ELECTRIC RUNNING SHEDS
BRANCH, HANNA ST.

GEI-25027

INSTRUCTIONS

GMG-153-B1 MOTOR GENERATOR SET

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GENERAL ELECTRIC

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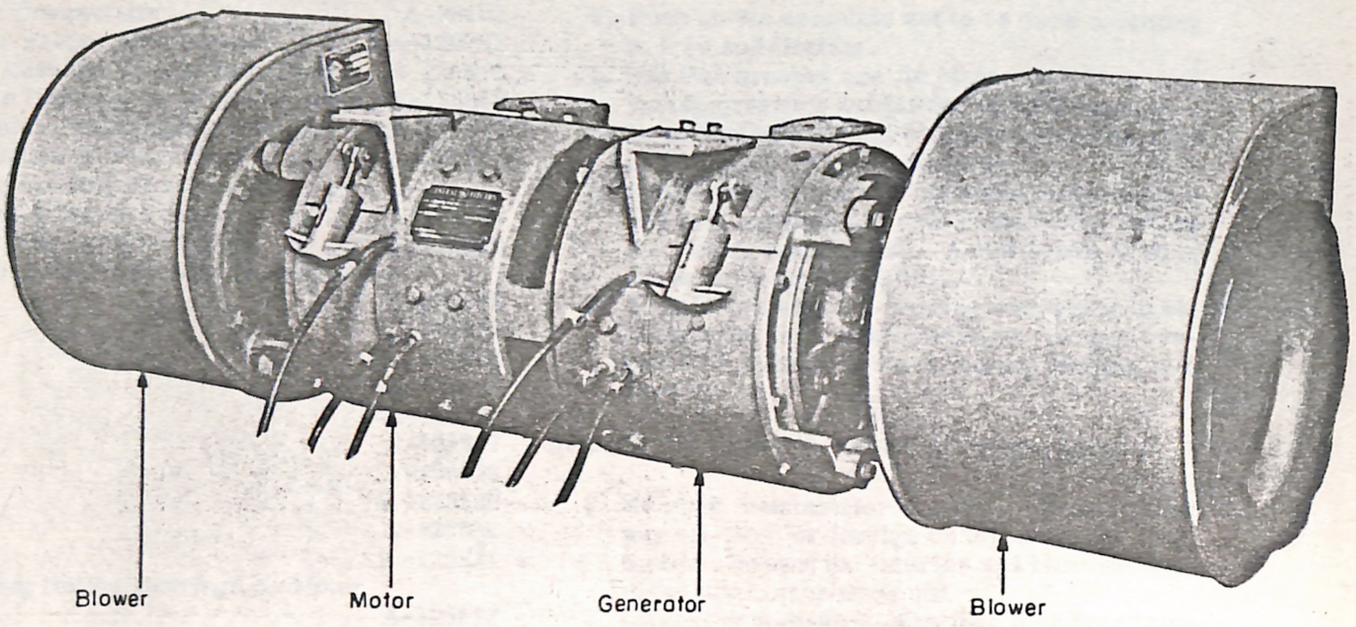


Plate A-125512 Motor-Generator Set, Type GMG-153-B1.

MAINTENANCE DATA

MOTOR-GENERATOR SET, MODEL 5GMG153B1 - 600/36 VOLT

Resistances at 25 C

Motor Series and Commutating Field	1.72 ohms
Shunt Field	2641 ohms
Armature	2.65 ohms
Generator Exciting Field	10.85 ohms
Commutating Field	0.01859 ohm
Armature	0.0440 ohm

Limits of Bearing Wear

Ball bearings are used in generator end. There are no measurable wear limits. Rough or noisy operation indicates dirt or serious wear, either of which is sufficient reason for bearing removal for cleaning or replacement.

Roller bearings are used in motor end.

Brush Data (Duplex Brush)

Pressure	43 - 53 oz
Size	1/2 in. by 1 in. by 1 3/4 in. long (Motor and Generator brushes are interchangeable)

Commutator Side Mica

Thickness	0.032 in.
Grooving Depth	3/64 in.

Commutator Diameter

New	5 1/4 in.
Minimum permissible	4 7/8 in.

Bearing Grease Capacity (60 percent full)

Generator End	1 3/4 oz
Motor End	1 oz

Weight of Motor

Set Complete	463 lb
Armature Only	120 lb

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DESCRIPTION

The motor-generator set is a four-pole, direct current machine with commutating-pole, compound motor, designed for operation on 600-volt line potential. There are two blowers, one mounted on each end of the motor-generator set which furnish air for cooling the motors and resistors. Anti-friction bearings of the ball type are used in the generator end of the set and roller bearings are used in the motor end.

The motor-generator set supplies power for operating the control devices for battery charging and auxiliary use.

INSPECTION

Inspect the sets periodically and overhaul them at less frequent but equally regular intervals. Local conditions will determine the frequency of inspection and overhauling. These sets should be overhauled approximately once every three years or every 160,000 miles of operation, and that an inspection of the brushes, commutator, armature and field be made every 1000 to 2000 miles.

INITIAL OR OVERHAULED CAR INSPECTION

1. Push on the complete set to be sure mounting is free and floating.
2. See that brushes are in place and free, and spring pressure is between 43 to 53 ounces.
3. Brush holders should be tight and located 1/16 to 3/32 inch from commutator.
4. It is usually necessary to clean commutators and seat brushes as sets collect dirt before end during installation. A soft brush seating stone is a simple solution.
5. If the set has been in storage where it is liable to damage, or absorb moisture, proper precautions should be taken before putting into service.

INSPECTION EVERY 2 WEEKS OR 2,000 MILES

1. Remove commutator covers. Do not allow any oil, dirt, or foreign material to fall into motor. Inspect the interior and blow out with clean dry compressed air.
2. Inspect commutator. See that it is free from copper beads, burned spots and that it has a smooth polished appearance. Wipe off any accumulation of oil, grease or dirt.
3. Examine brush holders; see that shunts are tight, and not burned or frayed; clean the insulators and replace them if cracked or broken.
4. See that the brushes are in good condition and fit freely in carbonway.
5. Examine armature, field coils and connections for charred or broken insulation or other injuries. Make necessary repairs.
6. Replace the covers.

INSPECTION EVERY 2 MONTHS OR 10,000 MILES

1. Inspect commutator for roughness and flat spots and sand it if necessary.
2. Look over brush holders, tighten all connections and see that it has 1/16 to 3/32 inch clearance from the commutator.
3. Replace broken, short or burned brushes.
4. Adjust brush pressure to 43 - 53 ounces.
5. See that cradle hanger bolts are tight.
6. Inspect grease seals for excess grease.

LUBRICATION

Lubricate the ball and roller bearings with a good grade of ball bearing grease such as G-E Ball Bearing Grease Type EWM-3S (G-E No. D6A2A5). There is a grease chamber in each framehead, where the bearing is housed. This chamber must not be filled more than 60 per cent of capacity when initially filled. Approximately one third of the total grease for each end of the set must be spread over the bearings themselves and the rest packed into the grease chamber in the framehead.

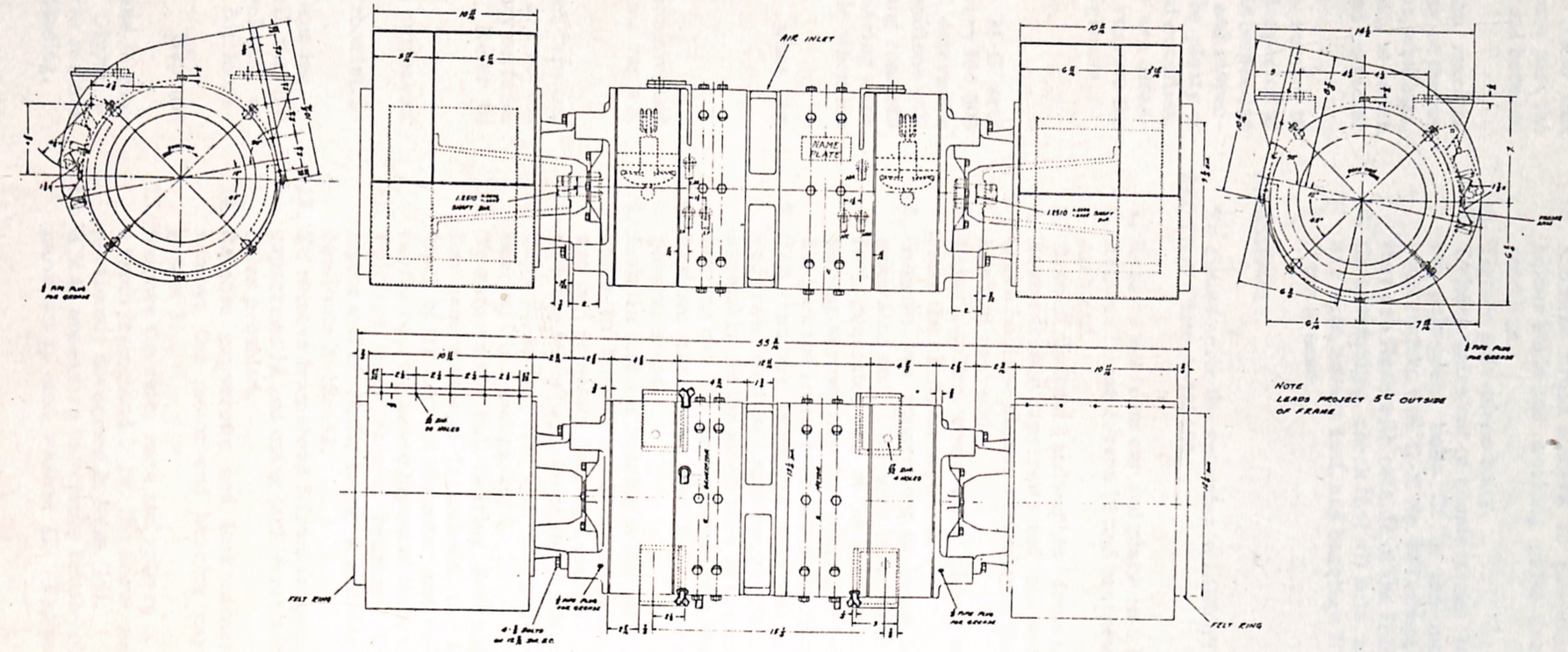


Plate A-125408 Motor-Generator GMG-153 Outline (from TT-6756361).

Add 1/2 ounce of grease to each armature bearing every 25,000 or 4 months. If it is found that addition of this much grease forces grease past the seals, less should be added or the interval between greasings lengthened.

Overlubrication is detrimental to the machine since grease is forced past the seals, may be thrown off the shaft onto the brushes, commutator, windings, etc. The amount of grease and frequency at which it should be added depends on severity and character of service.

It is suggested that a representative number of motor-generator sets of this type be inspected at the end of the first year's operation. This inspection to consist of removing the frameheads and inspecting the grease. If there appears to be plenty of grease in the framehead and it is in good condition, no grease should be added. If the sets are disassembled for overhauling at any time, remove the old grease and repack with clean, fresh grease.

OVERHAULING

To obtain satisfactory service, the M-G sets should receive a complete overhauling every 160,000 miles or three years. Experience will determine when this should be done, and local conditions will decide the most suitable time. Overhauling consists of reconditioning the insulation and replacing worn or damaged parts that are not accessible when the machines are on the car.

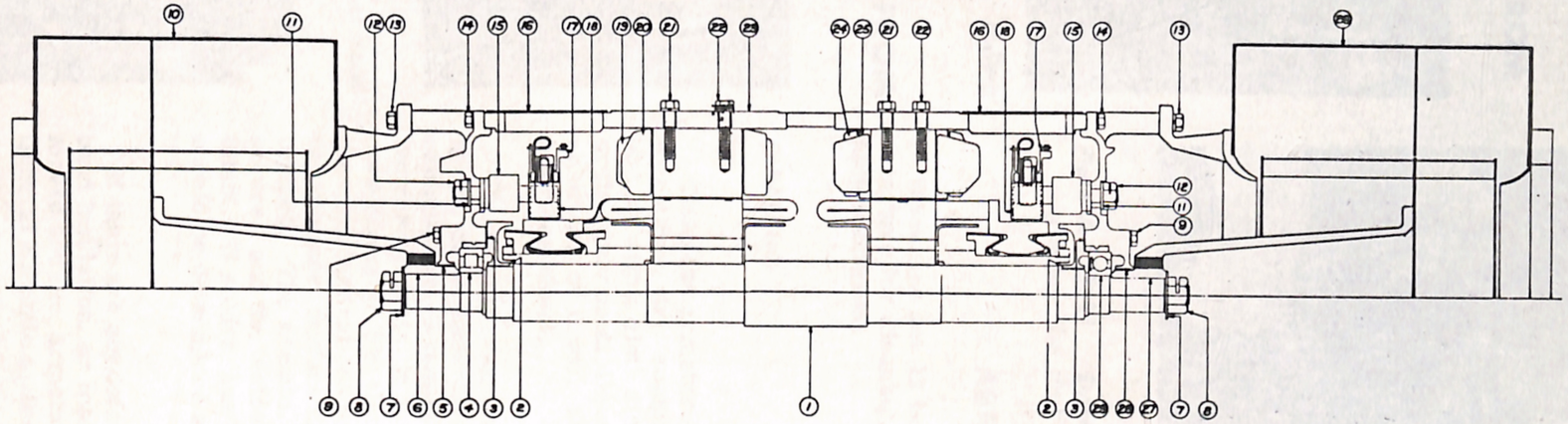
Perform the following operations when the machines are removed from the car:

1. Dismount machine.
2. Remove and clean armature.
3. Blow out dust and dirt with dry compressed air and wipe off grease and oil with a rag wet with carbon tetrachloride.
4. Dip and bake armature.
5. If commutators are rough or burned, turn and polish in a lathe. If commutators are not too bad, stoning will produce satisfactory surface.
6. Replace segments if necessary. Refer to "Commutator Repairs".
7. Tighten bars.
8. Groove side mica well below brush surface of commutator.
9. Blow out and clean interior using carbon tetrachloride to remove oil and grease.
10. Clean out frameheads and bearing housing.
11. Remove bearings and clean out all the old grease, using kerosene, safety solvent, or other petroleum solvent. Examine for looseness and damage.
12. Inspect gaskets under bearing cap. Replace defective gaskets with new ones.
13. If field coils and cables are tight and in good condition, give them two coats of Glyptal ® No. 1201 red enamel. If necessary to remove coils, dip and bake them before replacing.
14. Reassemble armature.
15. Examine brush holders to see that brush-holder studs and working parts are in good condition.
16. Tighten pole-piece bolts.
17. To keep water out of countersinks into which top pole-piece bolts fit in the motor, fill countersinks with G-E No. 837 compound until they are flush with outside of the frame.
18. On assembling, check that all nuts and bolts are tight, covers fast, and bearings filled with fresh grease.

DISASSEMBLY

To disassemble the set refer to LONGITUDINAL SECTION Plate A-125424.

1. Remove set from car and place on a bench.
2. Remove frame covers 16 and brushes 18 from each end.
3. Take off shaft nut 8 and washer 7 from each end.
4. Take out four capscrews and lock washers 13 which hold the blower assembly to the framehead, at each end.
5. Using a puller, remove the blower assembly from the shaft, on each end.
6. Remove two connections to brush holder on generator end. Remove framehead bolts 14 from generator end of the set, and inserting jacking screws into the generator framehead 28, jack the framehead out of the frame.
7. The armature complete with the generator end framehead and brush holders, ball bearing assembly and the inner race of the motor-end bearing can now be removed from the frame.
8. Remove capscrews and lock washers 9 on generator end.
9. Install a suitable bearing puller into the tapped holes in bearing cap 2 of the generator end and pull complete bearing assembly together with the framehead, from the armature shaft.
10. Remove puller and take off generator-end bearing cap 2 and gasket 3.
11. To remove the ball-bearing assembly from the generator-end framehead, use a wooden block of the correct diameter and mallet, and tap the bearing assembly out of the framehead.
12. Pull the inner race of bearing 4 from the motor end of shaft, using a suitable puller. See Plate A-125442.
13. To remove framehead 5 from frame; take out capscrews 14 and using jack screws in tapped holes provided.
14. Remove capscrews and lock washers 9 and remove the motor-end bearing cap 2 and gasket 3.
15. Remove the outer race and rollers of bearing 4 from framehead 5 by the same method as previously described in item (11).
16. If it is necessary to remove brush holder remove nut 12 and washer 11. Tap on end of



9 CAPSCREW & LOCKWASHER
8 NUT
7 WASHER
6 BLOWER WHEEL
5 FRAME HEAD
4 ROLLER BEARING
3 GASKET
2 BEARING CAP
1 ARMATURE

20 COMM. FIELD COIL (MOTOR END)
19 EXC. FIELD COIL (MOTOR END)
18 CARBON BRUSH
17 BRUSH HOLDER
16 FRAME COVER
15 BRUSH HOLDER STUD
14 CAPSCREW & LOCKWASHER
13 CAPSCREW & LOCKWASHER
12 NUT
11 WASHER
10 BLOWER HOUSING

29 BALL BEARING
28 FRAME HEAD
27 BLOWER WHEEL
26 BLOWER HOUSING
25 EXC. FIELD COIL (GEN. END)
24 COMM. FIELD COIL (GEN. END)
23 MAGNET FRAME
22 COMM. POLE PIECE BOLT & LOCKWASHER
21 EXC. POLE PIECE BOLT & LOCKWASHER

Plate A-125424 Longitudinal drawing of GMG-153-B. (from TT-6756676).

stud with mallet to loosen support from rabbet fit on inside of framehead.

REMOVING BALL BEARINGS FROM GENERATOR END

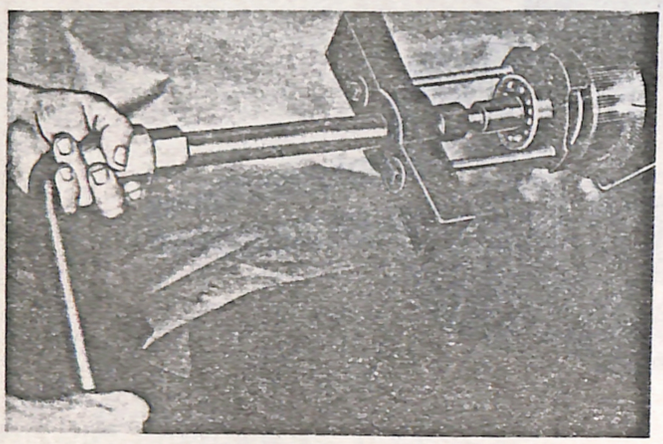


Plate A125518 Bearing puller in position, pulling the ball bearing from the generator end.

REMOVING ROLLER BEARINGS FROM MOTOR END

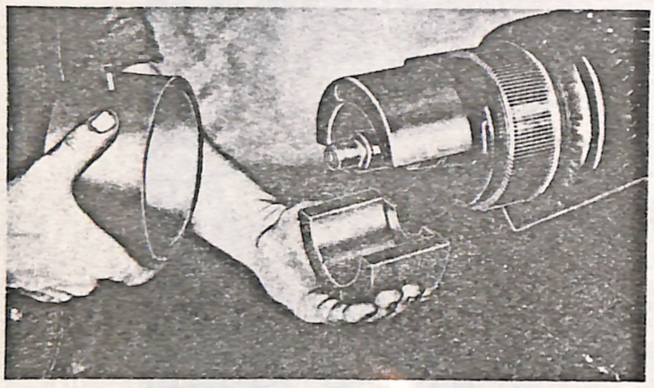


Plate A-125519 Attaching puller ring to inner race.

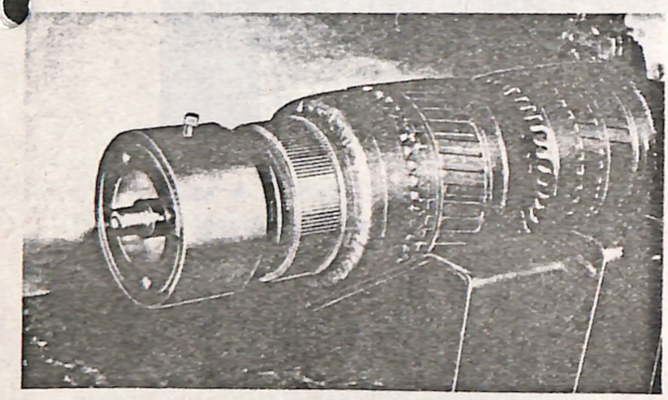


Plate A-125520 Ring in place.

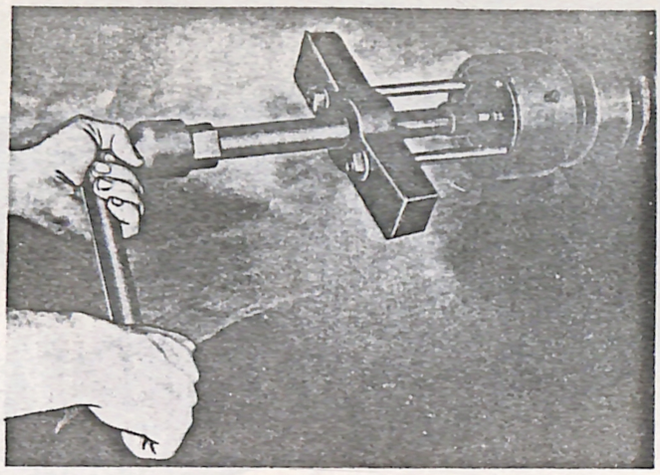


Plate A-125521 Drawing inner race of roller bearing along the shaft with bearing puller.

ARMATURES

When the set is being overhauled, remove the armature for cleaning, testing, repairing and varnish treatment.

CLEANING

Clean the armature thoroughly by blowing it out with clean, dry compressed air. Remove grease and oil with a cloth dipped in carbon tetrachloride or its equivalent. Do not use too much carbon tetrachloride, or it will soak into the insulation with injurious effect.

Thoroughly examine the condition of armature bands, coils, insulation, general assembly, and the commutator. Examination of the commutator may indicate defects in the winding such as short or open circuits. See illustration below. Be sure that the core laminations are not damaged, and that the commutator surface is not scored or otherwise injured. The armature bands should be tight and secure. and the soldering on the bands should be intact. If solder has been thrown off, the cause should be determined and corrected.

If there are any defects such as charred or brittle band insulation, or loose bands, they should be removed and the armature rebanded, using standard General Electric material.

The coil insulation should be clean and free from blisters, flakes, or cracked varnish surface. The armature should be given a varnish treatment while it is out of the frame.

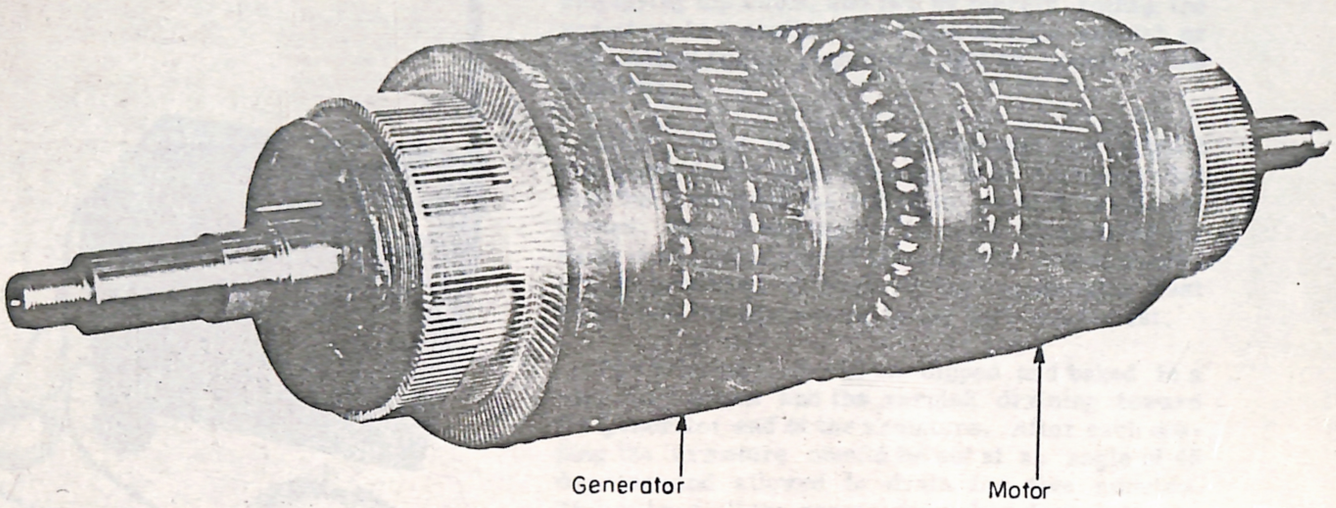


Plate A-125505 Armature for GMG-153 Motor Generator Set.

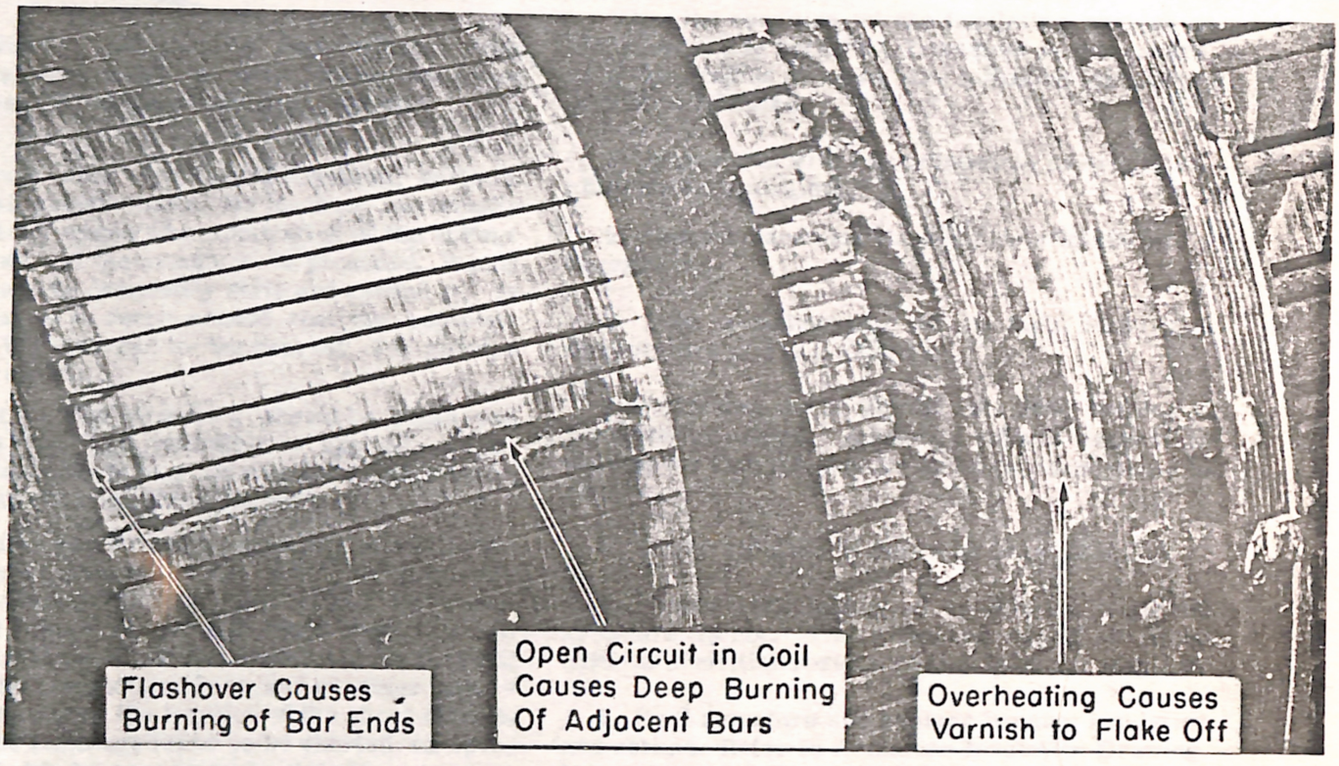


Plate A-118642 Overheating caused solder to melt out of this armature. Resulting open circuit in one coil caused burning of the two adjacent commutator bars.

HIGH-POTENTIAL TEST

When the armature has been thoroughly cleaned, measure insulation resistance with a megohmmeter. Insulation resistance should measure not less than one megohm before the high-potential test is applied.

If there is no external indication of failure and the megohmmeter indicates more than one megohm insulation resistance, apply high-potential test (1500 volts a-c for the motor end and 500 volts a-c for the generator end) for one minute between the conductors and the core. Apply the voltage between

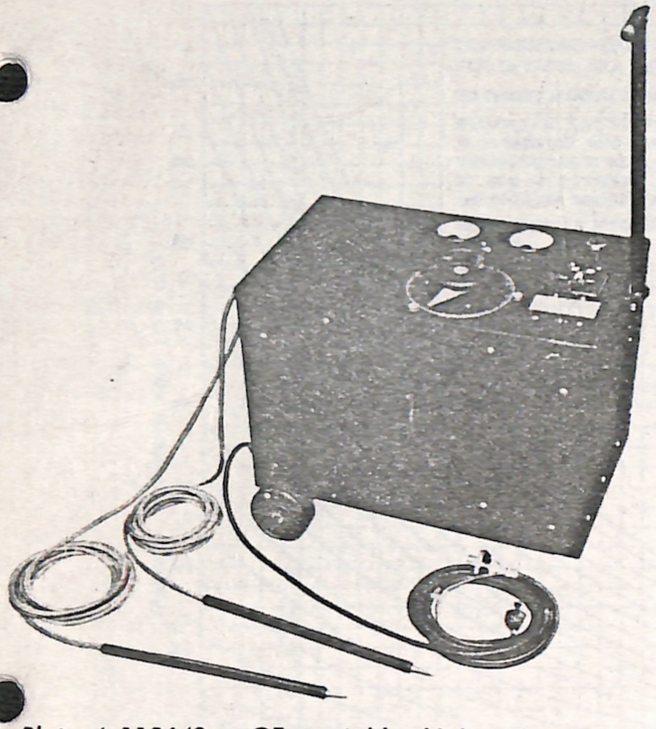


Plate A-118643 GE portable high voltage testing set. For information on other testing equipment see the GE Instrument catalog, GEA-602.

the armature shaft and the commutator surface. If a partial ground exists, its location can usually be detected by smoke when application of the voltage is sustained. If the armature is grounded, it may be necessary to completely strip and rewind it. In such cases, it is recommended that the complete armature be returned to the nearest G-E service shop for repairs.

CAUTION: The armature should be clean and dry before the high potential is applied. High-potential test should only be employed after overhauling and after varnish treatment.

A transformer (armature growler) or millivoltmeter may be used to test for short-circuited and open-circuited coils. If a short circuit is found, disconnect the armature-coil leads from the two commutator bars where the short circuit is located; then test the commutator bars and windings separately to determine the location of the short circuit. If any of the coils are found to be shorted or open, it will probably be necessary to strip the armature completely and rewind it with new coils, although in some cases a more simple repair can be made.

VARNISH TREATMENT

Even if no grounds or short circuits are found, the armature insulation may be so weak from age or wear that a breakdown may be imminent. Give the armature the following varnish treatment each time the motor-generator set is overhauled.

Varnish can be applied to armature successfully by two different methods. One, by the dip method employing dip tanks, and two by merely rolling the armature in a shallow pan filled with the varnish or red enamel to the required height to penetrate the windings.

In the event that the commutators are in good shape and do not need turning, it is recommended that the armatures be rolled in varnish instead of dipped. This saves the extra work of cleaning the shaft and commutator of the varnish, and of necessity, regrooving. If, however, the commutator must be turned, the dip method is the best and fastest.

The armature should be dipped and baked in a vertical position and the varnish draining toward the generator end of the armature. After each dipping the armature should be set at an angle of 45 degrees and allowed to drain for five minutes. This allows all the excess varnish to drain from the motor-armature head. Wipe off all varnish from shaft that has been immersed.

When the condition of the insulating varnish on the armature is such that treatment is necessary, or if the banding is loose, the following procedure should be followed:

1. Wipe clean with cloth dipped in carbon tetrachloride or equivalent.

2. Remove bands and banding base insulation, if necessary.

3. Bake armature for six to eight hours at a temperature of 110 C (230 F).

4. While hot, dip in Glyptal No. 2480 varnish at room temperature. Armature should remain in varnish for five minutes or until bubbles cease to rise.

5. Drain and bake 18 hours at 140 C (284 F).

6. Measure the insulation resistance while the armature is hot. The armature should be baked until the insulation resistance is at least 1/2 megohm.

7. Cool armature and replace banding insulation and reband. Refer to Armature Insulation Drawing. Use a high temperature solder in soldering the binding wire. General Electric B20D6 solder is used in the factory; use this or similar material (97.5 per cent lead, 2.5 per cent silver) in rebanding.

8. Dip armature in Glyptal No. 1201 red enamel to provide the outside finish. Drain and be sure to remove all enamel from the shaft, using a rag soaked in GE-1500 thinner.

9. Bake for 18 hours at 140 C (284 F).

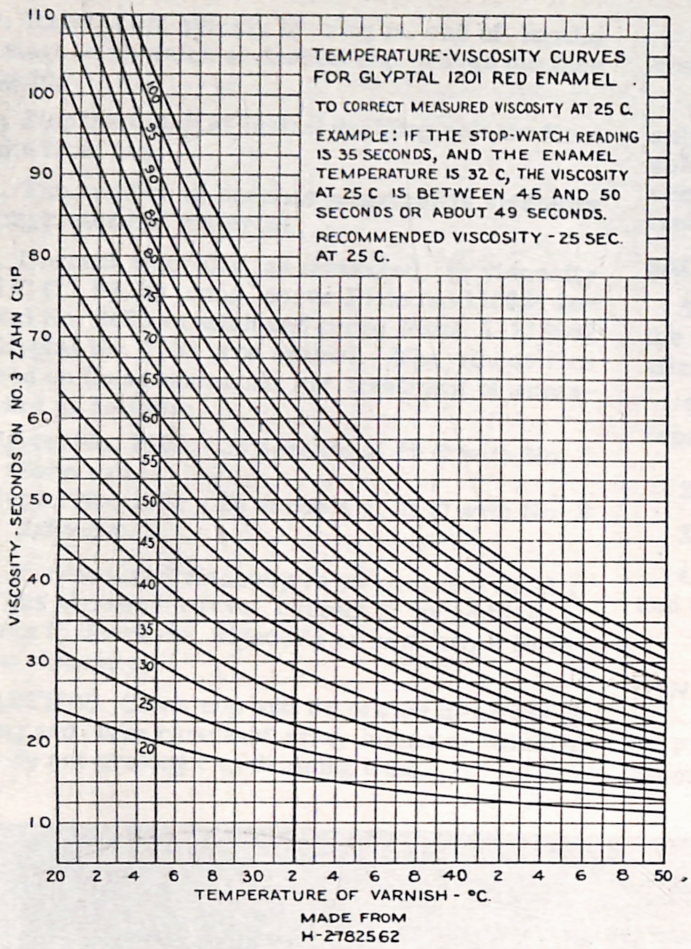


Plate A-118682 Temperature - Viscosity curves for Glyptal 1201 red enamel.

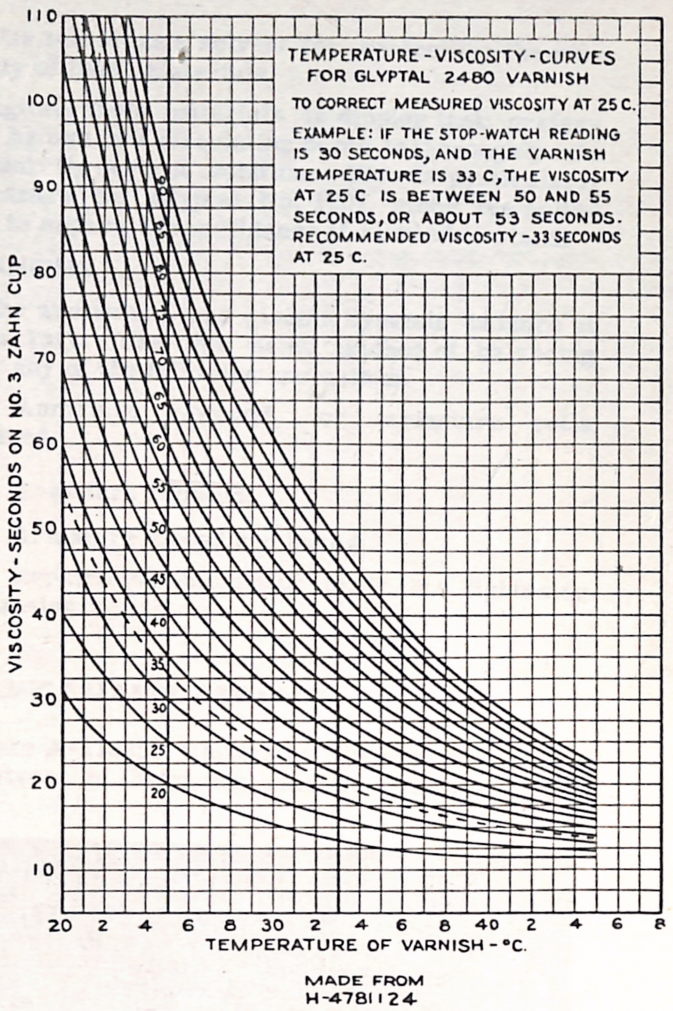


Plate A-118684 Temperature - Viscosity curves for Glyptol 2480 varnish.

Repeat the high-potential and bar-to-bar tests after the armature is dipped and baked.

PREPARATION OF VARNISHES

Glyptal No. 2480 varnish and Glyptal No. 1201 red enamel are recommended for dipping and baking armatures and field coils of rotating apparatus. Glyptal No. 2480, a clear synthetic varnish, has high heat endurance, ability to penetrate windings, and high dielectric strength. It bonds well, and is used to fill the fibrous structure of the insulation.

Glyptal No. 1201, a synthetic red enamel, has excellent film building properties, is resistant to oil and acid, and is used to provide surface finish. It has good heat endurance, and dielectric properties.

To obtain satisfactory penetration, bonding and curing with these finishes, it is essential that their viscosity be correct. The G-E Zahn viscosimeter is recommended for measuring the viscosity because of its convenience, accuracy and low cost.

The equipment necessary to measure viscosity is as follows:

1. Thermometer to measure temperature.
2. Stop watch.
3. Zahn viscosimeter, Cat. 5102111G3, for both Glyptal No. 2480 varnish and Glyptal No. 1201 red enamel.
4. Curve sheets for correcting viscosity to 77 F or 25 C.
   Curve A-118684 for Glyptal No. 2480 varnish.
   Curve A-118682 for Glyptal No. 1201 red enamel.

Method of measuring viscosity follows:

1. Mix material thoroughly and allow to settle for a few minutes to eliminate trapped air.

2. Immerse viscosimeter cup and let it remain for about a minute to allow it to assume the temperature of material.

3. Raise cup quickly by ring in end of handle and start stop watch at instant cup leaves surface of liquid.

4. Stop the watch at instant draining column first breaks from cup.

5. The number of seconds measured is viscosity at temperature of material.

6. Correct viscosity as measured, to viscosity at 25 C (77 F) by using curve Plate A-118684 for Glyptal No. 2480 varnish and curve Plate A-118682 for Glyptal No. 1201 red enamel. The viscosities desired on these materials for treatment of armature are as follows:

Glyptal No. 2480 - 33 seconds at 25 C with No. 3 Zahn cup.
Glyptal No. 1201 - 25 seconds at 25 C with No. 3 Zahn cup.

7. If measured viscosity is not correct at 25 C (77 F) as shown on curve, correct it by addition of solvents to decrease viscosity or new stock to increase viscosity.

CAUTION: Clean cup and its orifice after every reading and take care that stray lumps or skins in liquid do not prolong cup draining time.

Use toluol as a solvent for controlling the viscosity of these materials.

Agitate these materials in dipping tank, preferably by use of a circulating pump, to thoroughly mix solvent throughout solution. This is particularly necessary for Glyptal No. 1201, since the solids tend to separate from thinner if allowed to stand.

BALANCING

The armatures are given a dynamic balance at the factory. Use this same method of balancing after any of the following operations.

1. Armature rewound, or armature coils repaired.

2. Armature rebound.

3. Armature dipped and baked.

4. Repairs to commutator other than tightening and turning.

DYNAMIC-BALANCE ARMATURE

Plate A-118386 illustrates the use of a simple pivot-type of balancing machine made of steel

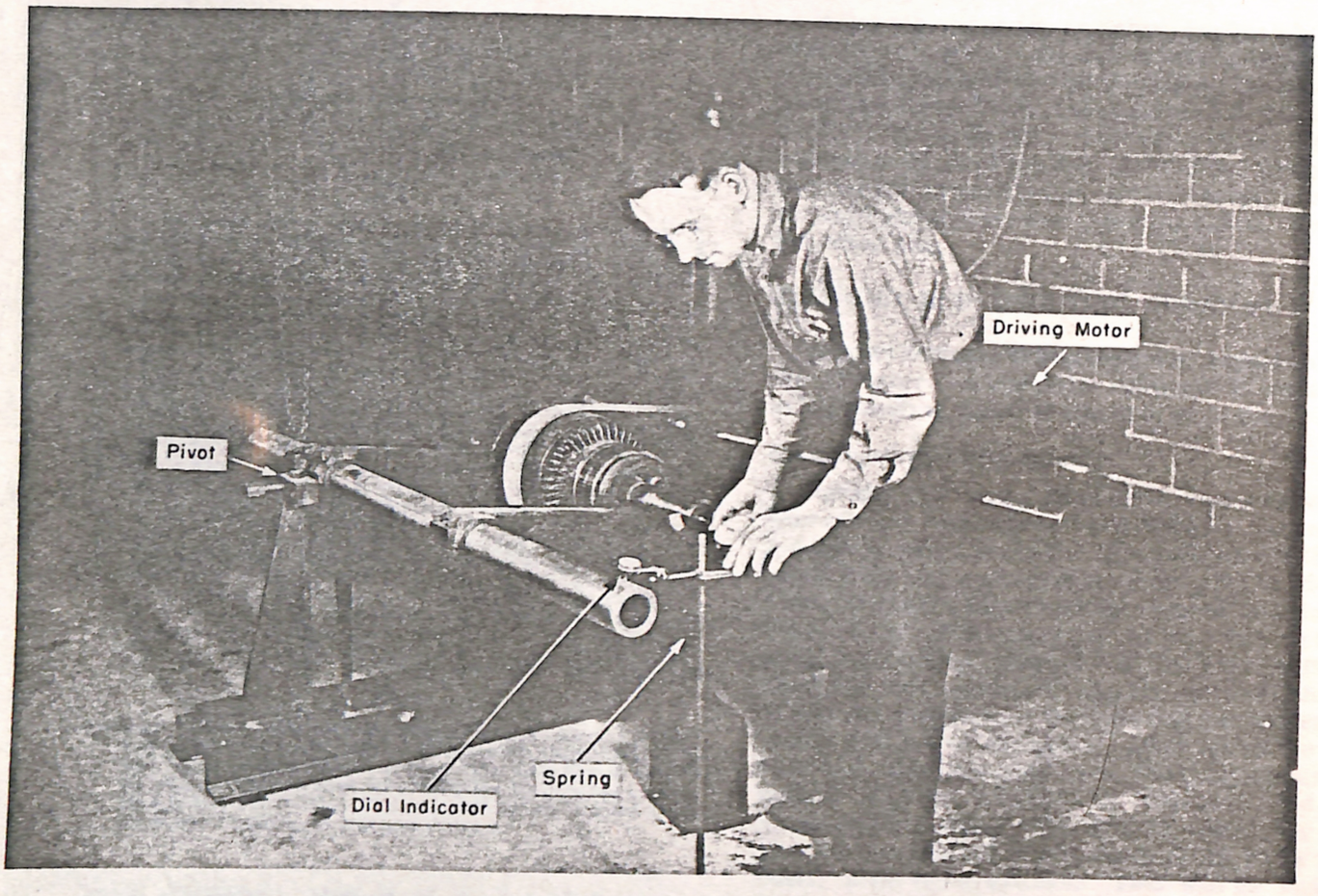
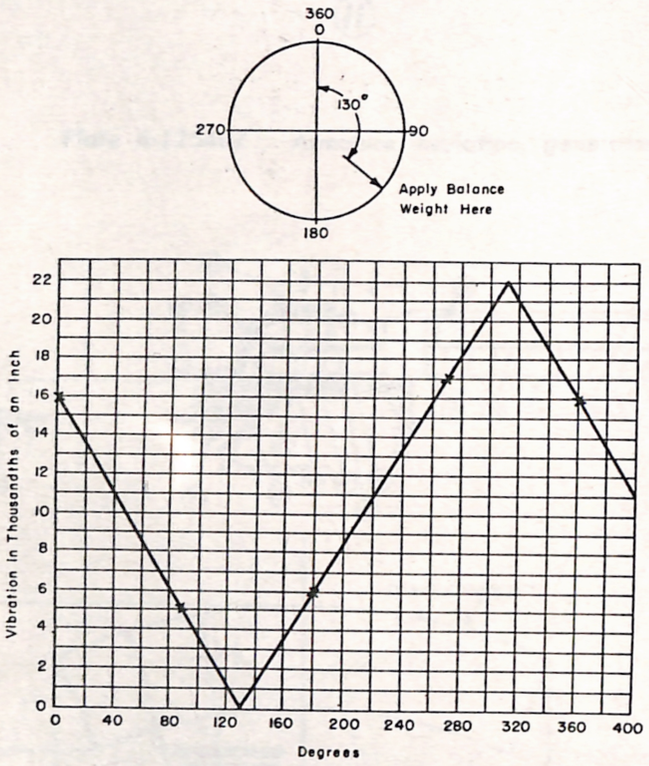


Plate A-118386 Method of dynamic balancing an armature using a dial gage.

through out. On the steel tubes are clamped fulcrum pivots which can be adjusted with respect to the armature being balanced. These fulcrum pivots are the means of holding one end of the rotor stationary, while the other end is allowed to vibrate on the spring pedestal. The following is the method of procedure when dynamic balancing, using this pivot-type machine.

Examine the armature and choose two convenient planes for the addition of balancing weights. For convenience, the balance weights are usually added to the commutator end inside the commutator cap and at the fan end in the air passages of the fan. The machine is arranged to pivot the frame in either of the two selected pivot planes; the pivot plane decided upon must coincide with one of the balancing planes already chosen. The frame is supported in a horizontal position by a helical spring under the heavy end, stiff enough to give the frame a natural frequency of several hundred oscillations per minute. A dial indicator is supported so that its sensitive point rests on the frame at the vibrating end. The trial and error method is used for locating the position and determining the amount of balance weight, as follows:



Example: Mark location points for weight, 90 degrees apart as shown. With weight at each point, measure vibration with dial indicator in thousandths of an inch; in above case the indicator reads 16 at 0° and 360°, 5 at 90°, 6 at 180° and 17 at 270°. Plot points and draw line through them to intercept base line. This point, 130 degrees, indicates location for balance weight to give minimum vibration.

Plate A-118394 Method of dynamic balancing an armature using a dial indicator.

When an armature is being balanced, the fulcrum pivots are placed in line with one of the planes in which the balancing weights are to be attached to the armature. Then the other end, which is allowed to vibrate, is marked in four positions, 90 degrees apart, and a weight of approximately the amount of unbalance expected on this end is attached to one of these positions. The maximum vibration is recorded at a speed approximately 25 per cent above the natural frequency of the spring and support. Repeat this procedure for the other three positions, which were marked on the end of the armature, by moving the weight and recording the maximum vibration. Care must be taken to bring the armature to the same speed for each trial.

By drawing a simple graph of magnitude and position weight, with magnitude as ordinate and position weight as abscissa, the location of the weight can be closely determined. Refer to Plate A-118394 for further explanation. The weight can then be attached temporarily at this location and increased or decreased in magnitude and moved angularly a few degrees until the best location and magnitude are determined. When the size and location of the balance weight has been established, the permanent weight should be secured in place by welding or riveting.

After one end of the armature has been balanced, turn the armature end-for-end in order to allow the unbalanced end to vibrate during the process of locating the amount and location of the balance weights in the manner described above. Another method is to use a second pivot plane without disturbing the armature and cradle except to release the first pivot plane and move the helical spring to the other end.

REPAIRING AND REWINDING ARMATURE

If tests indicate defective coils, repair them; or the armature completely rewound if necessary, using standard General Electric material.

Disconnecting Commutator

Remove the string band from the end winding nearest the commutator and take off the outside insulation over the coils. Then disconnect the coil leads from the commutator (this may be done by "cold method", using a wedge-shaped drift to force the leads out of the cups; or by the "hot method", using a soldering copper). If the cold method is used, the drift should be slightly narrower than the slot in the commutator bar, so that the copper segments will not be damaged. After all of the leads have been disconnected from the commutator, the ground may be located, as each coil and each commutator segment can then be tested for insulation from ground. If trouble is found to be in the coils, strip the armature. This will be easier if the armature is heated to approximately 125 C (257 F) to soften the varnish.

Insulating Core

The core head insulation need not be removed if found in good condition, but give it a few coats of Glyptal No. 2450 clear varnish. If the insulation is badly charred or damaged, remove it and replace with new core insulation as shown on the motor and generator armature insulation drawings.

Tests Before Rewinding

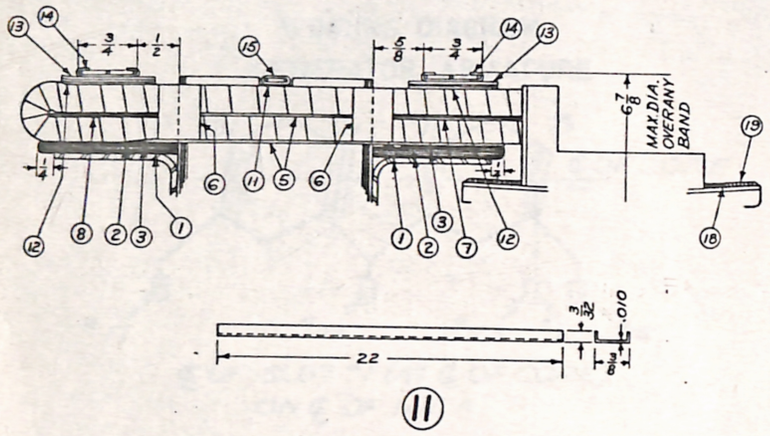
Before starting to rewind the armature, the commutator is tested as described under COMMUTATOR.

Rewinding Armature (See Generator and Motor Connections)

Put core insulation in place and assemble coils in slots and make connections according to Plate A-123889.

Tests During And After Rewinding

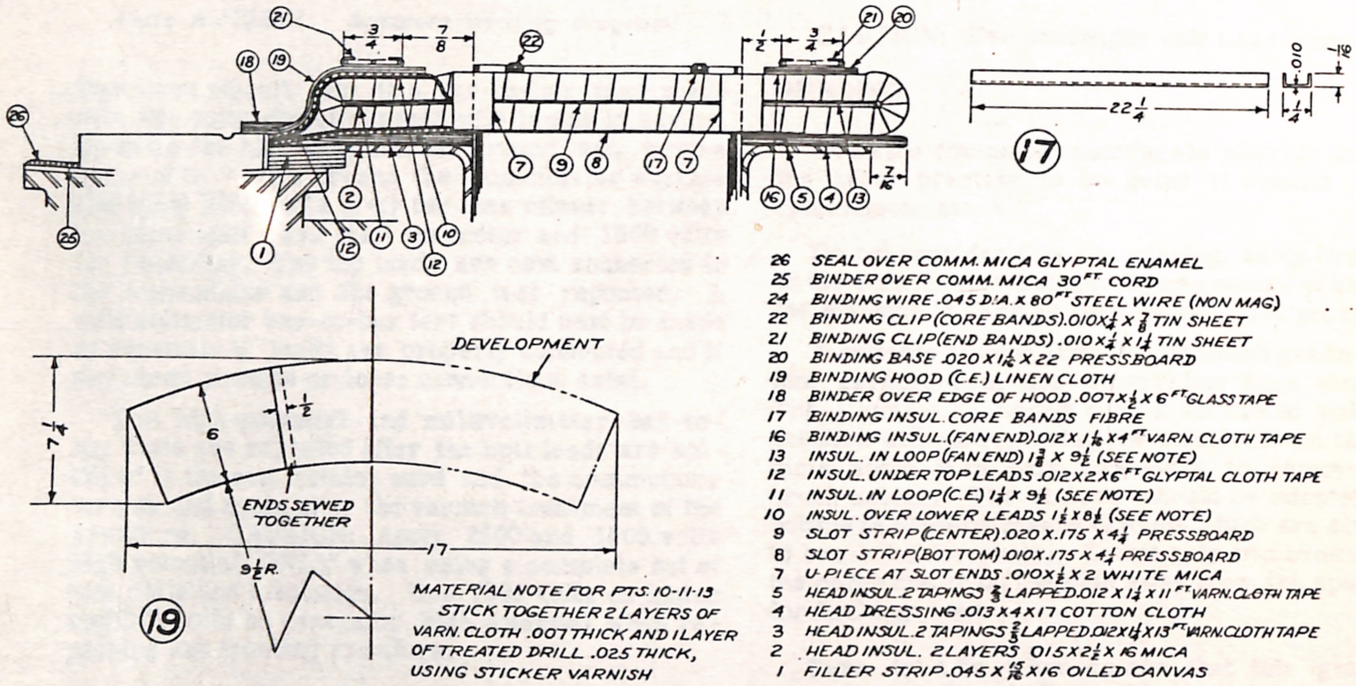
After the new coils have been placed in the slots and the bottom coil leads connected to the commutator, the armature is tested for short circuits between coils and for ground between coils and core.



19 SEAL OVER COMM. MICA GLYPTAL ENAMEL
18 BINDER OVER COMM. MICA 16 FT TWINE
17 BINDING WIRE .045 DIA. X 75 FT STEEL WIRE (NON MAG.)
15 BINDING CLIP (CORE BANDS) .010 X 1/4 X 7/8 TIN SHEET
14 BINDING CLIP (END BANDS) .010 X 1/4 X 1 1/4 TIN SHEET
13 BINDING BASE .030 X 1 1/8 X 23 VARN. PRESSBOARD
12 BINDING INSUL. (END BANDS 2 LAYERS) .012 X 1 1/8 X 45 VARN. CLOTH
11 INSUL. UNDER CORE BANDS FIBRE
8 WINDING INSUL. (P.E.) 1 3/16 X 10 (SEE NOTE)
7 WINDING INSUL. (C.E.) 1 5/8 X 10 (SEE NOTE)
6 U-PIECE AT SLOT ENDS .005 X 1/2 X 2 1/2 WHITE MICA
5 SLOT STRIP .010 X .180 X 2 7/8 FIBRE
3 TAPE FOR HOLDING PT 1 .005 X 1/2 X 6 FT COTTON TAPE
2 HEAD INSUL. (BOTH ENDS) 8 LAYERS .010 X 1 5/8 X 12 FT VARN CLOTH
1 HEAD DRESSING (BOTH ENDS) .013 X 3 1/4 X 18 COTTON CLOTH

MATERIAL NOTE FOR PTS. 7 & 8
STICK TOGETHER 2 LAYERS OF VARNISHED CLOTH .010 THICK BETWEEN 2 LAYERS OF TREATED DRILL .025 THICK, USING VARNISH

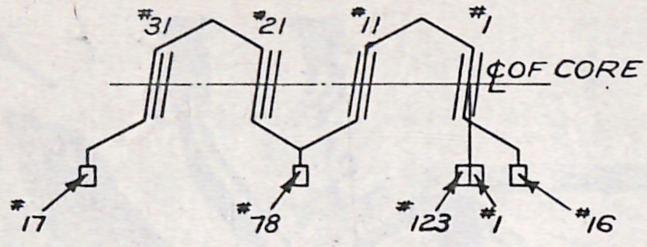
Plate A-125407 Armature insulation, generator of GMG-153 M-G set (from M-8837101).



26 SEAL OVER COMM. MICA GLYPTAL ENAMEL
25 BINDER OVER COMM. MICA 30 FT CORD
24 BINDING WIRE .045 DIA. X 80 FT STEEL WIRE (NON MAG)
22 BINDING CLIP (CORE BANDS) .010 X 1/4 X 7/8 TIN SHEET
21 BINDING CLIP (END BANDS) .010 X 1/4 X 1 1/4 TIN SHEET
20 BINDING BASE .020 X 1 1/8 X 22 PRESSBOARD
19 BINDING HOOD (C.E.) LINEN CLOTH
18 BINDER OVER EDGE OF HOOD .007 X 1/2 X 6 FT GLASS TAPE
17 BINDING INSUL. CORE BANDS FIBRE
16 BINDING INSUL. (FAN END) .012 X 1 1/16 X 4 FT VARN. CLOTH TAPE
13 INSUL. IN LOOP (FAN END) 1 3/8 X 9 1/2 (SEE NOTE)
12 INSUL. UNDER TOP LEADS .012 X 2 X 6 FT GLYPTAL CLOTH TAPE
11 INSUL. IN LOOP (C.E.) 1 1/4 X 9 1/2 (SEE NOTE)
10 INSUL. OVER LOWER LEADS 1 1/2 X 8 1/2 (SEE NOTE)
9 SLOT STRIP (CENTER) .020 X .175 X 4 1/4 PRESSBOARD
8 SLOT STRIP (BOTTOM) .010 X .175 X 4 1/4 PRESSBOARD
7 U-PIECE AT SLOT ENDS .010 X 1/2 X 2 WHITE MICA
5 HEAD INSUL. 2 TAPINGS 3/8 LAPPED .012 X 1 1/4 X 11 FT VARN. CLOTH TAPE
4 HEAD DRESSING .013 X 4 X 17 COTTON CLOTH
3 HEAD INSUL. 2 TAPINGS 3/8 LAPPED .012 X 1 1/4 X 13 FT VARN. CLOTH TAPE
2 HEAD INSUL. 2 LAYERS .015 X 2 1/2 X 16 MICA
1 FILLER STRIP .045 X 15/16 X 16 OILED CANVAS

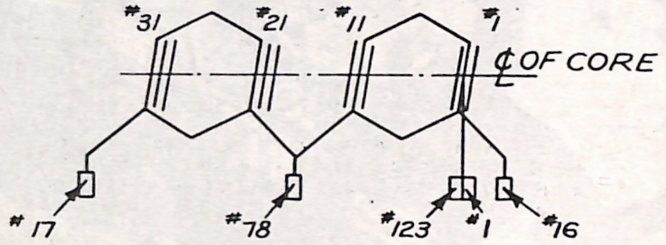
MATERIAL NOTE FOR PTS. 10-11-13
STICK TOGETHER 2 LAYERS OF VARN. CLOTH .007 THICK AND 1 LAYER OF TREATED DRILL .025 THICK, USING STICKER VARNISH

Plate A-125417 Motor armature insulation GMG-153 M-G set (from M8837106).



℄ OF SLOT #1 (AT ℄ OF CORE)
ON ℄ OF MICA

WINDING DIAGRAM
GENERATOR ARMATURE



℄ OF SLOT #1 (AT ℄ OF CORE)
ON ℄ OF MICA

WINDING DIAGRAM
MOTOR ARMATURE

Plate A-123889 Armature winding diagram.

The short circuit test is a bar-to-bar test made with 220 volts, direct current, with lamps in series. To make the high-potential or ground test, wrap a piece of bare wire around the commutator surface and apply 2500 volts (a-c) for one minute between the commutator and shaft for motor and 1500 volts for generator. The top leads are next connected to the commutator and the ground test repeated. A millivoltmeter bar-to-bar test should next be made to ascertain if leads are properly connected and if any short circuits or loose connections exist.

The high-potential and millivoltmeter bar-to-bar tests are repeated after the coil leads are soldered in the commutator ears and the commutator turned, and again after the varnish treatment of the armature. CAUTION: Apply 2500 and 1500 volts high potential ONLY when using a complete set of new coils and insulation. Use 1500 volts on motor and 500 volts on generator high potential when repairing and treating armature.

Commutator

See REPAIRS under COMMUTATORS.

COMMUTATORS

CLEANING

Do not use oil or grease on the commutator. The brushes contain sufficient graphite to maintain proper lubrication. If the commutator is not kept clean and free from grease and oil, carbon dust will collect in the grooves between the segments and will tend to cause a short circuit.

After the commutator becomes worn, burning or arcing at the brushes may be caused by high mica between segments. When this occurs, the only remedy is to remove the armature, turn the commutator to a smooth surface and undercut the mica.

The string band should be wiped clean, to remove any accumulation of oil, grease or carbon dust which tend to create flashovers that result in failure of the insulation. The string band should at all times have a smooth, glossy finish, which can be secured by frequently applying a coat of Glyptal No. 1201 red enamel.

SANDING

When the commutator shows slight signs of roughness or dirt, black surface, it can easily be polished with a fine grade of sandpaper, 00 or finer. Hold the sandpaper backed with a wood block against the surface as it rotates. After sanding, blow out the dust with dry compressed air to clean the sand from the slot between the segments.

CAUTION: Use sandpaper only on a commutator.

GRINDING

When the commutator surface is pitted or burned, the usual practise is to grind it smooth with a commutator stone.

Do not consider this resurfacing, as an overhaul on the commutator, but merely as a means of keeping the machine in service between overhaul periods.

A suitable stoning fixture with finish grade stone (not carborundum nor emery) has been devised. The illustration shows such a fixture in grinding position without removing the machine from the vehicle since it is only necessary to remove one brush holder. The fixture should be adapted for bolting in place by means of studs which are similar to brush-holder studs. Leave only two brushes on the commutator on the side away from the operator for braking power.

Care must be taken to see that this grinding operation does not leave the commutator out of round. The permissible eccentricity for the GMG-153B commutator is 0.002 inch. Precautions must

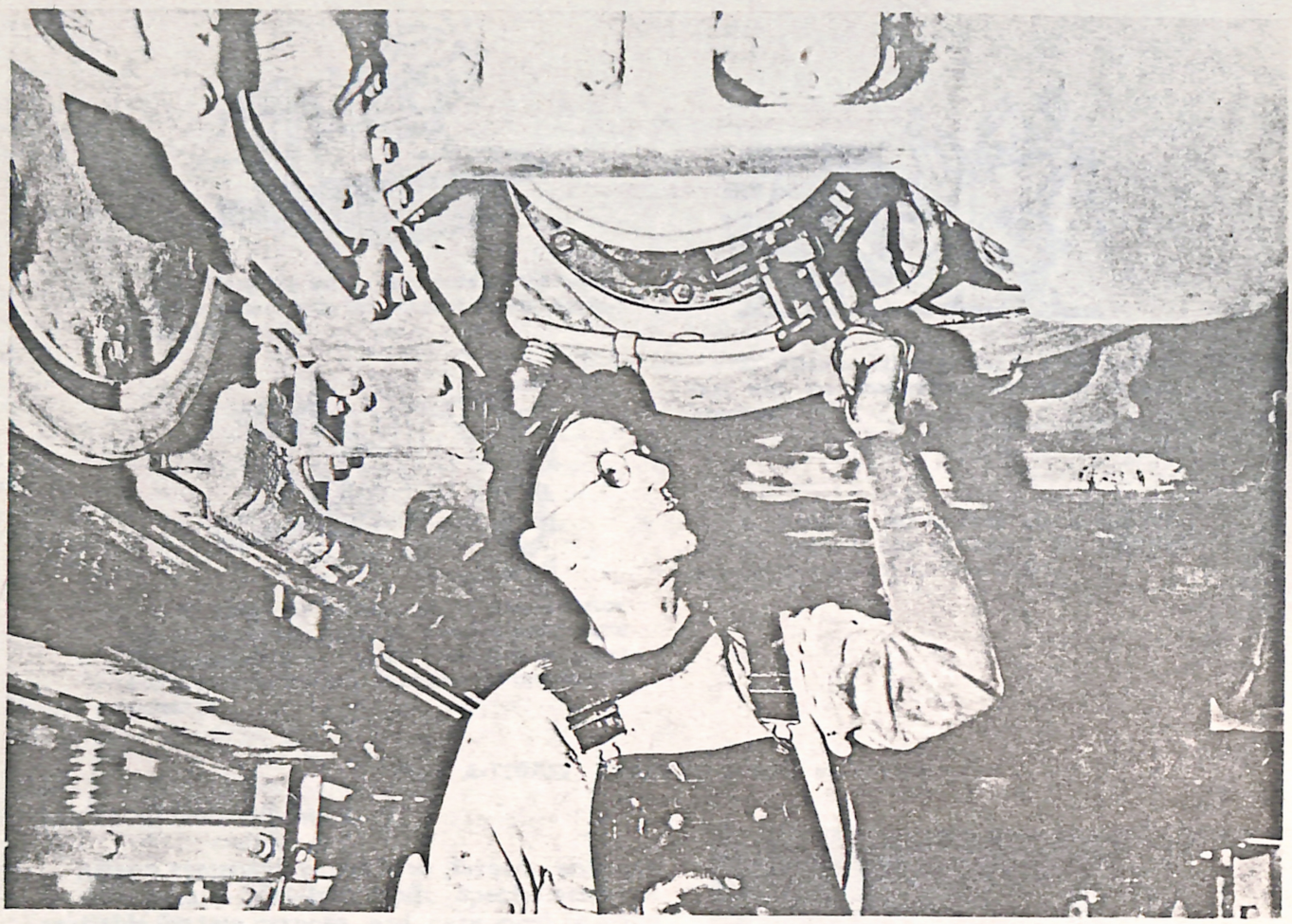


Plate A-99403 Using Button Control-stoning Commutator in P.C.C. car motor.

be taken to prevent the copper dust from entering the windings by using a cardboard shield or similar device. Cover also the fan outlet to prevent the fan from sucking the dust into the machine.

After the grinding is completed, clean the slots and remove any burrs on the commutator bars. Blow out the motor well with dry compressed air to remove all dust from grinding.

TURNING

If the commutator is badly worn or burned, turn the commutator in a lathe. Remove only enough copper to give a uniform surface, after which recut the side mica between segments. Polish and clean the commutator surface.

Whenever possible, turn the commutator by supporting the armature in its own bearings. If the armature is held on lathe centers, be sure that these centers are true with respect to the bearing seats.

Before turning a commutator, make a suitable covering to keep the chips and dust from working into the armature. This covering can best be made as follows:

Take a strip of cloth several inches wider than the length of the end connection, and long enough to encircle the commutator. Wrap this cloth around the commutator, binding the inside edge with a cord as close to the end connections as possible. Then turn the cloth up over the cord and bind with another cord to the outside of the armature.

Make sure that the turning post is so set that the ways are absolutely parallel to the commutator and that they are fastened and braced securely. Use a side-cutting tool with point ground to about 1/16-inch radius. Give the cutting side of the point considerable more rake than is customary for working iron and steel. Have the tool sharp enough to make a clean, smooth cut without dragging copper over the mica.

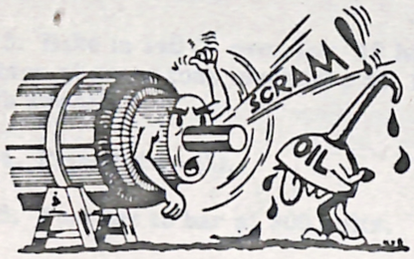
While turning the commutator, run it at a peripheral speed of approximately 300 feet per minute, which is about as fast as the tool will cut without burning. With a file, round off the ends of the commutator bars to at least 1/16-inch radius, while the commutator is still in the lathe.



1. Keep the mica segments of the commutator undercut to the correct depth, as indicated in Table.



2. Keep the surface of the commutator clean and smooth. Sand or stone it when signs of roughness or dirt appear, and if it becomes badly worn or burned, it should be turned and polished.



3. Allow no oil or grease to come in contact with the commutator surface or carbon brushes.

4. Keep the string band clean, and frequently apply a coat of Glyptal No. 1201 red enamel to maintain surface finish.

Plate A-120762 Rules for proper maintenance.

UNDERCUTTING THE MICA

After a commutator has been turned, undercut the side mica to 3/64-inch depth. Special saws are available for this purpose, and care must be taken not to cut the slots too wide. Remove the sharp edges of the commutator bars with a hand scraper or a knife. Do not bevel the edges of the segments. Clean out the slots to remove all mica chips and fins, and be sure that no copper chips remain in the slot. A satisfactory tool for this operation can be made from a piece of a worn-out hack-saw blade. See Plate A-118647.

The width of the mica is 0.032 inch.

After the mica has been undercut and the slots cleaned out, the commutator is ready for grinding and final polishing.

TIGHTENING

It is important that the segments be clamped as tightly as possible, so that they will not become loose in service. Test for loose bars by tapping them with a light hammer.

If the bars should become loose, this looseness can be corrected by tightening the commutator nut. However, this tightening is an operation which requires extreme care. This tightening requires five tons pressure at 100 C, using a 24-inch wrench.



Plate A-118647 A simple tool for cleaning out commutator slots can be made from a worn out hack saw blade.

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REPAIRS

In making all repairs to the commutator, care should be taken to keep all parts clean and free from dust and foreign material. Careful work is essential for the best results.

In case it is found necessary to replace a commutator, a set of segments, side mica or cones, a complete seasoning cycle must be performed on the commutator after assembly on the armature core and after armature has been rewound. This seasoning consists of a series of cycles of spinning, heating, pressing, etc. for the purpose of setting the mica insulation to produce a tight commutator. This should not be attempted unless there are proper facilities and a trained personnel for doing this work; otherwise these repairs should be sent to the nearest General Electric Service Shop, since these are high-speed commutators which require exacting heat treatment and seasoning after repairs or rebuilding.

Seasoning a commutator requires baking, pressing and tightening in accordance with the following process and in addition the commutators should be seasoned in a spin stand.

1. Stack copper and mica in stacking fixture. Assemble steel, copper and cones and tighten by hand, cold. Use 24-inch wrench.

2. Press and tighten at seven tons cold. Use 24-inch wrench.

3. Bake in 140 C oven for 10 hours, press and tighten at seven tons pressure at 100 C. Use 24-inch wrench.

4. Repeat item (3).

5. Test bar to bar at 300 volts.

6. Inspect and hi-pot at 3000 volts, test bar to bar at 300 volts.

7. After soldering, press and tighten at five tons at 100 C. Use 24-inch wrench.

8. After dipping and baking, press and tighten at five tons pressure at 100 C. Use 24-inch wrench.

9. Rough turn commutator and groove side mica.

10. Static balance complete armature assembly.

11. Finish turn commutator on own bearings.

TESTING AFTER REPAIRS

After the coils and head insulation have been stripped from the armature, a piece of bare wire should be wrapped around the commutator. Apply

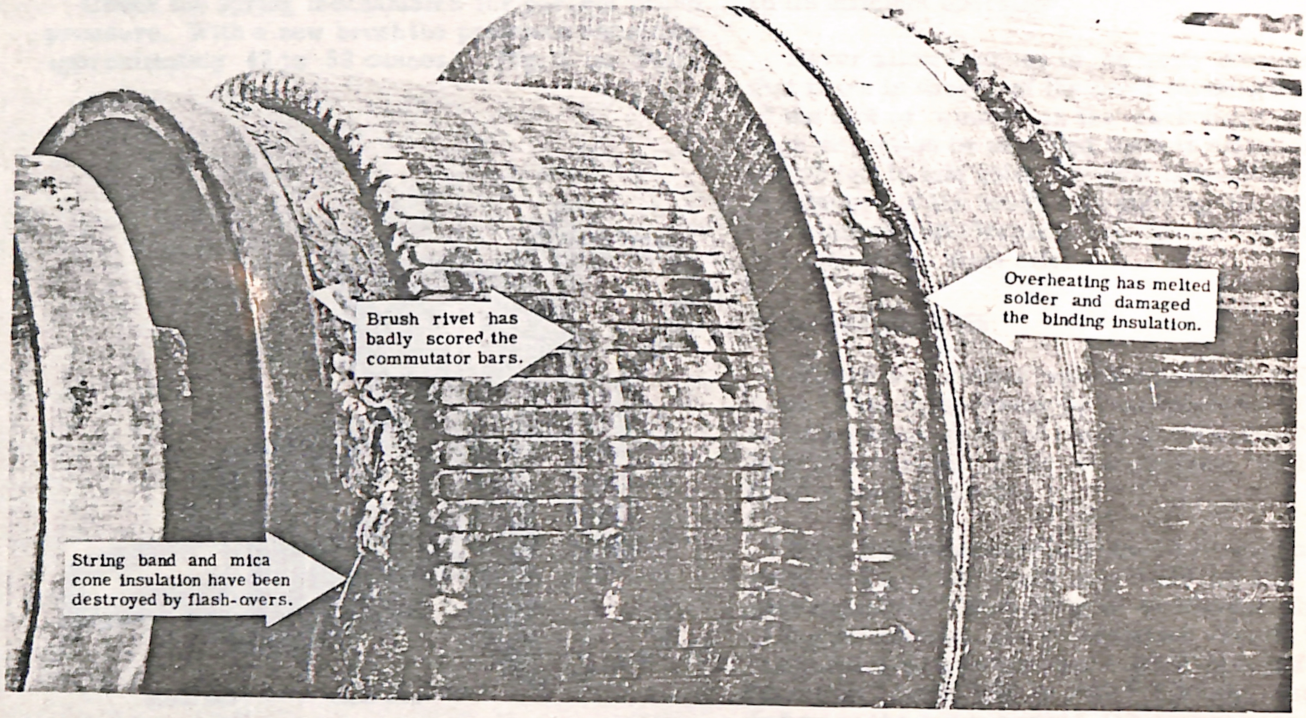


Plate A-118648 Armature damaged by brushes being allowed to wear down until the brush rivet scored the commutator surface.

a high-potential test for one minute between the commutator surface and the armature shaft. For the motor use 2500 volts (a-c) and for the generator use 1500 volts (a-c).

Before applying high-potential test, be sure that cone insulation outside of cap and shell is dry and free from oil or dirt. Bake commutator (assembled on core) at 110 C for approximately eight hours to be sure there is no moisture present.

A bar-to-bar test of 220 volts with lamps in series should be made to ascertain if short circuits exist between bars.

BRUSH HOLDERS AND BRUSHES

INSPECTION OF BRUSH HOLDERS

See Plate A-125517.

When brush holders have been removed from the frame, clean them by wiping off the bodies, insulators, etc., with carbon tetrachloride. Carefully examine the bodies for worn, burned or corroded spots. If flashovers have occurred, tell-tale marks will be left on the brush holders. Clean these burned or beaded spots with a file. If necessary, replace the stud.

Check the spring mechanisms for correct brush pressure. With a new brush the pressure should be approximately 43 to 53 ounces. Fig. 1 on Plate A-118840 shows the correct method of measuring spring pressure; the spring balance commonly used for this purpose is a fish scale of 5 or 10 pounds capacity.

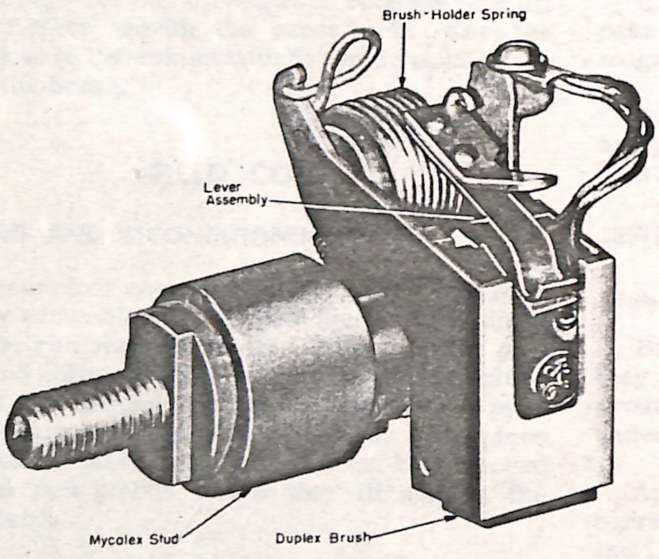


Plate A-125517 Type GMG-153 Brush Holder with brushes installed.

Smooth up the brush carbonway with a fine file and then check for size with a new brush; if the side clearance is more than 0.025 inch, replace the brush-holder body.

INSPECTION OF BRUSHES

Brushes should be clean and free in their holders. To determine the proper freedom of the brushes, release the spring levers, and raise and lower the brushes several times in their carbonways. These actions allow sand and grit, which may cause sticking, to drop out. Do this before blowing out the machine with dry compressed air, so that all the loose dust and dirt will be removed from the commutator.

WARNING - Do not snap the spring -- this might chip the brush.

Replace chipped or excessively worn brushes with new ones. The brushes originally supplied with the motor are of the proper grade for all service conditions, and when brush replacements are necessary, replace with the same grade of brush, or a G-E recommended substitute. Careful selection of brushes is especially necessary when only partial replacement is made, as two widely differing brushes on the same machine may be detrimental to its efficient operation.

Never allow brushes to be worn down so short that there is danger of the lever striking the bottom of the slot or window in the carbonway. Also at each inspection be sure that there is sufficient brush length left to last until the next inspection, without any danger of the brush clip striking the surface of the commutator. Replace any brushes worn within 3/8 inch of the steel clip.

SANDING BRUSHES

When new brushes are installed, carefully fit them to the commutator by sandpapering; first, by using a coarse grade of sandpaper and then followed by a fine grade. Poor commutation will result from a poor brush fit.

When it is necessary to fit an entire set of brushes, refer to Fig. 2 on Plate A-118840 for the method recommended. Cut a strip of sandpaper the width of the commutator and of sufficient length to wrap one and one-quarter times around the circumference. Insert the small end in a slot between segments, and wrap the paper around the commutator so that by rotating the armature in the proper direction, the paper will be held in place by the friction of the brushes.

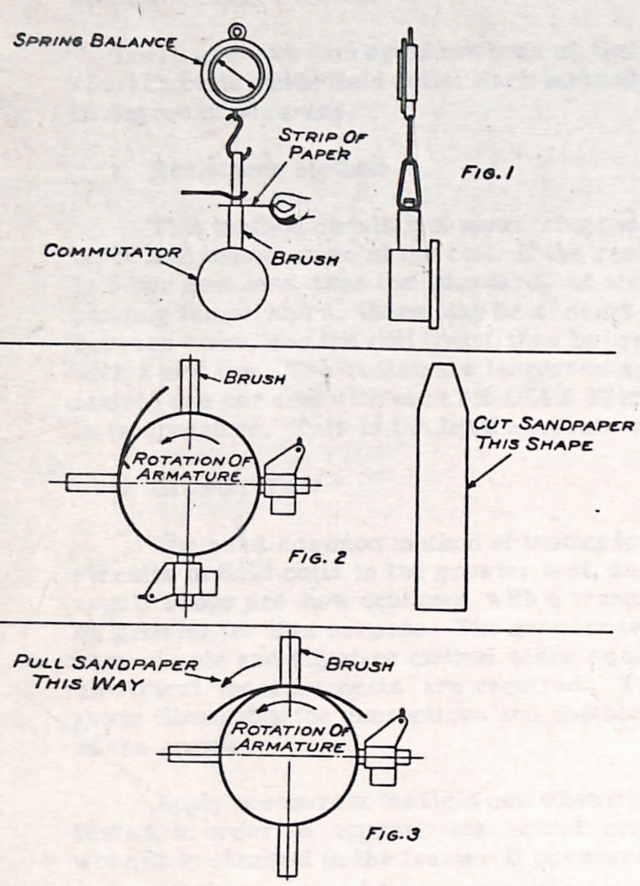


Plate A-118840 Method of sanding and obtaining brush pressure.

If only a few brushes are to be fitted, Fig. 3 on the same sketch illustrates a similar method. Draw the sandpaper in the direction of rotation and lift the brush when moving the paper back. Keep the paper close to the commutator to avoid rounding the edge of the brush.

FIELD COILS

CLEANING AND RECONDITIONING

The generator commutating field coils are permanently assembled on the pole pieces and cannot readily be removed from them. Therefore, the pole pieces and coils should be handled as an assembled unit, and precautions taken in dipping them to prevent the varnish from getting into the pole-piece bolt threads. Also, all varnish must be removed from the pole pieces where they fit against the frame bores.

The exciting field coils are assembled separately from the pole piece and can be easily removed for treatment.

If it becomes necessary to remove the field coils from the magnet frame, thoroughly clean them, bake them 12 hours at 110 C and dip them in Glyptal No. 1201 red enamel for ten minutes, or until bubbling stops. Allow them to drain for 15 minutes, or until dripping stops, replace them in the oven and again bake them for eight hours at 110 C. The enamel may be used at the viscosity at which it is taken from the barrel.

Before reassembling, the terminals of the coils should be thoroughly cleaned.

If the field coils are loose, place an oiled canvas pad next to the frame when the coils are put back in the magnet frame.

The field coils are "hot drawn" when they are assembled new. In order to avoid damaging the insulation, the coils are heated in an oven to approximately 100 C. Assemble in frame while hot.

After the field coils have been repaired and reassembled in the set, make the connections in accordance with the connection diagrams and proceed as follows:

Solder the connections.

Apply three wraps, 1/2 lapped of 0.015 x 1/2 No. 510 yellow varnished cloth.

Apply one wrap, 1/2 lapped of 0.015 x 1/2 cotton tape.

Brush over tape with coat of Glyptal No. 1201 red enamel.

Check coil polarity with connection diagrams; pass current through the windings and check with magnetic compass needle.

After the coils have cooled to room temperature, apply high-potential test. See HIGH-POTENTIAL TEST below for instructions.

TESTS

High-Potential Test

Before removing the field coils from the frame, they should be thoroughly cleaned and insulation-to-ground test applied. Dirt may cause a breakdown under the high-potential test.

Apply high potential of 1500 volts alternating current for one minute between field coil circuits and frame.

If a coil becomes grounded, remove and repair it by reinsulation.

Tests for Short Circuits

There are two accepted methods of testing for short circuits inside field coils. Each method varies in degree of accuracy.

a. Resistance Method

This method consists of measuring the resistance and temperature of the coil. If the resistance is 5 per cent less than the standard, at a corresponding temperature, there may be a short circuit between turns, and the coil must then be replaced with a new one. The resistance increases approximately one per cent with each 2.5 C (4.5 F) increase in temperature. This is the least accurate method.

b. Growler Test

The most common method of testing for short circuits in field coils is the growler test, and many repair shops are now equipped with a transformer or growler for this purpose. The growler test is a very simple and effective method, since no accurate electrical measurements are required. The diagram illustrates the connections and method of use of the growler.

Apply pressure to the field coil when it is being tested, in order to approximate actual conditions when it is clamped in the frame. If pressure is not applied, the coil may show no defect on test, but may give trouble from short circuited turns when clamped between the pole tips and the inside surface of the frame.

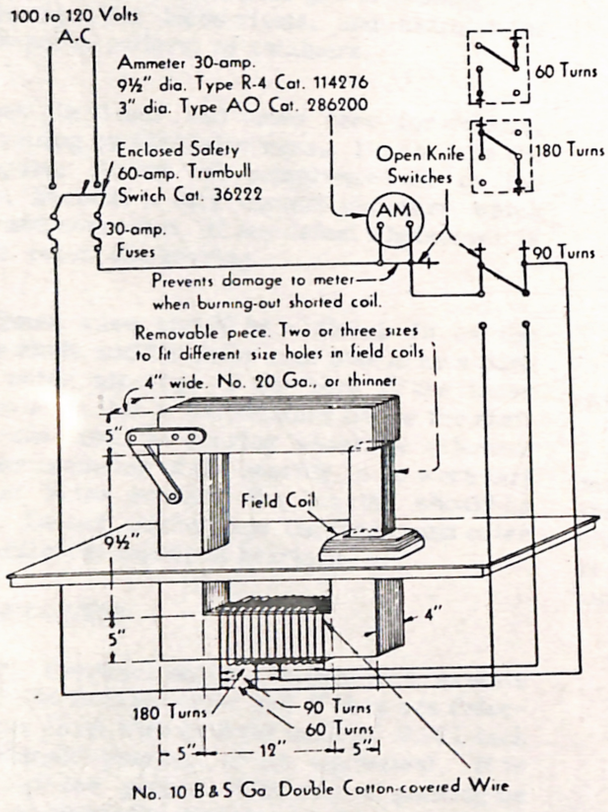


Plate A-118650 Growler test for field coils.

With the test in operation, after adjusting the knife switches for the desired number of turns on the transformer, place the removable portion of the core in place, but without the field coil. Note the deflection of the ammeter, which indicates the value of primary current. Open the line switch and place the coil in position around the transformer core; close the switch to reapply voltage to the transformer. If the ammeter shows the same deflection as before, the coil is free of short-circuited turns; if there is a short circuit, a much heavier current would flow in the primary coil of the transformer, and would be indicated by a greater deflection of the ammeter.

VARNISH TREATMENT

Where individual coils only are being replaced in an assembled frame, the following treatment should be given completely reinsulated field coils.

Clamp coils to hold shape (Do not clamp commutating coils).

1. Dip coils in Glyptal No. 2480 varnish at room temperature.
2. Bake coils for eight hours at 125 C (257 F).
3. Cool to 80 C (176 F) and dip in Glyptal No. 1201 red enamel of barrel viscosity.
4. Bake eight hours at 120 to 125 C (248 to 257 F).
5. Repeat (3) and (4).
6. Clean terminals.

NOTE: If field coils have been reinsulated and are merely being treated at a regular overhaul period, parts (2), (3) and (4) of the above treatment would be sufficient.

BEARINGS

ARMATURE

The armature of the motor-generator is supported on anti-friction type ball bearings on the generator end and cylindrical roller bearings on the motor end.

CORROSION

The principal cause of corrosion is water. Precautions must be taken to prevent moisture from entering the bearing assembly. Take particular care when the bearings are removed and cleaned, to keep a coating of oil or grease on the rolls at all times.

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OVERHAULING

When the machine is disassembled for regular overhaul and the armature has been removed, thoroughly clean the bearings and examine them for wear or defects.

Cleaning

Remove the bearings and clean out all the old grease, using kerosene, safety solvent, or other petroleum solvent. NEVER CLEAN BEARINGS WITH CARBON TETRACHLORIDE. Immediately after cleaning the bearings, dip them in a light mineral oil (about SAE-10) bath heated to 95 C. This hot oil removes any moisture and insures that a film of oil protects all parts of the bearing from corrosion. Immediately after this hot-oil dip, wrap the bearings in oiled paper and place them in a clean, dry storage place until ready to reassemble in the machine.

In addition to cleaning the bearings, thoroughly wash out the bearing housings with kerosene or petroleum spirits, being sure to remove all the hardened grease from both the front and back grease chambers.

After the bearings have been cleaned, give them a visual inspection and check for defects by rotating them in the hand and feeling for grit or binding. Inspect the cages for loose rivets, and examine for defective balls, rollers, or retainers.

Inspect the inner and outer race for defects, such as pitting or excessive wear. Do not take the cages apart. Do not use compressed air on the bearings, because it may contain moisture which would cause corrosion. If any defect whatsoever is observed, reject the bearing.

The inner race should be a shrink fit on the armature shaft, and the outer race should be a push fit in the outer housing. If the bore of the inner race is so worn that a satisfactory fit on the shaft cannot be obtained, the bearing should be rejected. If the outer diameter of the bearing is so worn that it is loose in the housing, the bearing should be rejected. Do not interchange the inner and outer races of different makes of bearings.

GREASE RETAINERS

At every overhaul period, inspect the gaskets used under the bearing caps and if they are defective, replace them with gaskets made of 0.021-inch thick Vellumoid packing, or its equivalent. It is important that the proper thickness of packing be used, as this affects the clearance between the outer race of the bearing and the housing or bearing cap.

NEW BEARINGS

New bearings should not be removed from the original packing until immediately before they are to be used. Unwrap the bearings in a clean dry place and remove the packing grease by washing the bearings thoroughly in kerosene or some similar petroleum solvent. Dry the parts well, and dip them into a light grade of lubricating oil about SAE-10, heated to 95 C (203 F), to prevent corrosion. Keep bearing parts covered at all times with clean rags, paper, or similar material to prevent the entrance of dirt, chips, etc. When ordering new bearings, order from the General Electric Company to be sure of obtaining exact duplicates.

PRECAUTIONS FOR HANDLING BEARINGS

1. Be careful not to damage the bearing.
2. Do not allow any dirt to get into the bearing.
3. Be sure your hand and tools are clean.
4. Provide a clean paper on which to lay the bearing.
5. After removal of a bearing, wash it in kerosene, dip it into hot oil and wrap in oiled paper.
6. Do not clean the bearing with carbon tetrachloride; use some form of petroleum spirits, such as kerosene.
7. Do not use compressed air on a bearing; it may contain moisture which would cause corrosion.
8. Before assembling the bearing on the shaft, be sure that the shoulders on the shaft are not burred or have rough edges.
9. Be sure that the bearing fit on the shaft is smooth and not scored.
10. Do not use a hammer against the outer race.
11. Do not use a cold chisel and hammer to free the inner race from the shaft.
12. Never heat any part of a bearing over 135 C (275 F).
13. When lubricating, use only fresh, clean grease, which is free from dirt, grit, moisture, or foreign material.

ASSEMBLY (REFER TO A-125424)

The sequence of operations when assembling the motor-generator set is essentially the reverse of those for disassembly. Parts having a shrink fit should be heated in a bath of clean oil or preferably, in an oven to a temperature of not over 110 C before assembling.

1. Generator End Bearing Assembly
   a. Install bearing cap 2 with gasket 3 in place on shaft.
   b. Heat ball bearing 29 to 110 C and place in position on the shaft with the inner race tight against the shoulder. Make sure the grease seal plate is located on the armature side.

c. Measure out 1 3/4 ounces of G-E Ball Bearing Grease, Type EWM-3S (G-E No. D6A2A5).
d. After the ball bearings have been allowed to cook, smear part of the grease over the balls and put the remainder in the grease chamber of the framehead 28.
e. Cover commutator with cardboard to prevent damage by brush holders.
f. If the brush holders have been removed reinstall them into place on the framehead 28.
g. Heat framehead 28 to 20 C above room temperature and assemble on shaft over the bearing. Clamp to bearing cap 2 and gasket 3 with capscrews and lock washers 9. Connect the two leads to brush holders.

2. Heat inner race of bearing 4 to 110 C and shrink into place on shaft tight against shoulder.

3. Heat framehead 5 to 20 C above room temperature. Drop outer race with rollers of bearing 4 into the framehead fit.

4. Assemble bearing cap 2 with gasket 3 and fasten with capscrews and lock washers 9.

5. Measure out one ounce of G-E Ball Bearing Grease Type EWM-3S (G-E No. D6A2A5) and smear part over the rollers and put the remainder in the grease chamber of the framehead.

6. Install armature into frame and pull the generator-end framehead into place by tightening up on capscrews 14. NOTE: In order to avoid cocking the framehead with consequent misalignment of the bearings, pull up evenly on the framehead capscrews.

7. Cover motor commutator with cardboard to prevent damage by brush holders.

8. If the brush holders have been removed, reinstall them into place on the framehead 5.

9. Install motor-end framehead 5 into place and tighten up evenly on capscrews 14. Connect the two leads to brush holders.

10. Rotate armature to make sure there is no binding.

11. Assemble blower assembly on each end of the shaft, taking care to have the feet in correct position relative to the frame of the motor-generator set, since this affects the angular location of the blower outlet.

12. Fasten blowers to frameheads 5 and 28 with the four capscrews and lock washers 13 each.

13. Secure the blowers with shaft nuts 8 and lock washers 7. Bend the lock washers up against one side of nut to keep the nut from backing off.

14. Assemble brushes and adjust so that bottom of carbonway is 1/16 to 3/32 inch from commutator surface.

15. Install brushes in both ends of set.

16. Inspect the interior of the set for loose parts, foreign matter, or other obstructions.

17. Replace all covers and tighten securely.

ASSEMBLING BALL BEARINGS ON GENERATOR END

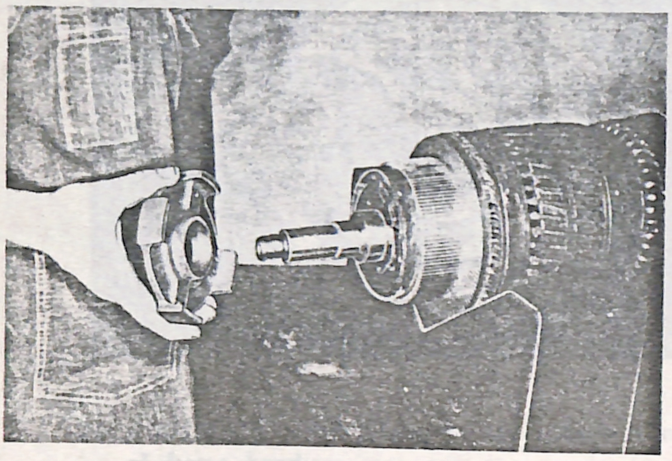


Plate A-125522 Place bearing cap in place on shaft.

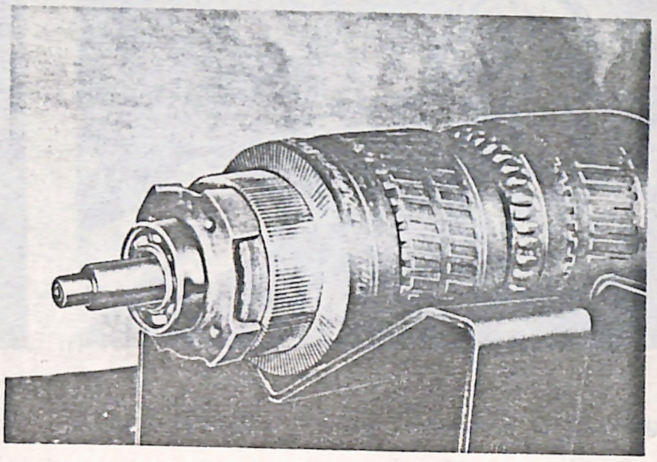


Plate A-125525 Bearing cap and ball bearing in place on the shaft.

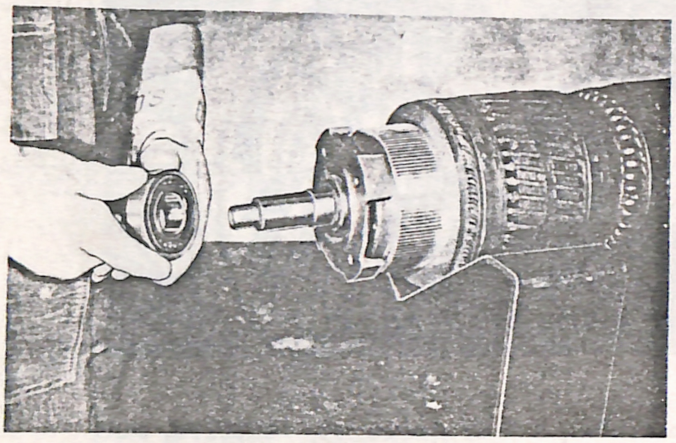


Plate A-125523 Heat ball bearing to 110C and place on shaft.

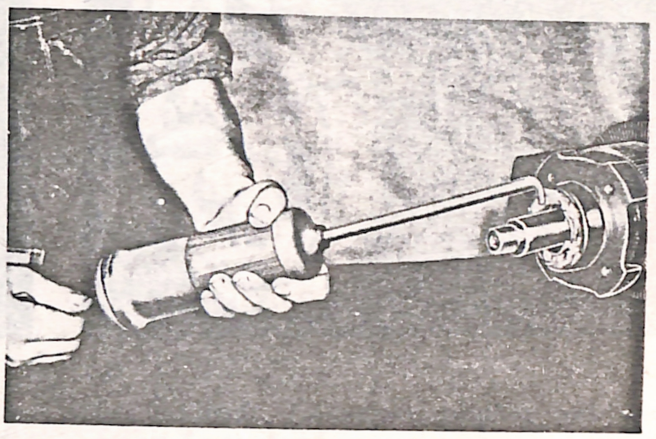


Plate A-125526 Put grease in bearing.

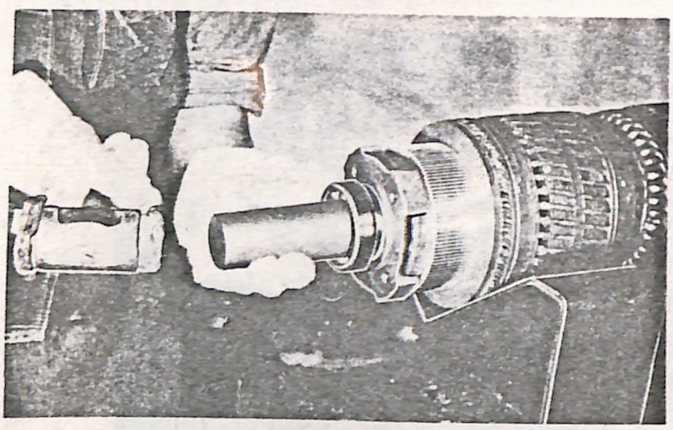


Plate A-125524 Drive the bearing home against the shoulder with a mallet and a pipe fitted over the shaft.

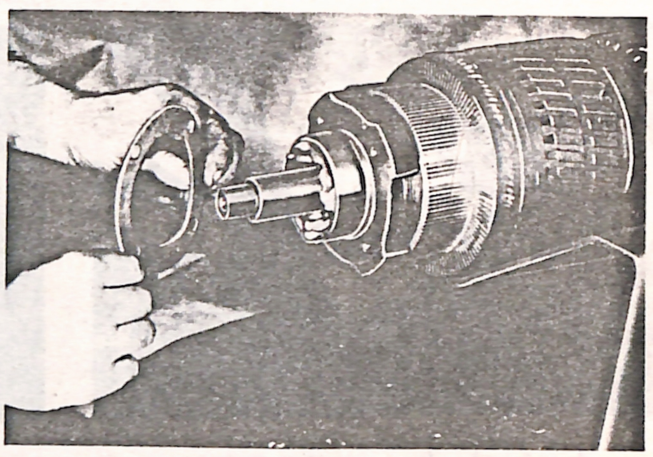


Plate A-125527 Put gasket on bearing cap.

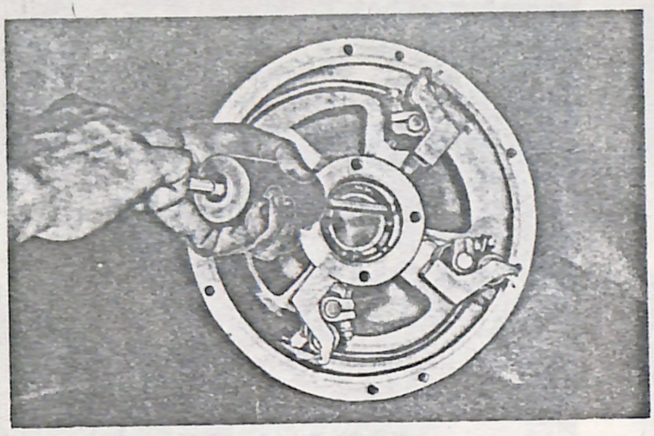


Plate A-125528 Put grease in the grease chamber of frame head.

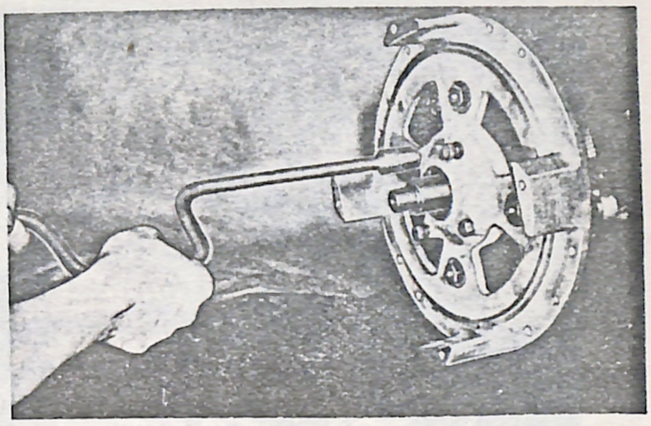


Plate A-125530 Bolting framehead to bearing cap.

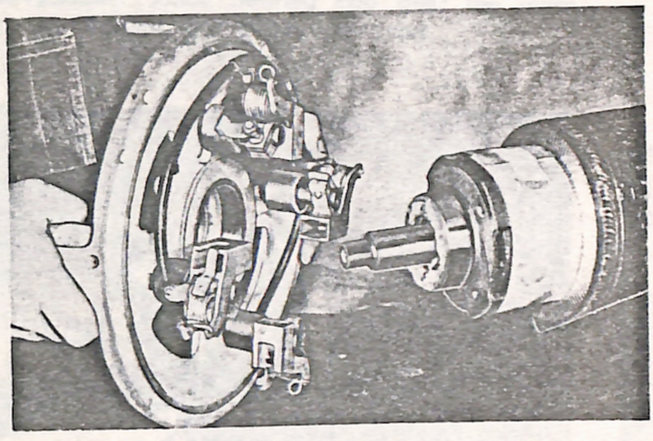


Plate A-125529 Put framehead into position on the shaft.

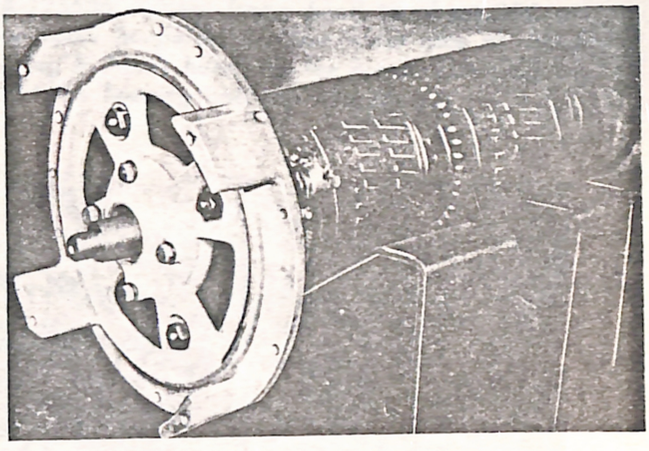


Plate A-125531 Armature complete with generator end frame head.

ASSEMBLING ROLLER BEARINGS ON MOTOR END

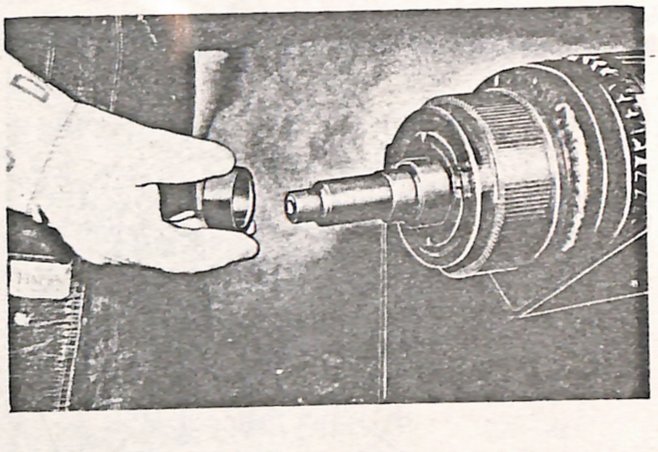


Plate A-125532 Heat inner race of roller bearing to 110C and place into position on shaft.

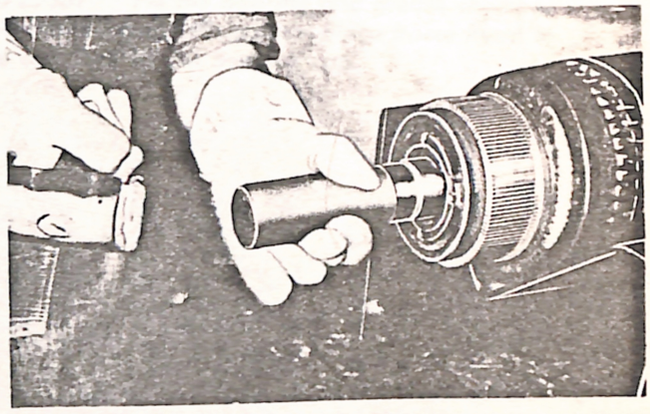


Plate A-125533 Hammer the bearing home with a mallet against the pipe fitted around the shaft and up against the inner roller bearing race.

TK-1191

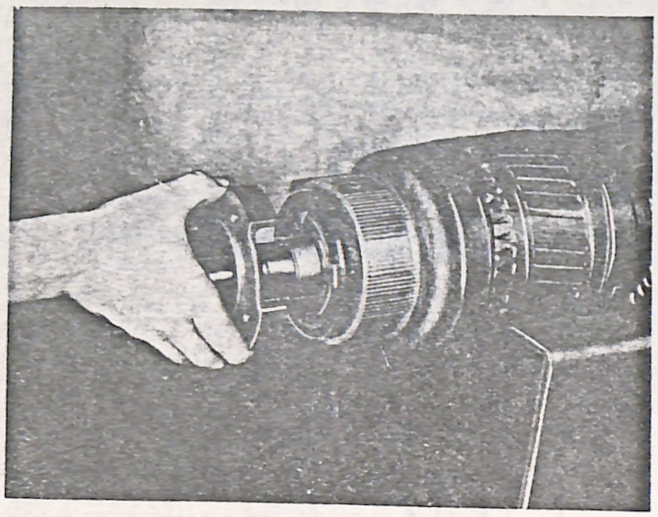


Plate A-125534 Place bearing cap over the inner race up against the commutator cap.

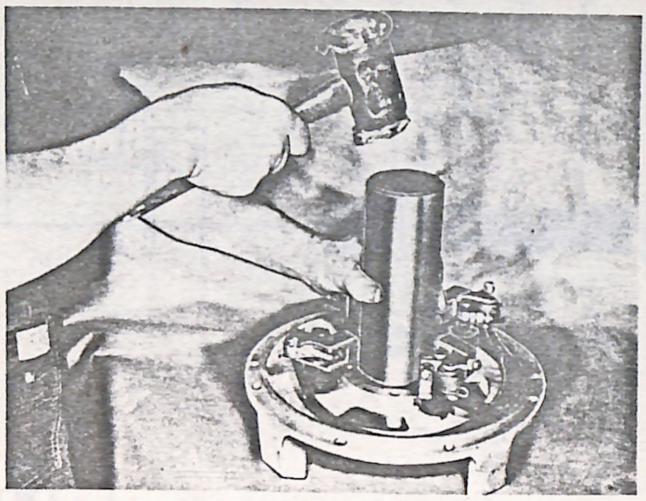


Plate A-125536 Heat frame head to about 20C above room temperature. Place outer race of roller bearing in frame head. Put the proper size plug against the bearing and top into place.

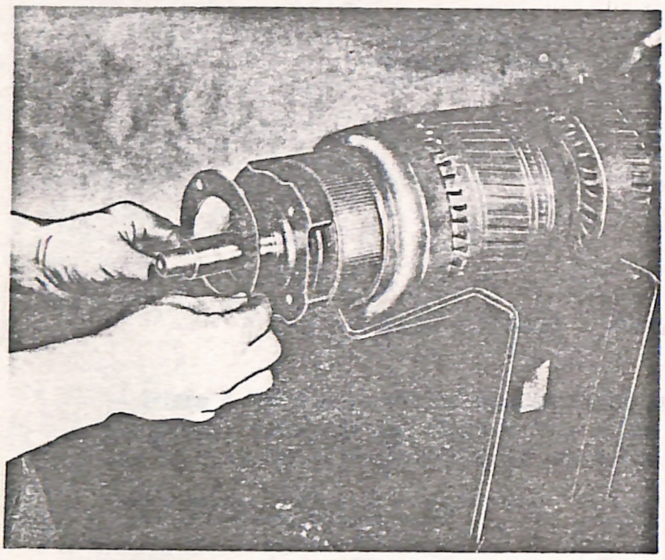


Plate A-125535 Place gasket against the bearing cap.

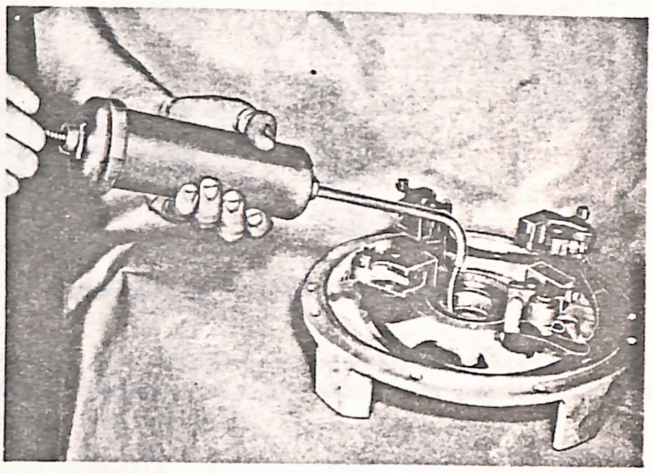


Plate A-125537 Fill the bearing and grease chamber of the frame head with grease. Place frame head in place and bolt to the bearing cap.

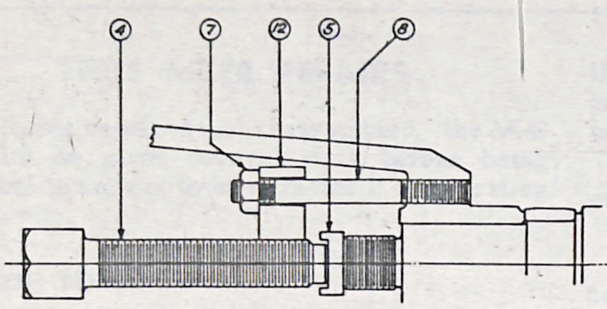


FIG. 1
CAT. 6746821G2
FAN PULLER (BOTH ENDS)

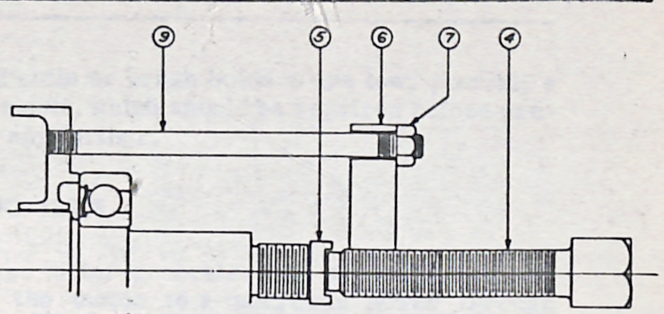


FIG. 2
CAT. 6746780G3
BEARING PULLER
(GEN. END)

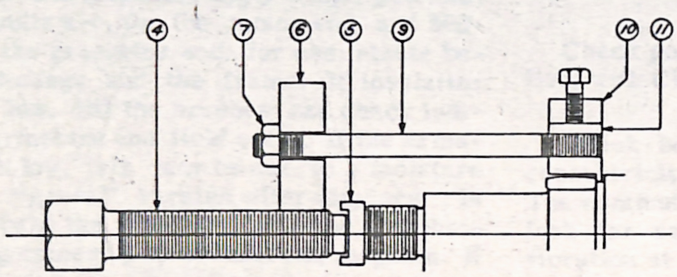


FIG. 3
CAT. 6746780G4
INNER RACE PULLER
(MOTOR END)

		1	1		PT-1	H-8864282	12	CLAMPING PLATE
2			2		PT-2	K-8828416	11	CLAMP
1			1		G-1	K-8826216	10	RING
4	4		4		PT-1	K-8802268	9	STUD
		3	3		PT-1	K-8808304	8	STUD
4	4	3	4	C&LT	STEEL		7	NUT HEX. $\frac{3}{4}$-16
1	1		1		PT-1	K-8806268	6	CLAMPING PLATE
1	1	1	1		PT-1	K-8808278	5	PRESSURE CAP
1	1	1	1		PT-1	K-8808277	4	BOLT
X							3	ASSEMBLY FIG.3
	X						2	ASSEMBLY FIG.2
		X					1	ASSEMBLY FIG.1
CAT. 6746780G4	G-4							
CAT. 6746780G3	G-3							
CAT. 6746821G2	G-2							
CAT. 6746821G1	G-1							

CAT. 6746821G1 COVERS ALL PARTS IN SUFFICIENT QUANTITY TO MAKE UP ASSEMBLIES IN FIGS. 1, 2, 3 WITHOUT DUPLICATION OF PARTS

Plate A-125442 Method of disassembly GMG-153-B M-G set.

Plate A-125442 shows the special tools required for proper assembly and disassembly of the GMG-153 B M-G Set. These drawings show the various operations to be performed by special pullers. The number of puller studs to be used for each operation is indicated.

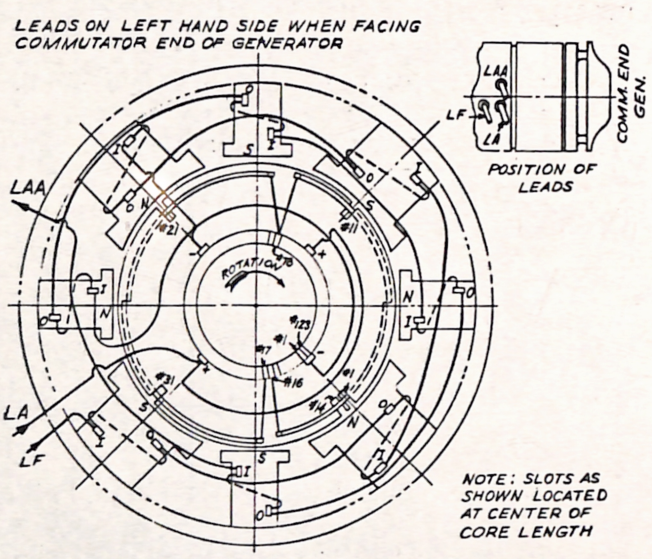


Plate A-125405 Connection diagram for generator of GMG-153 MG set. (From K-8828287)

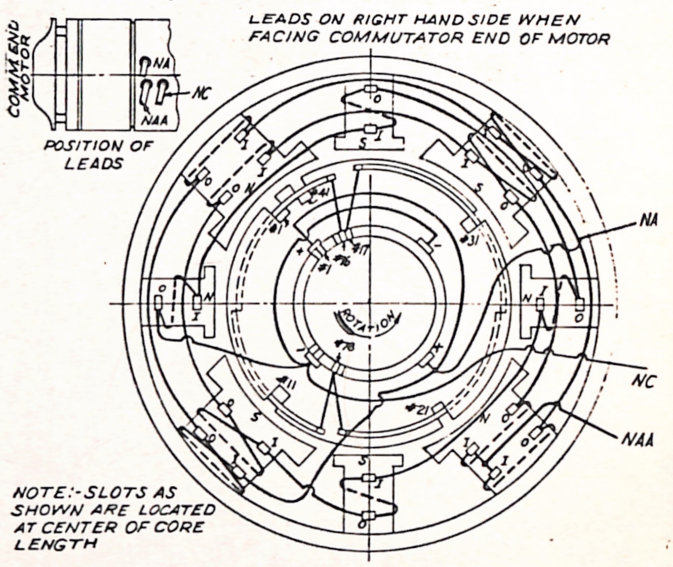


Plate A-125406 Connection diagram Armature and Field (Motor). (From K-8828289)

TESTS AFTER REPAIRS

After being repaired and reassembled, the M-G set should be given several tests before being placed back in service to be sure that it is operating satisfactorily.

INSULATION TESTS

Using a megohmmeter, measure the insulation resistance between the windings and the frame. If and only when the insulation resistance measures not less than one megohm, apply a high-potential test of 1500-volts a-c, for the motor end and 500-volts a-c for the generator end, for one minute between the windings and the frame. If insulation resistance is low, lift the brushes and check individually the armature and field coils. If the armature alone is low, this may be due to a moisture condition or "green" varnish after dippings. In this case, rebake the armature until the megohmmeter reading comes up to at least one megohm. If the field coils or brush holders are low, possibly a ground exists, which should be repaired before proceeding any further.

RUNNING TESTS

Set the motor-generator set on test bench and connect the motor to a source of power through suitable equipment. Block off fans and run the set at a speed of 1750 rpm under no load for 30 minutes and then check the bearing temperature to see that they do not rise higher than 60 to 70 C (140 to 158 F).

Check polarity of generator. LA should be positive, with CW rotation on generator end.

Check both commutators for smoothness and concentricity at several speeds up to 2000 rpm. The commutator must be concentric within 0.002 inch for satisfactory operation. Check machine vibration at several speeds up to 2000 rpm.