INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

SQUIRREL-CAGE *Life-Line* MOTORS

SPLASH & DRIP-PROOF, TYPE CSP

Frames 580 Through 683 **Sleeve or Ball Bearings**

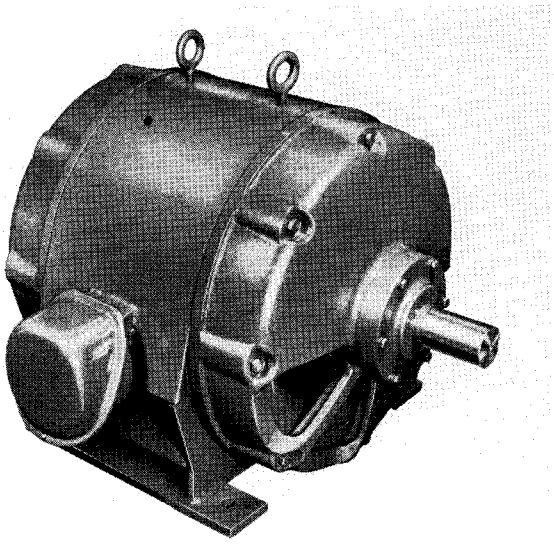


FIG. 1. Open Drip-Proof Ball Bearing Type CSP Life-Line Motor, Frames 580-683

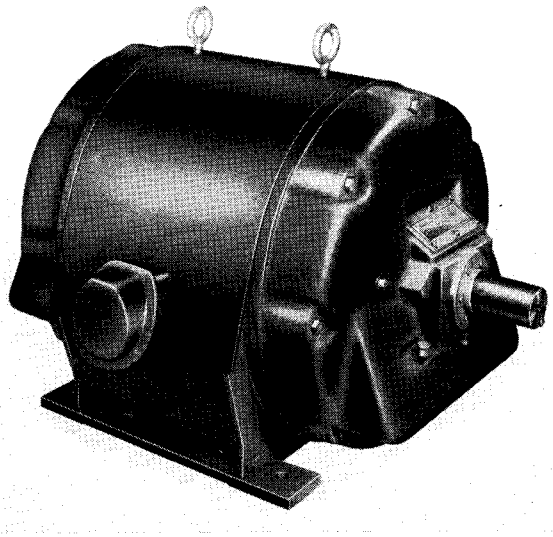


FIG. 2. Splash-Proof Sleeve Bearing Type CSP Life-Line Motor, Frames 580-683

LIFE-LINE Type CSP Motors in NEMA frame sizes of the 580 and 680 Series are squirrel-cage induction motors designed for a wide variety of constant speed applications. The stator core is encased in a specially designed ventilated splash-proof steel frame. Cast drip-proof end brackets protect the winding from falling chips and dripping liquids. Cast splash-proof brackets which give full protection against dripping and splashing liquids, can be supplied.

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.

RECEIVING

Unpack the motor and make certain that it was not damaged during shipment. Check to see that the nameplate data agrees with the voltage and frequency of the power supply provided for the motor.

The shaft extension may be coated with a slushing compound to prevent rusting during shipment and storage. This slushing compound may be removed by wiping with turpentine or a petroleum solvent, such as benzine, gasoline, Stoddard solvent, etc. See precautions under "Maintenance" for use of these solvents.

INSTALLATION

Mounting. Locate the motor in a place that is clean, dry and well-ventilated. If protecting shields or guards are used, they must not obstruct the free flow of air around the motor. The external air temperature should not exceed 40°C or 104°F.

Fasten to a rigid foundation using bolts or screws of the largest size permitted by the drilling in the mounting feet. The motor must rest evenly on all mounting pads.

Table No. 1. DIMENSIONS

Approximate Dimensions in Inches. Do not use for construction purposes.

FRAME NO.	HEIGHT (Without Eyebolts)	WIDTH (Without Conduit Box)	LENGTH (Without Shaft Ext.)	CENTERLINE SHAFT TO BASE	WEIGHT IN LBS. APPROX.
580	28⅞″	32¼″	37⅛″	14½″	2500
581	28⅞″	32¼″	41⅛″	14½″	2800
582	28⅞″	32¼″	45⅛″	14½″	3100
583	28⅞″	32¼″	49⅛″	14½″	3400
680	34 1/16″	38⅛″	45″	17″	3400
681	34 1/16″	38⅛″	49″	17″	3900
682	34 1/16″	38⅛″	53″	17″	4300
683	34 1/16″	38⅛″	59″	17″	4800

For wall or ceiling mounting of "Ball Bearing Motors" the brackets must be turned through 90 or 180° to keep surplus grease sump below shaft. For wall or ceiling horizontal mounting of "Sleeve Bearing Motors" the brackets must be turned 90 or 180° to keep oil reservoir below the shaft.

Method of Drive. Motors having the suffix "-S" or "-H" following the frame number are suitable for direct coupled service only. Motors having the suffix "-C" or "-D" are suitable for the following drives if they are included in the following tables which are based on NEMA recommendations.

1. Direct Drive. The motor shaft and driven shaft must be carefully aligned. Dowel the motor to the base.

Note: Coupling halves, pulleys, pinions or sprockets should have a close sliding fit on the shaft extension and must be securely locked to avoid hammering out in operation. If it is necessary to drive the part into position, it is important, that the end of the shaft opposite the extension be backed up so that the force of the blow is not taken in the bearing. Use a pinion puller for removing tight pulleys.

2. Belt Drive. Mount the motor on slide rails or a 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.

FLAT BELT DRIVE

FULL LOAD RPM OF MOTOR		MAX. HP. RATING
Above	Including	
900	1200	75
750	900	125
720	750	150
560	720	200

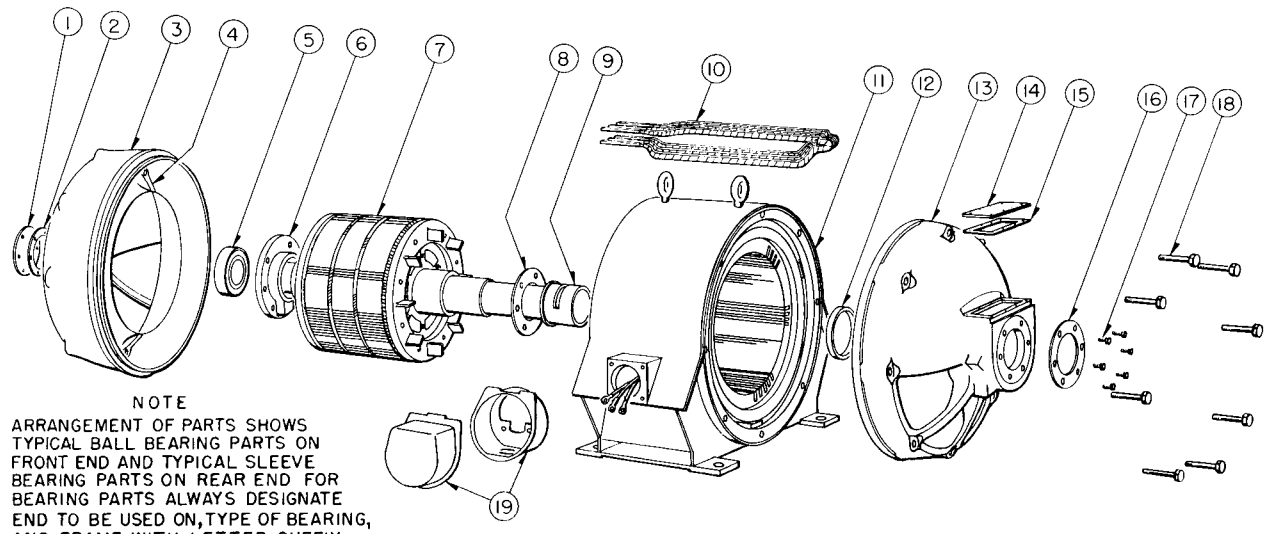
V-BELT DRIVE

FULL LOAD RPM OF MOTOR		MAX. HP. RATING
Above	Including	
900	1200	125
750	900	200
720	750	250
560	720	300

3. 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.

GEAR DRIVE

FULL LOAD RPM OF MOTOR		MAX. HP. RATING
Above	Including	
750	900	50
560	750	75



NOTE
ARRANGEMENT OF PARTS SHOWS TYPICAL BALL BEARING PARTS ON FRONT END AND TYPICAL SLEEVE BEARING PARTS ON REAR END FOR BEARING PARTS ALWAYS DESIGNATE END TO BE USED ON, TYPE OF BEARING, AND FRAME WITH LETTER SUFFIX. DRIVE END IS CONSIDERED REAR END.

LEGEND

1 OUTER BALL BEARING CAP (FRONT END)
2 OUTER BALL BEARING CAP GASKET (FRONT END)
3 BALL BEARING BRACKET (FRONT END)
4 AIR SHIELD
5. BALL BEARING (FRONT END)
6 BALL BEARING INNER CAP (FRONT END)
7 ROTOR
8. SLEEVE BEARING INNER CAP (REAR END)
9. SLEEVE BEARING
10. STATOR COILS
11 FRAME AND STATOR CORE ASSEMBLY
12. OIL RING
13. SLEEVE BEARING BRACKET (REAR END)
14. OIL SIGHT SLOT COVER (ON SLEEVE BEARING MOTORS ONLY)
15. OIL SIGHT SLOT COVER GASKET (ON SLEEVE BEARING MOTORS ONLY)
16. OUTER SLEEVE BEARING CAP (REAR END)
17. BEARING CAP SCREWS
18. BRACKET BOLTS
19. CONDUIT BOX AND CONDUIT BOX COVER

FIG. 3. Arrangement of Parts—Drip-Proof Type CSP Motor (Frames 580-683)

4. Chain Drive. Mount the motor on slide rails or a 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.

CHAIN DRIVE

FULL LOAD RPM OF MOTOR		MAX. HP. RATING
Above	Including	
900	1200	125
750	900	200
720	750	250

Electrical Connections. Be sure the motor is connected as shown on the nameplate diagram, and that the power supply (Voltage, Frequency and Number of Phases) corresponds with the nameplate data.

Connect to the power supply through a suitable switch and overload protection.

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

To change the direction of rotation on three-phase motors, interchange any two line leads.

To change the direction of rotation on two-phase 4-wire motors, interchange the line leads of either phase. To change the direction of rotation on 2-phase 3-wire motors, interchange the two outside leads.

Conduit Box. If the conduit box is desired on the opposite side of the motor, remove the brackets and rotor, reverse the frame, and reassemble.

The conduit box may be rotated 90° or 180° for use with horizontal conduit or conduit from above.

When the motor is mounted on a bedplate or 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. Squeeze connectors may be straight, 45° or 90°.

OPERATION

Run the motor without load to check the connections and direction of rotation.

The motor will operate satisfactorily with a 10% variation in voltage, a 5% variation in frequency, or a combined voltage and frequency variation of 10%, but not necessarily in accordance with the standards of performance established for operation at normal rating. To stop motor refer to instructions furnished with the starter. Before starting sleeve bearing motors see instructions on page 6 under operation and care of sleeve bearings. Before starting oil lubricated ball bearing motors see instructions on page 6.

MOTOR MAINTENANCE

Although Life-Line motors require a minimum of attention in service, they should be inspected at regular intervals to guard against excessive (1) dirt, (2) moisture, (3) friction and (4) vibration, which account for 90% of all motor failures.

1. Guard Against Dirt. Keep the insulation and mechanical parts of the motor clean. Dust that is free from oil or grease may be removed by wiping with a clean, dry cloth, or preferably, by suction. Suction is recommended over blowing out because it eliminates the danger of blowing metal chips and etc., into the insulation and also because of the danger of moisture in the compressed air. Dust may be blown from inaccessible parts with clean, dry air of moderate pressure.

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.

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. Drip-proof motors should always be guarded against the accidental intrusion of water from splatter or splashing.

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

Before starting motors which have been subjected to moisture, megger with a 500 volt megger. If resistance is below 2 megohms dry the winding in oven or circulate safe current. Continue drying until resistance rises to 2 megohms or preferably higher. Drying time will depend on size of machine and amount of moisture absorbed.

3. Guard Against Friction. Excessive friction or overheating of bearings is usually traced to one of the following causes:

a. Excessive bolt tension.

b. Poor alignment causing excessive vibration or binding.

c. Bent shaft.

d. Excessive end or side thrust due to gearing, flexible coupling, etc.

4. Guard Against Vibration. To avoid failures due to vibration, a few simple checks should be made regularly.

Check for misalignment such as may be caused by foundation settling or heavy floor loading.

Check to see if vibration from the driven machine is being transmitted to the motor.

Check for excessive belt or chain tension or the push-apart effect inherent in spur gears.

Check the motor mounting bolts and bracket bolts to be sure they are tight.

Coils. Revarnishing the windings when motors are overhauled will lengthen their life. Suitable varnish may be obtained from the nearest Westinghouse Sales Office.

GREASE LUBRICATED BALL BEARINGS

(1800 rpm and below)

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

External inspection after the motor 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.

Regreasing. Too much grease will cause churning, overheating and grease leakage. If grease leakage occurs the bearing has been over-

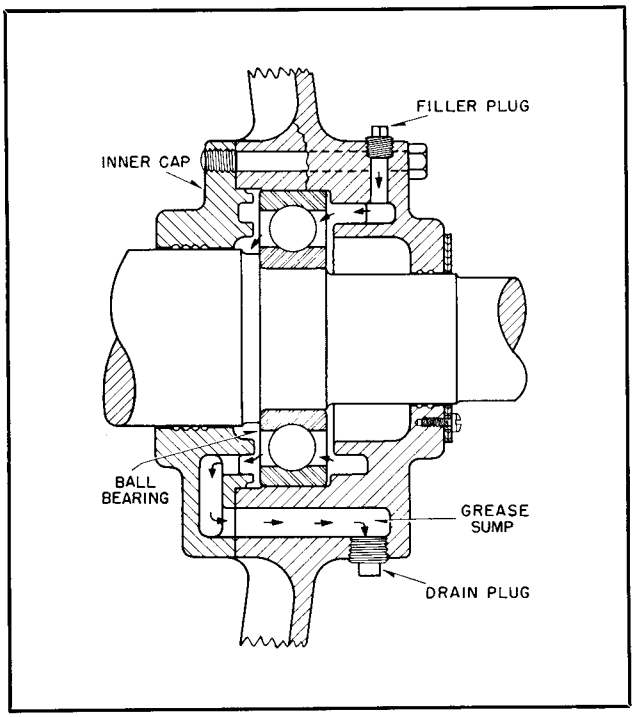


FIG. 4. Typical Ball Bearing (Grease Lubricated)

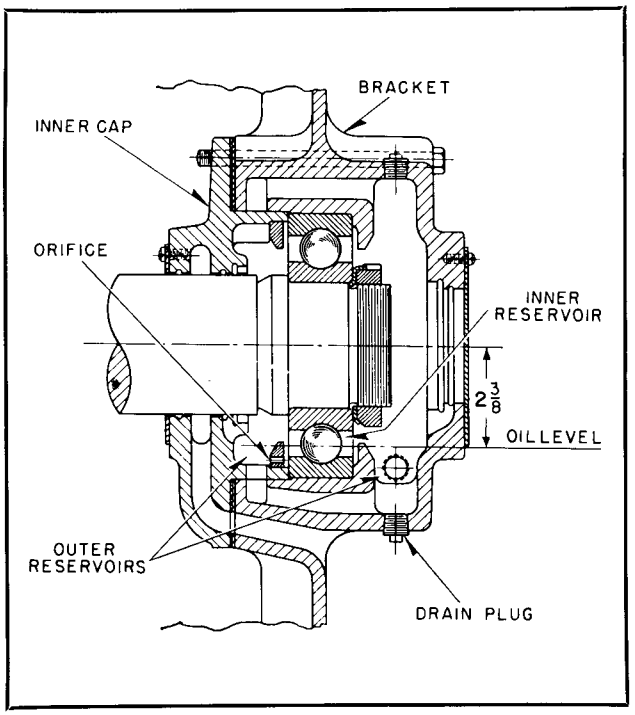


FIG. 5. Typical Ball Bearing (Oil Lubricated)

greased or the grease used was not suitable for the particular application.

If high pressure guns are used, great care should be taken to avoid overlubrication.

When shipped from the factory, grease lubricated ball bearing motors have sufficient grease of the right grade to last for a limited period. However, a charge of Westinghouse 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 4 ounces of grease per bearing be added every 2000 hours of operation. If experience indicates that this quantity results in a surplus of grease in the bearings, the quantity should be reduced. Remove the sump drain plug when greasing to allow the excess grease to run out. For the first several greasings there may be no excess grease, therefore, none will run out of the drain plug hole.

Lubricating System. Fig. 4 is a cross section view of a typical grease lubricated ball bearing assembly. New grease is introduced at the top of the bearing farthest from the body of the motor. A sufficient charge will force the old grease through the rolling members and out a partially restricted escape port during operation.

Excess grease is removed from the sump through drain plug openings. See Fig. 4. Periodic greasing and cleaning of the surplus grease sump will prevent damage to the bearings from deteriorated grease and will reduce the need for frequent bearing overhaul.

It is desirable for the most satisfactory service, to open the bearing housing once a year, or after every 5000 hours operation, to check the condition of the housing 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. If grease deterioration has occurred or if dirty, the bearing and housing parts should be thoroughly cleaned out and new grease added. Clean 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 to clean it properly. For disassembly of the bearing housing see notes under Removal of Brackets and Removal of Bearings.

WESTINGHOUSE GREASE—Ordering Data

8 oz. tube	Style No. 1360 876
1 lb. can	Style No. 1248 911
5 lb. can	Style No. 1248 912
10 lb. can	Style No. 1248 913
25 lb. can	Style No. 1360 877

For grease packed in larger containers please refer to the nearest Westinghouse Sales Office.

OIL LUBRICATED BALL BEARINGS (above 1800 rpm)

Lubrication. Before starting motor fill bearing reservoir with a good grade of lubricating oil having a viscosity of 180 to 220 SSU (equivalent to S.A.E. #10). This is done by pouring the oil in through the filling cup until no more can be added. Keep filling cup closed by screwing in the hinged, threaded plug tightly with the fingers.

Change of Oil. Every six months the reservoir should be drained by removing the drain plug located at the bottom of the oil sump in the casting. Refill with fresh, clean oil.

Lubricating System. Fig. 5 is a cross section of the bearing assembly. Circulation of oil through the bearing is maintained by the pumping action of the bearing itself. The oil level is maintained at about the center of the lowest ball. The bearing is located in an inner oil reservoir separated from the outer and larger reservoirs. When running, the bearing throws oil from the inner to the outer reservoirs; new oil is fed to the bearing through the orifice, at a controlled rate depending on the orifice size. So long as the oil level is maintained, the bearing is assured of an adequate and constant supply of oil at starting and at any speed.

DISASSEMBLY OF BALL BEARING MOTORS

Cleanliness. Since ball and roller bearings are sensitive to small amounts of dirt, they must be protected at all times. When necessary to disassemble the bearing housing, first thoroughly remove all dirt from the adjacent part, so no dirt will fall upon the bearing or into the bearing housing.

Removal of End Brackets. The end brackets can be removed by unscrewing all the bolts that hold the bracket to the frame and the six (6) bolts that hold the inner cap to the bearing housing. Upon removing the brackets, the rotor can be removed.

Removal of Bearings. The bearings can be removed using a wheel puller or similar device. The inner cap should be slid along the shaft away from the bearing so that the puller can be used against the inner race of the bearing. If the bearing is pulled by pressure against the outer race, it will be ruined.

Replacing of Bearings. To replace a bearing on the shaft, be sure that the bearing seat is free

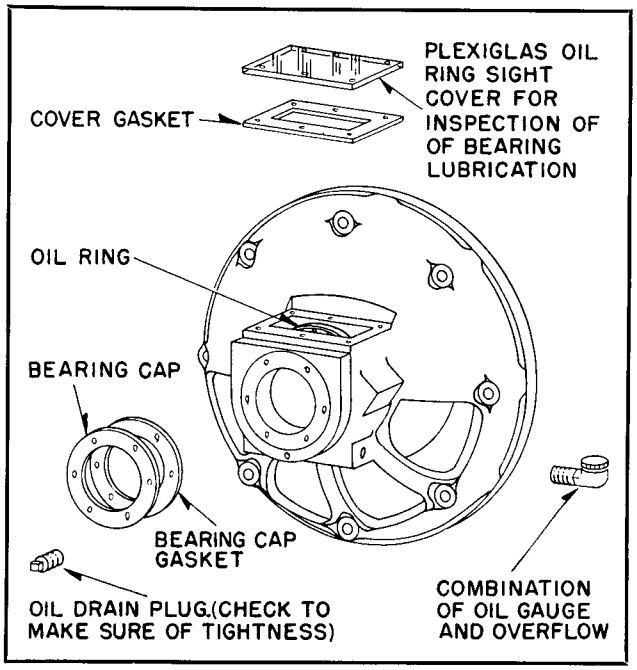


FIG. 6. Detail of Sleeve Bearing Bracket

of dirt, nicks or burrs. Heat the bearing in an oven or clean oil bath for ½ hour at a temperature of approximately 190°F but not to exceed 212°F at any time. Slip the hot bearing on the shaft and hold in place until bearing has cooled appreciably. Do not tighten lock nuts or assemble in bracket until bearing has cooled.

Mounting or Removing Pulleys and Couplings. In mounting or removing pulleys, couplings or pinions the bearing must not be subjected to axial pressure, especially hammer blows when these accessories are driven on 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.

SLEEVE BEARINGS

Lubrication. Before starting the motor, fill both oil reservoirs through the combination overflow gauge and filling device with best quality clean dynamo oil. (See Fig. 5). The oil used should have a viscosity of from 180 to 220 SSU (equivalent to S.A.E. #10). No oil should be poured in the top of the brackets through the oil ring slot cover of the bracket.

No oil need be added till the oil drops below the full level, which is ⅛ inch below the top of

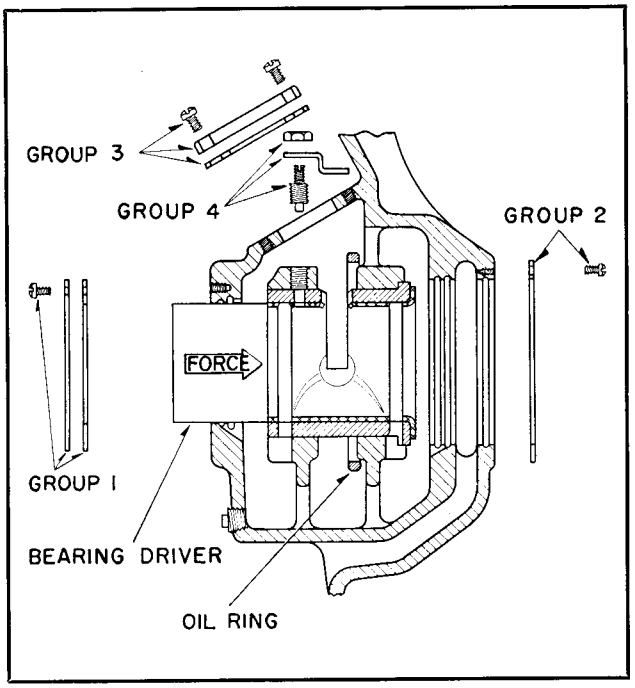


FIG. 7. Detail of Solid Sleeve Bearing

the overflow gauge. Do not flood the bearings. After oiling, close the cover of the overflow gauge.

If any oil is accidentally spilled on the bracket, it should be wiped off with a rag or waste. This prevents dirt from collecting on the surface of the motor. It also eliminates any possibility of oil getting into the windings which in time may mean an expensive repair job.

The construction of the Sealed Sleeve Bearing is such as to require no "flushing out". At intervals of about two years in average service, or during general overhaul periods, remove the bracket and thoroughly wash out the bearing housings, using hot kerosene oil and compressed air if available.

Removing Solid Sleeve Bearings. If it becomes necessary to remove sleeve bearings, proceed as follows:

1. Drain oil by removing drain plugs from bearing housing. See Fig. 6.

2. Remove oil ring inspection cover. (Group 3 of Fig. 7).

3. Remove bolts holding the bracket to the frame and force the bracket loose by striking it with a soft mallet or other soft material in a direction parallel to the shaft. Pull bracket off the shaft.

4. Remove bearing locking screw and oil ring keeper. (Item 4 of Fig. 3).

5. Remove outer and inner bearing caps. (Group 1 and 2 of Fig. 7).

6. Turn bracket 180° so that oil ring will drop through oil ring slot in the bearing. Position or hold with a piece of wire the oil ring away from bearing so that bearing can be removed without damage to oil ring.

7. Tap the bearing out toward the inside by placing a bearing driver or rod against bearing shoulder. (See Fig. 7).

8. To replace, reverse the above procedure, except take care to keep the oil ring clear of the bearing as before and preferably assemble the bracket on the shaft upside down so that the oil ring will not be caught and damaged between the end of the shaft and the side of the oil ring slot in the housing. Before bolting the bracket in place, it must be revolved on the shaft to the correct position. After bolting in place check to see that the oil ring revolves with the shaft.

Removing Split Sleeve Bearings. If it becomes necessary to remove split sleeve bearing proceed as follows:

1. Remove airshield bolts on upper half of bracket only. Do not disturb position of solid airshield by removing airshield bolts in lower half of bracket unless bottom half of bracket is also to be removed.

2. Remove three bolts holding upper half of bracket to frame.

3. Remove four bolts holding bracket halves together at split.

4. Remove two dowel bolts mounted through bracket halves by tightening up nuts.

5. Break sealing compound between bracket halves by bumping along split and frame fit with a copper or brass mallet.

6. Slide upper half of bracket axially back from frame to clear bracket fit.

7. Lift off upper half of bracket. Use bracket bolts in bracket holes for lifting lugs.

8. Lift off upper half of sleeve bearing from lower half. Bearing halves are held together by four dowel pins and slight pressure straight up will remove upper half. It may be necessary to use chisel at split to break sealing compound.

9. To remove lower half of bearing rotate bearing 180° around shaft and lift out. To rotate bearing apply a series of light bumps on outer edge of bearing shoulder with soft material rod and light hammer.

10. To replace reverse above procedure except be sure all old sealing compound is removed from both halves of parts. To remove sealing compound first scrape then use a coal tar solvent such as Xylol or Toluol. Do not apply new sealing compound to bearings or bracket halves until ready to join both halves as compound sets up quickly. When joining brackets be sure to connect first with dowel bolts.

11. To reseal splits use Westinghouse Red Enamel # B-6-614.

RENEWAL PARTS

Renewal Parts information may be obtained from the nearest Westinghouse Sales Office. Be sure to name the part or parts required (see Fig. 3) and give the complete nameplate reading on the motor for positive identification.

WESTINGHOUSE ELECTRIC CORPORATION
BUFFALO PLANT • MOTOR AND CONTROL DIVISION • BUFFALO 5, N. Y.
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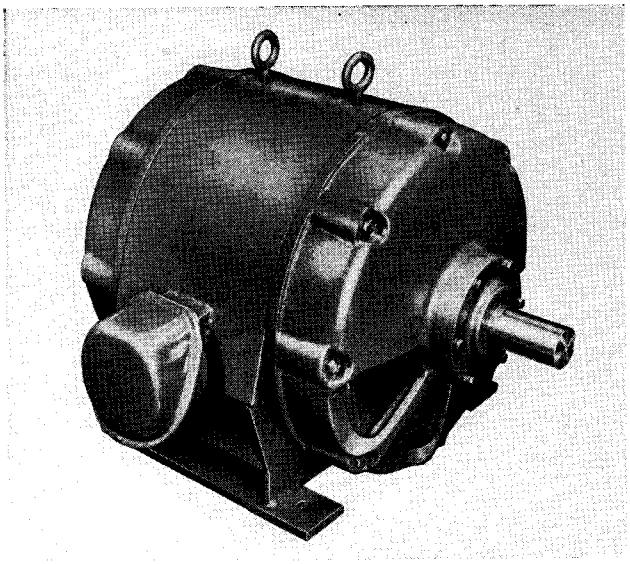

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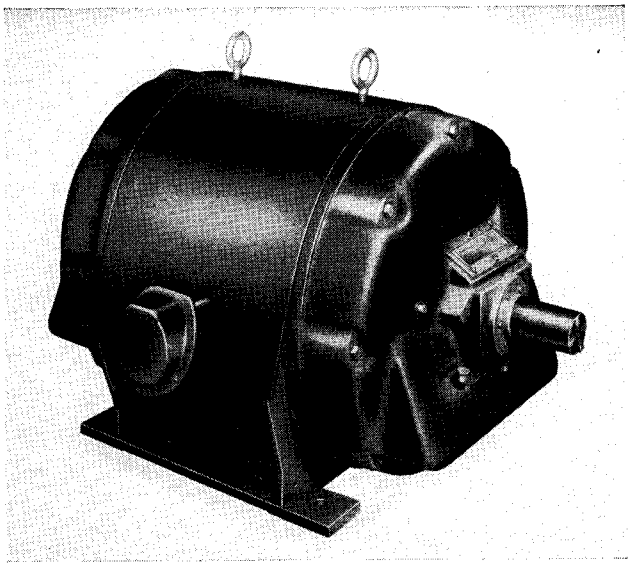

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RECEIVING

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INSTALLATION

Mounting. Locate the motor in a place that is clean, dry and well-ventilated. If protecting shields or guards are used, they must not obstruct the free flow of air around the motor. The external air temperature should not exceed 40°C or 104°F.

Fasten to a rigid foundation using bolts or screws of the largest size permitted by the drilling in the mounting feet. The motor must rest evenly on all mounting pads.

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2. Belt Drive. Mount the motor on slide rails or a 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.

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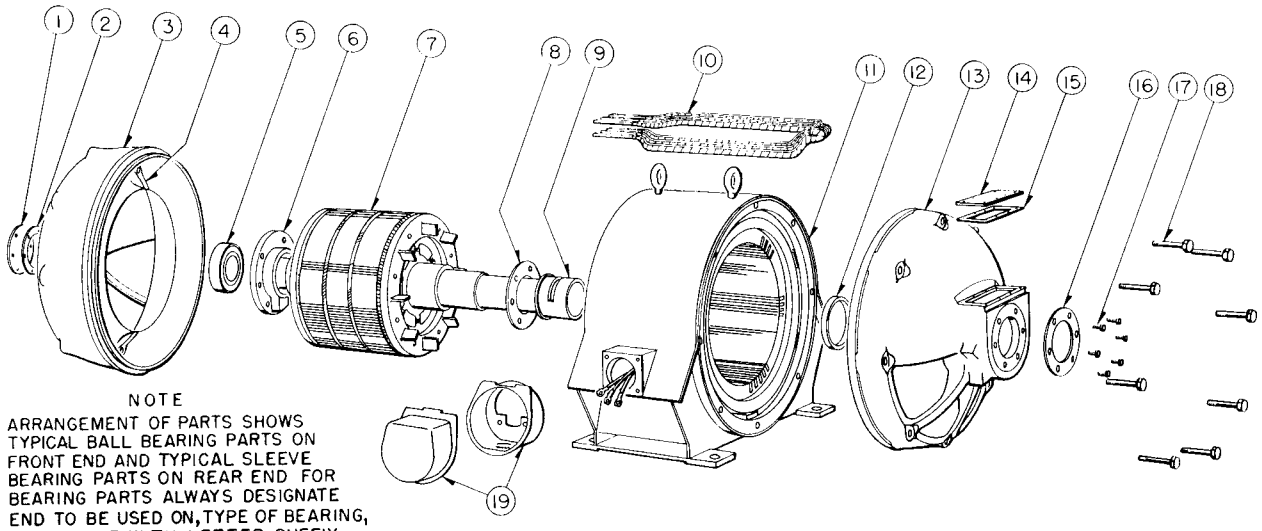
V-BELT DRIVE

FULL LOAD RPM OF MOTOR		MAX. HP. RATING
Above	Including	
900	1200	125
750	900	200
720	750	250
560	720	300

3. 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.

GEAR DRIVE

FULL LOAD RPM OF MOTOR		MAX. HP. RATING
Above	Including	
750	900	50
560	750	75



LEGEND

1 OUTER BALL BEARING CAP (FRONT END)
2 OUTER BALL BEARING CAP GASKET (FRONT END)
3 BALL BEARING BRACKET (FRONT END)
4 AIR SHIELD
5. BALL BEARING (FRONT END)
6 BALL BEARING INNER CAP (FRONT END)
7 ROTOR
8. SLEEVE BEARING INNER CAP (REAR END)
9. SLEEVE BEARING
10. STATOR COILS
11 FRAME AND STATOR CORE ASSEMBLY
12. OIL RING
13. SLEEVE BEARING BRACKET (REAR END)
14. OIL SIGHT SLOT COVER (ON SLEEVE BEARING MOTORS ONLY)
15. OIL SIGHT SLOT COVER GASKET (ON SLEEVE BEARING MOTORS ONLY)
16. OUTER SLEEVE BEARING CAP (REAR END)
17. BEARING CAP SCREWS
18. BRACKET BOLTS
19. CONDUIT BOX AND CONDUIT BOX COVER

FIG. 3. Arrangement of Parts—Drip-Proof Type CSP Motor (Frames 580-683)

4. Chain Drive. Mount the motor on slide rails or a 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.

CHAIN DRIVE

FULL LOAD RPM OF MOTOR		MAX. HP. RATING
Above	including	
900	1200	125
750	900	200
720	750	250

Electrical Connections. Be sure the motor is connected as shown on the nameplate diagram, and that the power supply (Voltage, Frequency and Number of Phases) corresponds with the nameplate data.

Connect to the power supply through a suitable switch and overload protection.

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

To change the direction of rotation on three-phase motors, interchange any two line leads.

To change the direction of rotation on two-phase 4-wire motors, interchange the line leads of either phase. To change the direction of rotation on 2-phase 3-wire motors, interchange the two outside leads.

Conduit Box. If the conduit box is desired on the opposite side of the motor, remove the brackets and rotor, reverse the frame, and reassemble.

The conduit box may be rotated 90° or 180° for use with horizontal conduit or conduit from above.

When the motor is mounted on a bedplate or 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. Squeeze connectors may be straight, 45° or 90°.

OPERATION

Run the motor without load to check the connections and direction of rotation.

The motor will operate satisfactorily with a 10% variation in voltage, a 5% variation in frequency, or a combined voltage and frequency variation of 10%, but not necessarily in accordance with the standards of performance established for operation at normal rating. To stop motor refer to instructions furnished with the starter. Before starting sleeve bearing motors see instructions on page 6 under operation and care of sleeve bearings. Before starting oil lubricated ball bearing motors see instructions on page 6.

MOTOR MAINTENANCE

Although Life-Line motors require a minimum of attention in service, they should be inspected at regular intervals to guard against excessive (1) dirt, (2) moisture, (3) friction and (4) vibration, which account for 90% of all motor failures.

1. Guard Against Dirt. Keep the insulation and mechanical parts of the motor clean. Dust that is free from oil or grease may be removed by wiping with a clean, dry cloth, or preferably, by suction. Suction is recommended over blowing out because it eliminates the danger of blowing metal chips and etc., into the insulation and also because of the danger of moisture in the compressed air. Dust may be blown from inaccessible parts with clean, dry air of moderate pressure.

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.

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. Drip-proof motors should always be guarded against the accidental intrusion of water from splatter or splashing.

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

Before starting motors which have been subjected to moisture, megger with a 500 volt megger. If resistance is below 2 megohms dry the winding in oven or circulate safe current. Continue drying until resistance rises to 2 megohms or preferably higher. Drying time will depend on size of machine and amount of moisture absorbed.

3. Guard Against Friction. Excessive friction or overheating of bearings is usually traced to one of the following causes:

a. Excessive bolt tension.

b. Poor alignment causing excessive vibration or binding.

c. Bent shaft.

d. Excessive end or side thrust due to gearing, flexible coupling, etc.

4. Guard Against Vibration. To avoid failures due to vibration, a few simple checks should be made regularly.

Check for misalignment such as may be caused by foundation settling or heavy floor loading.

Check to see if vibration from the driven machine is being transmitted to the motor.

Check for excessive belt or chain tension or the push-apart effect inherent in spur gears.

Check the motor mounting bolts and bracket bolts to be sure they are tight.

Coils. Revarnishing the windings when motors are overhauled will lengthen their life. Suitable varnish may be obtained from the nearest Westinghouse Sales Office.

GREASE LUBRICATED BALL BEARINGS
(1800 rpm and below)

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

External inspection after the motor 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.

Regreasing. Too much grease will cause churning, overheating and grease leakage. If grease leakage occurs the bearing has been over-

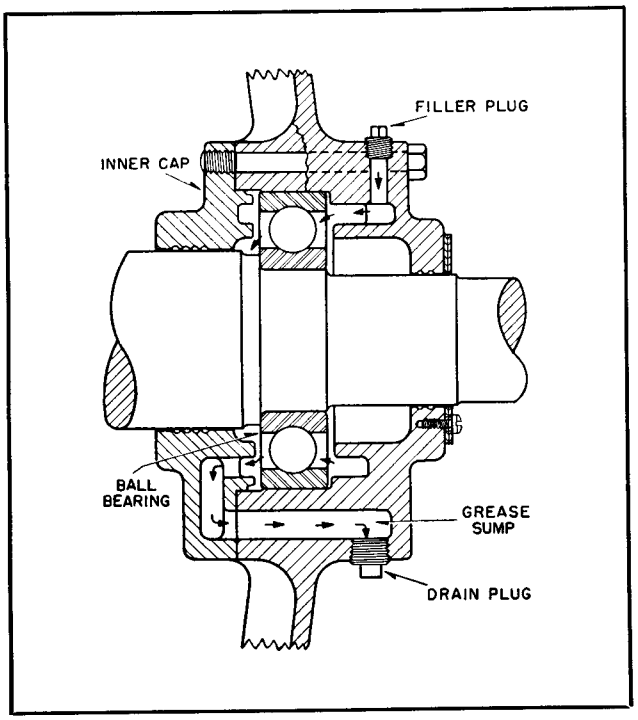


FIG. 4. Typical Ball Bearing (Grease Lubricated)

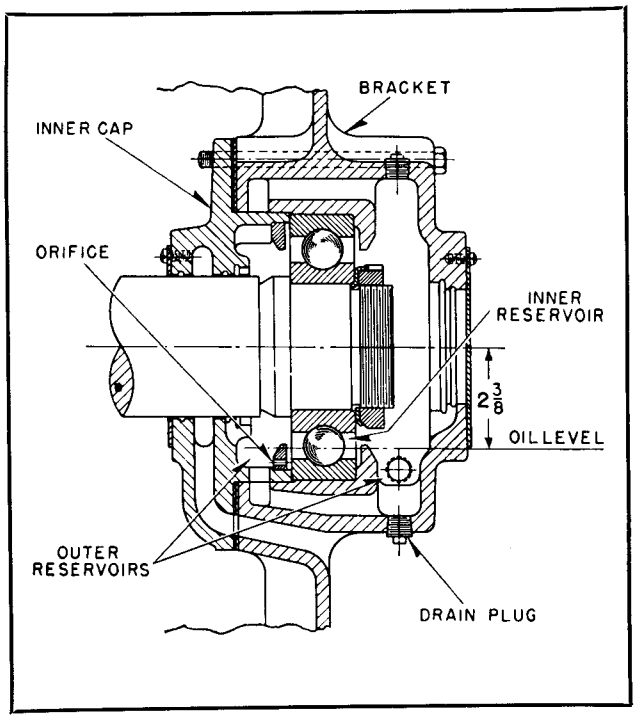


FIG. 5. Typical Ball Bearing (Oil Lubricated)

greased or the grease used was not suitable for the particular application.

If high pressure guns are used, great care should be taken to avoid overlubrication.

When shipped from the factory, grease lubricated ball bearing motors have sufficient grease of the right grade to last for a limited period. However, a charge of Westinghouse 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 4 ounces of grease per bearing be added every 2000 hours of operation. If experience indicates that this quantity results in a surplus of grease in the bearings, the quantity should be reduced. Remove the sump drain plug when greasing to allow the excess grease to run out. For the first several greasings there may be no excess grease, therefore, none will run out of the drain plug hole.

Lubricating System. Fig. 4 is a cross section view of a typical grease lubricated ball bearing assembly. New grease is introduced at the top of the bearing farthest from the body of the motor. A sufficient charge will force the old grease through the rolling members and out a partially restricted escape port during operation.

Excess grease is removed from the sump through drain plug openings. See Fig. 4. Periodic greasing and cleaning of the surplus grease sump will prevent damage to the bearings from deteriorated grease and will reduce the need for frequent bearing overhaul.

It is desirable for the most satisfactory service, to open the bearing housing once a year, or after every 5000 hours operation, to check the condition of the housing 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. If grease deterioration has occurred or if dirty, the bearing and housing parts should be thoroughly cleaned out and new grease added. Clean 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 to clean it properly. For disassembly of the bearing housing see notes under Removal of Brackets and Removal of Bearings.

WESTINGHOUSE GREASE—Ordering Data

8 oz. tube	Style No. 1360 876
1 lb. can	Style No. 1248 911
5 lb. can	Style No. 1248 912
10 lb. can	Style No. 1248 913
35 lb. can	Style No. 1449 558

For grease packed in larger containers please refer to the nearest Westinghouse Sales Office.

OIL LUBRICATED BALL BEARINGS (above 1800 rpm)

Lubrication. Before starting motor fill bearing reservoir with a good grade of lubricating oil having a viscosity of 180 to 220 SSU (equivalent to S.A.E. #10). This is done by pouring the oil in through the filling cup until no more can be added. Keep filling cup closed by screwing in the hinged, threaded plug tightly with the fingers.

Change of Oil. Every six months the reservoir should be drained by removing the drain plug located at the bottom of the oil sump in the casting. Refill with fresh, clean oil.

Lubricating System. Fig. 5 is a cross section of the bearing assembly. Circulation of oil through the bearing is maintained by the pumping action of the bearing itself. The oil level is maintained at about the center of the lowest ball. The bearing is located in an inner oil reservoir separated from the outer and larger reservoirs. When running, the bearing throws oil from the inner to the outer reservoirs; new oil is fed to the bearing through the orifice, at a controlled rate depending on the orifice size. So long as the oil level is maintained, the bearing is assured of an adequate and constant supply of oil at starting and at any speed.

DISASSEMBLY OF BALL BEARING MOTORS

Cleanliness. Since ball and roller bearings are sensitive to small amounts of dirt, they must be protected at all times. When necessary to disassemble the bearing housing, first thoroughly remove all dirt from the adjacent part, so no dirt will fall upon the bearing or into the bearing housing.

Removal of End Brackets. The end brackets can be removed by unscrewing all the bolts that hold the bracket to the frame and the six (6) bolts that hold the inner cap to the bearing housing. Upon removing the brackets, the rotor can be removed.

Removal of Bearings. The bearings can be removed using a wheel puller or similar device. The inner cap should be slid along the shaft away from the bearing so that the puller can be used against the inner race of the bearing. If the bearing is pulled by pressure against the outer race, it will be ruined.

Replacing of Bearings. To replace a bearing on the shaft, be sure that the bearing seat is free

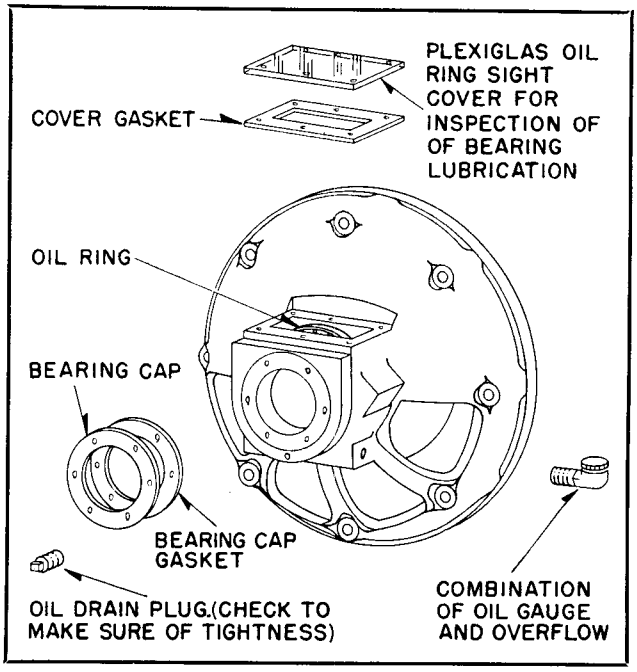


FIG. 6. Detail of Sleeve Bearing Bracket

of dirt, nicks or burrs. Heat the bearing in an oven or clean oil bath for ½ hour at a temperature of approximately 190°F but not to exceed 212°F at any time. Slip the hot bearing on the shaft and hold in place until bearing has cooled appreciably. Do not tighten lock nuts or assemble in bracket until bearing has cooled.

Mounting or Removing Pulleys and Couplings. In mounting or removing pulleys, couplings or pinions the bearing must not be subjected to axial pressure, especially hammer blows when these accessories are driven on 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.

SLEEVE BEARINGS

Lubrication. Before starting the motor, fill both oil reservoirs through the combination overflow gauge and filling device with best quality clean dynamo oil. (See Fig. 5). The oil used should have a viscosity of from 180 to 220 SSU (equivalent to S.A.E. #10). No oil should be poured in the top of the brackets through the oil ring slot cover of the bracket.

No oil need be added till the oil drops below the full level, which is ⅛ inch below the top of

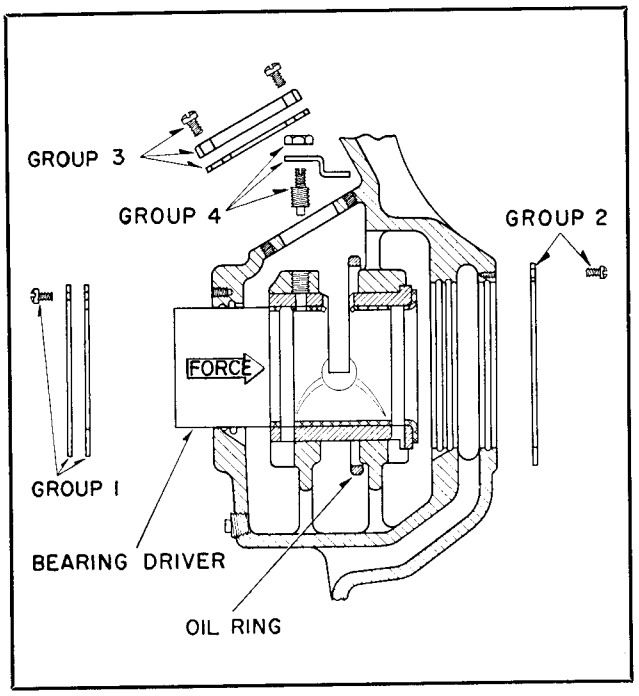


FIG. 7. Detail of Solid Sleeve Bearing

the overflow gauge. Do not flood the bearings. After oiling, close the cover of the overflow gauge.

If any oil is accidentally spilled on the bracket, it should be wiped off with a rag or waste. This prevents dirt from collecting on the surface of the motor. It also eliminates any possibility of oil getting into the windings which in time may mean an expensive repair job.

The construction of the Sealed Sleeve Bearing is such as to require no "flushing out". At intervals of about two years in average service, or during general overhaul periods, remove the bracket and thoroughly wash out the bearing housings, using hot kerosene oil and compressed air if available.

Removing Solid Sleeve Bearings. If it becomes necessary to remove sleeve bearings, proceed as follows:

1. Drain oil by removing drain plugs from bearing housing. See Fig. 6.

2. Remove oil ring inspection cover. (Group 3 of Fig. 7).

3. Remove bolts holding the bracket to the frame and force the bracket loose by striking it with a soft mallet or other soft material in a direction parallel to the shaft. Pull bracket off the shaft.

4. Remove bearing locking screw and oil ring keeper. (Item 4 of Fig. 3).

5. Remove outer and inner bearing caps. (Group 1 and 2 of Fig. 7).

6. Turn bracket 180° so that oil ring will drop through oil ring slot in the bearing. Position or hold with a piece of wire the oil ring away from bearing so that bearing can be removed without damage to oil ring.

7. Tap the bearing out toward the inside by placing a bearing driver or rod against bearing shoulder. (See Fig. 7).

8. To replace, reverse the above procedure, except take care to keep the oil ring clear of the bearing as before and preferably assemble the bracket on the shaft upside down so that the oil ring will not be caught and damaged between the end of the shaft and the side of the oil ring slot in the housing. Before bolting the bracket in place, it must be revolved on the shaft to the correct position. After bolting in place check to see that the oil ring revolves with the shaft.

Removing Split Sleeve Bearings. If it becomes necessary to remove split sleeve bearing proceed as follows:

1. Remove airshield bolts on upper half of bracket only. Do not disturb position of solid airshield by removing airshield bolts in lower half of bracket unless bottom half of bracket is also to be removed.

2. Remove three bolts holding upper half of bracket to frame.

3. Remove four bolts holding bracket halves together at split.

4. Remove two dowel bolts mounted through bracket halves by tightening up nuts.

5. Break sealing compound between bracket halves by bumping along split and frame fit with a copper or brass mallet.

6. Slide upper half of bracket axially back from frame to clear bracket fit.

7. Lift off upper half of bracket. Use bracket bolts in bracket holes for lifting lugs.

8. Lift off upper half of sleeve bearing from lower half. Bearing halves are held together by four dowel pins and slight pressure straight up will remove upper half. It may be necessary to use chisel at split to break sealing compound.

9. To remove lower half of bearing rotate bearing 180° around shaft and lift out. To rotate bearing apply a series of light bumps on outer edge of bearing shoulder with soft material rod and light hammer.

10. To replace reverse above procedure except be sure all old sealing compound is removed from both halves of parts. To remove sealing compound first scrape then use a coal tar solvent such as Xylol or Toluol. Do not apply new sealing compound to bearings or bracket halves until ready to join both halves as compound sets up quickly. When joining brackets be sure to connect first with dowel bolts.

11. To reseal splits use Westinghouse Red Enamel # B-6-614.

RENEWAL PARTS

Renewal Parts information may be obtained from the nearest Westinghouse Sales Office. Be sure to name the part or parts required (see Fig. 3) and give the complete nameplate reading on the motor for positive identification.

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