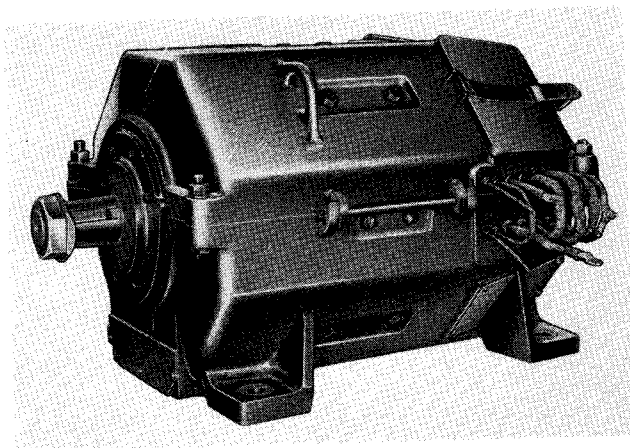




INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

DIRECT-CURRENT MILL TYPE MOTORS TYPE MC, 7½ TO 275 HP Series 600—Silicone Insulated



INTRODUCTION

MILL TYPE MC MOTORS in NEMA frame sizes 602 to 620 are direct-current machines designed for constant and variable speeds, plus constant and variable voltage applications.

The cast steel, split type frame, integral bearing and bearing housing assemblies, and compactness of mechanical design lends the 600 line MC motor to applications requiring ruggedness, dependability, and simplicity of maintenance.

Warranty. The Corporation in connection with apparatus sold agrees to correct any defect or defects in workmanship or material which may develop under proper or normal use during the period of one year from the date of shipment, by repair or by replacement f.o.b. factory of the defective part or parts, and such correction shall constitute a fulfillment of all the Corporation's liabilities in respect to said apparatus, unless otherwise stated in the quotation.

Any defects that may develop should be referred to the nearest Westinghouse Sales Office for complete servicing information.

Method of Drive. Mechanically the 600 line MC motor is interchangeable end for end and employs double, tapered shaft extensions from either of which the drive may be taken.

Either of the following drive methods may be used, depending on the particular application:

1. **Gear Drive.** Mount the motor and driven unit so as to maintain accurate alignment. The gears must mesh accurately to insure smoother operation and minimize wear, particularly on reversing operations.

Mount the gear on the motor close to the bearing housing to minimize overhang, allowing sufficient clearance for armature end play.

The motor should be chocked or doweled to its base.

2. **Direct Drive.** The motor shaft and the driven or driving shaft must be carefully aligned.

Dowel the motor to its base.

NOTE: Pinions or coupling halves must have an accurate fit and must be securely locked in place by means of the locking washer supplied. Use a pinion puller for removing tight pinions or coupling halves.

Electrical Connections. Install all wiring and fusing in accordance with the National Electric Code and local requirements.

Connect the motor and starter by referring to diagrams furnished with the starter and as given in diagrams Figs. 1 to 6.

Diagrams Figs. 1 and 2 apply to frame sizes 602 to 610 which have two brush arms and two-circuit armatures.

Diagrams Figs. 3 and 4 apply to frame sizes 612 and 614 which have four brush arms and two-circuit armatures.

Diagrams Figs. 5 and 6 apply to frame sizes 616 to 620 which have four brush arms and multiple circuit armatures.

OPERATION

Run the motor (except series wound motors operate on first point of control) without load to check the connections and direction of rotation. To start or stop the motor, refer to the instructions furnished with the starter or switchboard equipment.

D-C MILL TYPE MOTORS

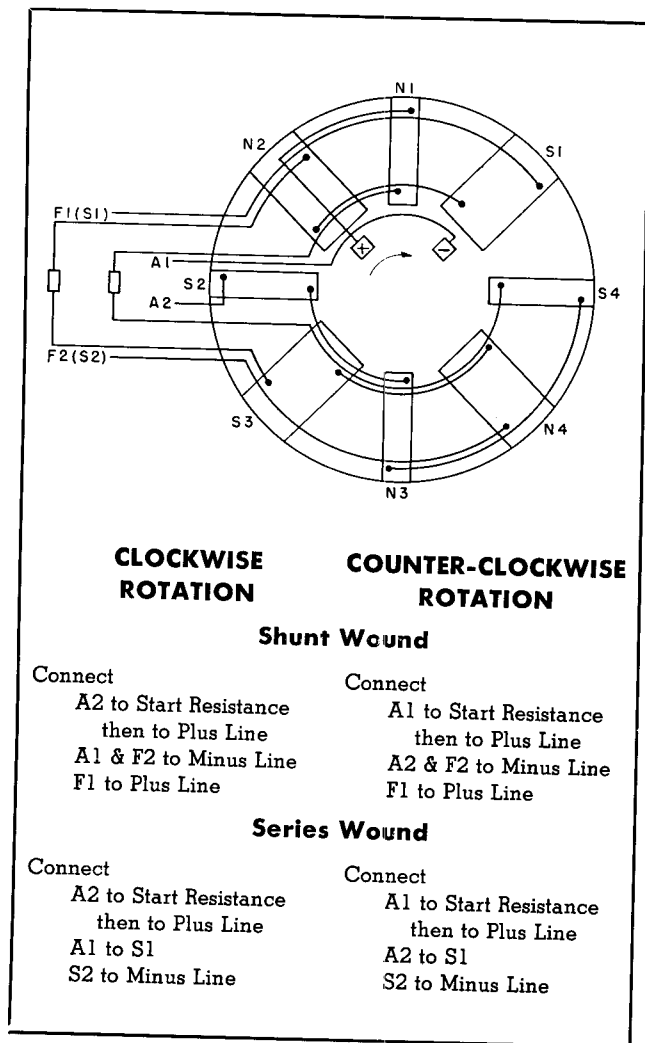


FIG. 1. Frames 602 to 610 Type MC Shunt or Series Wound with Two Brush Arms and Two Circuit Armatures

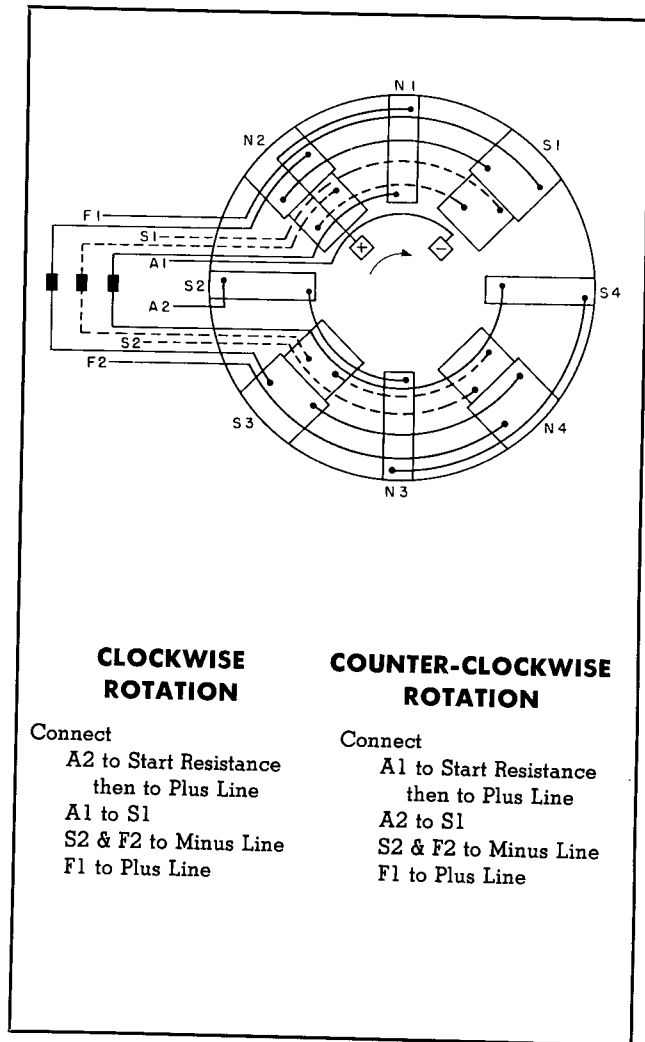


FIG. 2. Frames 602 to 610 Type MC Compound Wound with Two Brush Arms and Two Circuit Armatures

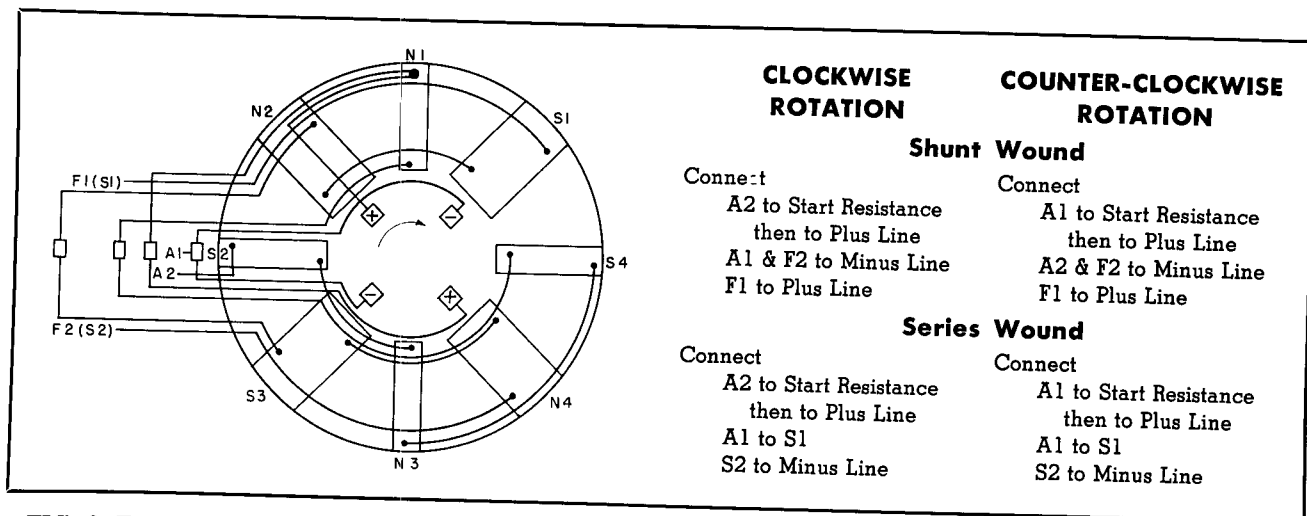


FIG. 3. Frames 612 and 614 Type MC Shunt or Series Wound with Four Brush Arms and Two Circuit Armatures

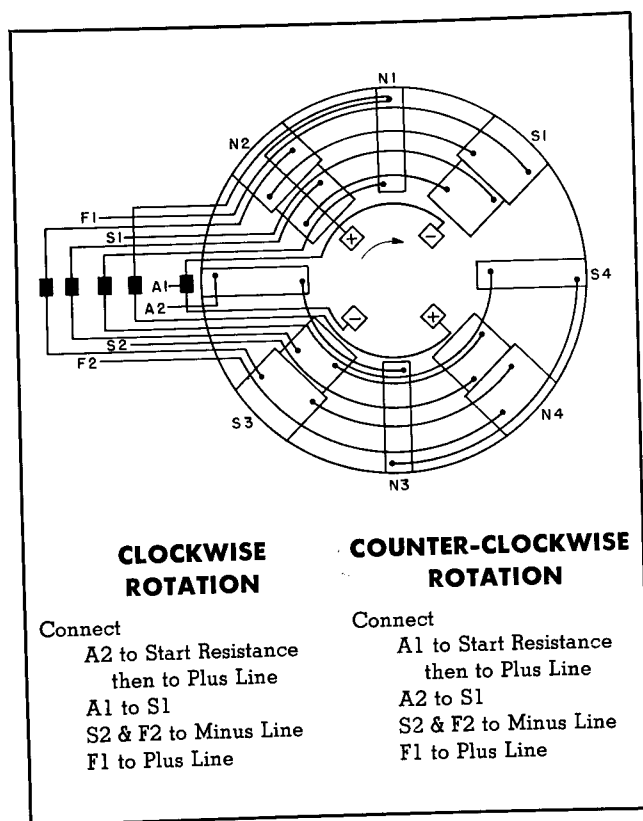
D-C MILL TYPE MOTORS

FIG. 4 Frames 612 and 614 Type MC Compound Wound with Four Brush Arms and Two Circuit Armatures

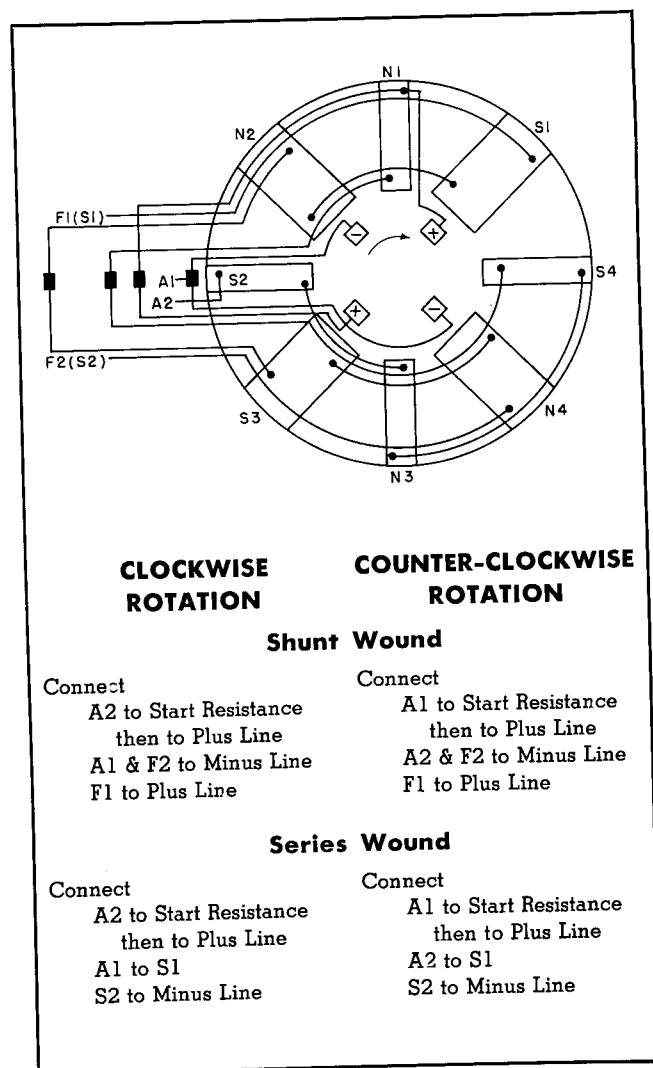


FIG. 5. Frames 616 to 620 Type MC Shunt or Series Wound with Four Brush Arms and Multi-Circuit Armatures

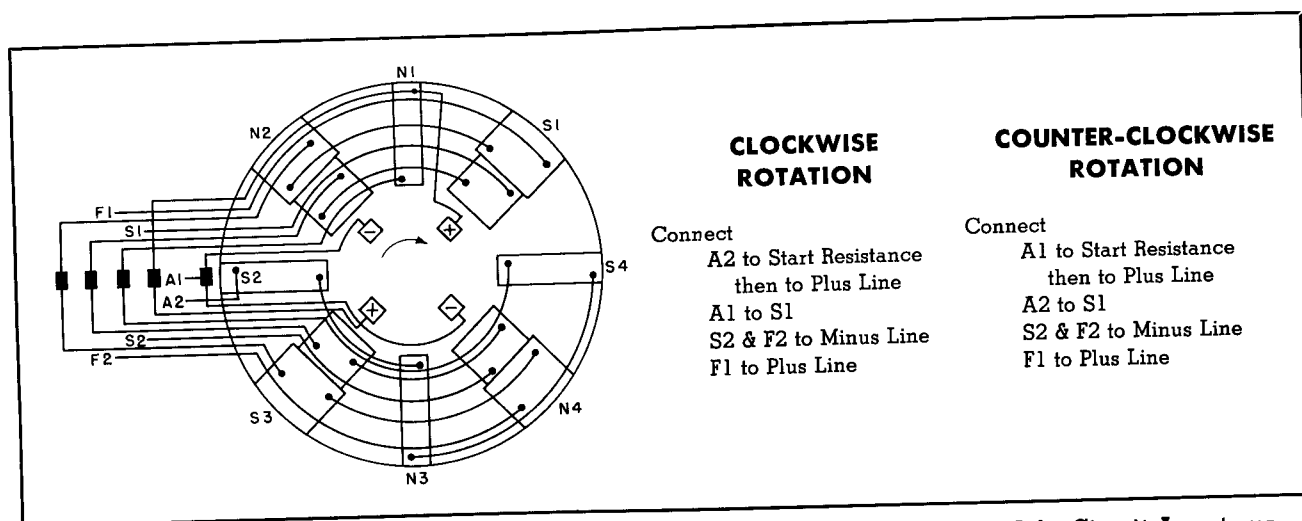


FIG. 6. Frames 616 to 620 Type MC Compound Wound with Four Brush Arms and Multi-Circuit Armatures

**ARMATURE COIL CONNECTION DATA FOR 600 LINE
230 VOLT, MC MOTORS**

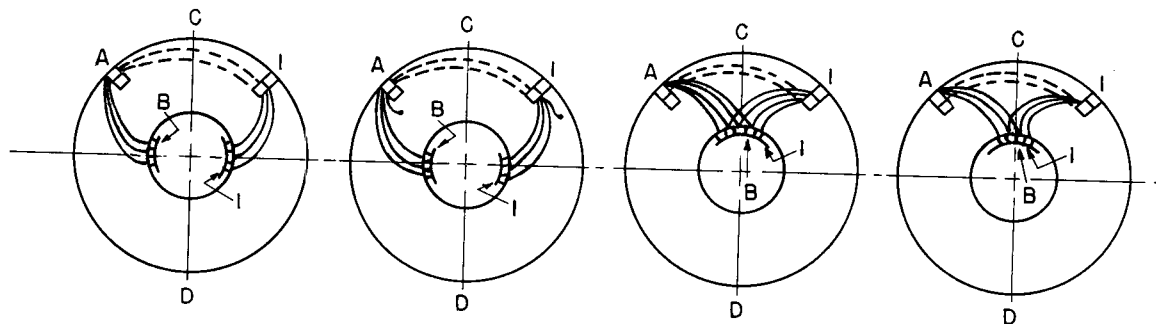


FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

FRAME	FIG. NO.	SLOTS 1 to A	BARS 1 to B	COIL CONNECTION DATA FOR 230 VOLT ARMATURES
2	7	8	42	CD, the center-line of mica between commutator bars 22 & 23 is on center-line of tooth between slots 4 & 5.
602	8	8	59	CD, the center-line of commutator bar No. 31 is on the center-line of tooth between slots Nos. 4 & 5.
603	8	8	59	CD, the center-line of commutator bar No. 31 is on the center-line of tooth between slots Nos. 4 & 5.
604	8	8	55	CD, the center-line of commutator bar No. 29 is on the center-line of tooth between slots Nos. 4 & 5.
606	7	10	57	CD, the center-line of commutator bar No. 30 is on the center-line of tooth between slots Nos. 5 & 6.
608	7	9	48	CD, the center-line of mica between commutator bars Nos. 25 & 26 is on center-line of slot No. 5.
610	7	13	72	CD, the center-line of mica between commutator bars Nos. 37 & 38 is on center-line of slot No. 7.
612	7	10	57	CD, the center-line of commutator bar No. 30 is on the center-line of tooth between slots Nos. 5 & 6.
614	7	10	57	CD, the center-line of commutator bar No. 30 is on the center-line of tooth between slots Nos. 5 & 6.
616	9	12	2	CD, the center-line of commutator bar No. 3 is on the center-line of tooth between slots Nos. 6 & 7.
618	10	13	2	CD, the center-line of mica between commutator bars Nos. 2 & 3 is on center-line of slot No. 7.
620	10	13	2	CD, the center-line of mica between commutator bars Nos. 2 & 3 is on center-line of slot No. 7.

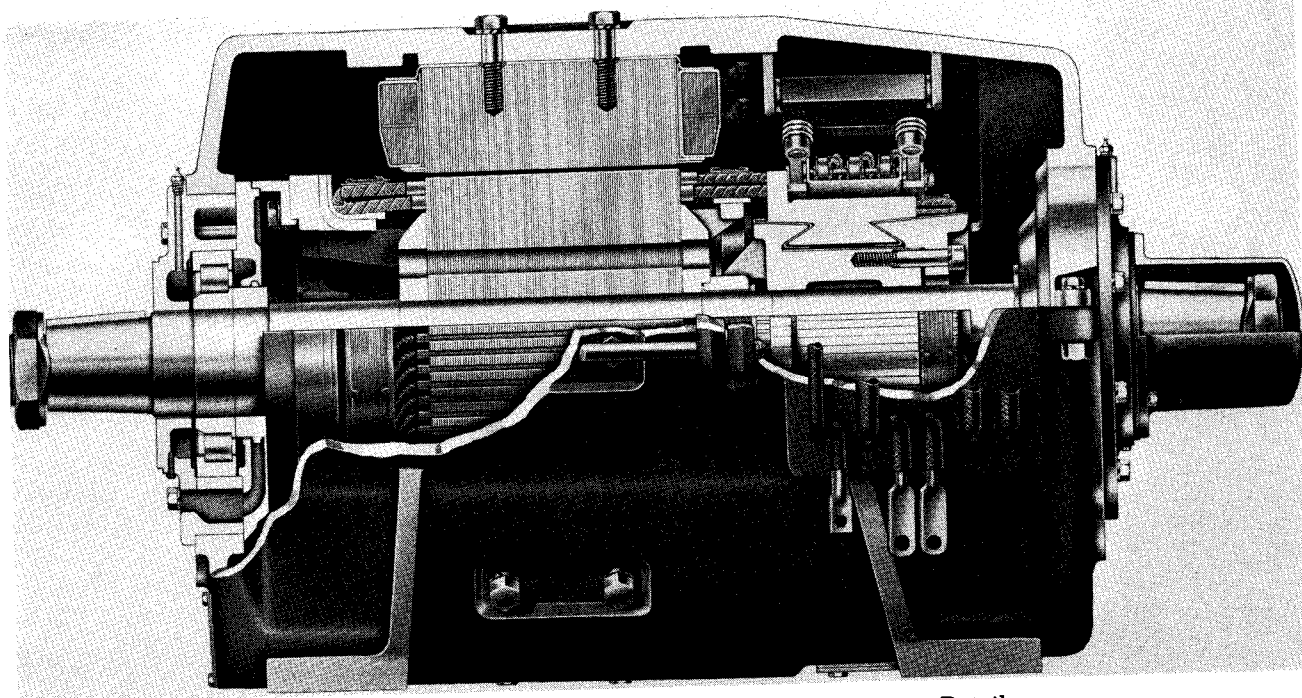


FIG. 11. Cutaway View Showing Type MC Construction Details

MAINTENANCE

Although the 600 line MC motor requires a minimum of attention in service, they should be inspected at regular intervals to guard against excessive dirt and moisture which account for a majority of all machine failures.

1. Guard Against Dirt. The insulation and mechanical parts of the machine should be kept clean. Dust that is free from oil or grease may be removed by wiping with a clean, dry cloth, or preferably, by suction. Dust may be blown from inaccessible parts with clean, dry air, using not more than 30 to 50 pounds pressure. **Use care to prevent personal injury from the air hose; use goggles to avoid eye injury from flying particles.**

When grease or oil is present, wipe with a cloth moistened (but not dripping) with a petroleum solvent of a "safety type" such as Stoddard solvent or similar materials available under various trade names. When a material is difficult to remove, carbon tetrachloride is more effective than petroleum solvents. **Wear neoprene gloves to prevent skin irritation when using either petroleum solvents or carbon tetrachloride.**

Petroleum solvents are flammable and comparatively nontoxic.

Carbon tetrachloride is nonflammable, but is highly toxic. Suitable ventilation should

be provided to avoid breathing vapors. When ventilation is not sufficient to prevent a distinct odor of carbon tetrachloride, a chemical cartridge respirator or gas mask must be used.

2. Guard Against Moisture. Machines should always be guarded against the accidental intrusion of water from splatter or splashing.

Stand-by units should be run at least once a week to guard against moisture condensation.

Before windings are blown out with air, make sure that water has not condensed in the air line.

Coils. All field coils are class H (Silicone) insulation and are of the unit assembly type—each individual coil is completely insulated with mica and protected by glass tape, assembled on a steel shell, and held securely to the shell by means of a steel washer. An extended edge of the wall is crimped over in several places and tack welded to hold the washer in place. The whole field coil assembly is impregnated with silicone varnish.

Field Coil. The field coils Fig. 12 and 13 are easily replaced or reinsulated by cutting the tack-weld with a sharp chisel, straightening the small lugs, removing the washer, and then removing the coil. The shell can be cleaned up, coils replaced, washer installed, lugs reset (new lugs may be cut in the shell if necessary and again tack-welded to the washer.

D-C MILL TYPE MOTORS

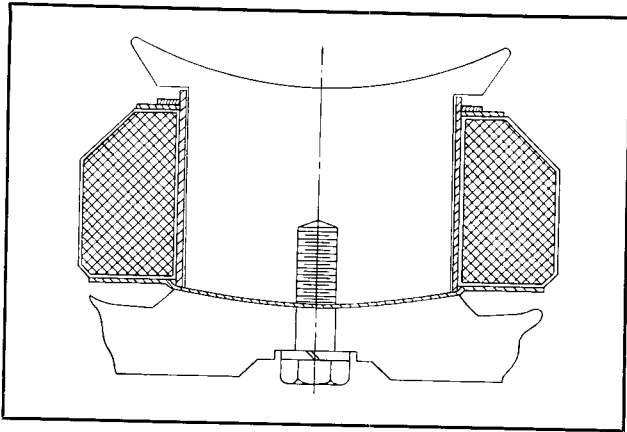


FIG. 12. Cross-Section of Field Coil and Pole Assembly

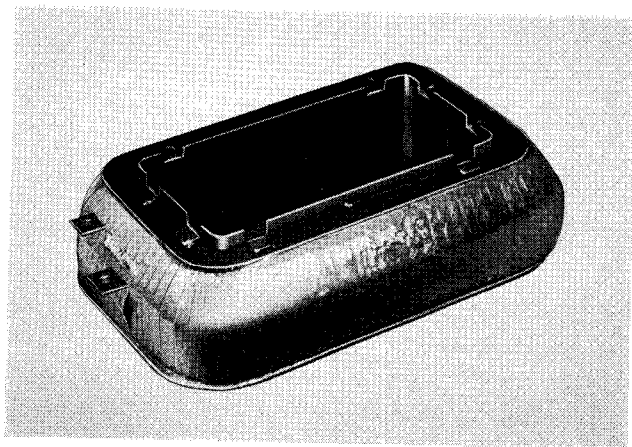


FIG. 13. Field Coil

Armature Coils. The armature coils are full class H (silicone) insulated. The coil conductors are completely insulated with silicone bonded glass and coil ground protection is provided by a glass and mica wrapper. The complete armature is given one impregnation and one additional dip in silicone varnish.

Revarnishing the windings when the motor is overhauled will lengthen their life. To obtain maximum coil life, a baking silicone varnish is recommended. Good results can be obtained by using a non-silicone baking varnish. To obtain full use of the varnish, the coils and armature should be placed in an oven for baking. Suitable varnish can be obtained from the nearest Westinghouse Sales Office.

Brushholders. Brushholders Fig. 14, are designed for easy adjustment or removal, they provide the maximum of corrosion resistance. The holders on all sizes are made of cast brass, mounted on machined blocks which are securely welded to the motor frame. Leads are bolted to extra heavy contact pad permitting many redressings . . . adding life to brushholder.

Two brushholders are used on Frames 602 to 610 inclusive.

Four brushholders are used on Frames 612 and 614

Four double brushholders are used on Frames 616 and 618. Eight double brushholders are used on frame 620. All use precision cast bronze finger for accurate and long life.

Brushes. Use only the brushes recommended by Westinghouse. These brushes are recommended on the basis of extensive tests which have proven their reliability for this service. Brushes should have only sufficient clearance in the box to slide easily.

Care of Commutator and Brushes. Keep the commutator clean, wiping it at frequent intervals with a clean canvas cloth free from all lint. The brushes should fit the commutator, making contact over the entire surface.

A commutator that is taking on a polish and shows no signs of wear requires no other attention; but a rough, raw, copper-colored commutator should be smoothed with a piece of sandpaper or sandstone ground to fit and then polish with No. 00 sandpaper. Always lift brushes when polishing commutator and do not replace them until all grit has been removed. Never use emery cloth or emery paper on the commutator.

Bearings. The bearings are the semi-self contained roller type installed in an independent housing (the bearings and bearing housings lift out of the frame with the armature and shaft). Both bearings and their assemblies are identical and the armature is free to float.

The life and quietness of roller bearings depend largely on cleanliness and proper lubrication. When

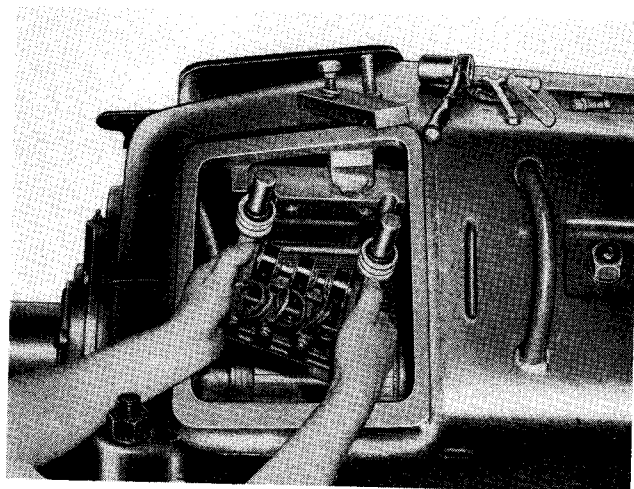


FIG. 14. Brushholder and Mounting

D-C MILL TYPE MOTORS

shipped from the factory, the bearings have sufficient grease of the correct grade for a limited time. However, a charge of grease should be added soon after the motor is put in operation, and thereafter at suitable intervals as determined by experience. The ideal condition is that the bearing housing be from one-third to one-half full of grease.

CAUTION—DO NOT OVER-GREASE:

When roller bearings are over-greased the bearing runs warm which may damage the bearing. Also the excess grease will escape along the shaft.

The grease to be used for roller bearings should be compounded from a pure mineral oil and a lithium base soap. It should have minimum free oil

separation in storage. It should be free from dirt and filings such as powdered mica, flake graphite, etc. It should be free from acid or alkali or from ingredients which will form these compounds. It should have maximum resistance to drying, gumming or oxidation. The melting point or dropping temperature should be about 300°F. In general, use a grease of a reliable grease manufacture especially recommended for roller bearings. (Refer to Westinghouse Renewal Parts PL 163).

RENEWAL PARTS

Renewal Parts information may be obtained from the nearest Westinghouse Sales Office. Be sure to give the complete nameplate reading on the machine for positive identification.



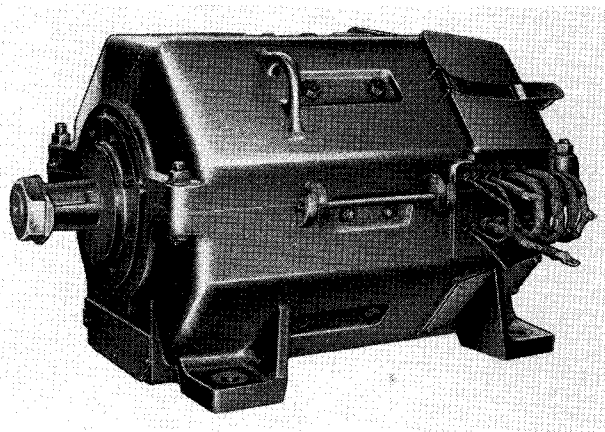
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Printed in U.S.A.





INSTALLATION • OPERATION • MAINTENANCE INSTRUCTIONS

DIRECT-CURRENT MILL TYPE MOTORS TYPE MC, 7½ TO 275 HP Series 600—Silicone Insulated



INTRODUCTION

MILL TYPE MC MOTORS in NEMA frame sizes 602 to 620 are direct-current machines designed for constant and variable speeds, plus constant and variable voltage applications.

The cast steel, split type frame, integral bearing and bearing housing assemblies, and compactness of mechanical design lends the 600 line MC motor to applications requiring ruggedness, dependability, and simplicity of maintenance.

Warranty. The Corporation in connection with apparatus sold agrees to correct any defect or defects in workmanship or material which may develop under proper or normal use during the period of one year from the date of shipment, by repair or by replacement f.o.b. factory of the defective part or parts, and such correction shall constitute a fulfillment of all the Corporation's liabilities in respect to said apparatus, unless otherwise stated in the quotation.

Any defects that may develop should be referred to the nearest Westinghouse Sales Office for complete servicing information.

Method of Drive. Mechanically the 600 line MC motor is interchangeable end for end and employs double, tapered shaft extensions from either of which the drive may be taken.

Either of the following drive methods may be used, depending on the particular application:

1. **Gear Drive.** Mount the motor and driven unit so as to maintain accurate alignment. The gears must mesh accurately to insure smoother operation and minimize wear, particularly on reversing operations.

Mount the gear on the motor close to the bearing housing to minimize overhang, allowing sufficient clearance for armature end play.

The motor should be chocked or doweled to its base.

2. **Direct Drive.** The motor shaft and the driven or driving shaft must be carefully aligned.

Dowel the motor to its base.

NOTE: *Pinions or coupling halves must have an accurate fit and must be securely locked in place by means of the locking washer supplied. Use a pinion puller for removing tight pinions or coupling halves.*

Electrical Connections. Install all wiring and fusing in accordance with the National Electric Code and local requirements.

Connect the motor and starter by referring to diagrams furnished with the starter and as given in diagrams Figs. 1 to 6.

Diagrams Figs. 1 and 2 apply to frame sizes 602 to 610 which have two brush arms and two-circuit armatures.

Diagrams Figs. 3 and 4 apply to frame sizes 612 and 614 which have four brush arms and two-circuit armatures.

Diagrams Figs. 5 and 6 apply to frame sizes 616 to 620 which have four brush arms and multiple circuit armatures.

OPERATION

Run the motor (except series wound motors operate on first point of control) without load to check the connections and direction of rotation. To start or stop the motor, refer to the instructions furnished with the starter or switchboard equipment.

D-C MILL TYPE MOTORS

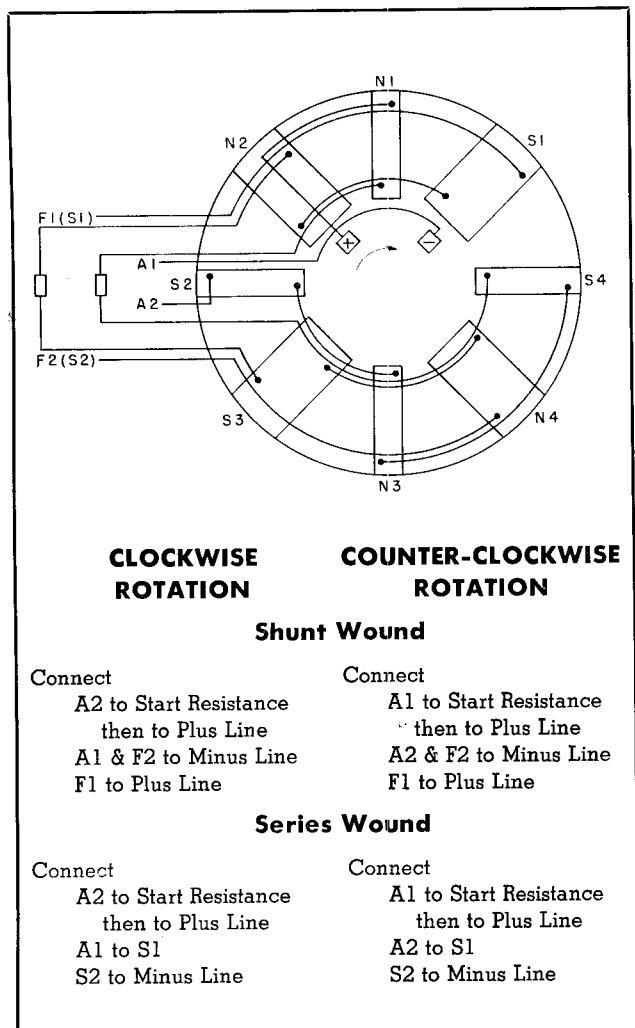


FIG. 1. Frames 602 to 610 Type MC Shunt or Series Wound with Two Brush Arms and Two Circuit Armatures

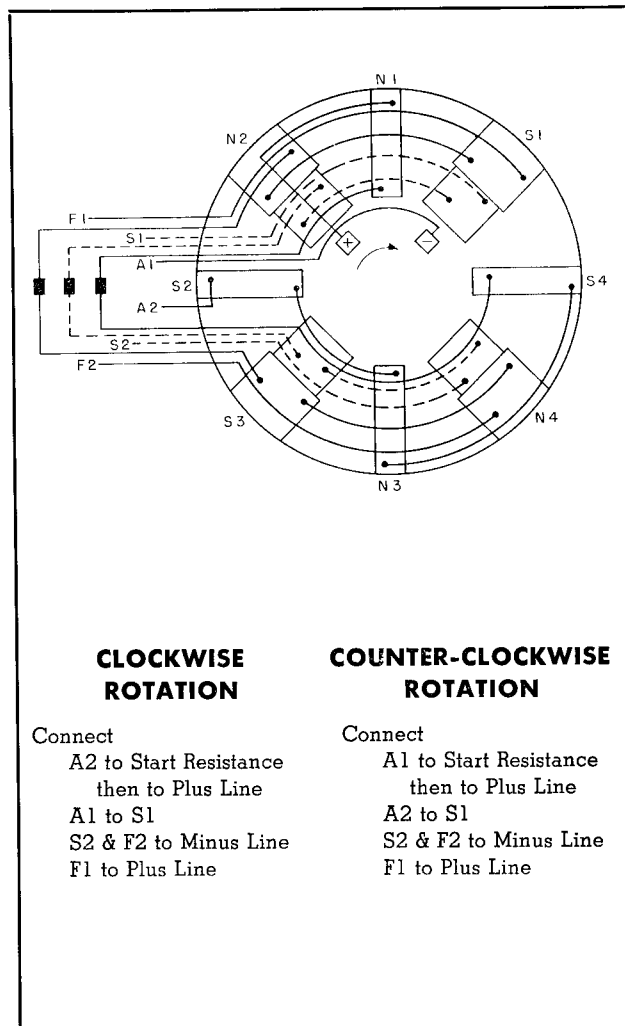


FIG. 2. Frames 602 to 610 Type MC Compound Wound with Two Brush Arms and Two Circuit Armatures

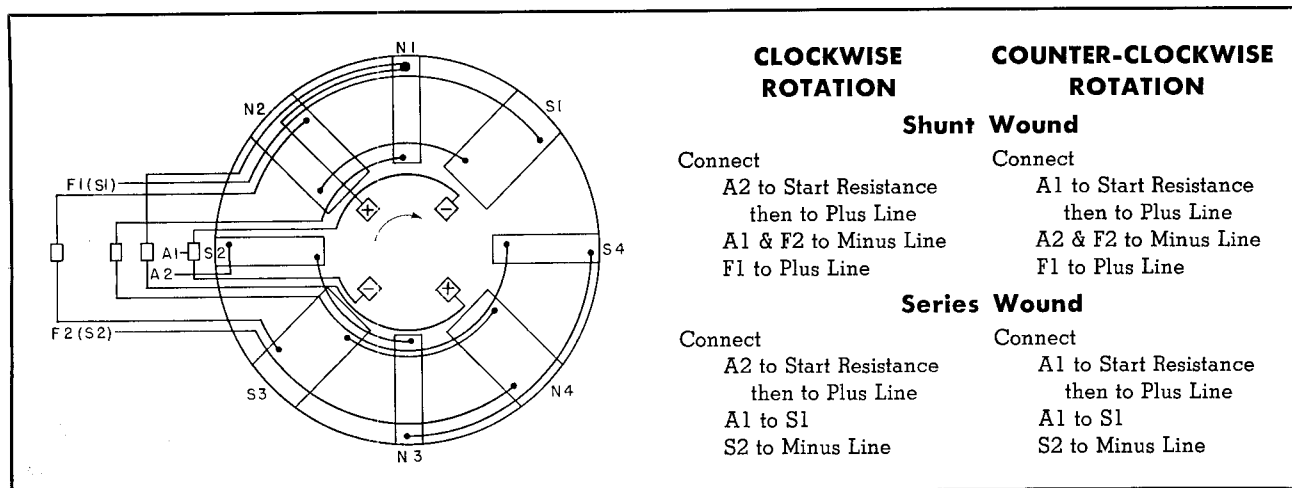


FIG. 3. Frames 612 and 614 Type MC Shunt or Series Wound with Four Brush Arms and Two Circuit Armatures

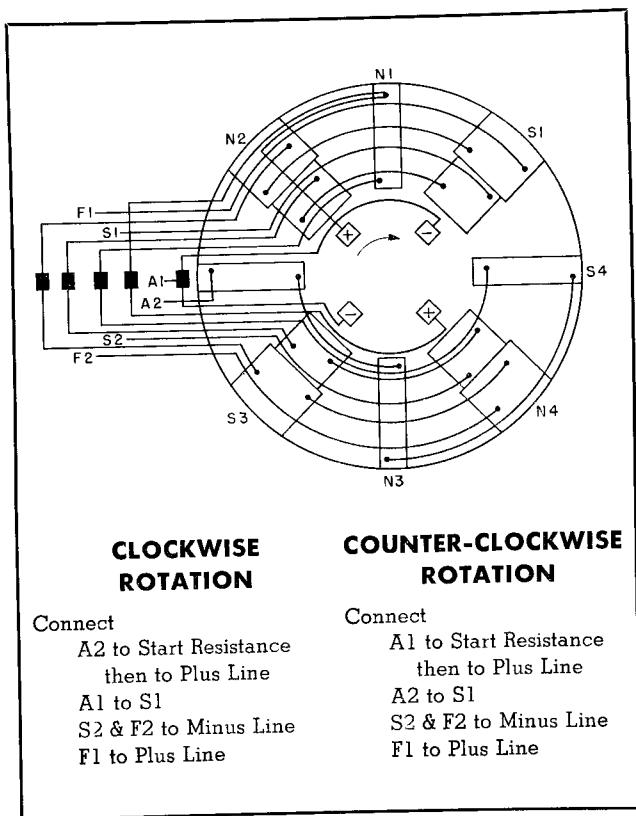
D-C MILL TYPE MOTORS

FIG. 4 Frames 612 and 614 Type MC Compound Wound with Four Brush Arms and Two Circuit Armatures

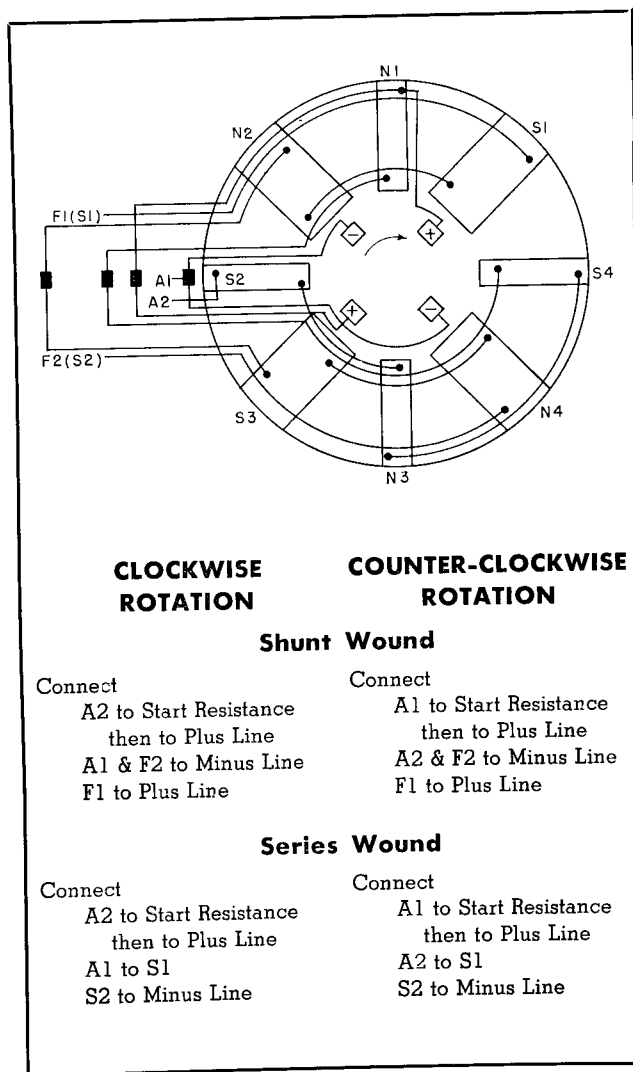


FIG. 5. Frames 616 to 620 Type MC Shunt or Series Wound with Four Brush Arms and Multi-Circuit Armatures

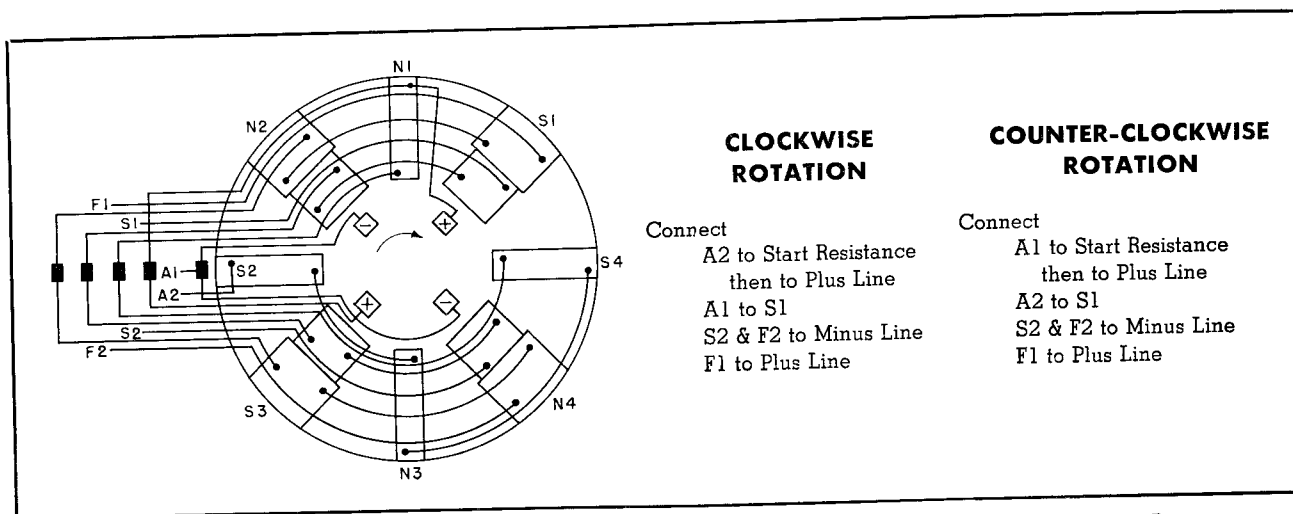


FIG. 6. Frames 616 to 620 Type MC Compound Wound with Four Brush Arms and Multi-Circuit Armatures

**ARMATURE COIL CONNECTION DATA FOR 600 LINE
230 VOLT, MC MOTORS**

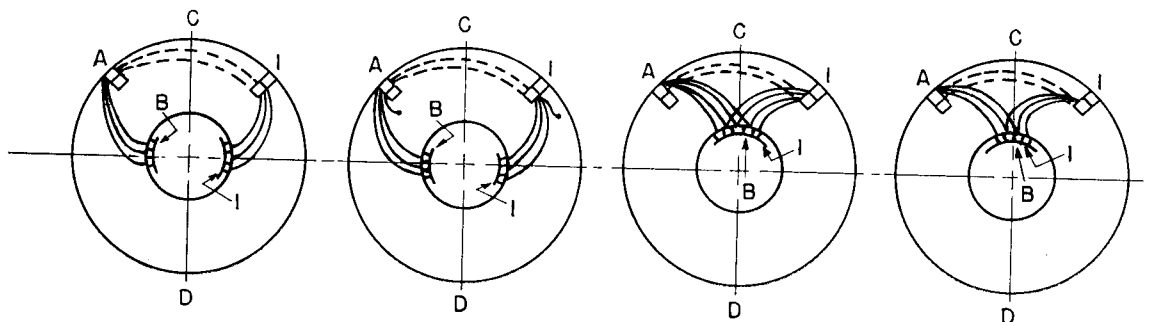


FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

FRAME	FIG. NO.	SLOTS 1 to A	BARS 1 to B	COIL CONNECTION DATA FOR 230 VOLT ARMATURES
2	7	8	42	CD, the center-line of mica between commutator bars 22 & 23 is on center-line of tooth between slots 4 & 5.
602	8	8	59	CD, the center-line of commutator bar No. 31 is on the center-line of tooth between slots Nos. 4 & 5.
603	8	8	59	CD, the center-line of commutator bar No. 31 is on the center-line of tooth between slots Nos. 4 & 5.
604	8	8	55	CD, the center-line of commutator bar No. 29 is on the center-line of tooth between slots Nos. 4 & 5.
606	7	10	57	CD, the center-line of commutator bar No. 30 is on the center-line of tooth between slots Nos. 5 & 6.
608	7	9	48	CD, the center-line of mica between commutator bars Nos. 25 & 26 is on center-line of slot No. 5.
610	7	13	72	CD, the center-line of mica between commutator bars Nos. 37 & 38 is on center-line of slot No. 7.
612	7	10	57	CD, the center-line of commutator bar No. 30 is on the center-line of tooth between slots Nos. 5 & 6.
614	7	10	57	CD, the center-line of commutator bar No. 30 is on the center-line of tooth between slots Nos. 5 & 6.
616	9	12	2	CD, the center-line of commutator bar No. 3 is on the center-line of tooth between slots Nos. 6 & 7.
618	10	13	2	CD, the center-line of mica between commutator bars Nos. 2 & 3 is on center-line of slot No. 7.
620	10	13	2	CD, the center-line of mica between commutator bars Nos. 2 & 3 is on center-line of slot No. 7.

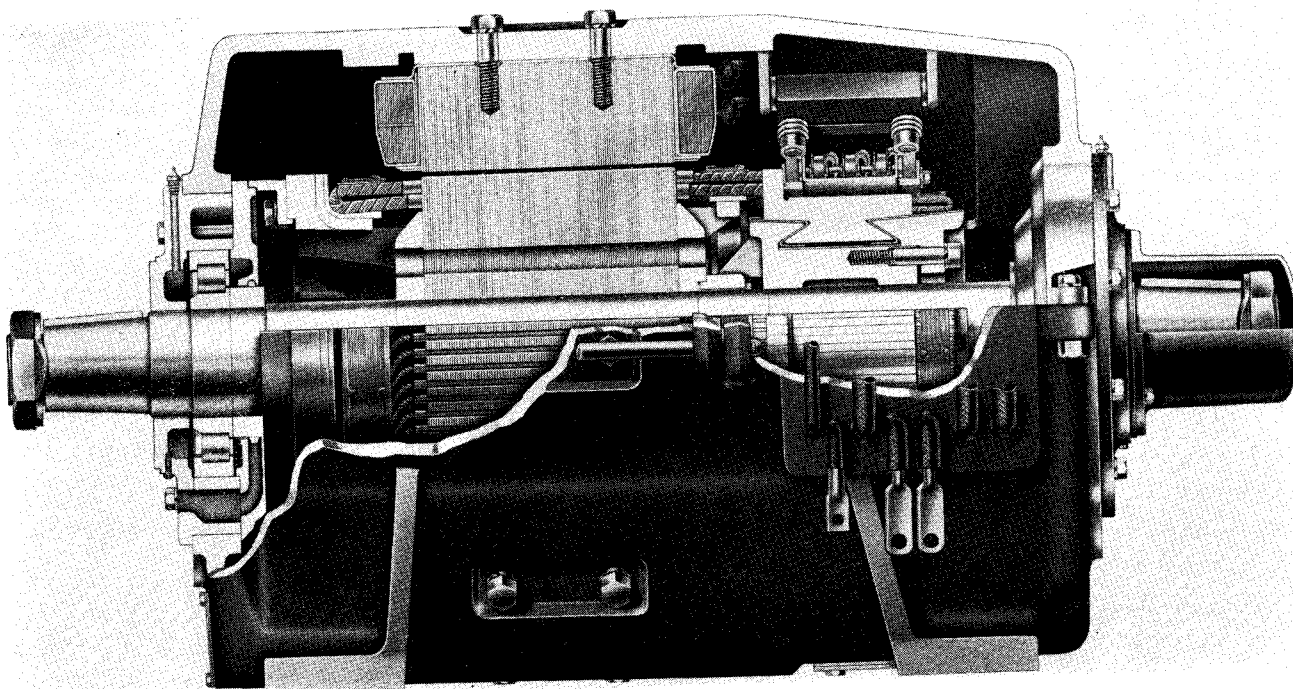


FIG. 11. Cutaway View Showing Type MC Construction Details

MAINTENANCE

Although the 600 line MC motor requires a minimum of attention in service, it should be inspected at regular intervals to guard against excessive dirt and moisture which account for a majority of all machine failures.

NOTE: Procedure to be followed for cleaning silicone insulated machines differs from procedures used for standard Class A and B insulated machines.

1. **Guard Against Dirt.** The insulation and mechanical parts of the machine should be kept clean.

a. Dust that is free from oil or grease may be removed by wiping with a clean, dry, lint-free cloth, or preferably by suction. Dust may be blown from inaccessible parts with clean, dry air, using no more than 30 to 50 pounds pressure.

Use care to prevent personal injury when using an air hose; use goggles to avoid eye injury from flying particles.

b. When grease or oil is present, the wiping cloth may be moistened with Stoddard Solvent. Dry by blowing air over the windings or by baking in an oven. Check the insulation resistance before returning to service.

CAUTION: Do not use carbon tetrachloride, vapor degreasers, or petroleum solvents other than Stoddard solvent, as they are detrimental to silicone varnish.

2. **Guard Against Moisture.** Machines should always be guarded against the accidental intrusion of water from splatter or splashing.

Stand-by units should be run at least once a week to guard against moisture condensation.

Before windings are blown out with air, make sure that water has not condensed in the air line.

Coils. All field coils are class H (Silicone) insulation and are of the unit assembly type—each individual coil is completely insulated with mica and protected by glass tape, assembled on a steel shell, and held securely to the shell by means of a steel washer. An extended edge of the wall is crimped over in several places and tack welded to hold the washer in place. The whole field coil assembly is impregnated with silicone varnish.

Field Coil. The field coils Fig. 12 and 13 are easily replaced or reinsulated by cutting the tack-weld with a sharp chisel, straightening the small lugs, removing the washer, and then removing the coil. The shell can be cleaned up, coils replaced, washer installed, lugs reset (new lugs may be cut in the shell if necessary and again tack-welded to the washer).

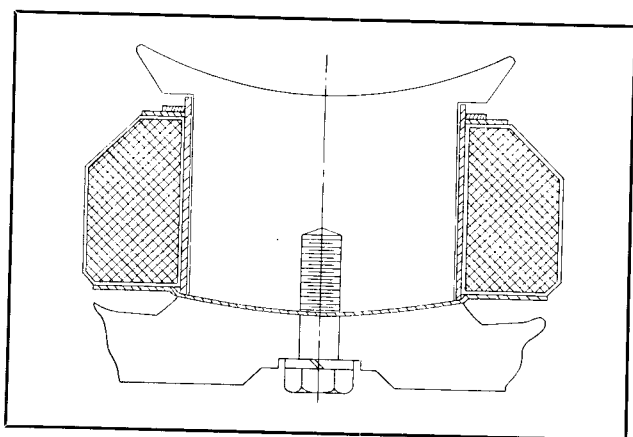


FIG. 12. Cross-Section of Field Coil and Pole Assembly

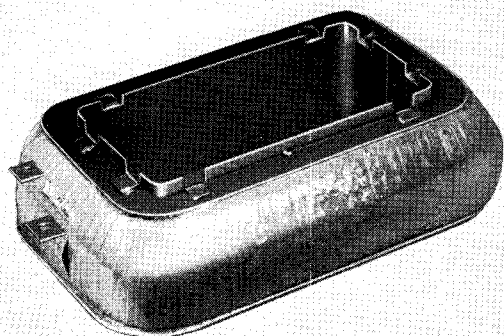


FIG. 13. Field Coil

Armature Coils. The armature coils are full class H (silicone) insulated. The coil conductors are completely insulated with silicone bonded glass and coil ground protection is provided by a glass and mica wrapper. The complete armature is given one impregnation and one additional dip in silicone varnish.

Revarnishing the windings when the motor is overhauled will lengthen their life. To obtain maximum coil life, a baking silicone varnish is recommended. Good results can be obtained by using a non-silicone baking varnish. To obtain full use of the varnish, the coils and armature should be placed in an oven for baking. Suitable varnish can be obtained from the nearest Westinghouse Sales Office.

Brushholders. Brushholders Fig. 14, are designed for easy adjustment or removal, they provide the maximum of corrosion resistance. The holders on all sizes are made of cast brass, mounted on machined blocks which are securely welded to the motor frame. Leads are bolted to extra heavy contact pad permitting many redressings . . . adding life to brushholder.

Two brushholders are used on Frames 602 to 610 inclusive.

Four brushholders are used on Frames 612 and 614

Four double brushholders are used on Frames 616 and 618. Eight double brushholders are used on frame 620. All use precision cast bronze finger for accurate and long life.

Brushes. Use only the brushes recommended by Westinghouse. These brushes are recommended on the basis of extensive tests which have proven their reliability for this service. Brushes should have only sufficient clearance in the box to slide easily.

Care of Commutator and Brushes. Keep the commutator clean, wiping it at frequent intervals with a clean canvas cloth free from all lint. The brushes should fit the commutator, making contact over the entire surface.

A commutator that is taking on a polish and shows no signs of wear requires no other attention; but a rough, raw, copper-colored commutator should be smoothed with a piece of sandpaper or sandstone ground to fit and then polish with No. 00 sandpaper. Always lift brushes when polishing commutator and do not replace them until all grit has been removed. Never use emery cloth or emery paper on the commutator.

Bearings. The bearings are the semi-self contained roller type installed in an independent housing (the bearings and bearing housings lift out of the frame with the armature and shaft). Both bearings and their assemblies are identical and the armature is free to float.

The life and quietness of roller bearings depend largely on cleanliness and proper lubrication. When

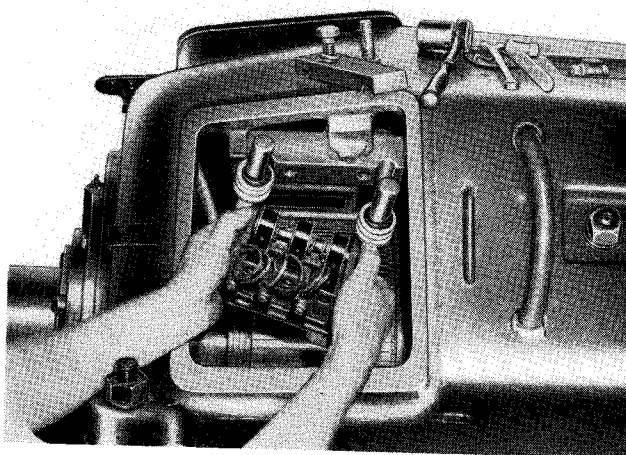


FIG. 14. Brushholder and Mounting

D-C MILL TYPE MOTORS

shipped from the factory, the bearings have sufficient grease of the correct grade for a limited time. However, a charge of grease should be added soon after the motor is put in operation, and thereafter at suitable intervals as determined by experience. The ideal condition is that the bearing housing be from one-third to one-half full of grease.

CAUTION—DO NOT OVER-GREASE:
When roller bearings are over-greased the bearing runs warm which may damage the bearing. Also the excess grease will escape along the shaft.

The grease to be used for roller bearings should be compounded from a pure mineral oil and a lithium base soap. It should have minimum free oil

separation in storage. It should be free from dirt and filings such as powdered mica, flake graphite, etc. It should be free from acid or alkali or from ingredients which will form these compounds. It should have maximum resistance to drying, gumming or oxidation. The melting point or dropping temperature should be about 300°F. In general, use a grease of a reliable grease manufacture especially recommended for roller bearings. (Refer to Westinghouse Renewal Parts PL 163).

RENEWAL PARTS

Renewal Parts information may be obtained from the nearest Westinghouse Sales Office. Be sure to give the complete nameplate reading on the machine for positive identification.



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