Instructions for Squirrel-Cage Motors Vertical Hollow Shaft & Vertical Solid Shaft High Thrust Frames 213 through 445

I.L. 3830-6

LIFE-LINE-A VERTICAL HOLLOW AND SOLID SHAFT MOTORS are designed for use on deep well or high thrust pump applications. Sturdy cast iron construction is employed throughout with the stator core completely encased in a cast iron frame. The brackets register directly in accurately machined fits in the frame. The lower bracket provides a housing for the greasable guide bearing as well as a register fit and mounting holes to mate with the pump head. The upper bracket provides a sealed, oil tight housing for oil or grease lubricated thrust bearings.

On Fan Cooled and Explosion Proof frame sizes, none of the internal parts are exposed to the external air.

Explosion Proof Assemblies are so identified by an Underwriters' Label installed on the motor. Underwriters' labels can be mounted only at point of manufacture.

The presence of the Underwriters' label on the motor is certification that it has been built to rigidly controlled standards to assure utmost safety of operation in hazardous locations. If necessary to dismantle a labeled motor for servicing in the field, it is imperative that the factory assembly be duplicated in all respects upon reassembly.

RECEIVING

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

INSTALLATION

Mounting

Locate the motor in a place that is clean and well ventilated. The motor enclosure is such that dripping, wind blown and splashing water will not damage the motor. Under conditions of extreme weather and moisture, additional protection, such as a pump house is recommended; however, the free flow of air around the motor must not be obstructed. The external air temperature should not exceed 40 degrees C or 104 degrees F, unless the motor has been specially designed or otherwise cleared for use in a higher ambient temperature.

Bolt the motor to the pump head or rigid foundation using bolts of the largest size permitted by the holes in the motor bracket.

Accurate alignment between motor and pump is of extreme importance. Misalignment will result in bearing trouble.

VHS MOTORS

When mounting VHS motors, remove the hood and coupling. Lower the motor onto the pump head with the pump shaft extending through the hollow shaft. The motor bracket should bolt home square with the pump head and at right angles with the pump head shaft. The pump head shaft should be centered within the motor hollow shaft. Fit the coupling onto the motor and key it to the pump shaft using a gib head key. Put on the adjusting nut supplied with the pump and draw up on the impellers. Lock the adjusting nut in place with a screw through the nut into a tapped hole in the coupling.

THRUST

The axial thrust load imposed upon the motor by the pump shaft and impellers plus the hydraulic load should not exceed the value for which the motor was ordered.

METHOD OF DRIVE

VHS motors may be equipped with either ratchet or clutch drives (to be specified by the purchaser).

1. Ratchet Type VHS Motors: These motors are equipped with a non-reverse ratchet that permits rotation in the CCW direction (looking downward at the motor) only. The ratchet consists of a stationary plate with teeth cast into it, and a rotating drive hub or runner with balls or pins operating in slots. When the motor starts in the forward or CCW direction, the inclined faces of the ratchet teeth, and the inertia of the balls or pins move where they are held by centrifugal force. When the motor stops, the balls or pins move outward or down and prevent CW or reverse rotation by locking against the faces of the teeth.

2. Clutch Type VHS Motors: These motors are equipped with a disengaging clutch that consists of a coupling and drive hub or runner. The drive hub is keyed to the motor shaft, and the coupling is keyed to the pump shaft and attached with a screw to the pump shaft adjusting nut. The coupling centers on the drive hub by means of a machined fit. The coupling is driven by two pins attached to the drive hub and engaging corresponding holes in the coupling. Disengagement of the clutch is caused by a lifting of the pump shaft which in turn lifts the coupling off the two drive pins.

3. Solid Shaft Vertical Motors: These motors are provided with a shaft extension suitable for coupled service, and are either straight or tapered as selected by the purchaser.

NOTE: Coupling halves 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 coupling in 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 bearings. Use a pinion puller for removing tight couplings.

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 a three-phase motor, interchange any two line leads.

To change the direction of rotation on a two-phase motor, interchange the leads of either phase.

Conduit Box

The conduit box may be rotated 360 degrees in 90 degree steps.

OPERATION

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

The motor will operate satisfactorily with a 10 percent variation in voltage, a 5 percent variation in frequency, or a combined voltage and frequency variation of 10 percent, but not necessarily in accordance with the standard of performance established for operation at normal ratings.

MAINTENANCE

Inspection

Although LIFE-LINE A motors require a minimum of attention in service, they should be inspected at regular intervals to check for excessive (1) dirt, (2) moisture, (3) friction, and (4) vibration, which account for 90 percent 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. 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 non-flammable, 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: The motor should not be subject to extreme moisture conditions such as high humidity during shut down periods, exposure to water under pressure such as hosing down, or severe weather conditions.

   During prolonged periods of idleness, the motor should be run at least once a week, or should be provided with heaters to guard against moisture condensation.

   Before blowing motor windings out with air, make sure the air line is free of condensation.

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

   a) Poor alignment causing excessive vibration or binding.
   b) Bent shaft.
   c) Excessive thrust.
   d) Wrong oil and/or oil viscosity.
   e) Overgreasing.

   To avoid failures due to vibration, a few simple checks should be made regularly:

   a) Check for misalignment such as may be caused by foundation settling.
   b) Check to see if any pump vibration is being transmitted to the motor.
   c) 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.

GUIDE BEARING

The guide bearings are single row width conrad type greasable ball bearings.

When shipped from the factory, the bearings and bearing cavities are packed with a sufficient quantity of the proper grade grease to last for a long period.

Because of oxidation or eventual bleeding of the oils from the grease, regreasing is required. When regreasing is required, special care must be taken to insure that dirt or foreign particles are not forced into the bearing cavities along with the new grease. Use only a good grade of grease suitable for ball bearings. It is important the grease has the correct consistency. A lithium base all-purpose grease is recommended (8-10 percent lithium soap, worked penetration at 25°C is 265 to 295, 182°C is the dropping point minimum).

For normal applications, guide bearings should be regreased every 3 to 6 years; for severe application, the bearings should be regreased more often (based on past experience). Overgreasing will cause the bearings to run warm, thus causing an accelerated oxidation rate of the grease. To regrease: 1) Run motor to allow grease to warm up. 2) Stop motor. 3) Remove grease drain plug. 4) Free or loosen any hardened grease in drain line. 5) Wipe off grease fitting, use clean grease and a clean gun. 6) Add grease with a hand gun until grease appears at the drain hole. 7) To purge the excess grease, run the motor at least 10 minutes before replacing the drain plug. NEVER add grease unless the drain line is free.

THRUST BEARING

The thrust bearings are either angular contact ball bearings, or spherical roller thrust bearings depending on the motor's thrust rating.

Unless conditions are severe, the thrust bearing need not be serviced more frequently than every three years; however, if other service on the pump or well is necessary, the thrust bearing should be inspected. NOTE: For oil lubricated motors, the oil should be changed at regular intervals as called for on the lube nameplate.

213 through 286 frame motors have grease lubricated thrust bearings; use the same grease as described for the guide bearing, except 324 frame F.C. and EP motors are also grease lubricated. Other motors 324 frame and larger are oil lubricated; use a good grade of turbine type oil with rust and oxidation inhibitor additives. The oil should have the proper viscosity to avoid unnecessary heating or bearing wear.

Too heavy an oil could cause the following: 1) Increased fluid friction losses resulting in higher operating temperatures; higher temperatures will cause the oil to oxidize or break down at an accelerated rate. 2) A heavy oil tends to churn or foam more than a lighter weight oil. 3) Bearings may run warmer because of reduced oil circulation through and around bearing.

Too light an oil may allow the oil film to wipe or break down on the rubbing surfaces such as; the end of the rollers and the race flanges in spherical roller bearings, contact surface between the cage and rollers or balls, the slight slipping of the balls or rollers on the outer race when under heavy thrust loads.

For standard applications, the oil viscosity called for on the lube nameplate should be used. Do not use type E.P. oil. For severe applications, contact the nearest Westinghouse Sales Office and give them the following information; ambient temperature (average), thrust loads, type and brand name of lubricating oil to be used, motor serial number.

TO DISASSEMBLE MOTOR

To service or inspect the thrust bearing, the parts should be removed in the following order (see Figs. 1, 2 and 3): Hood, drive nut from pump shaft,* coupling,* flinger, locknut and washer, ratchet plate, ratchet balls,* bearing runner and bearing. Care must be taken not to drop the ratchet balls into the motor.

When the thrust bearing is removed, the upper bracket can be lifted off the frame fit after removing bracket bolts. The wound stator and frame can then be lifted off the lower bracket - the rotor and shaft will remain in position being held by the lower bearing in the lower bracket.

If required, the rotor and shaft can be lifted out with the upper bracket by removing the lower bearing cap, and leaving the thrust bearing and runner on the shaft.

Extra Hi-Thrust Motors (364 through 445 frame motors) with spherical roller thrust bearings will follow a similar procedure for assembly and disassembly, the only difference will be the spring plate and springs under the outer race of the thrust bearing. When reassembling be sure spring plate and springs are seated.

Adjust Shaft End Play: On the standard Vertical Hi-Thrust Motors, the lower guide bearing is restrained to take momentary up thrust. On spherical bearing motors the restrained lower bearing also

*Solid shaft motors will not have a pump shaft nut, coupling, or ratchet balls.

maintains spring tension on the thrust bearing during any periods the motor is running without external thrust load.

* When reassembling the motor, it is important a pre-load stress is not left on the guide and thrust bearing. The following assembly procedure should be used:

1. Leave the locknut holding the runner on shaft loose.
2. Tighten lower bearing cap bolts.
3. Tighten down on shaft locknut until bearings are just starting to preload. When preloading is experienced there is no endplay and the rotor will not turn as freely by hand.
4. After slightly preloading the bearings, back off the locknut approximately 1/4 turn for angular contact bearing motors, and 1/2 turn for spherical roller bearing motors.
5. Shaft endplay for angular contact bearing motors should be .004" to .006". Endplay for spherical roller bearing motors should be .008" to .010".
6. If equipment is available, it is desirable that shaft endplay be checked using a dial indicator to measure movement as rotor and shaft is raised and lowered.
7. To measure endplay on spherical roller bearing motors, the shaft will have to be pressed down to be sure the bearing is bottoming on the spring plate. This can best be done by assembly first without springs and mark shaft accordingly. Then reassemble motor with springs to mark a shaft.

RENEWAL PARTS

Renewal parts information may be obtained from the nearest Westinghouse Sales Office. Be sure to name the part or parts required (see Figs. 1, 2 and 3) and give the complete nameplate data on the motor for positive identification.

Returning Apparatus Authorization and shipping instructions for the return of any apparatus must be obtained by the purchaser from Westinghouse Sales Office or distribution outlet before returning apparatus. In no event will Westinghouse be responsible for apparatus returned without proper authorization and identification.

Warranty Westinghouse warrants that the equipment delivered by it will be of the kind and quality described in the order or contract and will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within one year after date of shipment, Westinghouse shall, upon prompt written notice from the purchaser, correct such nonconformity by repair or replacement, f.o.b. point of shipment, of the nonconforming part or parts. This warranty is in lieu of all warranties of merchantability, fitness for purpose, or other warranties of quality, express or implied, and correction of nonconformities, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of Westinghouse with respect to the quality of the equipment.

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*This does not apply for special units with DB thrust bearings for continuous up or down thrust.

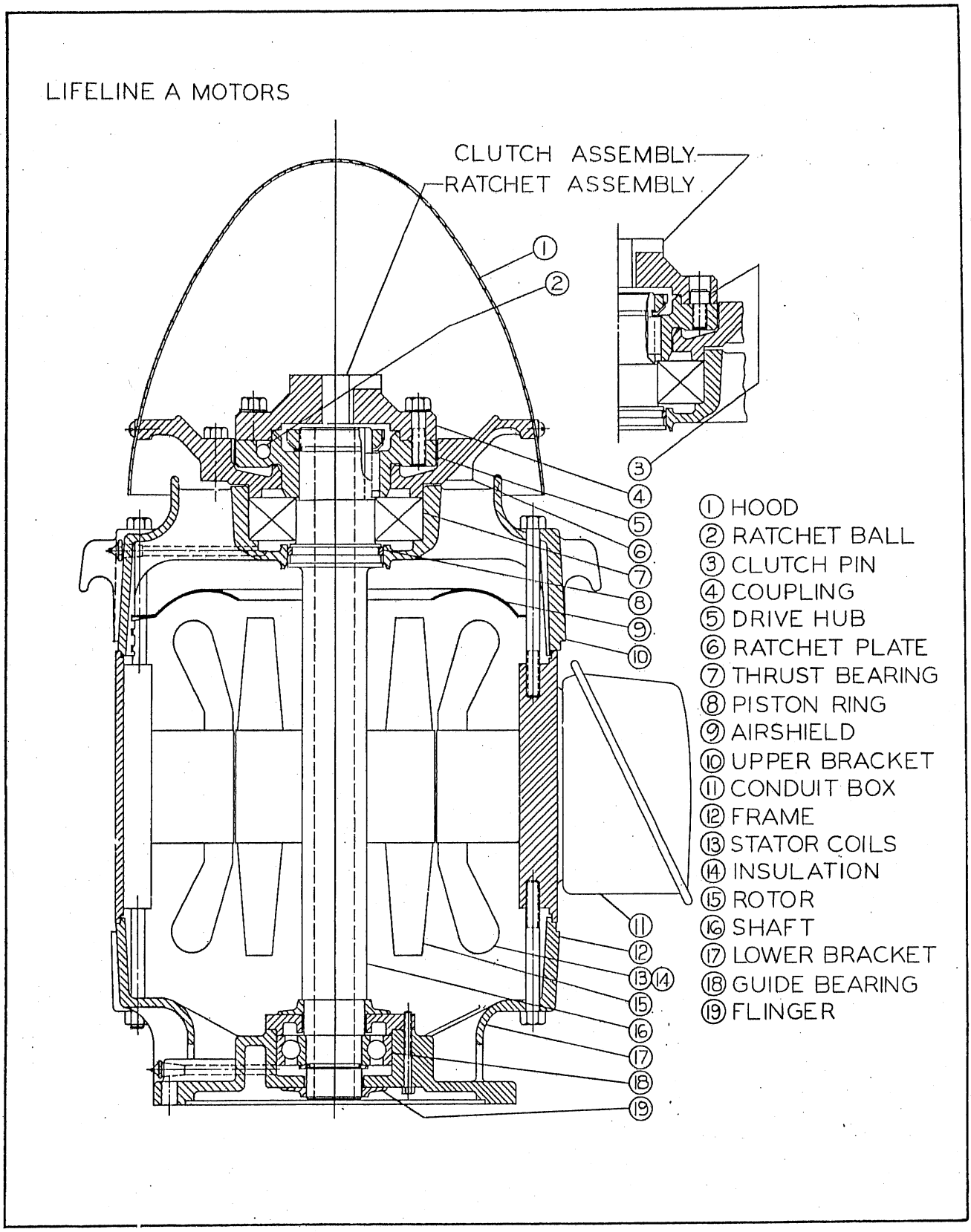

Fig. 1 Arrangement of Parts, Vertical Hollow Shaft Type A Life-Line Motor, Frames 213-286-U (Solid Shaft Motors Use Same Construction Except Top Coupling is omitted)

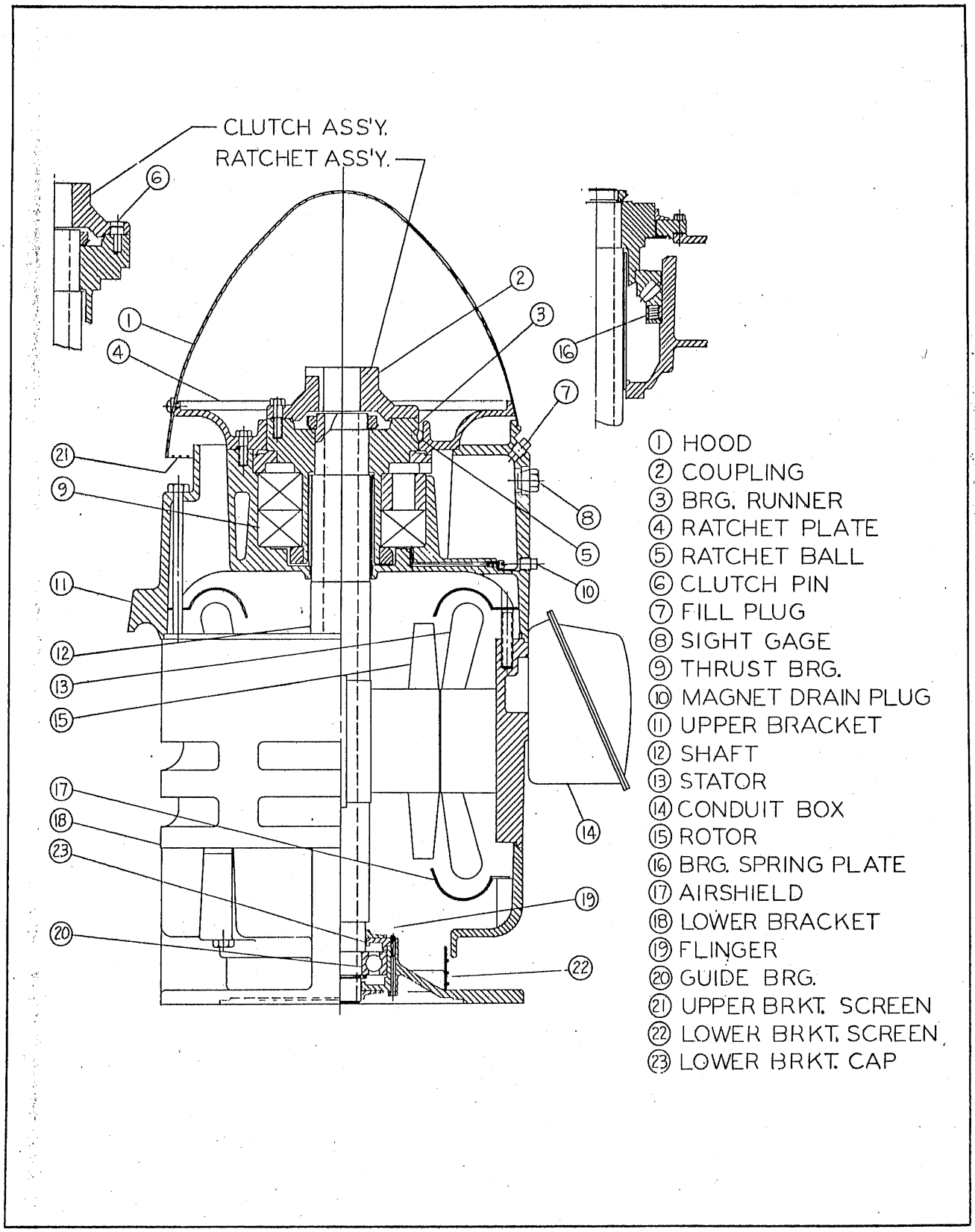

Fig. 2 Vertical Hollow Shaft Type ADDP-LLA Frames 324-445-U (Solid Shaft Motors Use Same Construction Except Top Coupling is Omitted)

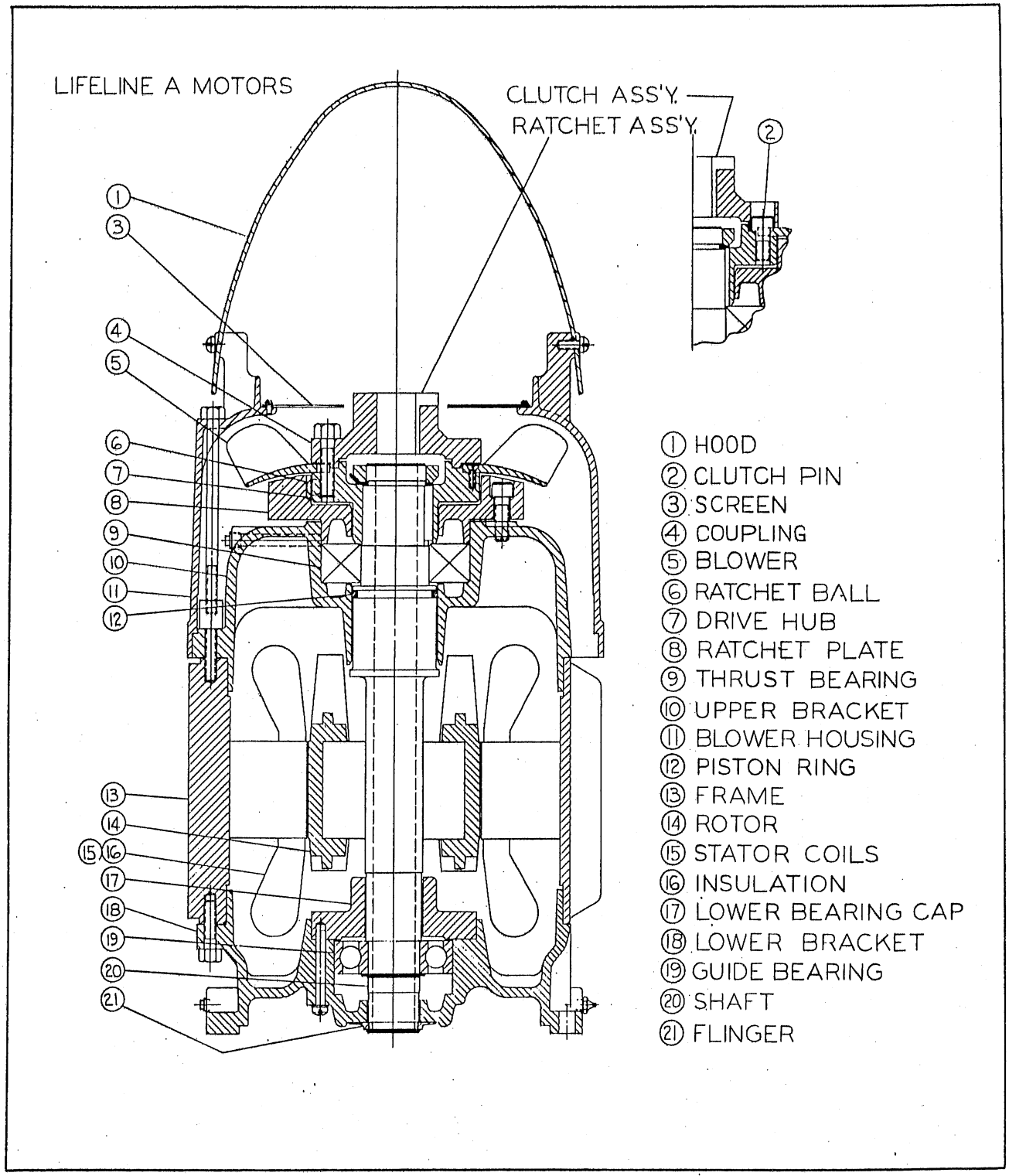

Fig. 3 Arrangement of Parts, Vertical Hollow Shaft Fan-Cooled or Type A Life-Line Explosion Proof Motor, Frames 213-326 (Solid Shaft Motors Use Same Construction Except Top Coupling is omitted)

Westinghouse Electric Corporation

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