TYPE CS SQUIRREL CAGE INDUCTION MOTORS
TYPES CW AND CI WOUND ROTOR INDUCTION MOTORS

Built in Frames Nos. W-254 to 800

Oil or Grease Lubricated Ball Bearings

INSTRUCTIONS

INSTALLATION

Inspection—After unpacking, make sure that the motor was not damaged during shipment. See that the nameplate reading agrees with the voltage and frequency provided for the motor. (The motor is guaranteed for successful operation only with voltage variation within 10% and frequency within 5% of the nameplate rating.)

Mounting—The motor should be located in a well ventilated, easily accessible place, where the external air temperature will not exceed 40°C. or 104°F. The foundations must be rigid enough to prevent excessive vibration.

For wall or ceiling horizontal mounting (on 800 series frames or smaller) turn the motor brackets through 90 or 180 degrees to keep the surplus grease sump below the shaft.

ELECTRICAL CONNECTIONS

Connect the motor and starter by referring to the diagrams furnished with the starter. Install all wiring and fusing in accordance with the National Electric Code, and local requirements.

A conduit box is supplied, but conduit and conduit fittings are not furnished with the motor. These items may be purchased from any Electrical Dealer, or Plumber's Supply House.

When the motor is mounted on a bedplate, or on slide rails for belt adjustment, flexible metallic conduit should be used to protect the leads to the motor. In making this connection a squeeze connector should be used for attaching the flexible conduit to the conduit box, as shown in Fig. 1.

Squeeze connectors may be straight, 45°, or 90°.

In order to connect a squeeze connector to the conduit box in Fig. 1 first remove the cover of the box. Run a locknut well down the threads of the connector and place the connector in the large hole of the middle section of the conduit box. Screw a conduit bushing over the end of connector, swing the connector to the desired position and draw the locknut up tight against the box. Follow the same procedure with rigid conduit or reducing bushing

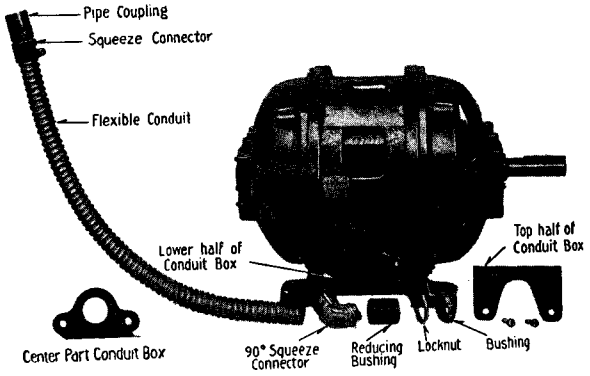

FIG. 1—METHOD OF CONNECTING MOTOR TO LINE

Connection of Motor to Power Circuit with Standard Number of Terminals.

Three-Phase (Three Terminals). Connect any lead to any motor terminal. To reverse the direction of the motor, interchange any two leads.

Two-Phase, Four Wire (Four Terminals). Connect the leads from one phase to motor terminals T1 and T3 and the leads from the other phase to motor terminals T2 and T4. To reverse the direction of the motor, interchange the leads of one phase.

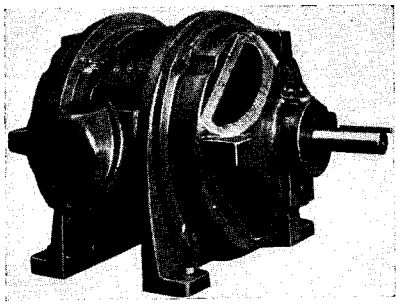

FIG. 2

Above type of conduit box is used for some motors while others have the type shown in Fig. 1

Two-Phase, Three Wire (Four Terminals). Connect the two outside leads to motor terminals T1 and T2 and the common lead to T3 and T4. To reverse the rotation of the motor, interchange the two outside leads.

Connection of Motor with More than Standard Number of Terminals. Refer to the connection plate on the motor or to the connection sheet filed in the instruction envelope.

OPERATION

Run the motor without load to check the connections, and direction of rotation. To stop the motor, refer to the instructions furnished with the starter.

METHOD OF DRIVE

Belt Drive—Mount the motor on the slide rails or bedplate which allows for adjusting the belt tension. Mount the motor pulley close to the bearing housing, allowing sufficient clearance for rotor end play. Align the pulleys so that the belt runs true, and tighten the belt just enough to prevent slippage. Use a belt wide enough to carry the load without excessive tension. The motor should be moved towards the driven machine as far as the slots in the rails or bedplate permit.

Chain Drive—Mount the motor on the slide rails or bedplate which allows for adjusting the chain tension. Mount the motor sprocket close to the bearing housing, allowing sufficient clearance for rotor end play, and align the sprockets accurately.

Gear Drive—Mount the motor and driven unit so as to maintain accurate alignment. The gears must mesh accurately to prevent vibration. Mount the motor gear close to the bearing housing to minimize the overhang allowing sufficient clearance for rotor end play. Dowel the motor to the base.

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INSTRUCTIONS—Continued

Direct Drive—The motor shaft and the driven shaft must be in line, except for a slight allowance with flexible couplings. Dowel the motor to the base.

MAINTENANCE

Coils—Do not allow dirt and oil to collect on the stator coils. Inspect the insulation regularly. After a few years service, or oftener for very severe conditions, it is advisable to apply a coat of baking Varnish. (Baking Varnish No. 335 is much superior to any air drying Varnish). Varnish can be obtained from the nearest Westinghouse Dealer. Westinghouse Service Shops are equipped to bake motors.

Brushes and Slip Rings for Types CW and CI Wound Rotor Motors

The Brushes—Should make good contact with the slip rings along the whole face of the brush. If necessary grind new brushes in with fine sandpaper. Maintain a free sliding fit between the brushes and the brush holder by cleaning both thoroughly when necessary.

Maintain the brush spring tension at the correct value, determined by the grade of brushes and the local service conditions. Make the pressure as low as consistent with good brush slip ring contact. A correct pressure per square inch is between 2 and 3 pounds for carbon or graphite brushes and between 3 and 5 pounds for metallic brushes. Each brush should bear equal pressure. Do not use lubricants. Use the correct grade of brushes which may be obtained from the nearest Westinghouse Dealer.

The Slip Rings—Should be maintained smooth and true. Grind or turn them if necessary to restore a smooth and true surface.

OPERATION AND CARE OF BALL AND ROLLER BEARINGS

Quietness and life of ball and roller bearings depends largely on cleanliness and proper lubrication.

INSPECTION

1. When the motor is installed make certain that the rotor turns easily, particularly if the motor is not installed until some months after being shipped.

2. Never open the bearing housing under conditions which would permit entrance of dirt.

3. External inspection of the motor at the time of the first greasing soon after it is put into operation will determine whether the bearings are operating quietly and without undue heating. Further inspection will not be necessary except at infrequent intervals, probably at greasing periods.

4. If practicable, it is desirable for the most satisfactory service, to open the bearing housings once a year, or after every 5,000 hours' operation, to check the condition of the bearings and grease. If difficult to inspect the pulley or pinion end bearing, the condition of the bearing at the opposite end will usually be representative of both.

5 If grease deterioration has occurred or if dirt has gained entrance to the housing, the bearing and housing parts should be thoroughly cleaned out and new grease added.

LUBRICATION

Oil lubrication: When oil is required as on certain high speed or vertical motors, instructions furnished with the motor will so state or the lubrication fittings furnished will indicate that oil is to be used.

Oil lubricated motors are shipped without oil. Before starting see that the drain plugs are tight and fill to overflow or gauge level with a good grade of approved mineral oil.

Grease Lubrication

1. Grease is generally used as a lubricant. Ordinary cup greases are not satisfactory because of great tendency to deterioration under the severe churning action of the bearings. To be suitable for ball or roller bearing lubrication a grease should be compounded from a pure mineral oil and a sodium base soap. It should be free from dirt and fillers, 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 not melt at the highest operating temperature of the bearings and it should maintain a fairly uniform consistency over a large temperature range. Keep grease clean by using only closed containers.

Do Not Over Lubricate

2. A small amount of lubricant is essential, sufficient to maintain a film of lubricant over the surface of the balls and races. Too much grease will cause churning, overheating and grease leakage. If grease leakage occurs the bearing has been over filled, or the grease used is not suitable for the particular application.

If high pressure guns are used, great care should be used to avoid over lubrication.

When shipped from the factory, grease lubricated ball and roller bearing motors have sufficient grease of the right grade to last for a limited period. 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. As a guide, it is suggested that grease should be added every three months of operation in amounts as indicated in the following table. If experience indicates that these quantities result in a surplus of grease in the bearing, the quantity should be reduced or the greasing periods lengthened or both. The ideal condition is that the bearing housing be from ⅓ to ½ full of grease.

As the shaft extension diameter is easily determined and is roughly proportional to the bearing size the following table for grease additions is prepared on this basis.

Shaft Extension Diameter	Weight of Grease to be added.
¾ to 1¼	¾ oz.
Above 1¼ to 1⅞	1 oz.
Above 1⅞ to 2⅜	2 oz.
Above 2⅜	3 oz.

1 oz. = 1¼ cu. in.

3. When surplus grease sump below bearing is supplied, this should be kept empty at all times. Pipe plug openings are provided at lower outside end of the bearing housings through which the excess grease may be removed. See Fig. 3. By adding grease at intervals and allowing the excess to escape into the surplus grease sump, damage to bearings from deteriorated grease will be prevented and

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INSTRUCTIONS—Continued

the necessity for periodic bearing overhaul will be greatly decreased or eliminated altogether. Provision is made for automatically discharging the surplus grease to the sump. New grease is introduced at the side of the bearing furthest from the body of the motor. An ample charge will fill the outer space and work its way in among the rolling members, gradually forcing the old grease through a partially restricted escape port during operation of the bearing.

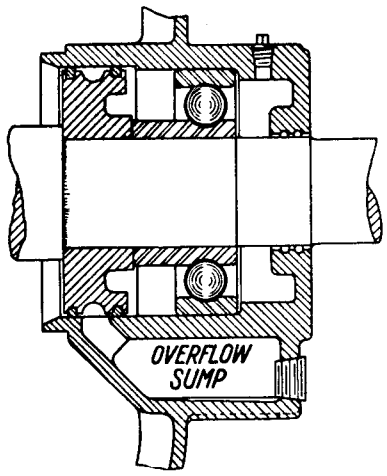

FIG. 3—BEARING HOUSING EQUIPPED WITH OVERFLOW GREASE SUMP.

Regreasing

4. When the bearing housing has been disassembled and the bearing thoroughly cleaned with a suitable solvent it should be immediately regreased after first spraying or flushing with good lubricating oil. Apply the new grease either from a tube or by hand, over and between the balls or rollers. Do not use more than the amount specified in the table.

5. For horizontal grease lubricated motors under average conditions of temperature use grease as per Westinghouse Electric & Mfg. Company Specification No. 1082C.

For vertical grease lubricated motors use grease as per Westinghouse Electric & Mfg. Company Specification No. 2694.

For horizontal motors operating under unusually cold conditions use grease as per Westinghouse Electric & Mfg. Company Specification No. 4739.

A copy of any or all of the above specifications will be supplied On Request.

Cleanliness

Ball and roller bearings are especially sensitive to even a small amount of dirt. Hence, they must be protected from it at all times. If necessary to disassemble the bearing housing, first thoroughly remove dirt from all adjacent parts so that dirt will not fall into bearing or interior of housing.

If impossible to immediately reassemble housing, cover bearing and exposed interior of housing with clean wrapping materials. If dirt or deteriorated grease is found in the bearing or housing, the parts should be thoroughly cleaned with carbon tetrachloride (avoid allowing this liquid to remain on adjacent motor windings). In some cases, it may be necessary to entirely remove the bearing from the shaft in order to clean it properly.

If special seals are used to prevent dirt entering housing be sure that these are carefully replaced when housing is re-assembled.

MECHANICAL DAMAGE

1. In mounting or removing bearings, pressure should be applied only against the inner race, always using a sleeve or other intermediate piece if mounting or removal is accomplished by hammer blows. Cover bearing carefully during these operations if there is danger of flying particles getting in amongst the balls or rollers. Never attempt to remove a ball or roller bearing by exerting pressure against the outer race, as the bearing may be seriously damaged.

2. In mounting or removing pulleys, couplings or pinions the bearing must not be subjected to axial pressure, expecially hammer blows as when these accessories are driven on to the shaft with a mallet. Any pressure of this kind should be taken by supporting the opposite end of the shaft against a stop of some kind.

For additional information, methods of locating and correcting troubles and making repairs, apply to the nearest Westinghouse District Office.

CONSTRUCTION

Type CS motors are squirrel cage induction motors, for constant speed service.

Types CW and CI motors are wound rotor induction motors, for constant or varying speed service having continuous and intermittent ratings respectively.

The completely wound and insulated stator core unit for open motors frame series W-254 to W-445 inclusive, may be pressed into the motor frame as a complete unit. This greatly facilitates the repair of damaged stators. The completely wound and insulated stator core unit can be obtained at a price which is less than the average cost of replacing damaged coils.

The core is pressed into the stator frame and anchored by tack welds or set screws. If the coils should be damaged by overload or accident, these tack welds may be chipped out, the damaged stator element pressed out and a new factory wound core pressed in. This saves time and money as compared with the previous practice of stripping and rewinding the motor. The replacing core may be anchored either by tack welds or by drilling and tapping holes for two set screws.

RENEWAL PARTS

On the following page is a list of the Renewal Parts and the quantities of each that we recommend should be stocked by the user of this apparatus to minimize service interruptions caused by breakdowns. The parts recommended are those most subject to wear in normal operation, or to damage or breakage due to possible abnormal conditions.

The list of Renewal Parts is given as a guide. When continuous operation is a primary consideration, additional insurance against shutdowns is desirable. Under such conditions more renewal parts should be carried, considering the severity of the service and the time required to secure replacements.

ORDERING INSTRUCTIONS

Name the part and give its style number. Give the complete name plate reading. State whether shipment is desired by express, freight or by parcel post. Send all orders or correspondence to nearest Sales Office of the Company. Small orders should be combined so as to amount to a value of at least $1.00 net; where the total of the sale is less than this, the material will be invoiced at $1.00.

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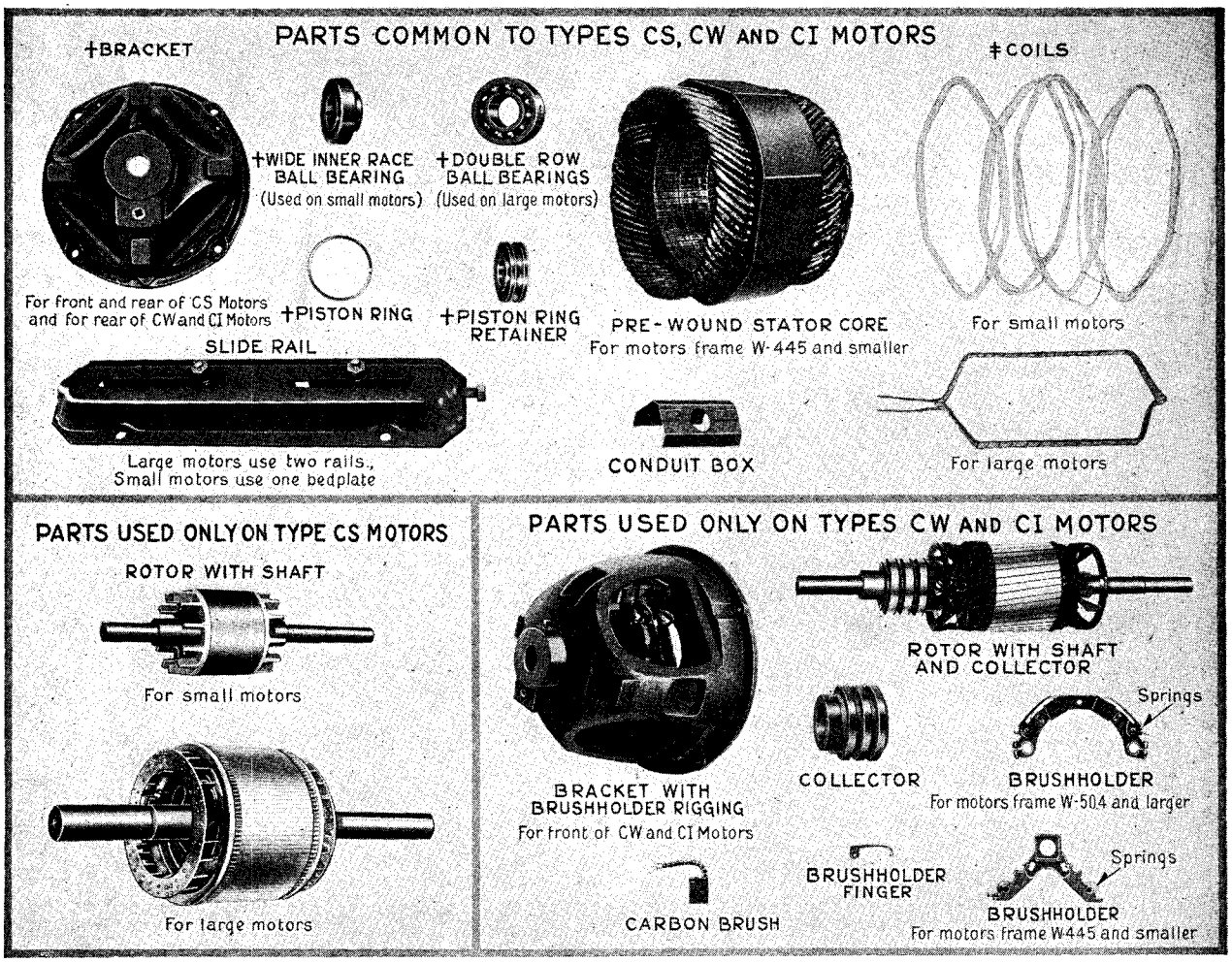
RENEWAL PARTS DATA



†Specify whether for Front or Rear (Pulley) end. The parts illustrated are used on Frames W-445 and smaller. Larger motors have Cartridge construction which use Inner and Outer Bearing Caps (not illustrated) instead of Piston Rings and retainer.
‡These Coils are used for Stator of CS Motors and for Stator and Rotor of CW and CI Motors.

RECOMMENDED STOCK OF RENEWAL PARTS

Motors in use	1	5
(For Types CS, CW and CI Motors)		
Name of Part	No. Per Motor	Recommended For Stock
Pre-wound Stator Core (for frames W-445 and smaller)	1	1 / 1
Stator Coils (for frames W-504 and larger)	1 set	⅓ set / 1 set
Cut Winding Insulation, Class No. 1	1 set	⅓ set / 1 set
Ball Bearing, Front	1	1 / 1
Ball Bearing, Rear (Pulley End)	1	1 / 1
Piston Ring, Front	2	1 / 2
Piston Ring, Rear	2	1 / 2
(Additional Parts for Types CW and CI Motors)		
Rotor Coil	1 set	⅓ set / 1 set
Cut Winding Insulation, Class No. 1	1 set	⅓ set / 1 set
Carbon Brush	1 set	1 set / 2 sets
Brushholder	1 set	1 / 1
Brushholder Spring	1 set	1 / 1
†Brushholder Finger	1 set	1 / 1

Parts indented are included in the part under which they are indented.
†For 504 frame and larger.

See page 3 for instructions for ordering Renewal Parts.

Westinghouse Electric & Manufacturing Company
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