous powder which it contains deteriorates.

Reassembly—Reassemble the rear luminous sight assembly in accordance with the sequence given in Figure 43. Reattach the assembly to the mount bracket by means of the screw and lock washer.

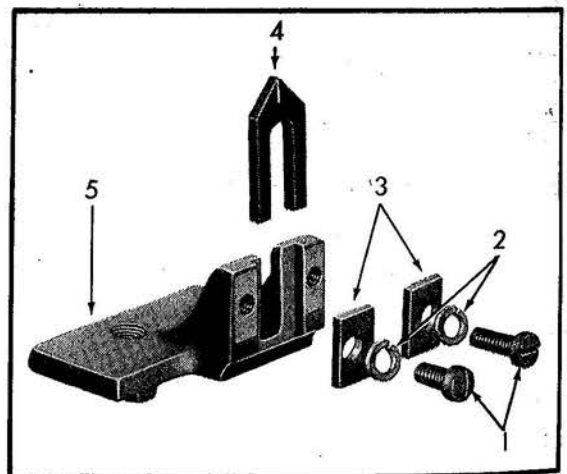


Figure 42.—Sequence of Disassembly of Rear Luminous Sight

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Switch Assembly

Disassembly—Remove the switch box cover by removing the four bolts and nuts with accompanying washers which hold the assembly together. Remove the two wires from the switch to the terminal board. Disassemble the switch box cover in accordance with the sequence given in Figure 44. Unfasten the three wires that enter the switch box through the conduit, and unsolder the lugs on the ends of the wire. Remove the four socket head screws that hold the conduit to the cradle bracket, and also remove the locking plates. Remove the two bolts and nuts with accompanying washers that hold the switch assembly to the cradle bracket. Withdraw the switch box assembly from engagement with the cradle bracket, pulling the three wires through the conduit. The internal parts of the switch box may now be removed in the sequence, as shown in Figure 45.

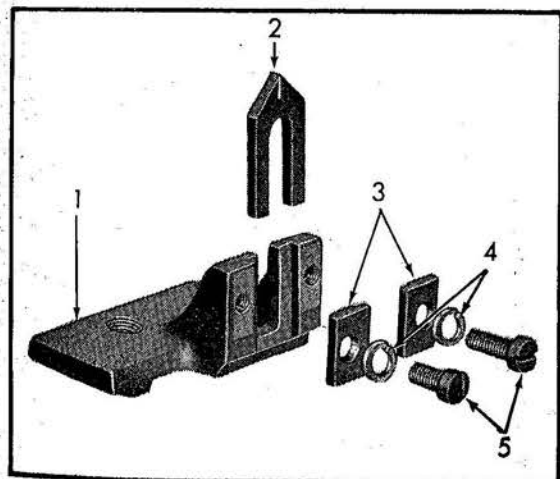


Figure 43.—Sequence of Reassembly of Rear Luminous Sight

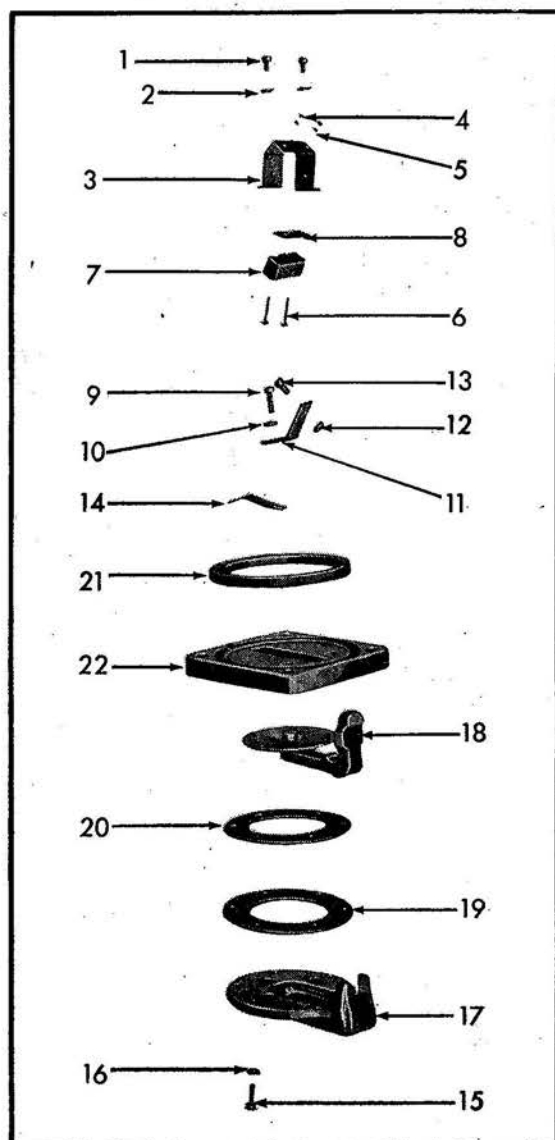


Figure 44.—Sequence of Disassembly of Switch Box Cover

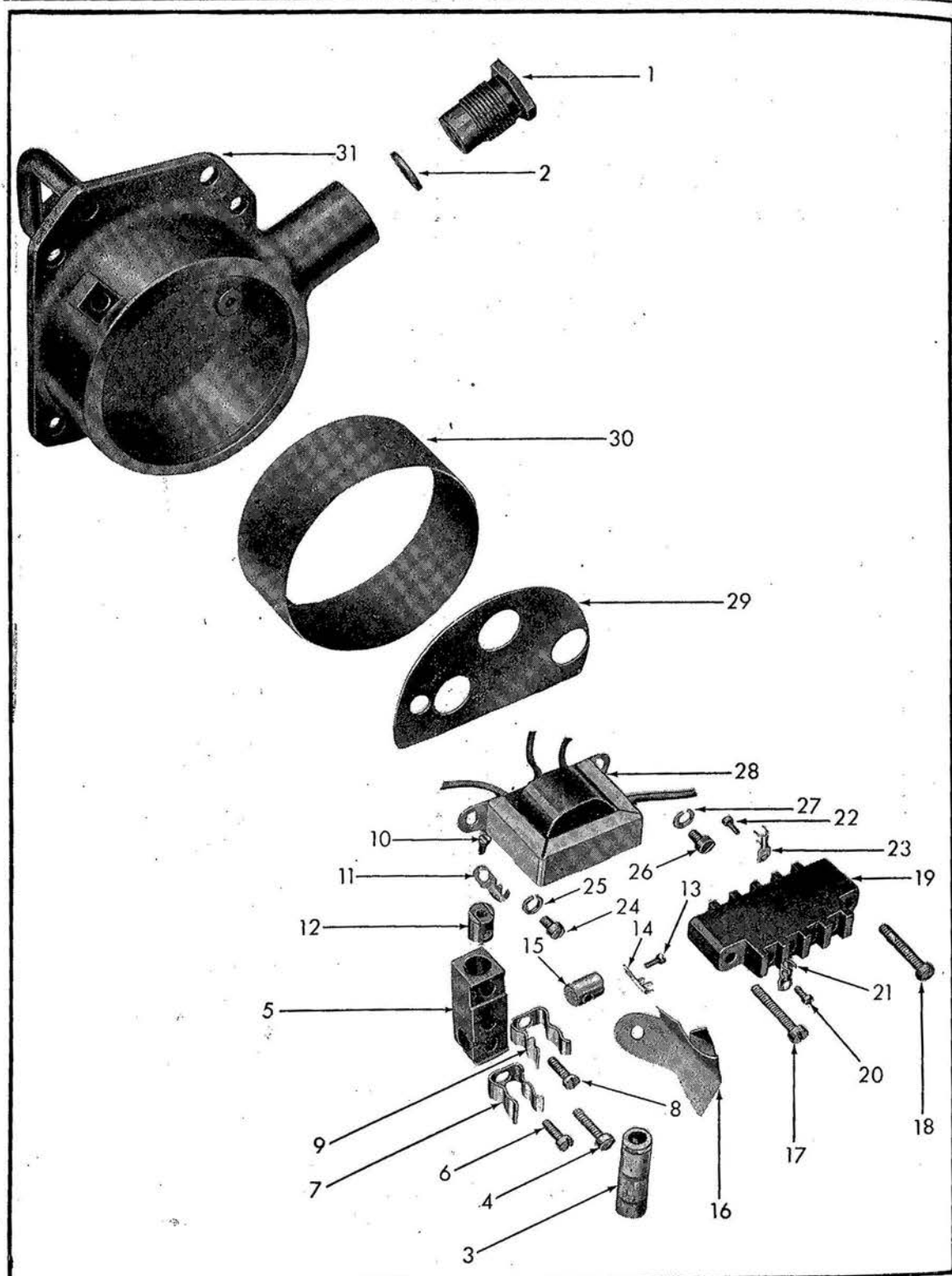


Figure 45.—Sequence of Disassembly of Switch Box

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Repair—Any defective items in the switch box assembly must be replaced. An electrical test should be made of the transformer to see that it operates satisfactorily. An electrical test should also be made of the terminal board to see that there are no short circuits. If the copper diaphragm has become defective or buckled, it will have to be replaced. Replacement of the diaphragm necessitates replacement of the switch lever, spacer, and pin, which are a soldered unit. It will be necessary to replace the cover seal at the time of major overhaul of the submarine.

NOTE: Later units are furnished with a flat spring on the inside of switch box cover, which aids the copper diaphragm in returning to its central position.

Reassembly—Reassemble the items that make up the switch box cover assembly as given in Figure 46. Reassemble the items within the switch box in accordance with Figure 47. If further disassembly of the Target Bearing Transmitter Mk 8 is contemplated, the switch box assembly should not be reattached to the cradle bracket, because of the difficulty which will be experienced with the three wires that go through the conduit. For final assembly, of the instrument the reversal of disassembly should be carried out. After reassembly, see *Maintenance on Board Submarine*, page 30, for adjustment of switch operating screw. Also check to see that the switch lever operates freely and does not bind upon the lever guard. If this condition is present, release the six screws holding the guard to the switch box cover, readjust the lever, and retighten the screws. Consult the wiring diagram shown in Figure 14 for wiring the terminal block within the switch box assembly.

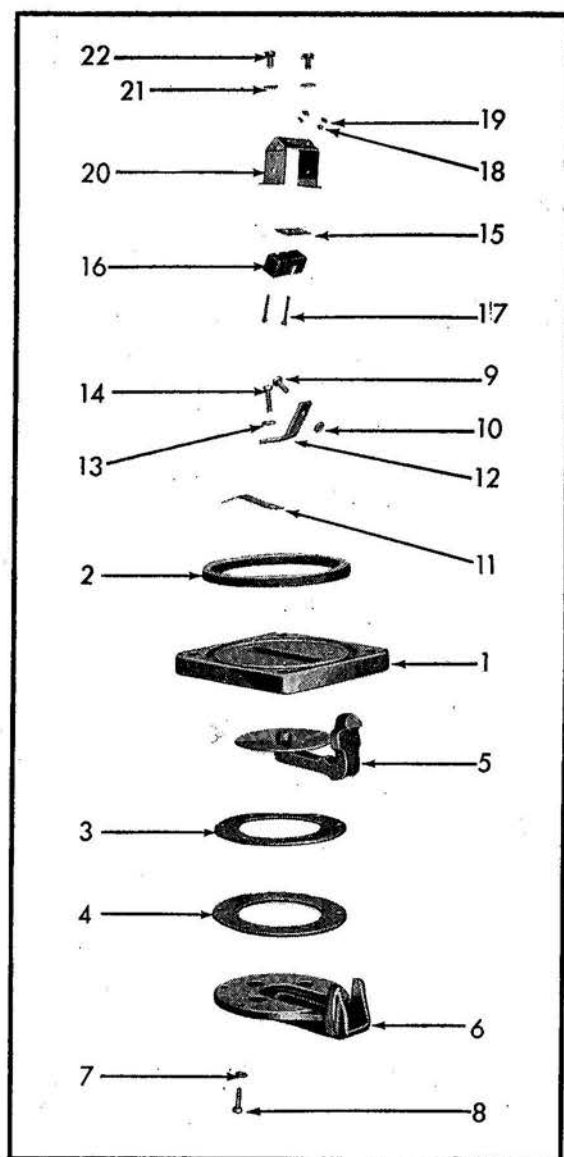


Figure 46.—Sequence of Reassembly of Switch Box Cover

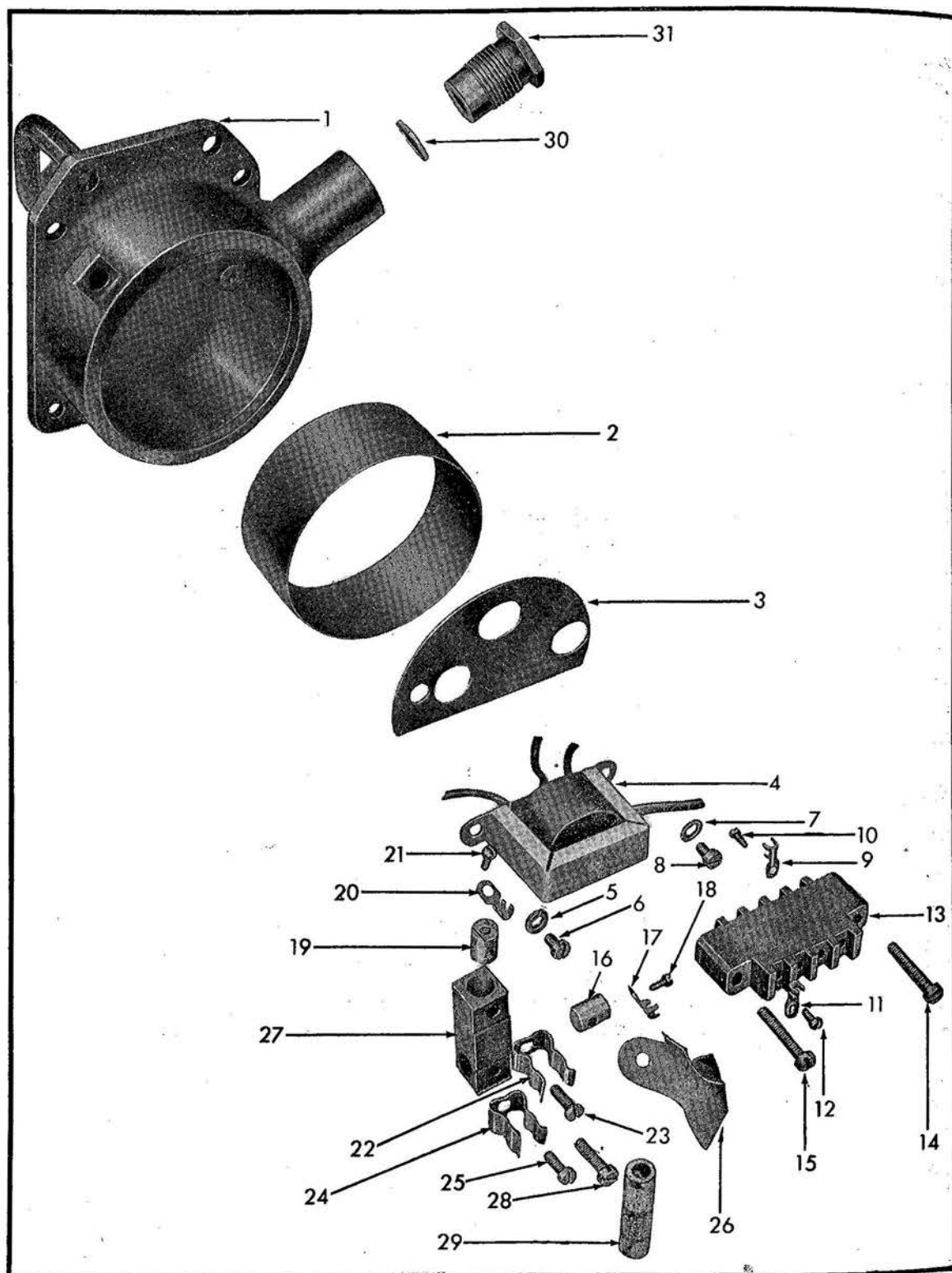


Figure 47.—Sequence of Reassembly of Switch Box

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DISASSEMBLY, REPAIR, AND REASSEMBLY

BASE AND COVER ASSEMBLY

Cover

Disassembly—The cover is fastened to the base by means of 16 bolts and nuts with accompanying washers. In removing the cover, care should be taken not to damage the internal parts of the target bearing transmitter or the electrical wires of the flexible cable.

Repair—In case of damage to the cover, it will be necessary to replace it or weld on a suitable patch. After welding, the inside should be painted with a coat of paint No. 18 and the outside with a coat of paint No. 18 and a coat of paint No. 39. Do not remove the drain plug which is sealed in place with litharge and glycerine. Later units do not have a drain plug. At the time of major submarine overhaul, the seal in the cover should be replaced.

Reassembly—The cover is reassembled to the base by means of the 16 bolts, nuts, and accompanying washers. Use a torque wrench for tight-

ening the nuts. Torque should not exceed 25 foot-pounds. When reassembling, coil the excess cable around the bottom of the cover.

Dial and Dial Guard

Disassembly—It will be necessary to have the cradle bracket and associated parts connected to it removed from the main shaft before disassembly of the dial and dial guard from the base. The dial is attached to the dial guard by means of eight screws and washers, and the dial guard is attached to the base by means of four bolts and lockwashers.

Repair—If either the dial or dial guard is damaged, it must be repaired.

Reassembly—The dial and dial guard are reassembled to the base in the reverse order in which they were disassembled. Dowel pins in both the dial guard and base assure correct positioning.

Synchro Generators

Disassembly—Disconnect the five leads to each synchro generator from the terminal block on the chassis. To remove the generators, remove the four screws, washers, and generator clamps which hold the generators in place on the chassis. Remove each generator by withdrawing it from the chassis. For disassembly of the one-speed synchro generator, see the sequence given in Figure 48. For disassembly of the 36-speed synchro generator follow sequence given in Figure 49.

Repair—Repairs on the Type 5G Synchro Generator Mk. 1 must be made by personnel trained in the servicing of this type of instrument. If the gears mounted on the synchro generators become worn or damaged, it will be necessary to replace them.

Reassembly—Reassemble the one-speed synchro generator in accordance with the sequence given in Figure 50, using wrench 8-Z-940 to tighten the nut.

Reassemble the 36-speed synchro generator in accordance with the sequence given in Figure 51. The following procedure must be used to reassemble the synchro generators to the chassis: Place the hand grips on zero and lock. Electrically zero each synchro generator, following the procedure given in Ordnance Specification 671. Assemble each synchro generator, to its proper place on the chassis, being careful not to rotate the gear on the synchro generator shaft, which would disturb the electrical zeroing. Clamp each synchro generator in place with four generator clamps, using screws and lock washers.

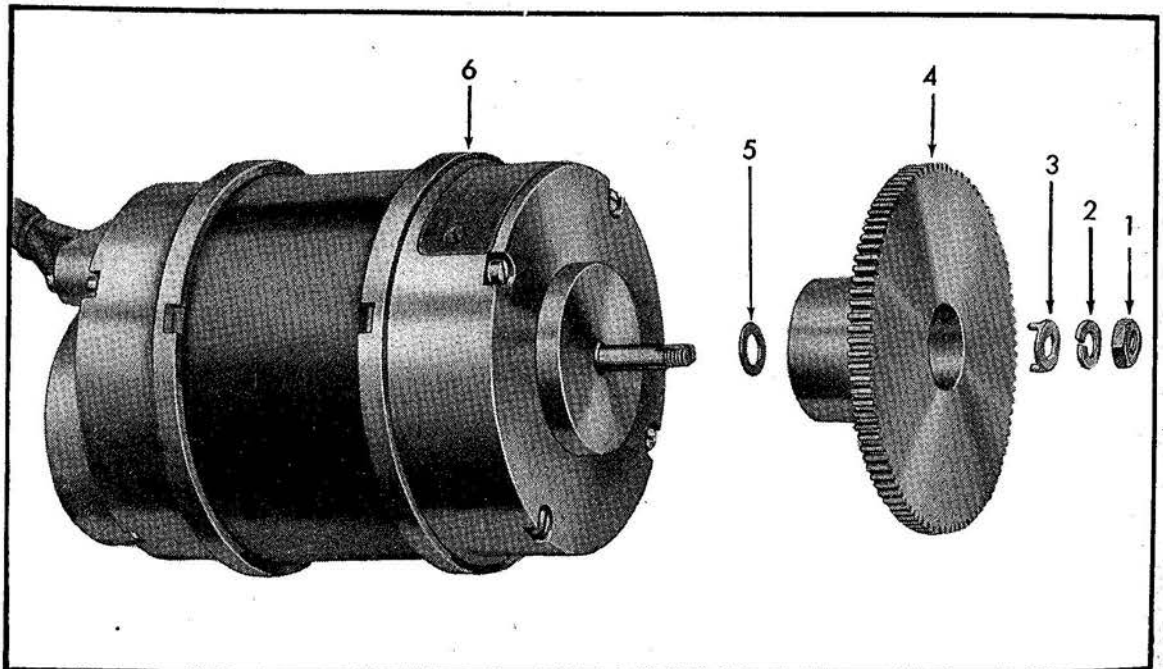


Figure 48.—Sequence of Disassembly of One-Speed Synchro Generator

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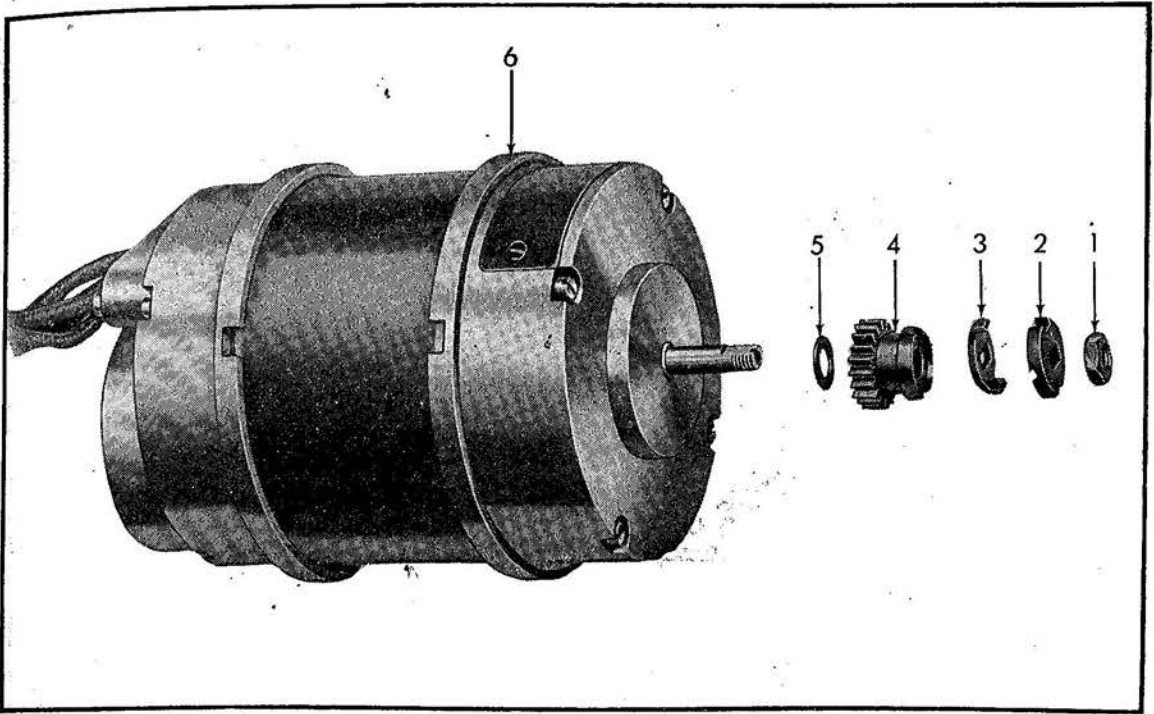


Figure 49.—Sequence of Disassembly of 36-Speed Synchro Generator

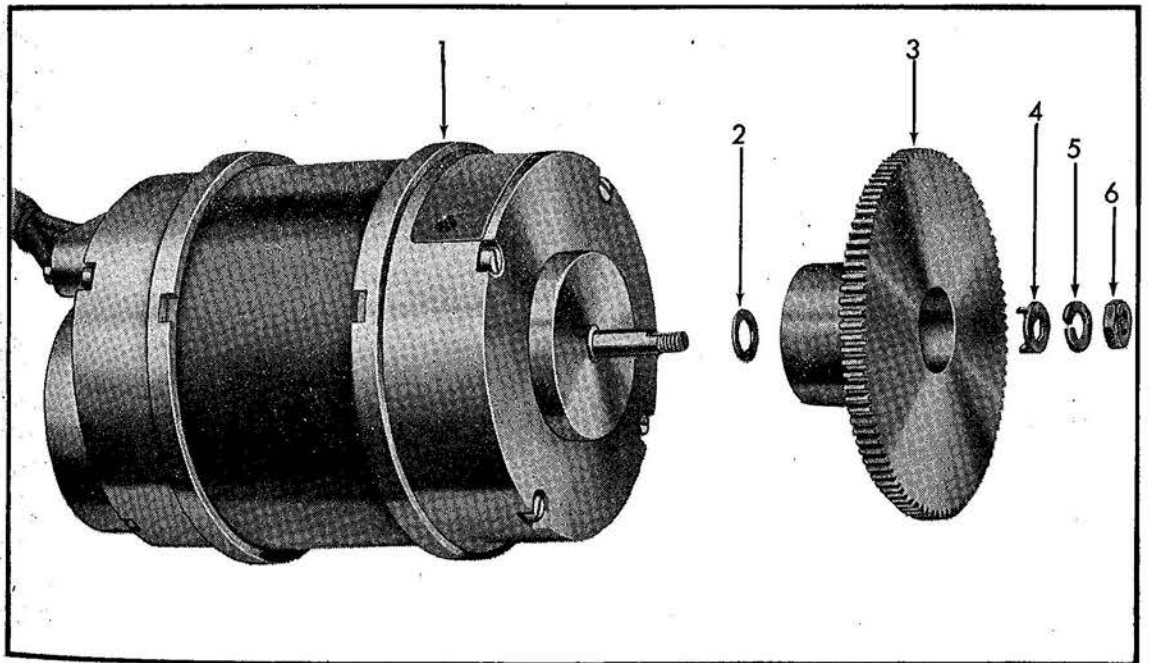


Figure 50.—Sequence of Reassembly of One-Speed Synchro Generator

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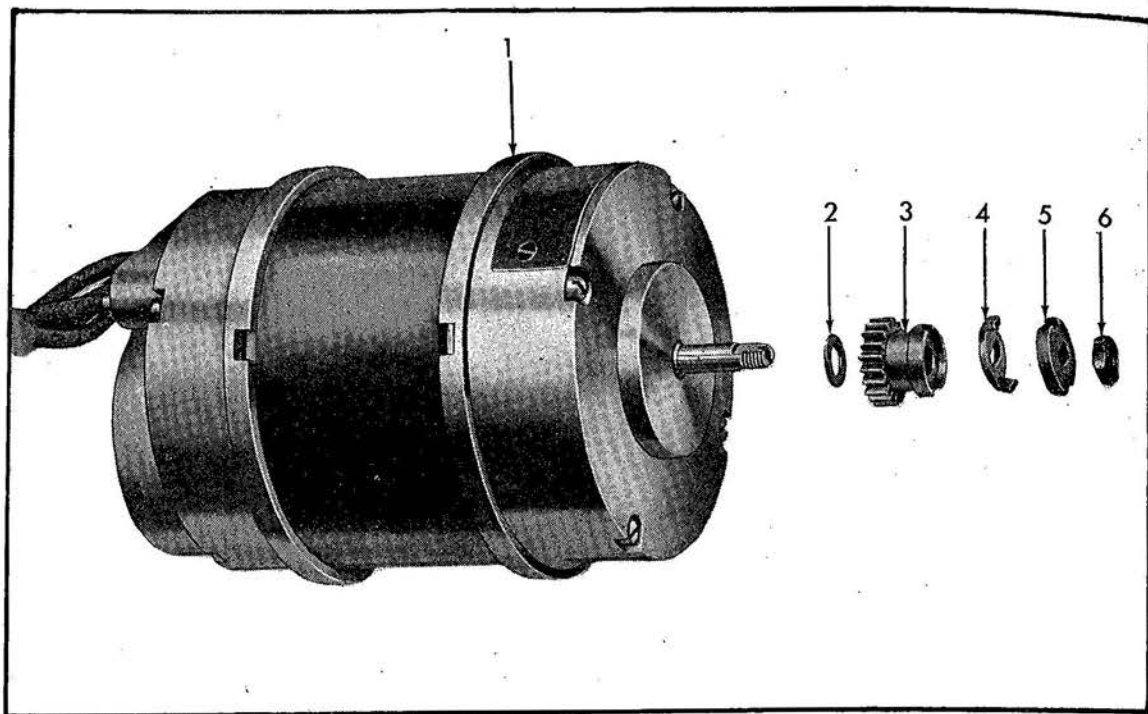


Figure 51.—Sequence of Reassembly of 36-Speed Synchro Generator

Check the synchro generators with a pair of synchro receivers to see that the readings are correct. Slight correction can be made by rotating each synchro generator in its mounting until the correct reading is obtained. This adjustment must be made every time the synchro generators are removed from their mounted position in the chassis. Connect the synchro generator leads to their respective places on the terminal block.

Brush Holders

Disassembly—Each of the three brush holders is removed from engagement with the chassis by disconnecting the electrical lead to the brush and by removing the two screws which hold them to

the chassis. The brush holder assembly may be withdrawn as a unit from the chassis. For disassembly of the brush holder itself, follow the sequence given in Figure 52.

Repair—If the brush holder becomes defective while in service, the defective parts of the brush holder assembly must be replaced.

Reassembly—Reassemble the brush holder assembly in accordance with the sequence given in Figure 53. Reassemble the proper brush holder to its location in the chassis, and attach in place by means of two screws. Reconnect the lead from the cable to the brush holder.

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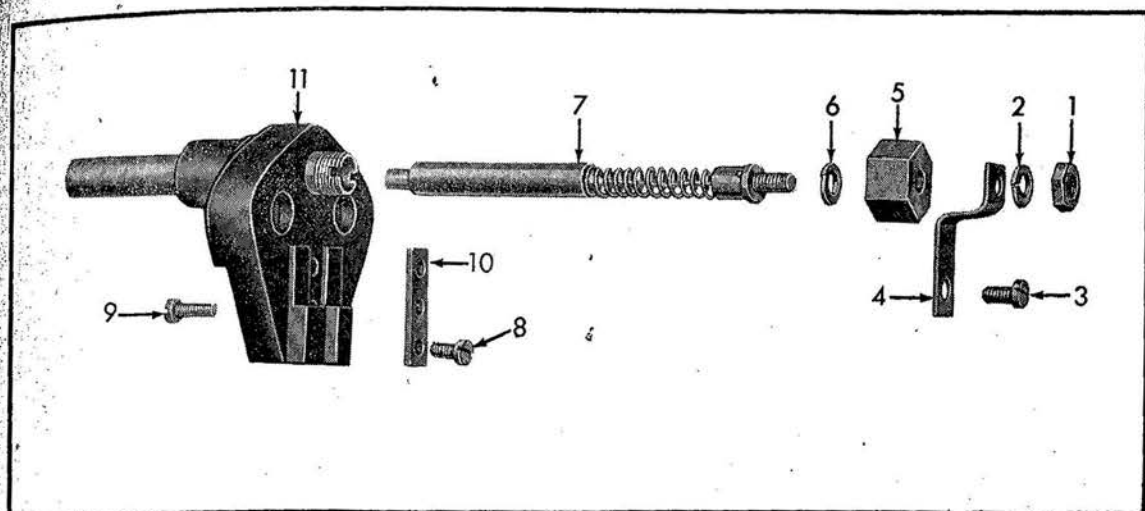


Figure 52.—Sequence of Disassembly of Brush Holder

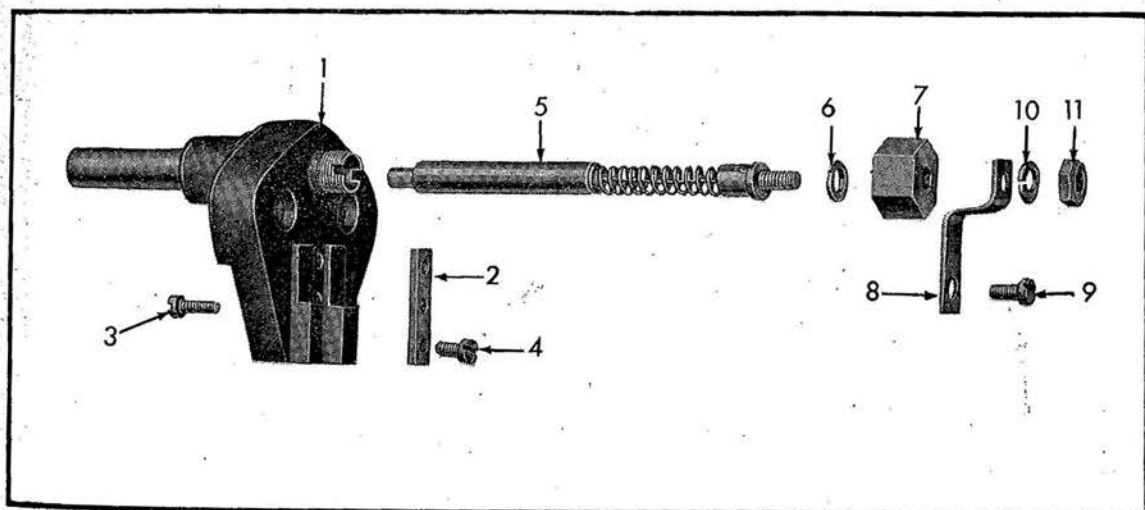


Figure 53.—Sequence of Reassembly of Brush Holder

Chassis

Disassembly—In order to disassemble the chassis from the base, it will be necessary to remove the synchro generators and the leads from the cable to the terminal block and the three brush holder assemblies. Remove the bolt, lock washers, and three thrust washers from the end of the main shaft. Disassemble the chassis from the base by removing the five bolts and accompanying washers from the flange on the chassis. The cluster gear and cluster gear shaft may be removed from the chassis by following the sequence shown in Figure 54. The bushing in which the main shaft

rotates may be removed from the chassis by using a plug of the proper diameter with the aid of an arbor press (see Figure 55). Do not remove this bushing or the bushings within the cluster gear unless they are found defective.

Repair—If the chassis is defective or damaged, it must be replaced by a new one. Replace all defective parts of the cluster gear and cluster gear shaft assembly if they are defective or damaged. Replace the bushing in which the main shaft rotates if it is excessively worn.

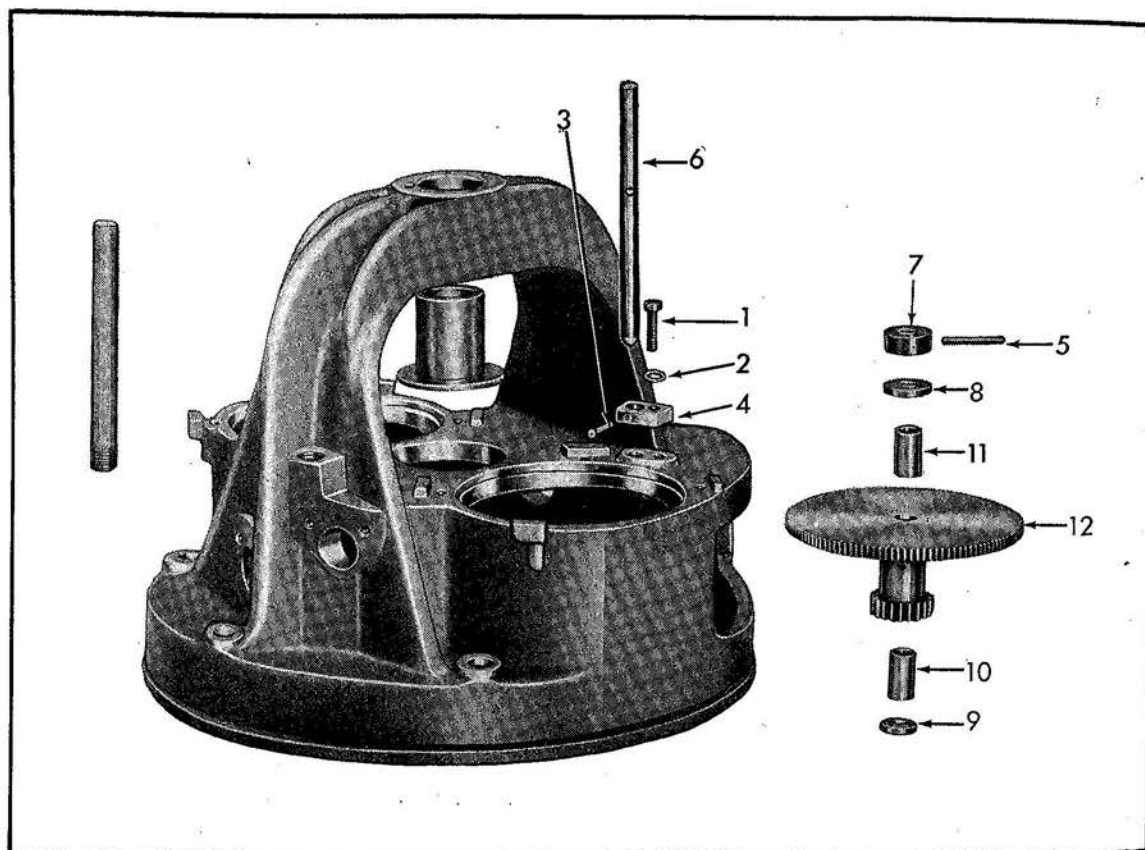


Figure 54.—Sequence of Disassembly of Cluster Gear from Chassis

RESTRICTED

Reassemble the chassis to the base, using the five bolts and accompanying washers to hold the two parts together.

NOTE: The main shaft assembly must be in place before the chassis is reassembled to the base.

Reassemble the brush holders to their respective places in the chassis and connect the leads from the cable to the brush holders. Reassemble the synchro generators to the chassis and zero the synchros, using the procedure given under reassembly of the synchro generators.

Reassembly—Reassemble the cluster gear shaft and cluster gear to the chassis in accordance with the sequence given in Figure 56.

Figure 55.—Removal of Bushing from Chassis

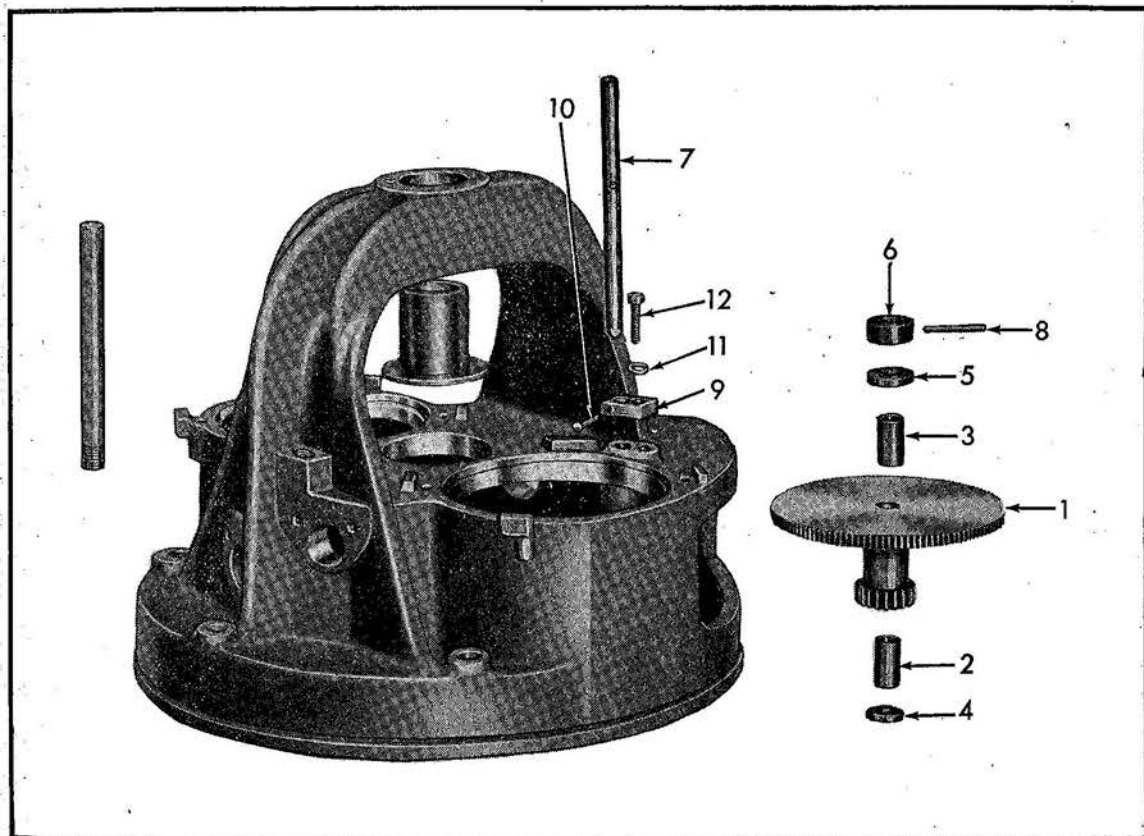
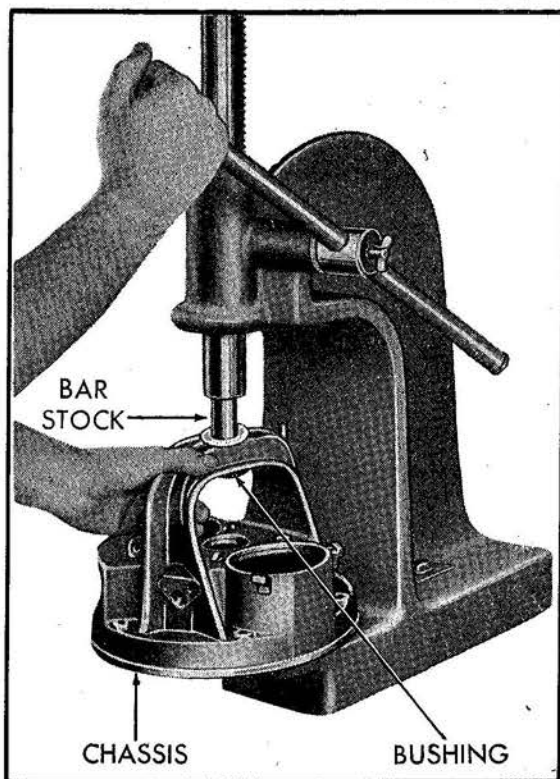


Figure 56.—Sequence of Reassembly of Cluster Gear to Chassis

RESTRICTED

Main Shaft Assembly

Disassembly—In order to remove the main shaft, it will be necessary to remove the cradle bracket and accompanying parts, the cover, synchro generators, brush holders, and chassis. Remove the main shaft from engagement with the base by pulling the shaft toward the chassis side of the base.

NOTE: Carefully fold the wires to the switch box, so that they will not damage the seals as they are pulled through.

If the individual items that go to make up the main shaft assembly all appear to be in good condition, do not disassemble these items from the main shaft. If disassembly is necessary, follow the sequence given in Figure 57.

NOTE: It will be necessary, if the collector rings are to be removed to unsolder the connecting wires before the collector rings are removed.

Repair—If any of the items in the main shaft assembly are defective or damaged, it will be necessary to replace them. Inspect the condition of the main shaft at the place where the main shaft seal rotates. If corrosion is evident, replace the main shaft.

Reassembly—Reassemble the main shaft assembly in accordance with the sequence given in Figure 58.

NOTE: In reassembling the shield to the shield holder, place the one long screw in the hole as shown in Figure 59.

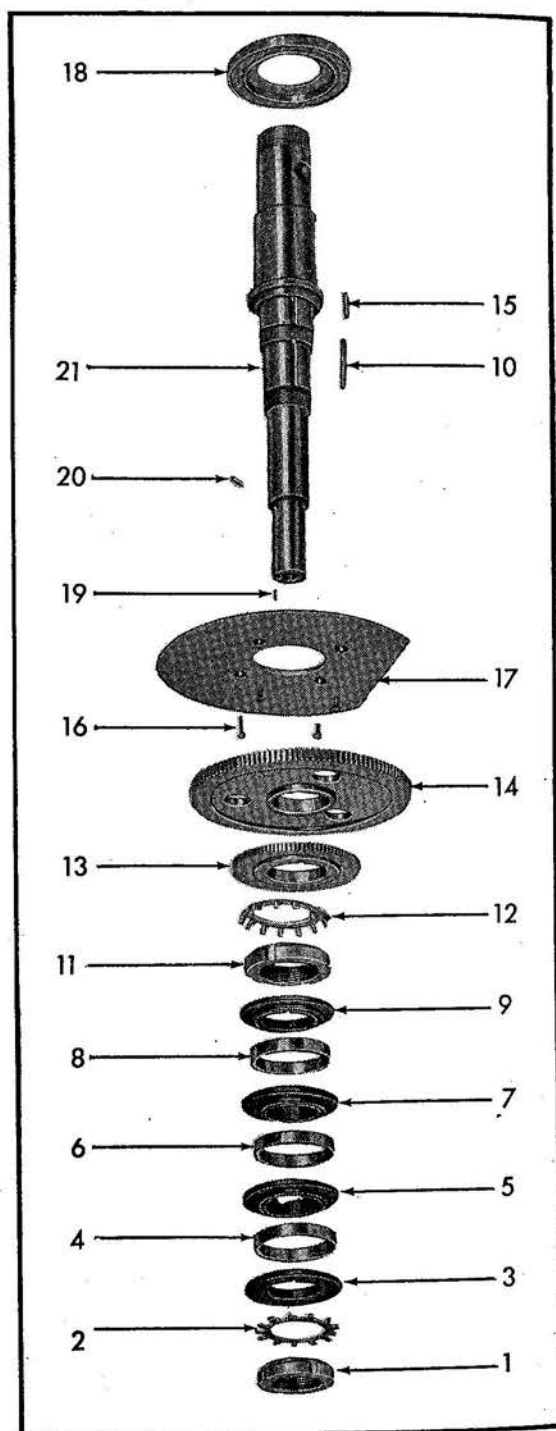


Figure 57.—Sequence of Disassembly of Main Shaft

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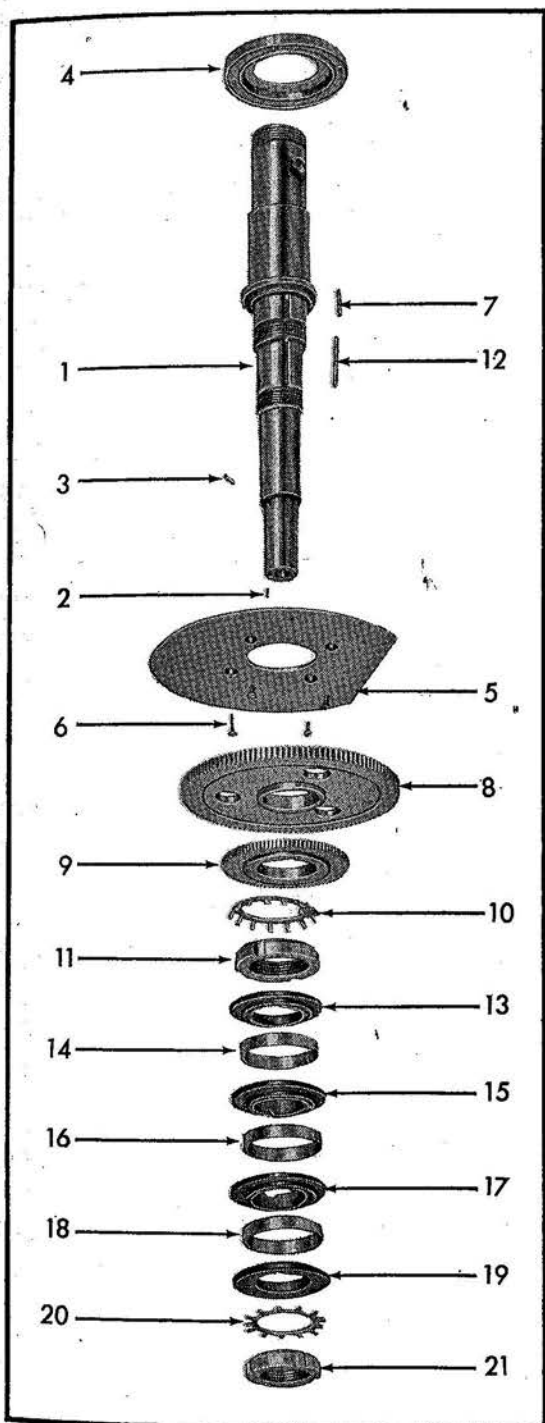


Figure 58.—Sequence of Reassembly of Main Shaft

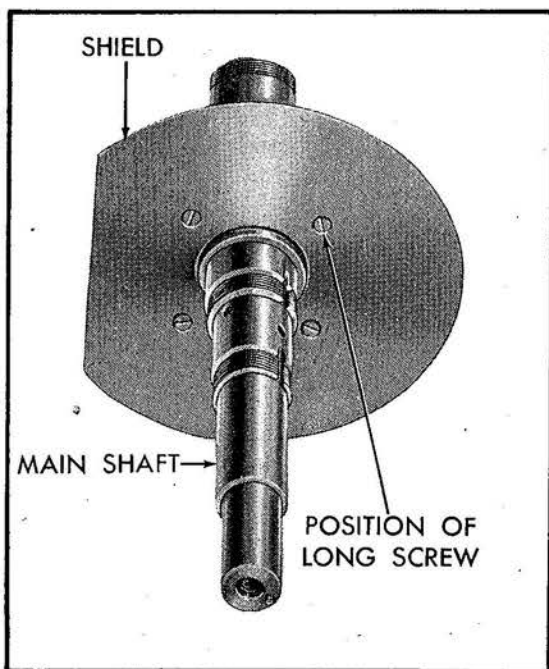


Figure 59.—Position of Long Screw in Shield

In reassembling the collector rings, it will be necessary to solder the wire to the collector ring before assembling the collector ring to its insulator. See that the notch in the spacer aligns with the proper hole in the shaft before assembling the slip ring. It may be necessary to clean out the hole in the spacers to have them fit properly upon the shaft. If a new shaft is used, be sure to insert the two pins which mate with corresponding holes in the thrust washers. If the sealing screw at the top of the shaft has been removed, coat threads with litharge and glycerine before assembly. The shaft seal assembly should be coated with a light oil before reinserting the shaft, as a lubricant is needed on the "O" rings and garter seal to prevent damage.

When inserting the main shaft assembly into the base (Figure 60) the one long screw (Figure 59) in the shield must be inserted into the hole in the base. This hole is a clearance hole, and the screw is located within it to prevent the shield from rotating when the shaft is turned. After the shaft is inserted into the base, reassemble the two thrust washers upon the end of it. Reassemble the chassis to the base. Place the two washers, thrust washers, and screw on the end of the shaft. Reassemble the brush holders to the chassis and in-

sert the synchros into the chassis, zeroing them as per instructions under reassembly of synchro generators.

Shaft Seal Assembly and Base

Dissassembly—In order to remove the shaft seal assembly, it is necessary to disassemble the target bearing transmitter completely. This involves removal of the grips, cradle, cradle bracket, cover, synchro generators, brush holders, chassis, and main shaft assembly.

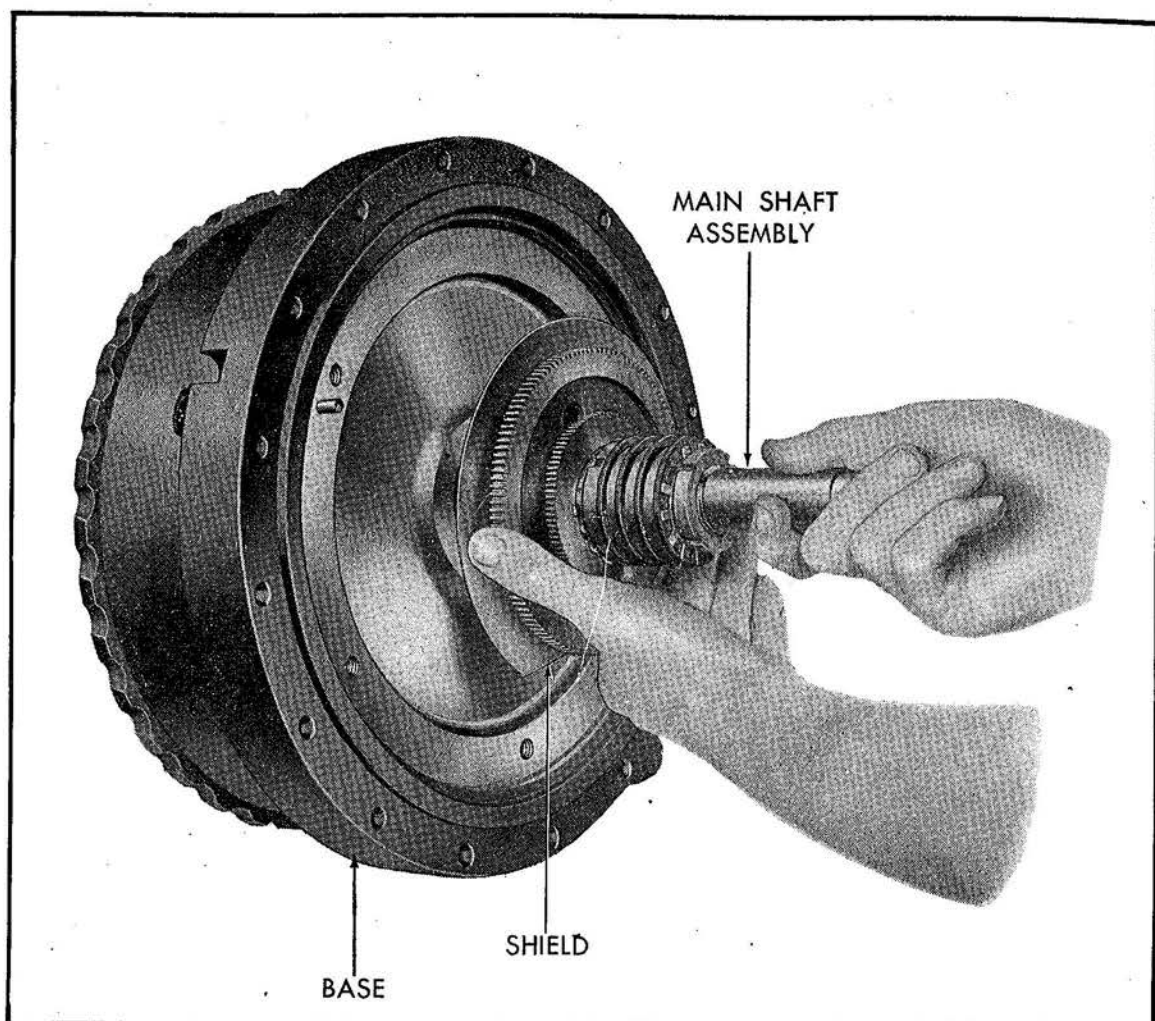


Figure 60.—Reassembling Main Shaft to Base

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DISASSEMBLY, REPAIR, AND REASSEMBLY

With a screwdriver, remove the four screws holding the seal cover to the base. Remove the seal cover. Place the base upside down in an arbor press. With a block of suitable size, carefully press out the shaft seal assembly (see Figure 27). For disassembly of the shaft seal assembly, follow the sequence given in Figure 61. The base itself needs no disassembly.

Repair—If the "O" ring packings or garter seal are defective, they must be replaced. Under operating circumstances it is not necessary to replace any of these seals other than at the time of major submarine overhaul. If the "O" ring packings are replaced, be certain that the grooves in which they seat have no burrs which might chip the packing upon reassembly. If the shaft bearing is excessively worn, it should be replaced. The only repair necessary on the base itself is the replacement of the lead washer which is located underneath the plug which caps the hole in which the grease fitting is located.

Reassembly—Reassemble the parts of the shaft seal assembly in accordance with the sequence given in Figure 62. Coat the "O" rings with grease Navy Specification 14-L-5 Type A. The cavity of the garter seal should be filled with grease of the same type. Press the main shaft seal into the base, being certain that the pin located in the shaft bearing seats in the hole in the flange of the base. Replace the seal cover on the base and insert the four screws locking it in place. Apply a light oil to the internal surface of the main shaft seals before reassembling the main shaft to the base. Reassemble the instrument in reverse of the order in which it was disassembled.

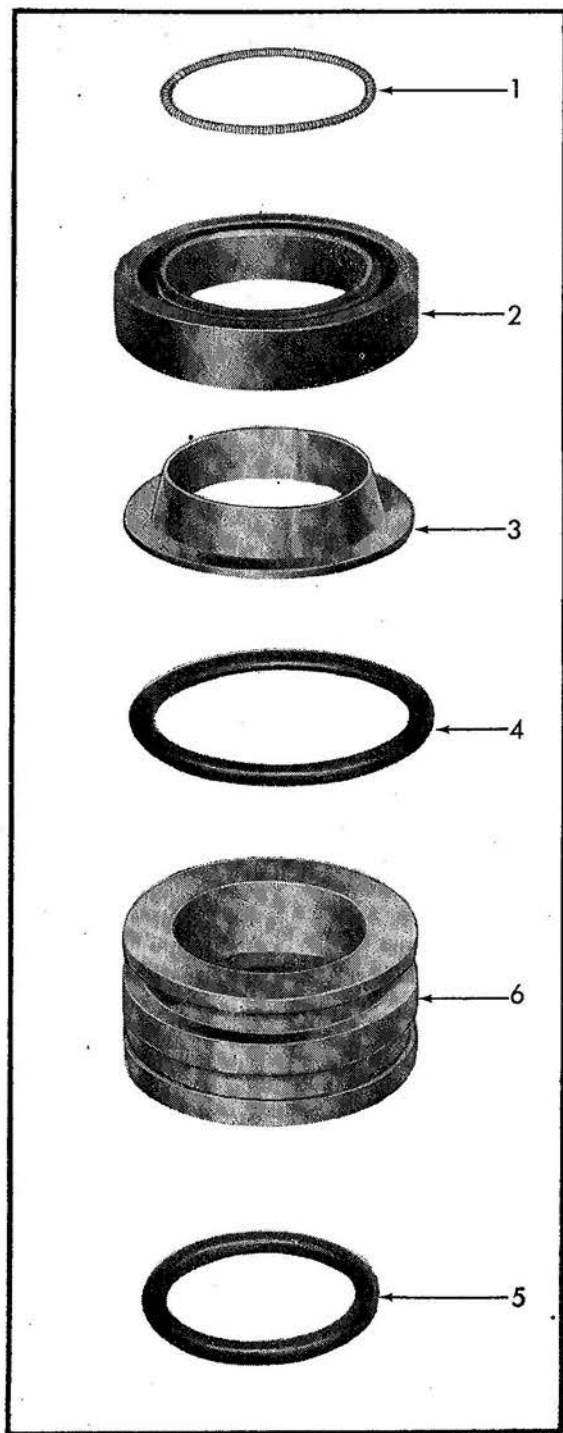


Figure 61.—Sequence of Disassembly of Shaft Seal Assembly

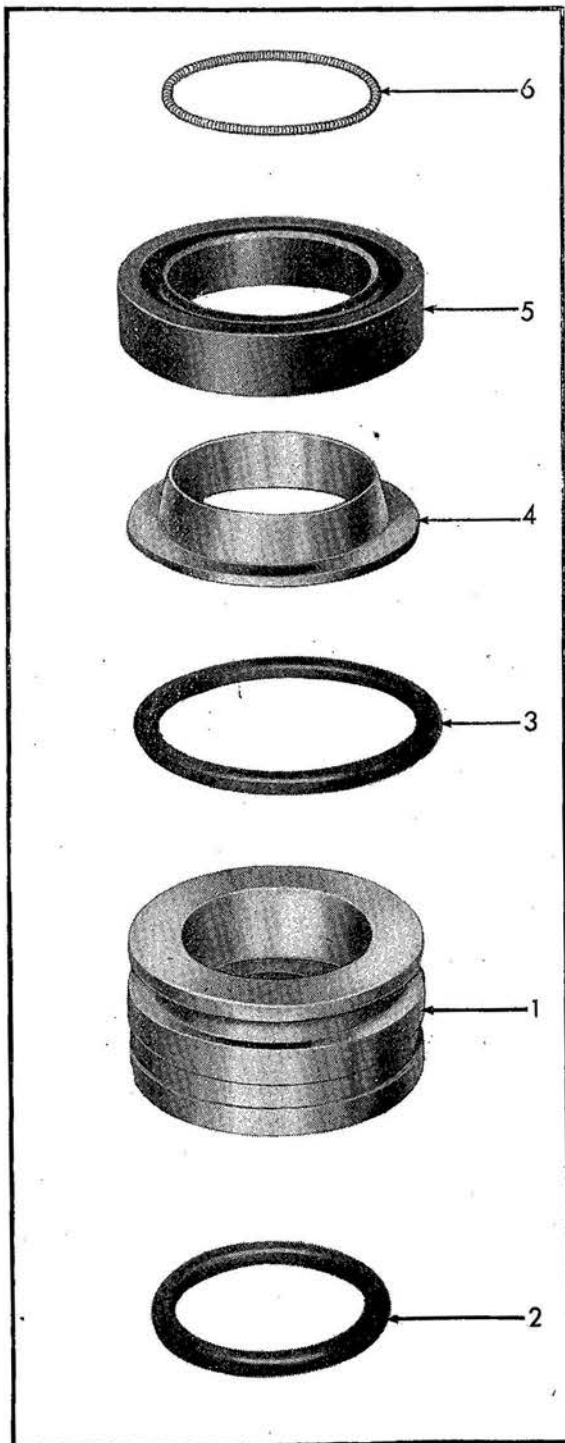


Figure 62.—Sequence of Reassembly of Shaft Seal Assembly

After reassembly of the complete instrument, grease in accordance with Navy Specification 14-L-5 Type A should be applied by means of a grease gun to the grease fitting located in the base. Sufficient grease should be applied to fill the passage and also cover the component parts of the main shaft seal. Any excess grease which oozes out should be removed with a cloth.

STORAGE

The Target Bearing Transmitter Mk 8 is stored in the assembled condition. It is a wise precaution to insert a plug in the terminal tube of the cover to seal this against entrance of dirt. If the pressure-proof telescope is not on the instrument, the terminal tube in the switch box should be sealed with a plug.

If the instrument has been in "dead" storage for a period of a year, the main shaft seal assembly seals, i.e., the two "O" rings and the garter seal, should be replaced. If it is found that corrosion has taken place on the main shaft where the seals touch it, the shaft itself will have to be replaced.

TEST PROCEDURE

The instrument is to be tested to 300 pounds per square inch external pressure after complete disassembly and reassembly.

TARGET BEARING TRANSMITTER MARK 8

PARTS CATALOG

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CATALOG SECTION

INTRODUCTION

The following is the Catalog Section. It consists of an index by figure numbers of all catalog illustrations; illustrations of parts by sub-assemblies; and a numerical parts list giving parts numbers, part nomenclature, the number of items required per unit, and a cross-reference to illustrations in which the parts are shown.

HOW TO USE THE CATALOG SECTION

1. If the location of the part is known, refer to the index of illustrations for the sub-assembly on which the part is illustrated.
2. If the part number is known, refer to the numerical index, which is cross-referenced with the figure numbers which will show where the part is used.
3. The illustrations give the number of the part and its nomenclature. The numerical parts list gives the number of the item used in the unit, as well as a cross-reference to the figure number or figure numbers on which the part will be found.
4. It is to be noted that illustration numbers in the Catalog Section begin with Figure 100 (see page 66).

RESTRICTED

INDEX OF ILLUSTRATIONS

FIGURE		PAGE
Figure 100	Target Bearing Transmitter Mark 8.....	66
Figure 102	Target Bearing Transmitter Mark 8 (With Telescope Removed)	67
Figure 102	Target Bearing Transmitter Mark 8 (Partially Exploded).....	68
Figure 103	Cradle and Grips Assembly.....	69
Figure 104	Cradle Assembly	70
Figure 105	Holder Assembly, Binocular.....	71
Figure 106	Grip Assembly, Left Hand	72
Figure 107	Grip Assembly, Right Hand	73
Figure 108	Bracket Assembly, Cradle	74
Figure 109	Leaf Assembly, Front, Sight	75
Figure 110	Leaf Assembly, Rear, Sight	75
Figure 111	Switch Assembly	76
Figure 112	Box Details, Switch	77
Figure 113	Cover Details, Switch Box	78
Figure 114	Base and Cover Assembly	79
Figure 115	Cover Details	80
Figure 116	Base Details	81
Figure 117	Seal Details, Shaft	82
Figure 118	Base and Chassis Assembly	83
Figure 119	Chassis and Shaft Assembly	84
Figure 120	Chassis Assembly	85
Figure 121	Shaft Assembly	86
Figure 122	Generator Assembly, Synchro (36-speed)	87
Figure 123	Generator Assembly, Synchro (one-speed)	87
Figure 124	Holder Assembly, Brush	88
Figure 125	Board Assembly, Terminal	89

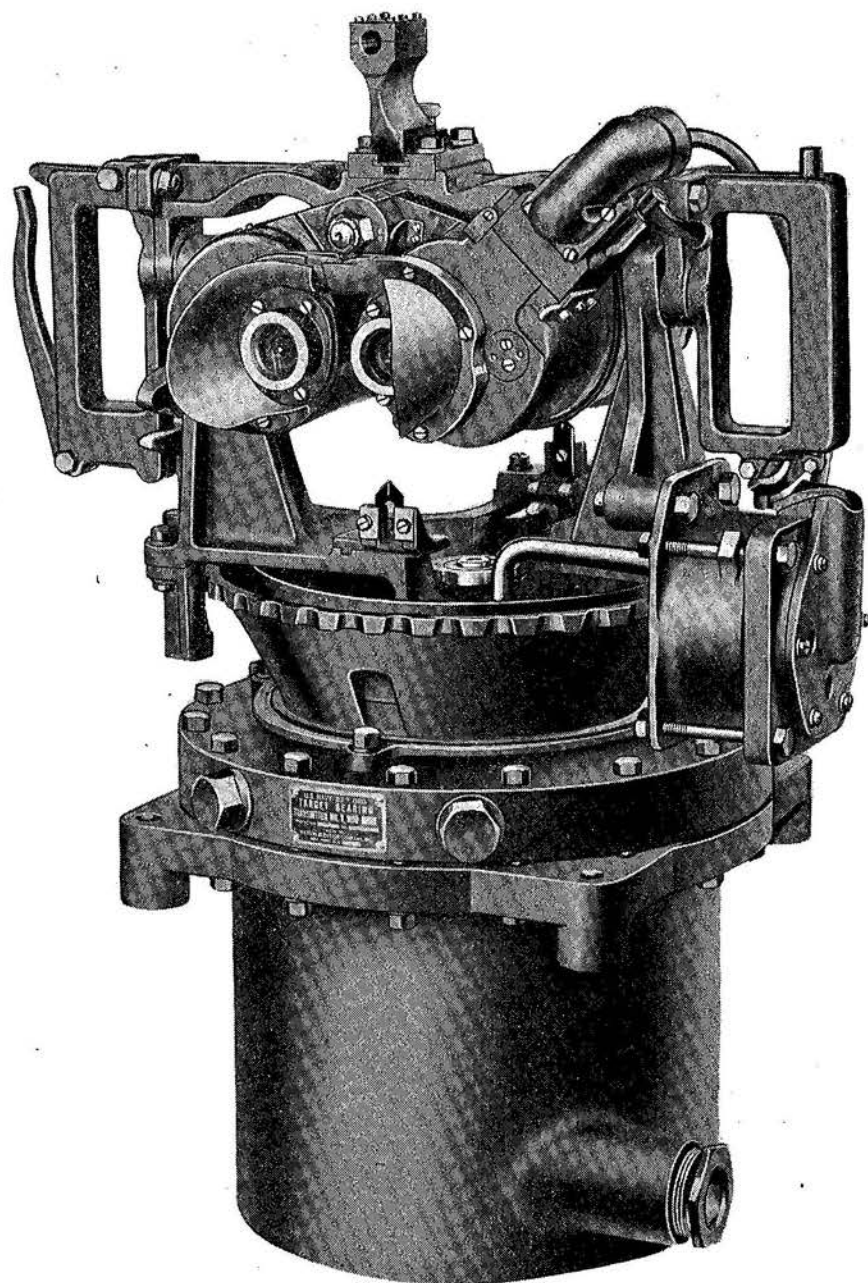


Figure 100.—Target Bearing Transmitter Mark 8

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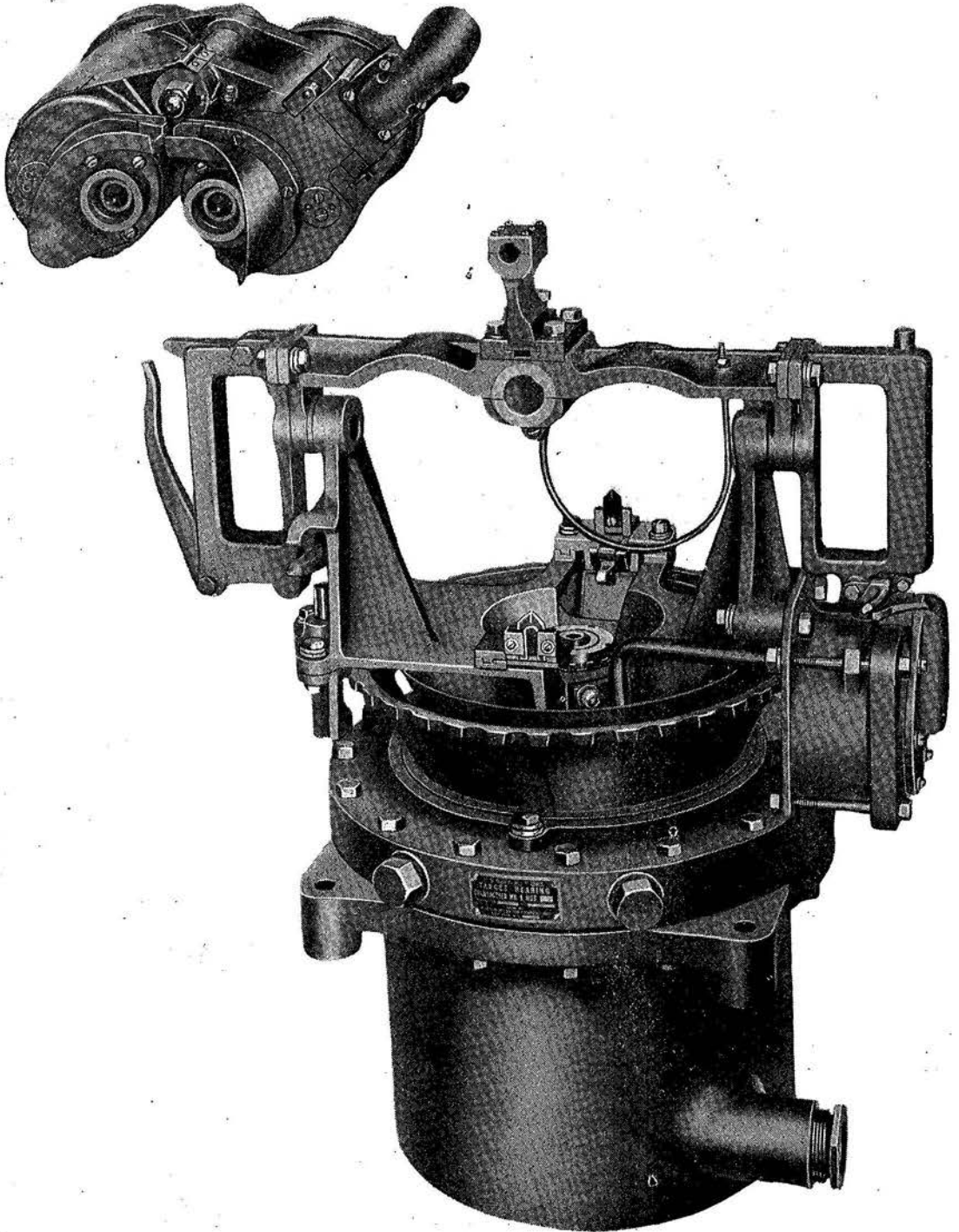


Figure 101.—Target Bearing Transmitter Mark 8
(With Telescope Removed)

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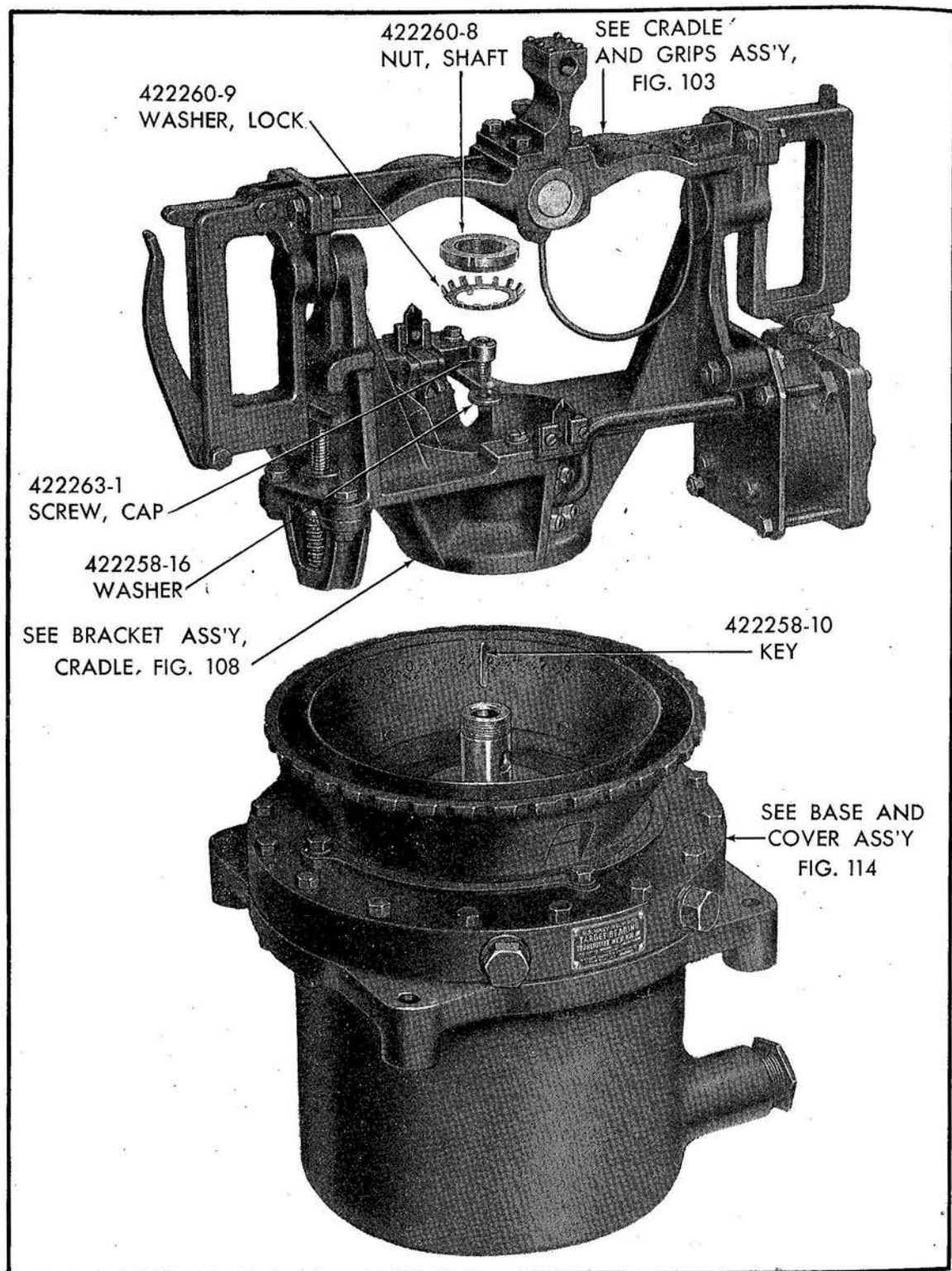


Figure 102.—Target Bearing Transmitter Mark 8
(Partially Exploded)

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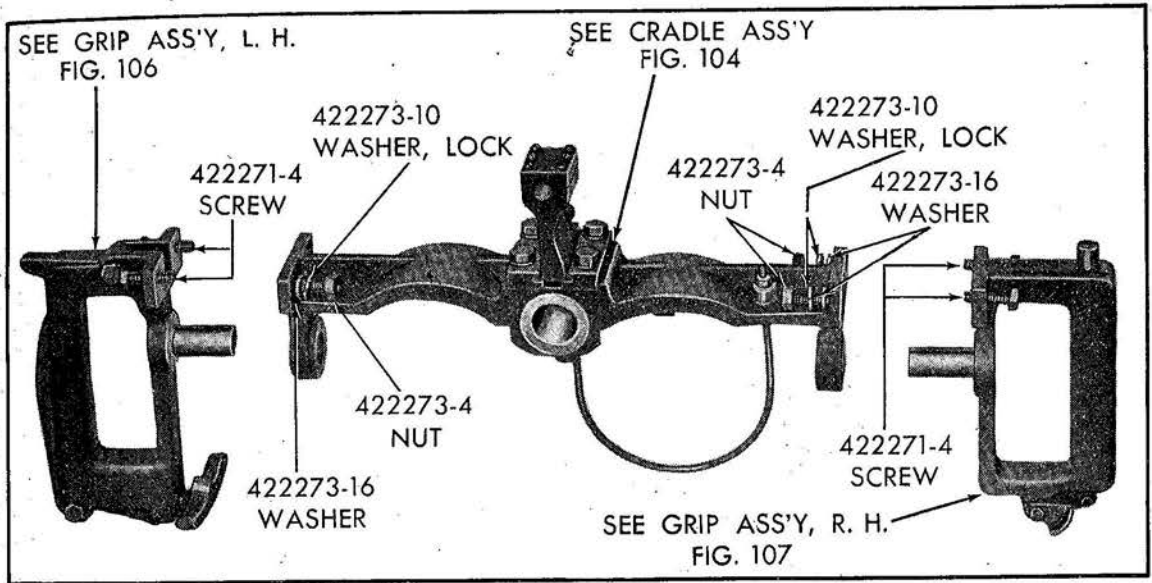


Figure 103.—Cradle and Grips Assembly

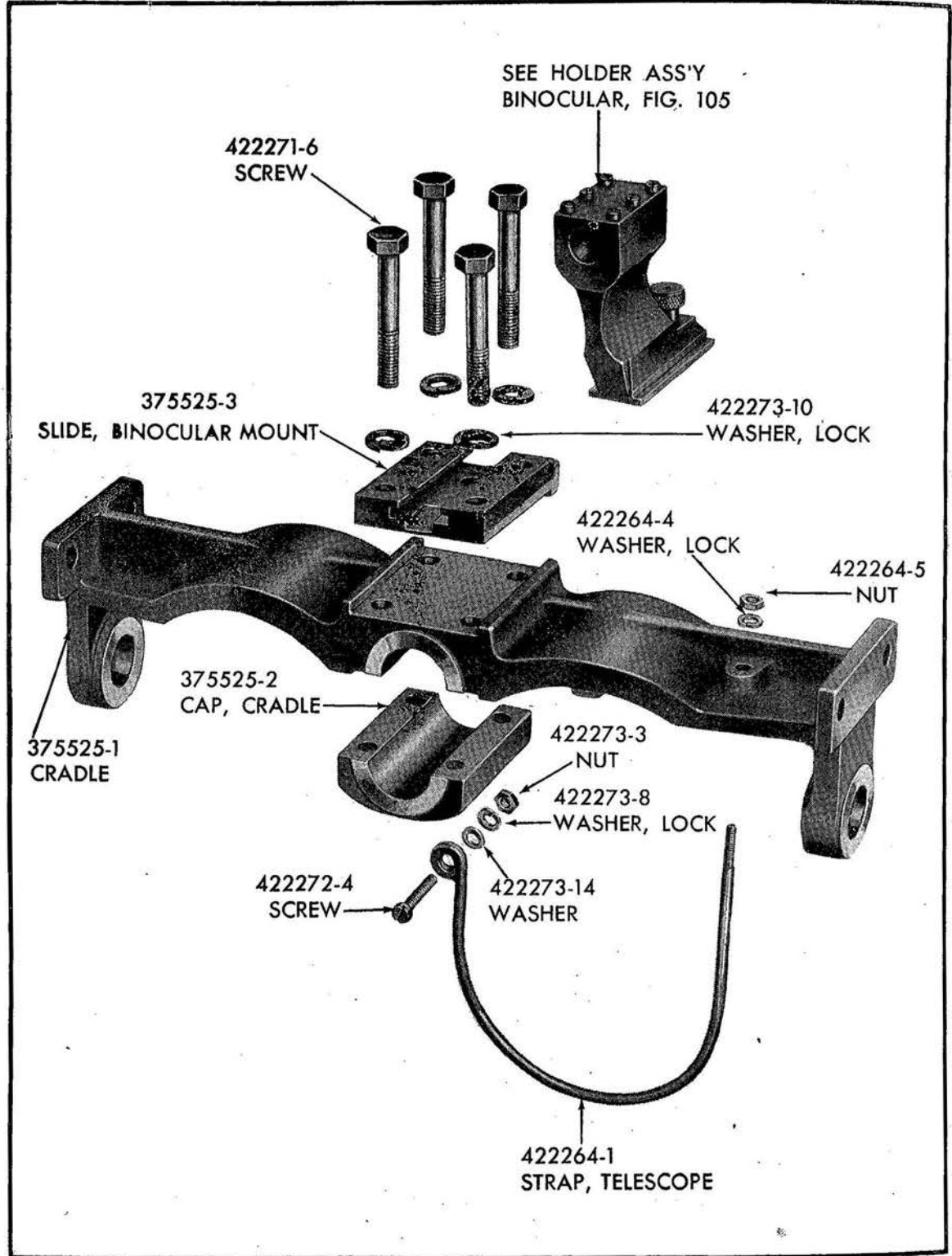


Figure 104.—Cradle Assembly

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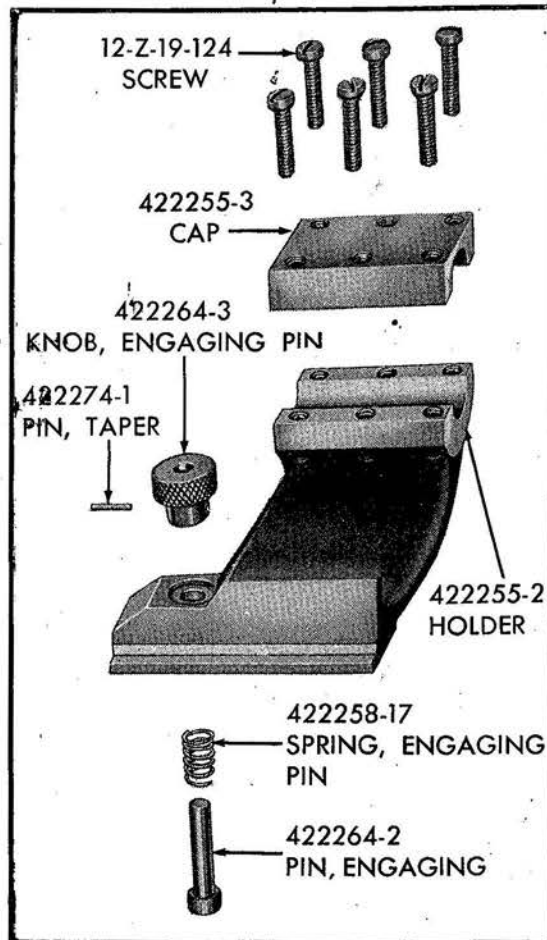


Figure 105.—Holder, Assembly, Binocular

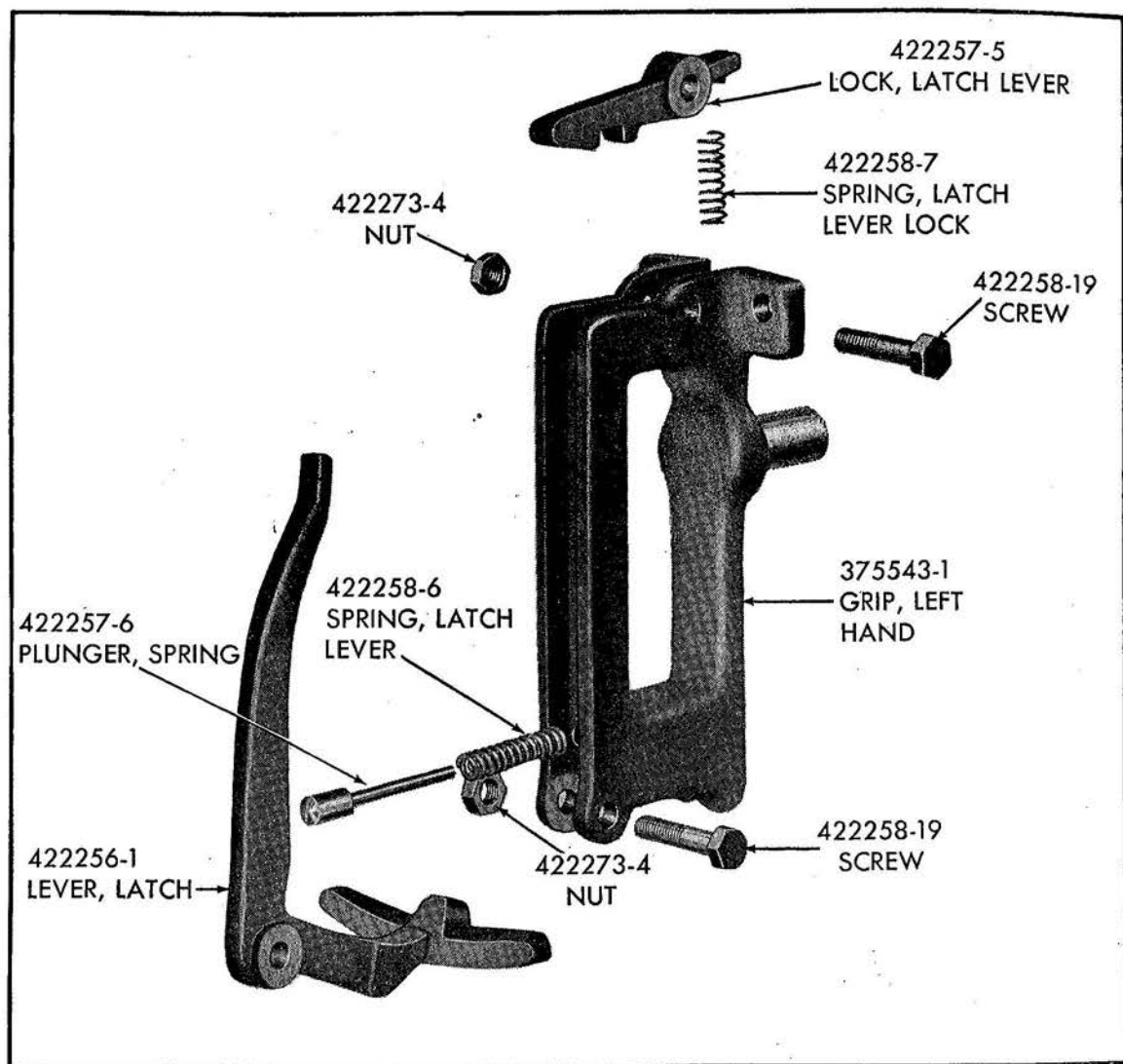


Figure 106.—Grip Assembly, Left Hand

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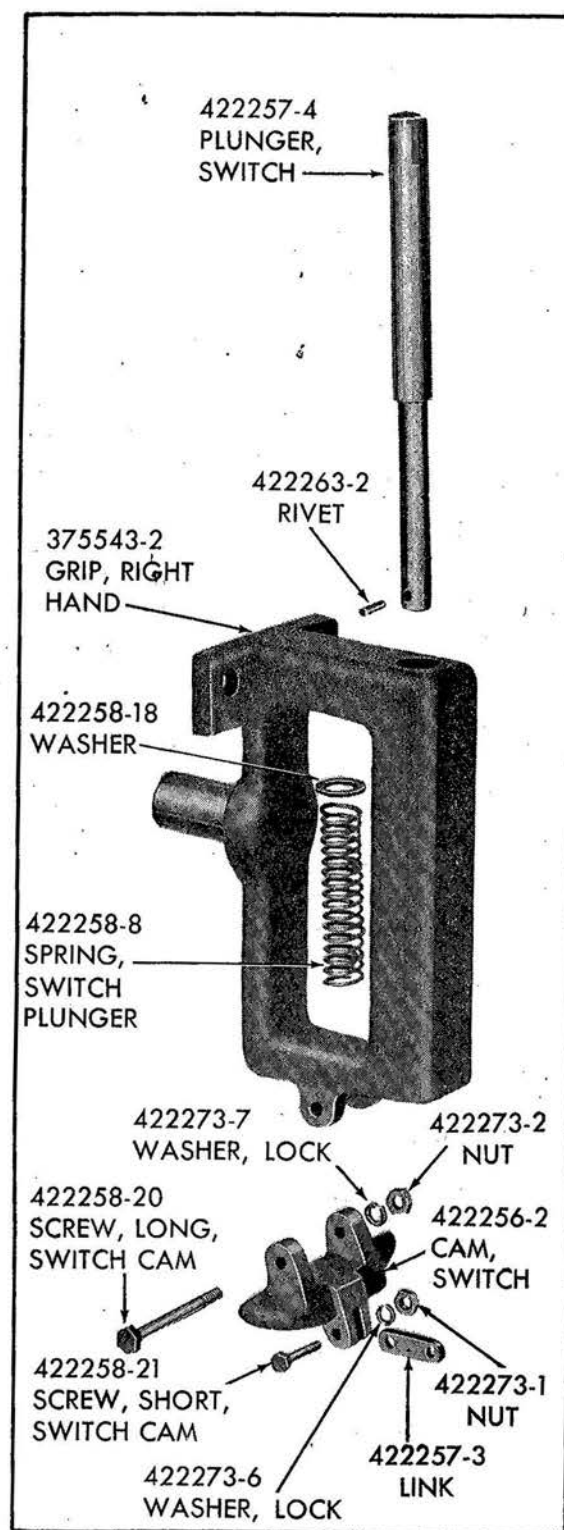


Figure 107.—Grip Assembly, Right Hand

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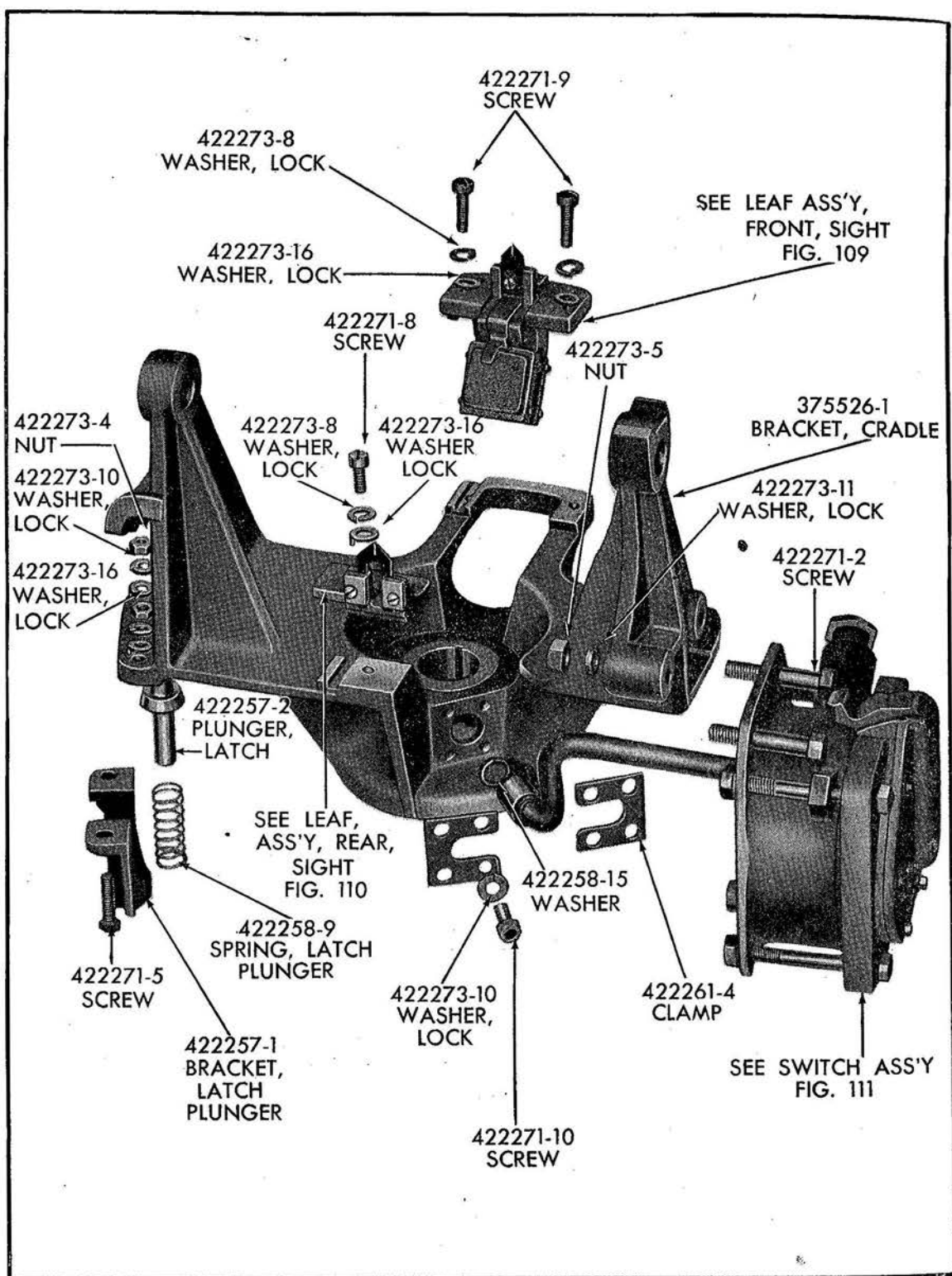


Figure 108.—Bracket Assembly, Cradle

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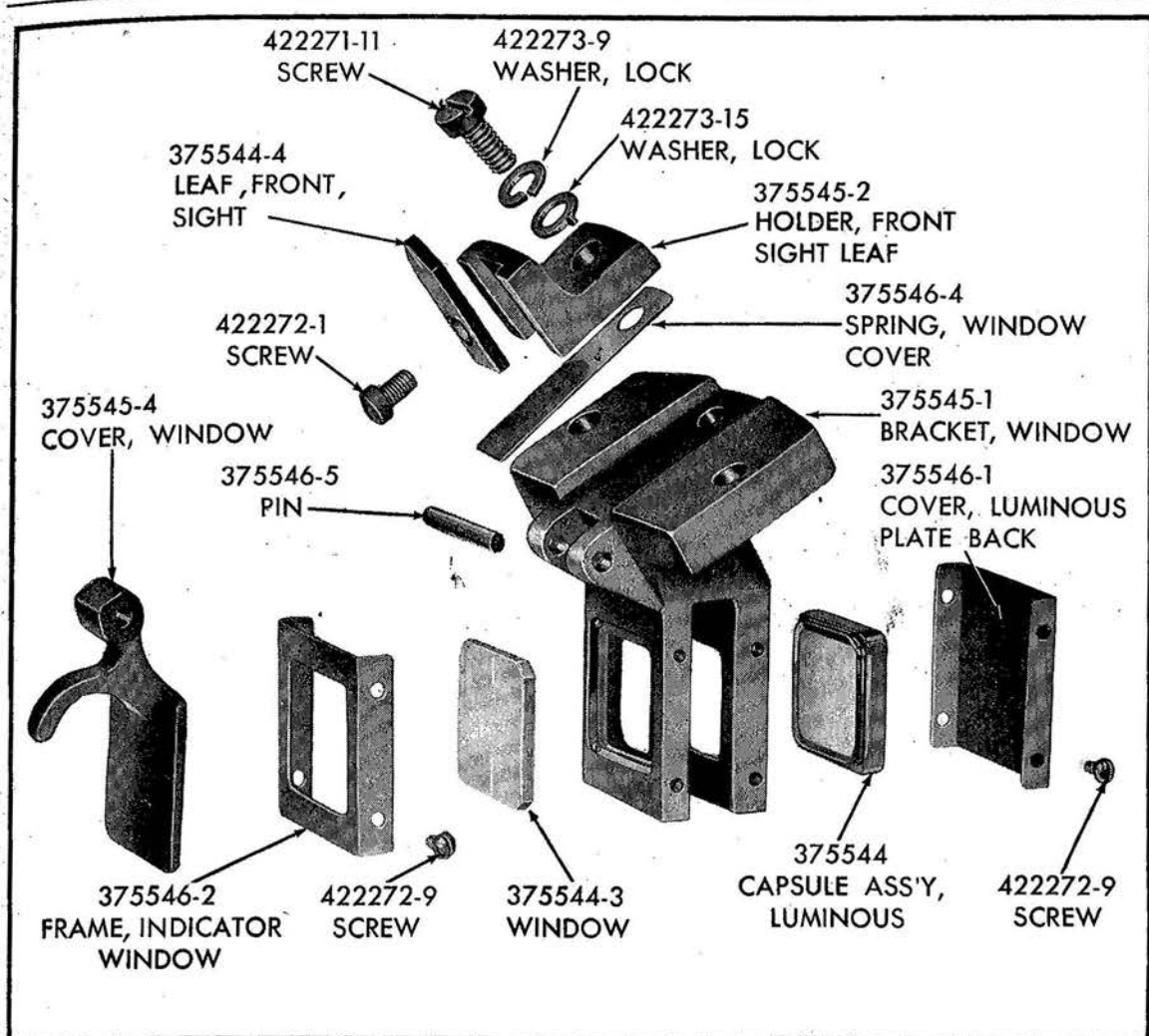


Figure 109.—Leaf Assembly, Front, Sight

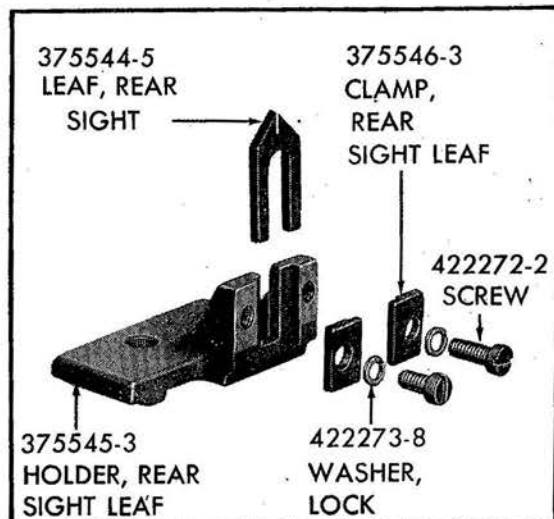


Figure 110.—Leaf Assembly, Rear, Sight

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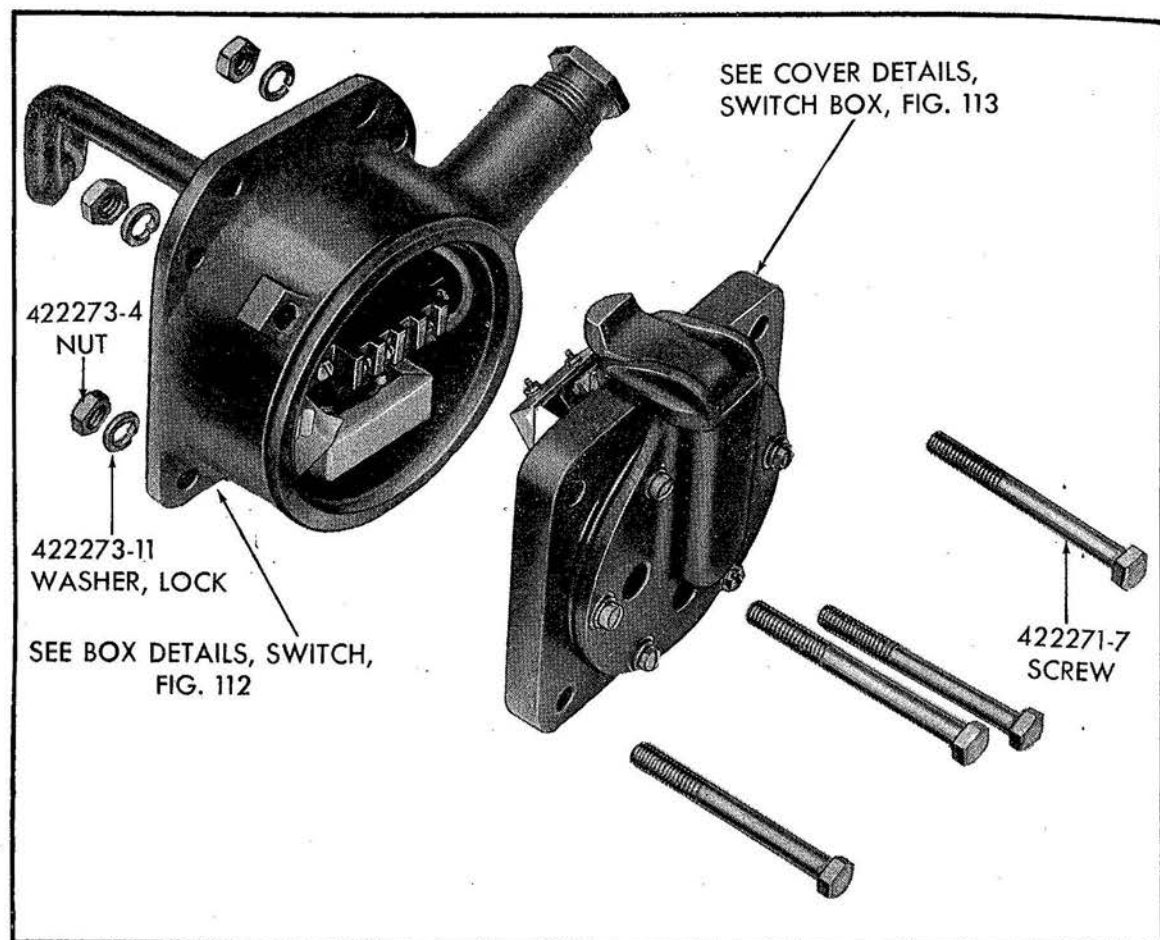


Figure 111.—Switch Assembly

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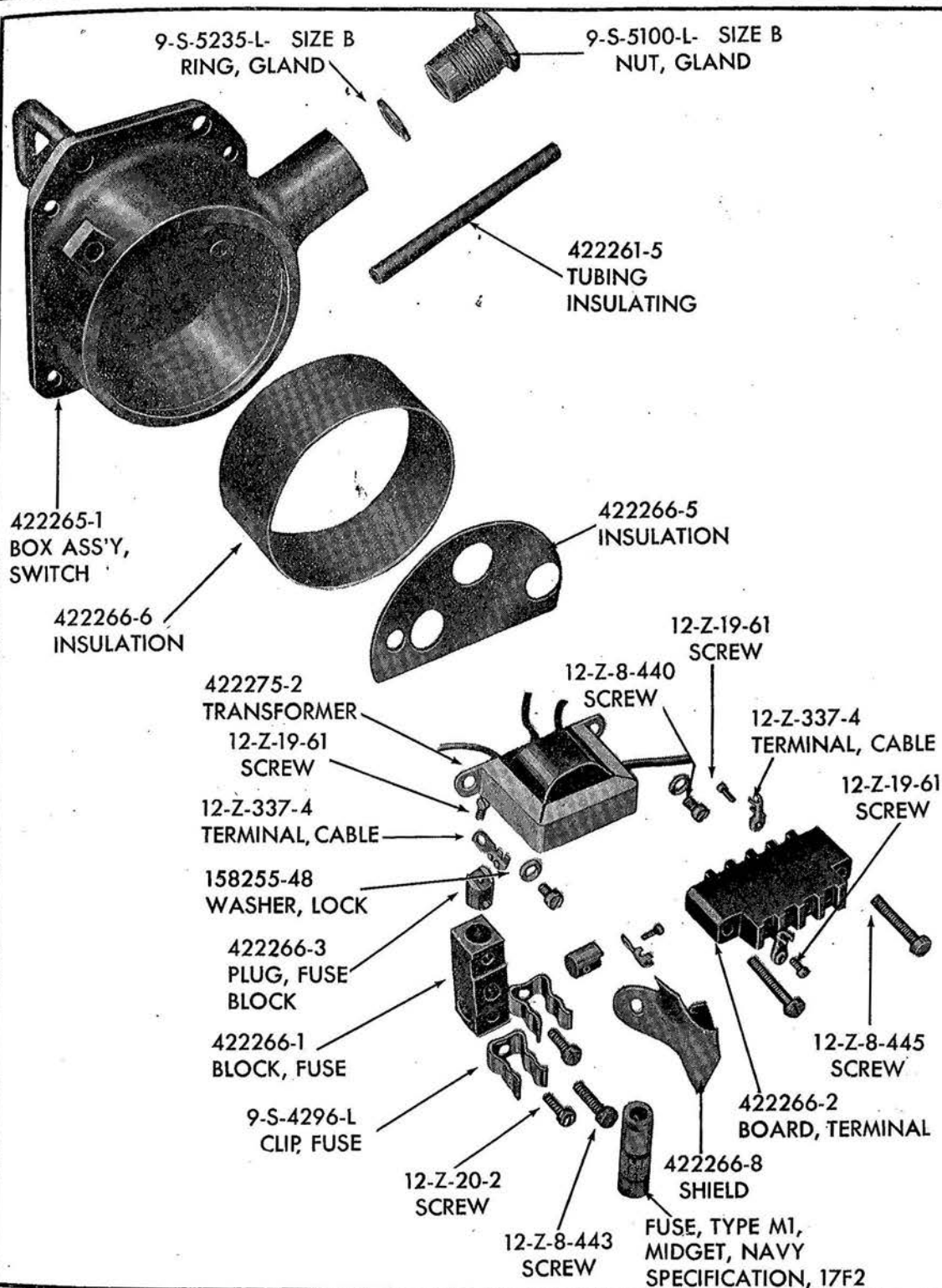


Figure 112.—Box Details, Switch

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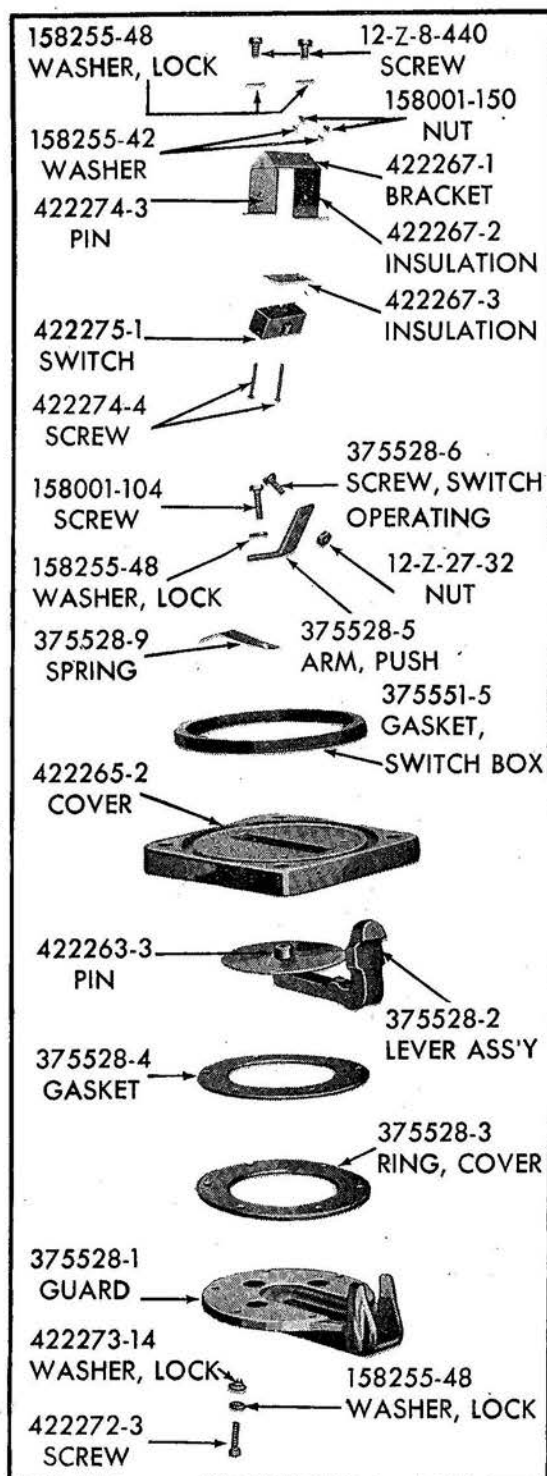


Figure 113.—Cover Details, Switch Box

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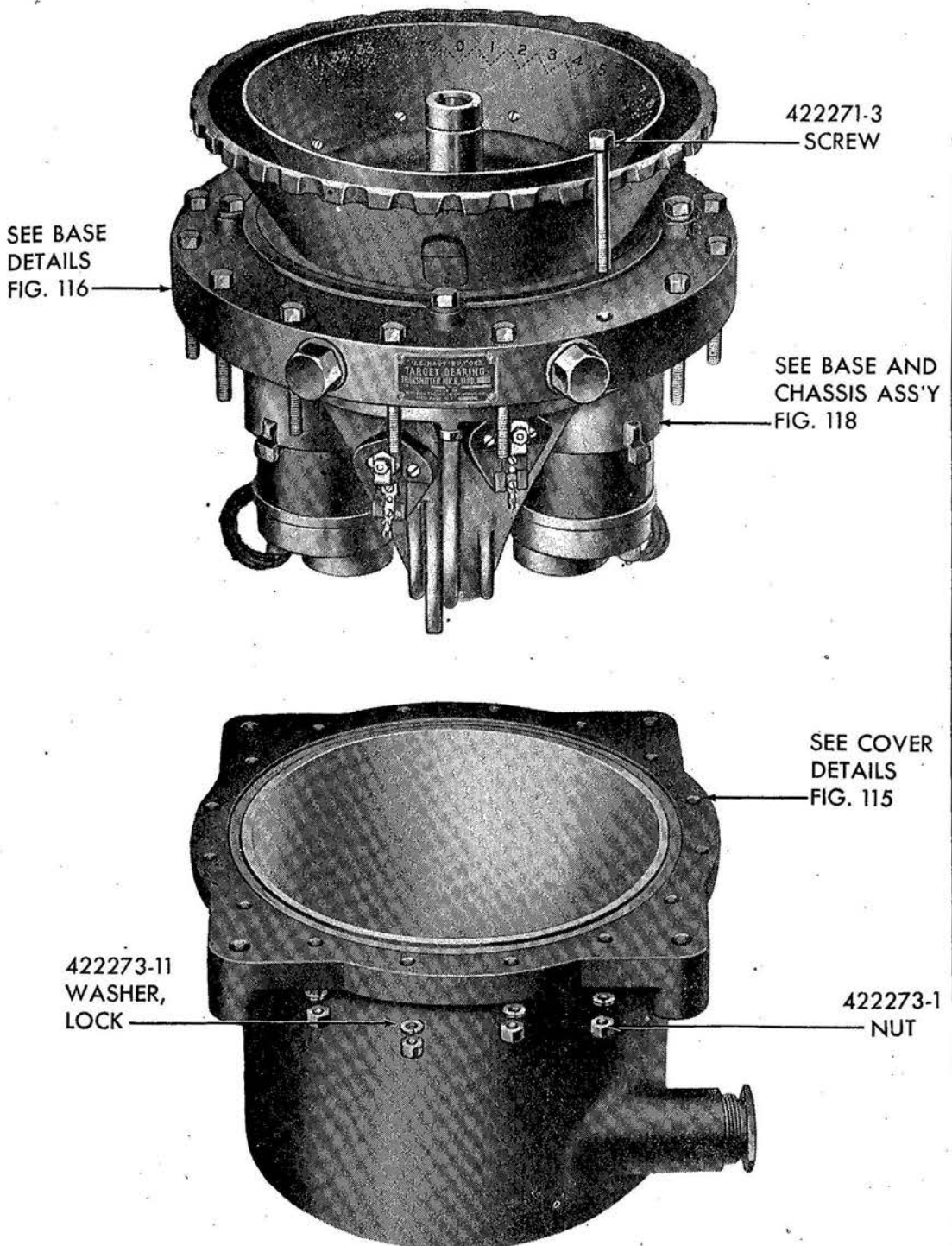


Figure 114.—Base and Cover Assembly

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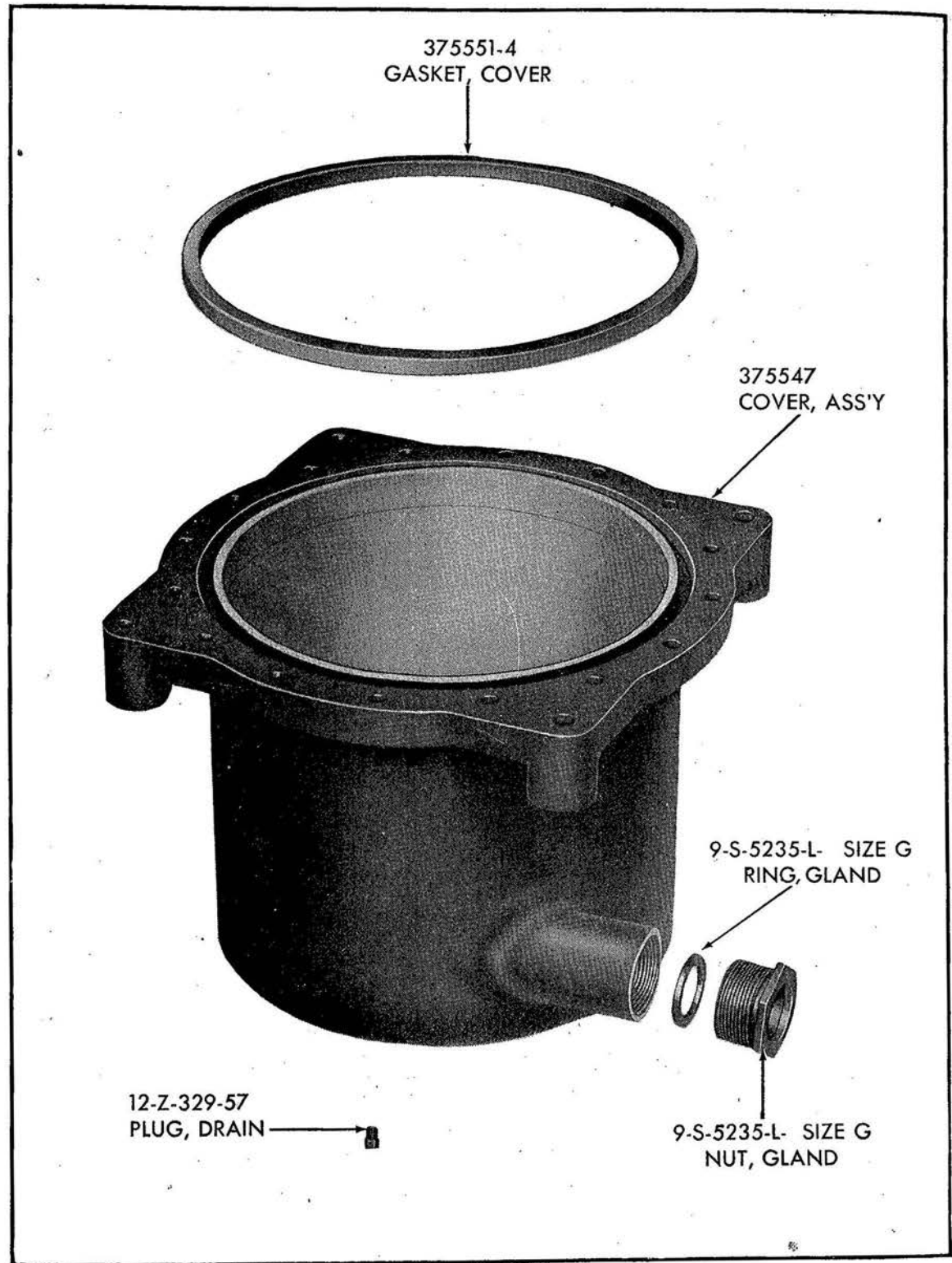


Figure 115.—Cover Details.

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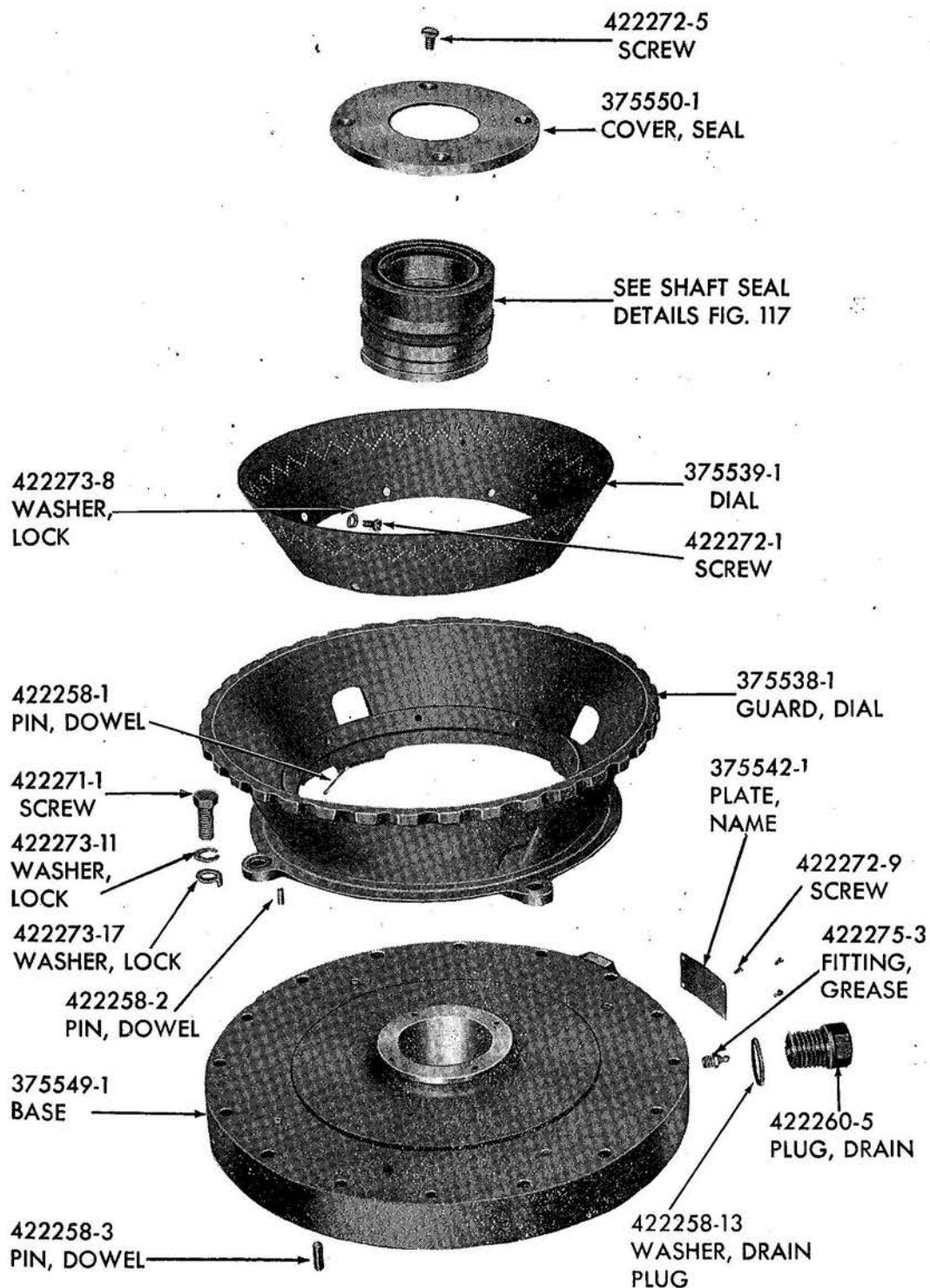


Figure 116.—Base Details

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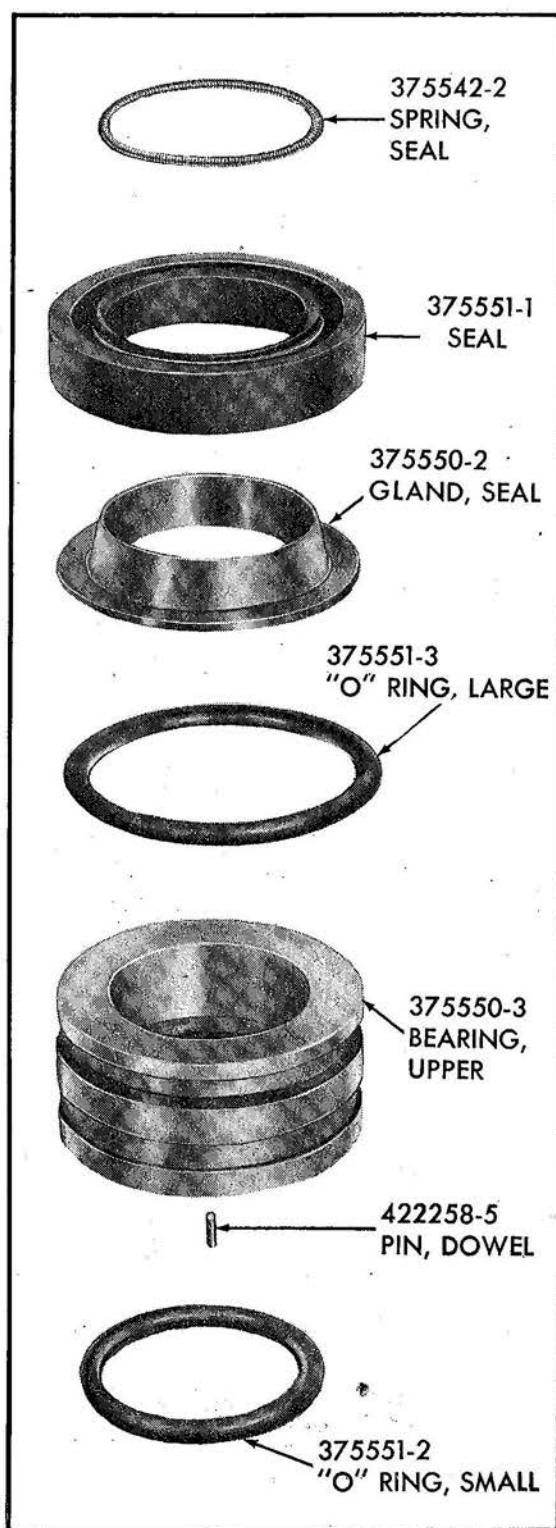


Figure 117.—Seal Details, Shaft

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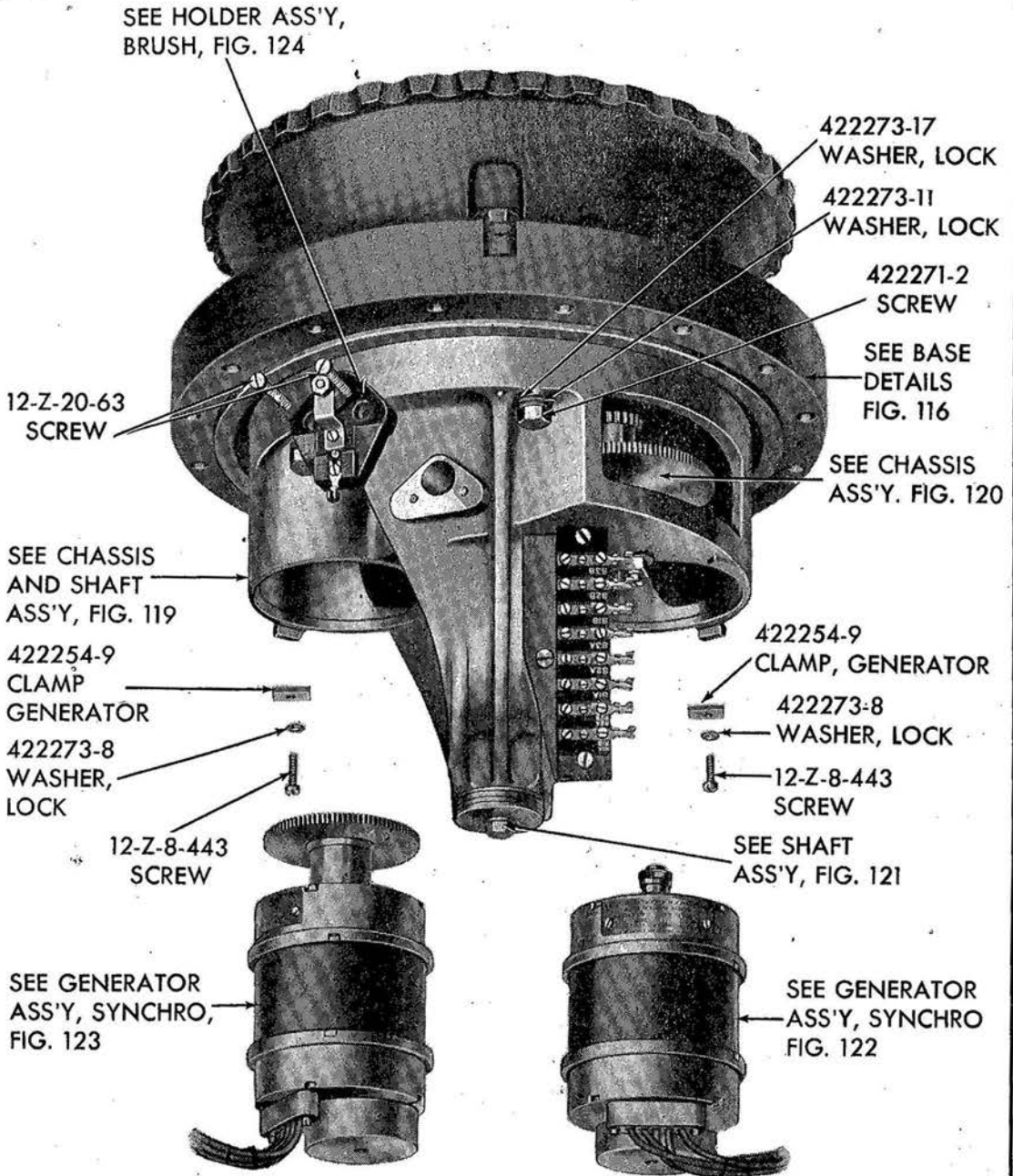


Figure 118.—Base and Chassis Assembly

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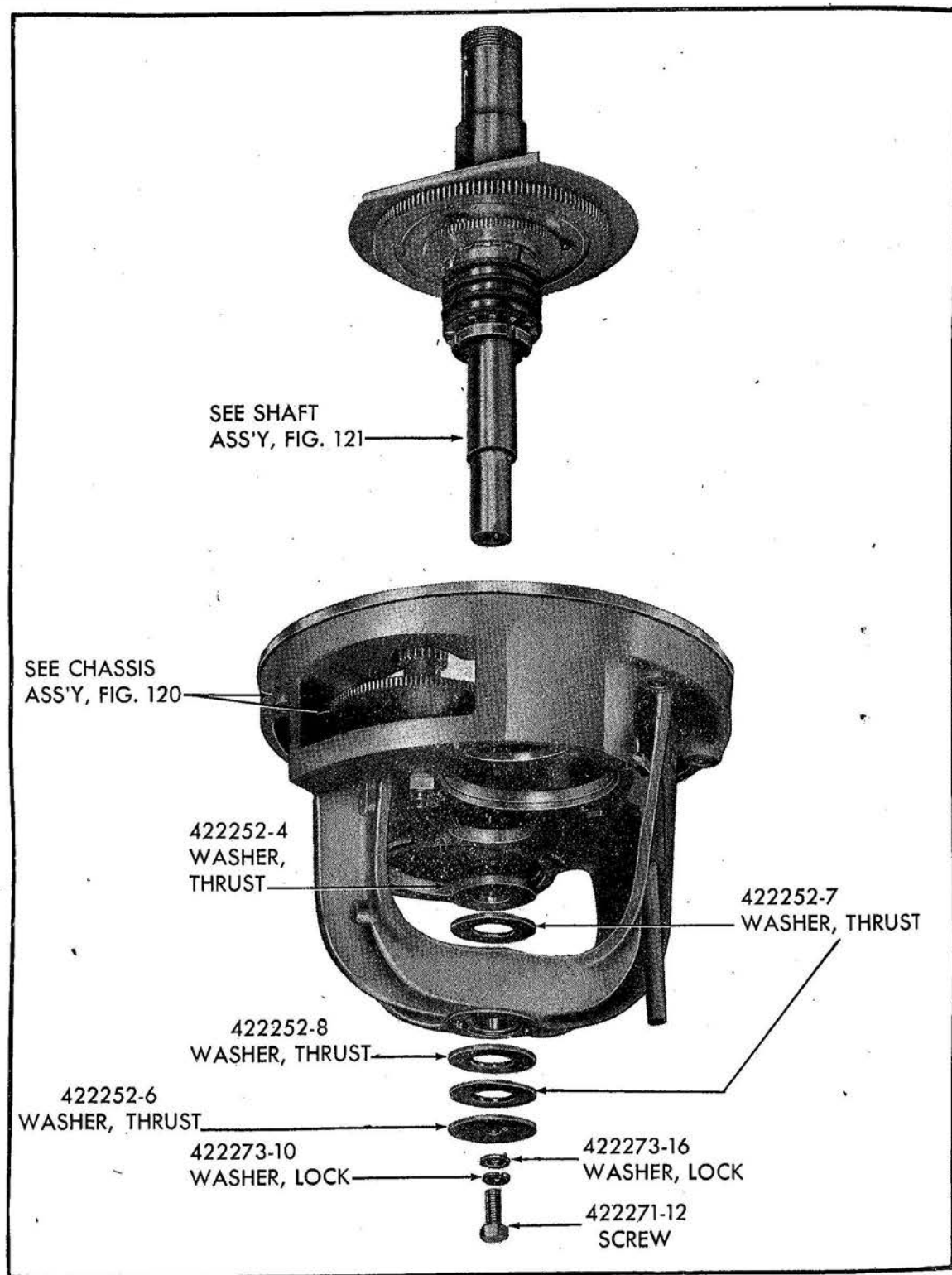


Figure 119.—Chassis and Shaft Assembly

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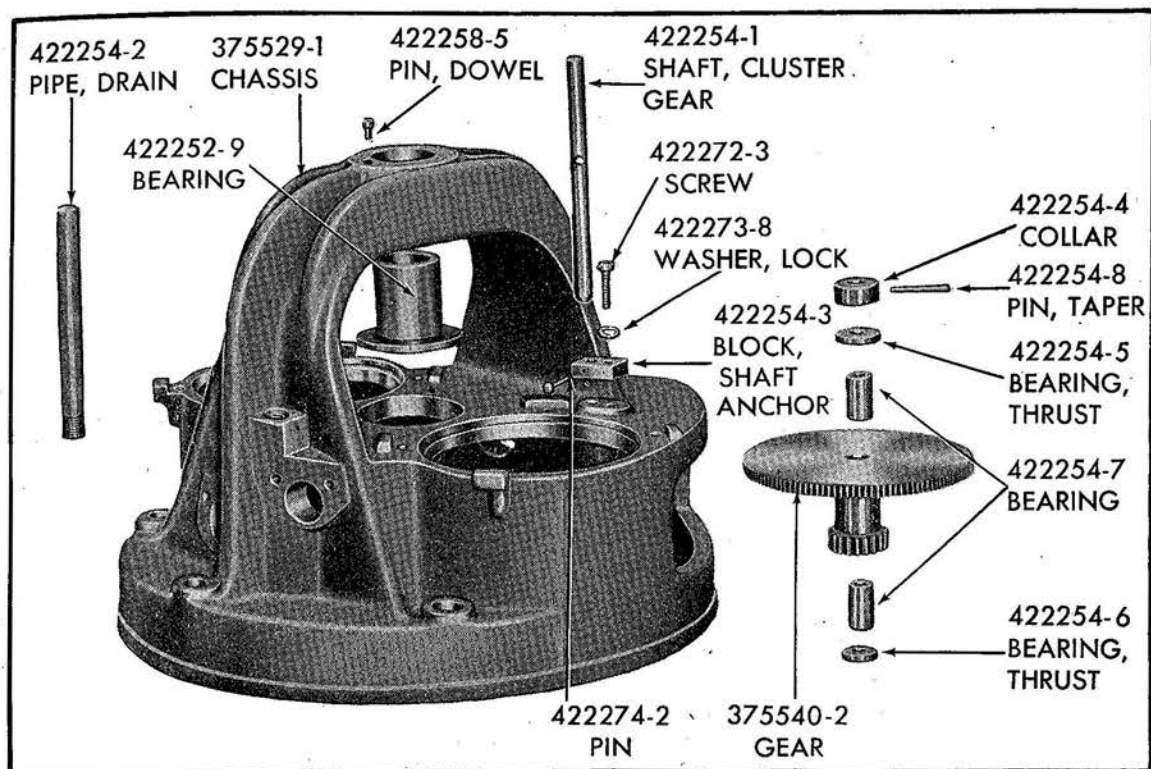


Figure 120.—Chassis Assembly

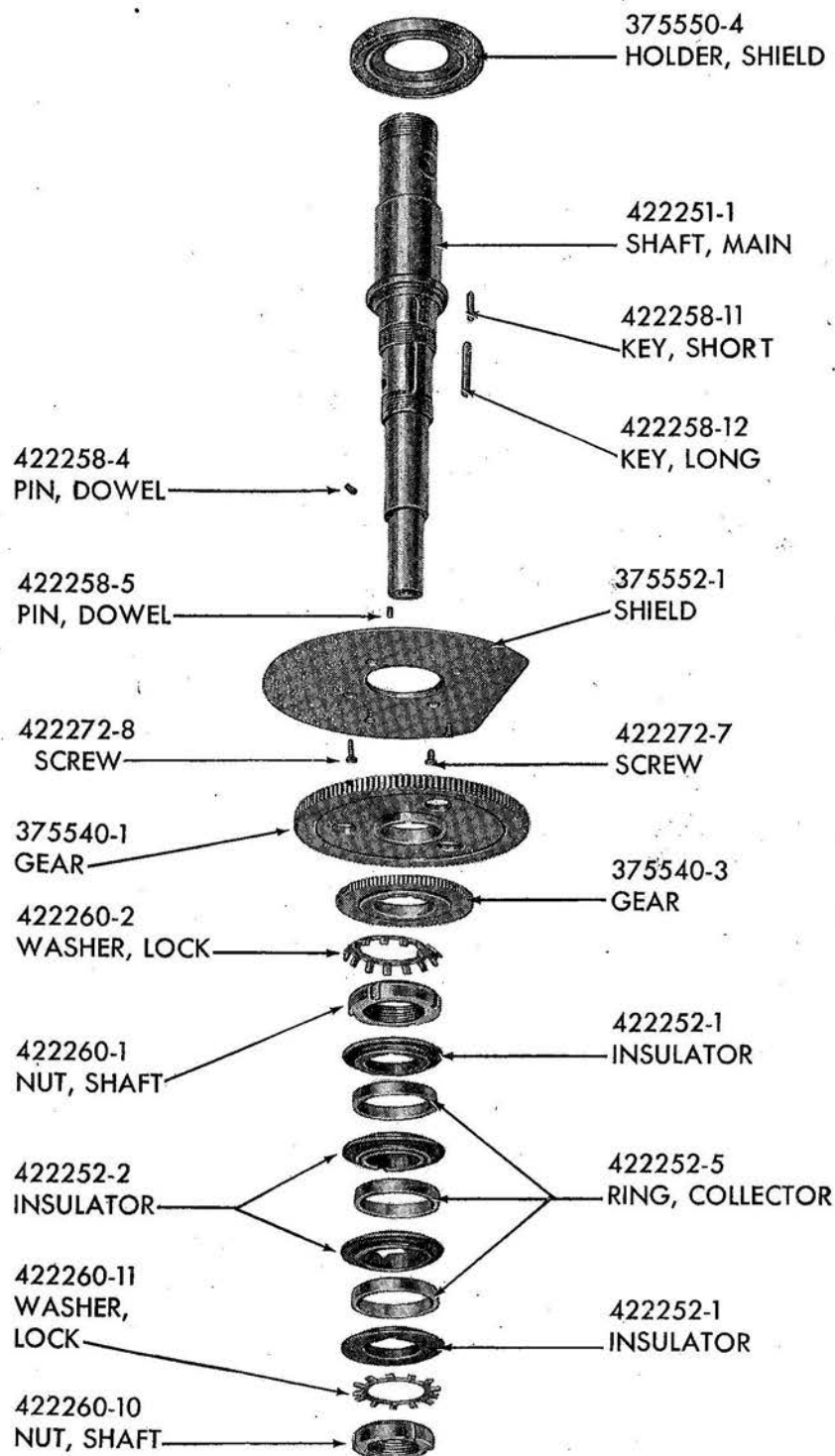


Figure 121.—Shaft Assembly

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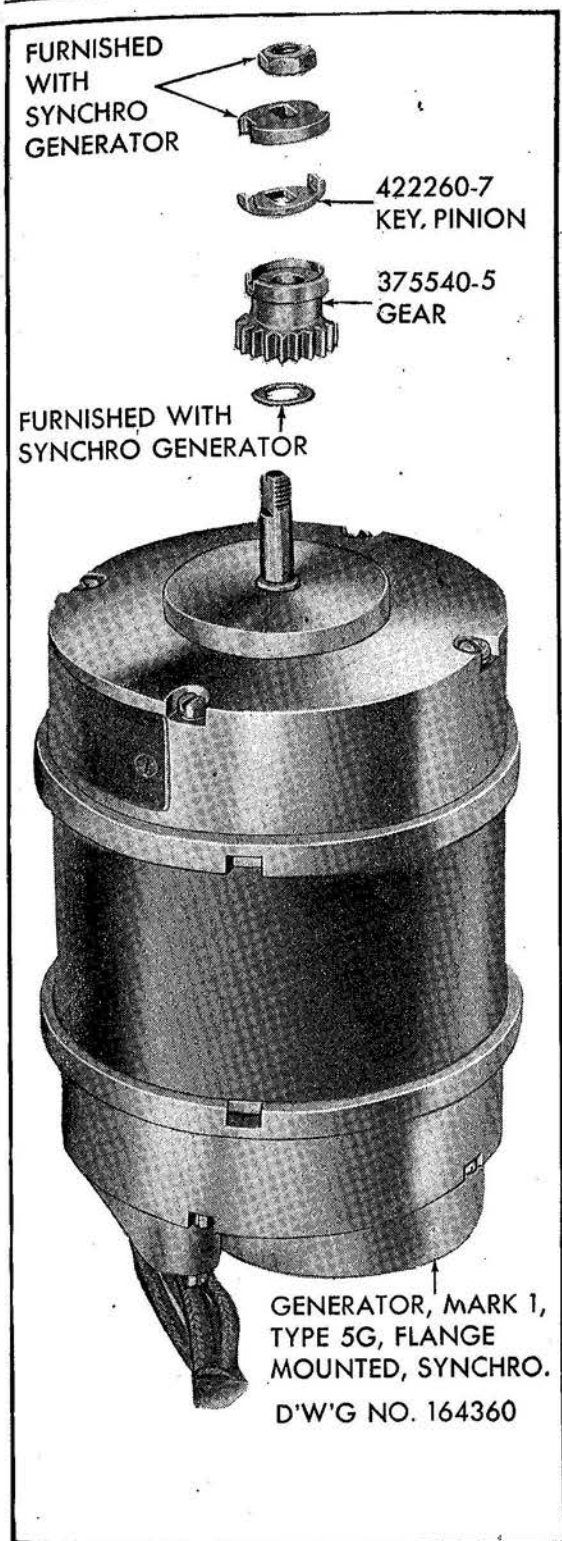


Figure 122.—Generator Assembly, Synchro (36 Speed)

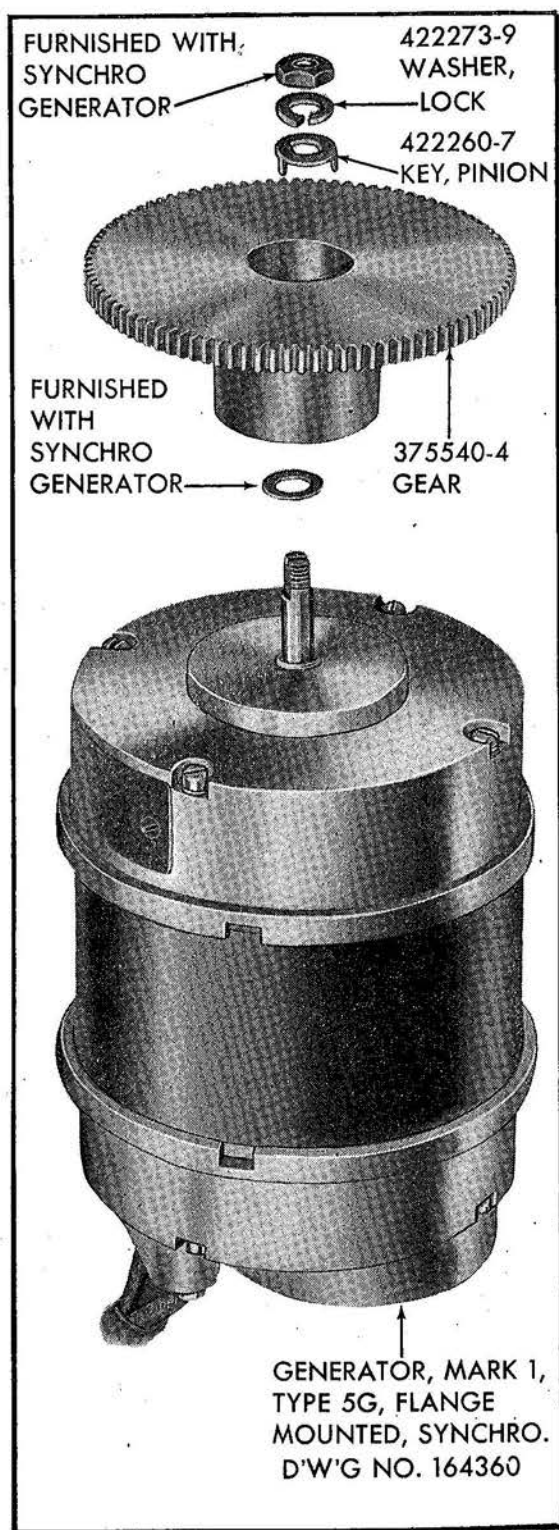


Figure 123.—Generator Assembly, Synchro (One Speed)

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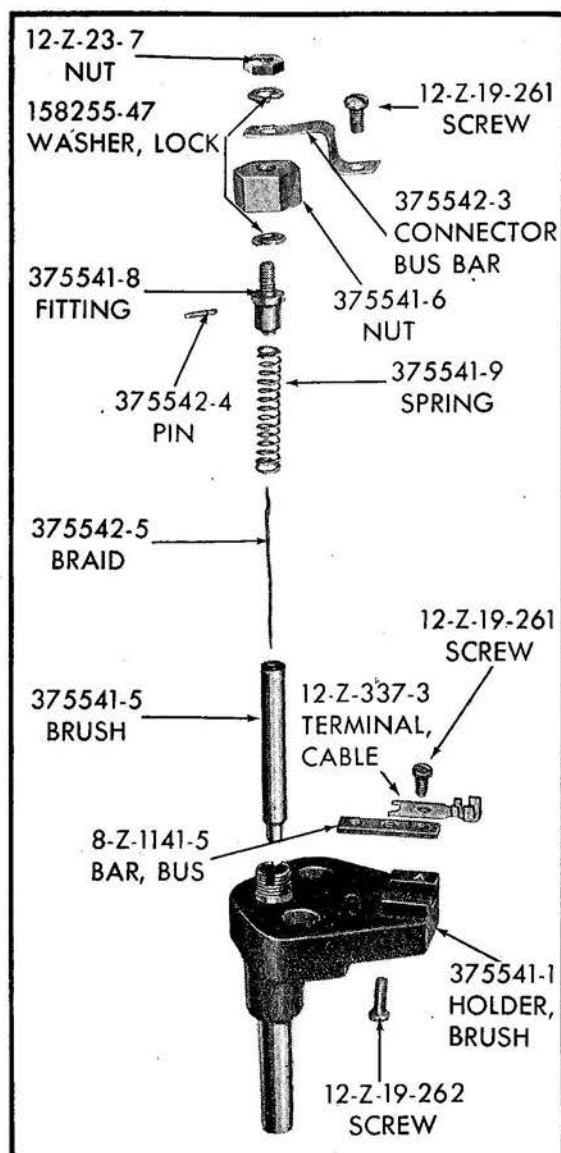


Figure 124.—Holder Assembly, Brush

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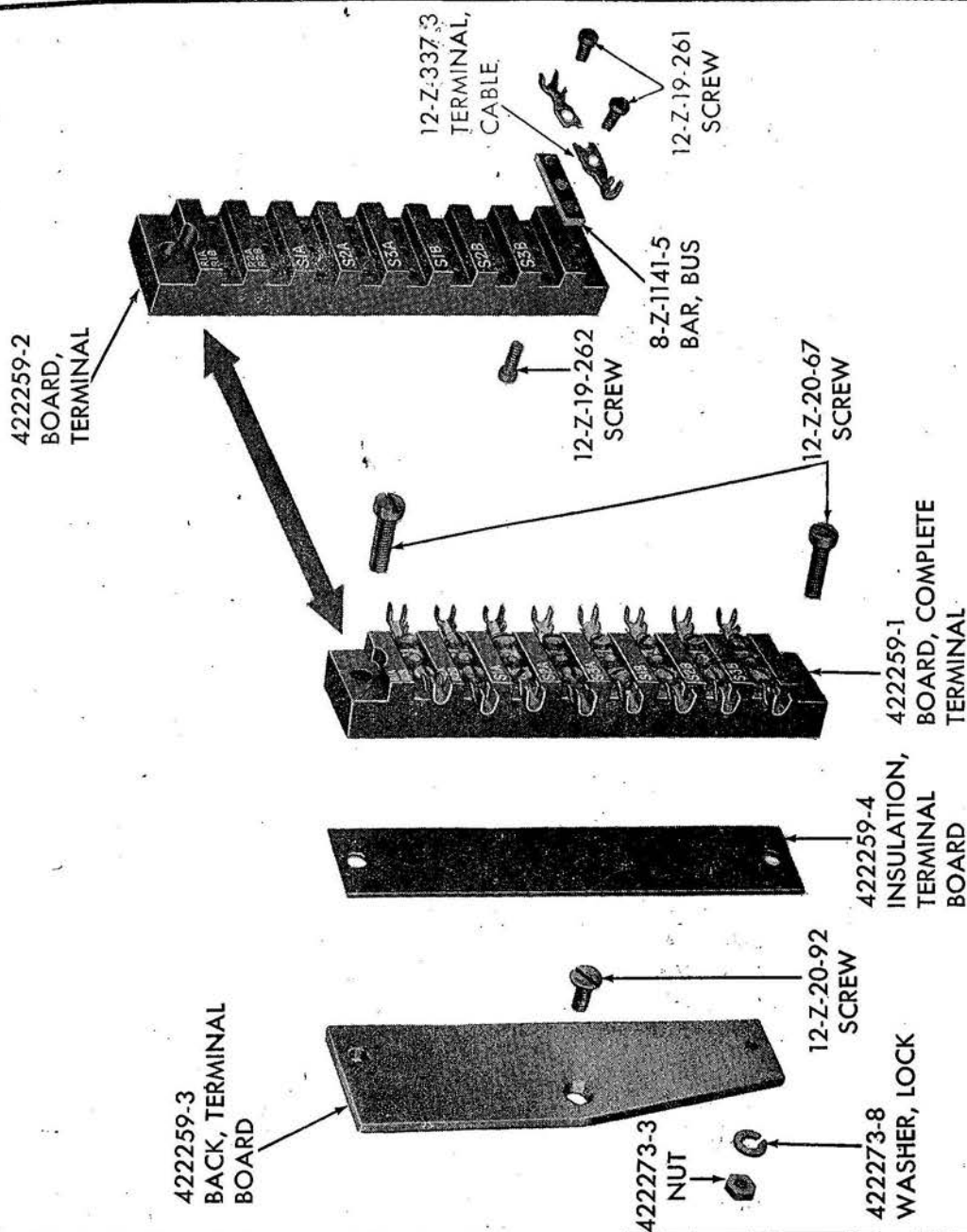


Figure 125.—Board Assembly, Terminal

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TARGET BEARING TRANSMITTER MARK 8

Numerical List of Parts

Fig. No.	Part No.	Nomenclature	No. Req'd
124, 125	8-Z-1141-5	Bar, Bus	11
112	*9-S-4296-L	Clip, Fuse	2
112	*9-S-5100-L Size B	Nut, Gland	1
115	*9-S-5235-L Size G	Nut, Gland	1
112	*9-S-5235-L Size B	Ring, Gland	1
115	*9-S-5235-L Size G	Ring, Gland	1
112, 113	12-Z-8-440	Screw	4
112, 118	12-Z-8-443	Screw	9
112	12-Z-8-445	Screw	2
112	12-Z-19-61	Screw	10
105	12-Z-19-124	Screw	6
124, 125	12-Z-19-261	Screw	22
124, 125	12-Z-19-262	Screw	11
112	12-Z-20-2	Screw	2
118	12-Z-20-63	Screw	6
125	12-Z-20-67	Screw	2
125	12-Z-20-92	Screw	1
124	12-Z-23-7	Nut	3
113	12-Z-27-32	Nut	1
115	12-Z-329-57	Plug, Drain	1
124, 125	12-Z-337-3	Terminal, Cable	19
112	12-Z-337-4	Terminal, Cable	10
113	158001-104	Screw	1
113	158001-150	Nut	2
113	158255-42	Washer	2
124	158255-47	Washer, Lock	6
112, 113	158255-48	Washer, Lock	11
122	164360	Generators Assembly, Synchro (36 Speed)	1
123	164360	Generator Assembly, Synchro (One Speed)	1
104	375525-1	Cradle	1
104	375525-2	Cap, Cradle	1
104	375525-3	Slide, Binocular Mount	1
108	375526-1	Bracket Cradle	1

*Bureau of Ships Drawing No.

RESTRICTED

Fig. No.	Part No.	Nomenclature	No. Req'd
111	375527	Switch Assembly	1
113	375528-1	Guard	1
113	375528-2	Lever Assembly	1
113	375528-3	Ring, Cover	1
113	375528-4	Gasket	1
113	375528-5	Arm, Push	1
113	375528-6	Screw, Switch Operating	1
113	375528-9	Spring	1
120	375529-1	Chassis	1
116	375538-1	Guard, Dial	1
116	375539-1	Dial	1
121	375540-1	Gear	1
120	375540-2	Gear	1
121	375540-3	Gear	1
123	375540-4	Gear	1
122	375540-5	Gear	1
124	375541	Holder, Assembly, Brush	3
124	375541-1	Holder, Brush	3
124	375541-5	Brush	3
124	375541-6	Nut	3
124	375541-8	Fitting	3
124	375541-9	Spring	3
116	375542-1	Plate, Name	1
117	375542-2	Spring, Seal	1
124	375542-3	Connector, Bus Bar	3
124	375542-4	Pin	3
124	375542-5	Braid	3
106	375543-1	Grip, Left Hand	1
107	375543-2	Grip, Right Hand	1
109	375544	Capsule Assembly, Luminous	1
109	375544-3	Window	1
109	375544-4	Leaf, Front, Sight	1
110	375544-5	Leaf, Rear, Sight	1
109	375545-1	Bracket, Window	1
109	375545-2	Holder, Front Sight Leaf	1
110	375545-3	Holder, Rear Sight Leaf	1
109	375545-4	Cover, Window	1
109	375546-1	Cover, Luminous Plate Back	1
109	375546-2	Frame, Indicator Window	1

Fig. No.	Part No.	Nomenclature	No. Req'd
110	375546-3	Clamp, Rear Sight Leaf	2
109	375546-4	Spring, Window Cover	1
109	375546-5	Pin	1
115	375547	Cover Assembly	1
116	375549-1	Base	1
116	375550-1	Cover, Seal	1
117	375550-2	Gland, Seal	1
117	375550-3	Bearing, Upper	1
121	375550-4	Holder, Shield	1
117	375551-1	Seal	1
117	375551-2	"O" Ring (Small)	1
117	375551-3	"O" Ring (Large)	1
115	375551-4	Gasket, Cover	1
113	375551-5	Gasket, Switch Box	1
121	375552-1	Shield	1
121	422251-1	Shaft, Main	1
121	422252-1	Insulator	2
121	422252-2	Insulator	2
119	422252-4	Washer, Thrust	1
121	422252-5	Ring, Collector	3
119	422252-6	Washer, Thrust	1
119	422252-7	Washer, Thrust	2
119	422252-8	Washer, Thrust	1
120	422252-9	Bearing	1
120	422254-1	Shaft, Cluster Gear	1
120	422254-2	Pipe, Drain	1
120	422254-3	Block, Shaft Anchor	1
120	422254-4	Collar	1
120	422254-5	Bearing, Thrust	1
120	422254-6	Bearing, Thrust	1
120	422254-7	Bearing	2
120	422254-8	Pin, Taper	1
118	422254-9	Clamp, Generator	8
105	422255	Holder, Assembly, Binocular	1
105	422255-2	Holder	1
105	422255-3	Cap	1
106	422256-1	Lever, Latch	1
107	422256-2	Cam, Switch	1
108	422257-1	Bracket, Latch Plunger	1
108	422257-2	Plunger, Latch	1
107	422257-3	Link	1
107	422257-4	Plunger, Switch	1

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Fig. No.	Part No.	Nomenclature	No. Req'd
106	422257-5	Lock, Latch Lever	1
106	422257-6	Plunger, Spring	1
116	422258-1	Pin, Dowel	1
116	422258-2	Pin, Dowel	1
116	422258-3	Pin, Dowel	1
121	422258-4	Pin, Dowel	1
117, 120, 121	422258-5	Pin, Dowel	3
106	422258-6	Spring, Latch Lever	1
106	422258-7	Spring, Latch Lever Lock	1
107	422258-8	Spring, Switch Plunger	1
108	422258-9	Spring, Latch Plunger	1
102	422258-10	Key	1
121	422258-11	Key (Short)	1
121	422258-12	Key (Long)	1
116	422258-13	Washer, Drain Plug	1
108	422258-15	Washer	1
102	422258-16	Washer	1
105	422258-17	Spring, Engaging Pin	1
107	422258-18	Washer	1
106	422258-19	Screw	2
107	422258-20	Screw, Long, Switch Cam	1
107	422258-21	Screw, Short, Switch Cam	1
125	422259	Board Assembly, Terminal	1
125	422259-1	Board, Complete, Terminal	1
125	422259-2	Board, Terminal	1
125	422259-3	Back, Terminal Board	1
125	422259-4	Insulation, Terminal Board	1
121	422260-1	Nut, Shaft	1
121	422260-2	Washer, Lock	1
116	422260-5	Plug, Drain	1
122, 123	422260-7	Key, Pinion	2
102	422260-8	Nut, Shaft	1
102	422260-9	Washer, Lock	1
121	422260-10	Nut, Shaft	1
121	422260-11	Washer, Lock	1
108	422261-4	Clamp	2
112	422261-5	Tubing, Insulating	3
102	422263-1	Screw, Cap	1
107	422263-2	Rivet	1
113	422263-3	Pin, Dowel	1
104	422264-1	Strap, Telescope	1

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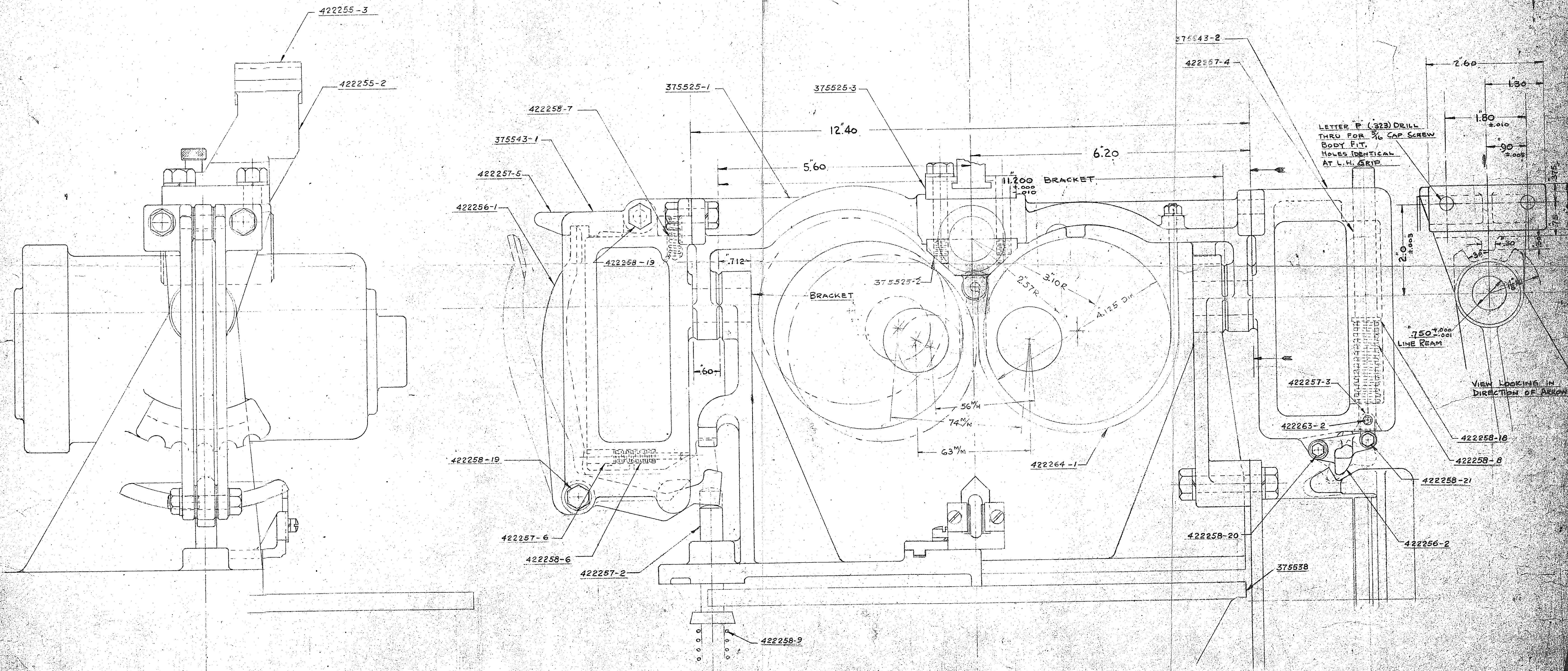
TARGET BEARING TRANSMITTER MARK 8

OP 1189

Fig. No.	Part No.	Nomenclature	No. Req'd
105	422264-2	Pin, Engaging	1
105	422264-3	Knob, Engaging Pin	1
104	422264-4	Washer, Lock	1
104	422264-5	Nut	1
112	422265-1	Box Assembly, Switch	1
113	422265-2	Cover	1
112	422266-1	Block, Fuse	1
112	422266-2	Board, Terminal	1
112	422266-3	Plug, Fuse Block	2
112	422266-5	Insulation	1
112	422266-6	Insulation	1
112	422266-8	Shield	1
113	422267-1	Bracket	1
113	422267-2	Insulation	1
113	422267-3	Insulation	1
116	422271-1	Screw	4
108, 118	422271-2	Screw	7
114	422271-3	Screw	16
103	422271-4	Screw	4
108	422271-5	Screw	2
104	422271-6	Screw	4
111	422271-7	Screw	4
108	422271-8	Screw	1
108	422271-9	Screw	2
108	422271-10	Screw	4
109	422271-11	Screw	1
119	422271-12	Screw	1
109, 116	422272-1	Screw	9
110	422272-2	Screw	2
113, 120	422272-3	Screw	7
104	422272-4	Screw	1
116	422272-5	Screw	4
121	422272-7	Screw	3
121	422272-8	Screw	1
109, 116	422272-9	Screw	12
107, 114	422273-1	Nut	17
107	422273-2	Nut	1
104, 125	422273-3	Nut	2
103, 106	422273-4	Nut	12
108, 111			
108	422273-5	Nut	2
107	422273-6	Washer, Lock	1

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Fig. No.	Part No.	Nomenclature	No. Req'd
107	422273-7	Washer, Lock	1
104, 108	422273-8	Washer, Lock	24
110, 116, 118, 120, 125			
109, 123	422273-9	Washer, Lock	2
103, 104	422273-10	Washer, Lock	15
108, 119			
108, 111	422273-11	Washer, Lock	31
114, 116, 118			
104, 113	422273-14	Washer	7
109	422273-15	Washer, Lock	1
103, 108	422273-16	Washer, Lock	10
119			
116, 118	422273-17	Washer, Lock	9
105	422274-1	Pin, Taper	1
120	422274-2	Pin	1
113	422274-3	Pin	2
113	422274-4	Screw	2
113	422275-1	Switch	1
112	422275-2	Transformer	1
116	422275-3	Fitting, Grease	1
112	Type M1, Midget	Fuse (Navy Spec. 17F2)	1



TARGET BEARING TRANSMITTER MARK 8

WATSON ELEVATOR CO., INC.
ENGLEWOOD, NEW JERSEY

MADE IN →	3-21-44	J.W.K.	
AL →	DATE 12-2-43	OWNED BY GMB	DE-KID-PT.
NARY →	12-13-48	GMB	<i>[Signature]</i>
	SCALE	DWG. NO.	
	FULL	AA-7050	