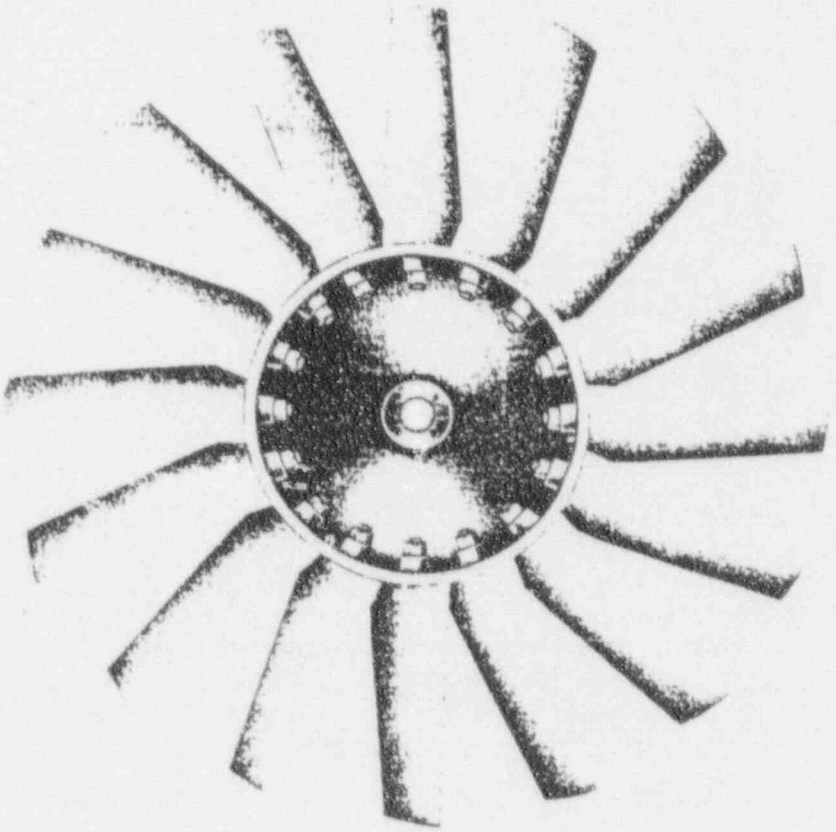
INSTALLATION AND MAINTENANCE MANUAL

FOR

JOY SERIES 1000 AXIVANE DIRECT CONNECTED SINGLE AND TWO STAGE AXIAL FLOW FANS



Bulletin No.
NP 403

JOY MANUFACTURING CO.
NEW PHILADELPHIA, OHIO

NUCLEAR REGULATORY COMMISSION

Docket No. 50-348/364 Official Exh. No. APC #99

In the matter of APC

Staff ✓ IDENTIFIED 2/13/92

Applicant _____ RECEIVED 2/13/92

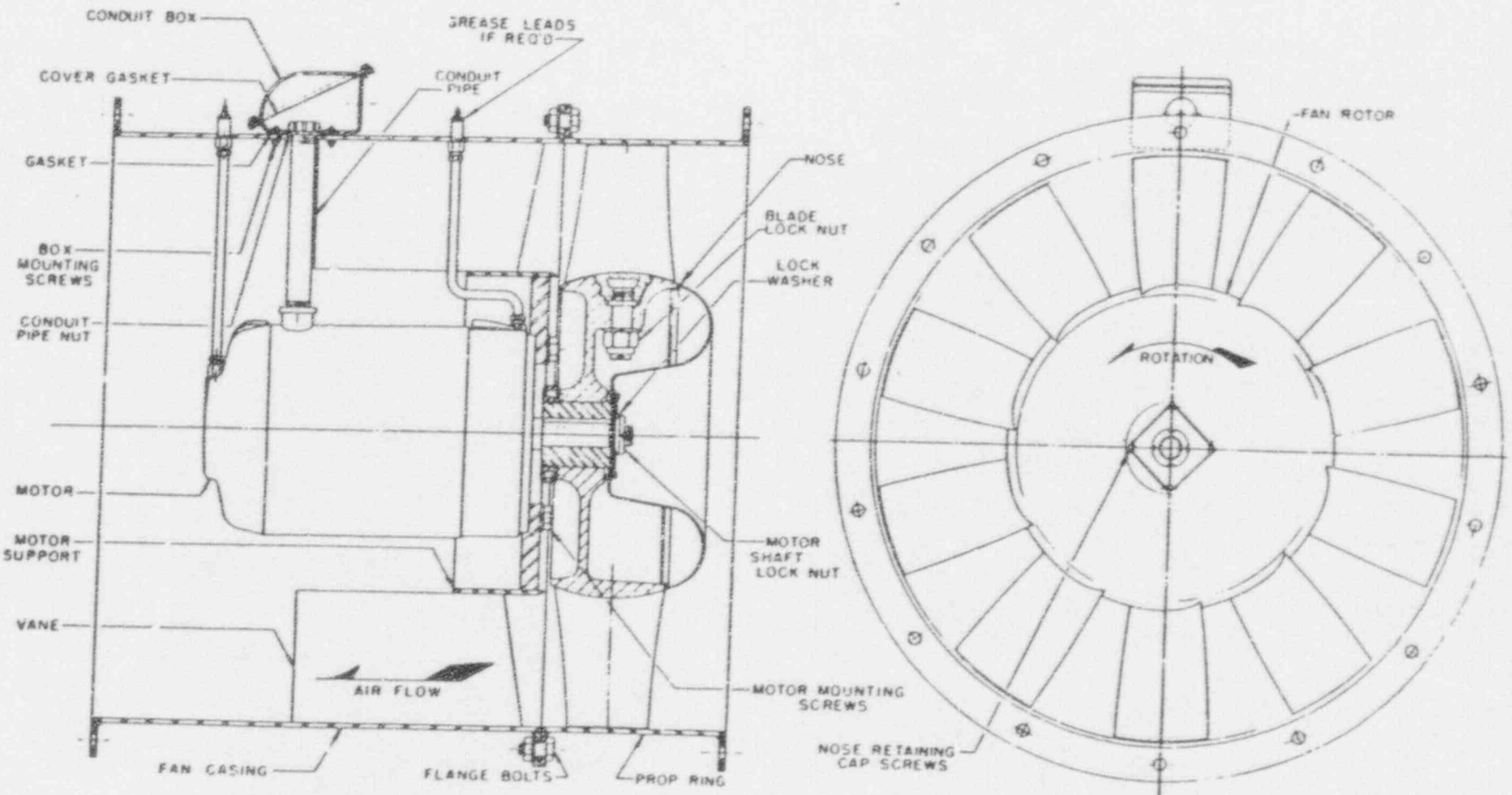
Intervenor _____ REJECTED _____

Cont'g Off'r _____

Contractor _____ DATE _____

Other _____ Witness _____

Reporter L. Slup



0034203

Figure 1

FAN NOMENCLATURE

SERVICE MANUAL . . SERIES 1000 AXIVANE FANS

GENERAL

1. FAN DESCRIPTION

The Joy Series 1000 AXIVANE fans are of fabricated steel construction with cast aluminum blades and hubs. The blades and hubs are cast in permanent molds for true blade alignment and accurate aerodynamic blade cross sections of all rotor assemblies. Fan models covered by this manual have motors mounted in the air stream and the rotor mounted directly on the motor-shaft.

The fans are given one coat of Machinery Gray prior to shipment. Special finishes and coatings are available at additional charge. All rotor assemblies are balanced before being mounted in the fans. Before the fans are shipped they are operated and vibration tests made. Any unit which shows vibration in excess of .001" must be rebalanced before shipment to meet this standard.

2. FAN ACCESSORIES

All Joy Series 1000 fans are equipped with intake and discharge flanges to provide for duct connection. Joy Inlet bells (for good inlet flow when fan is taking air from plenum), Joy inlet bell screens and Joy fan supports are available as standard accessories at extra cost.

Joy Inlet bells are fabricated of sheet aluminum. Joy Screen guards are made of crimped aluminum wire, and Jay fan supports are made of formed steel plate. Fan supports, when purchased with fan, are always bolted to the fan prior to shipment. External grease leads (as described on page 5), when deemed necessary, can be provided at slight additional cost.

3. PART NUMBERS 0034204

All required parts for the direct connected Series 1000 AXIVANE fans are described in figure 1 (page 2) and figure 5 (page 7). Figure 1 shows the complete fan assembly, while figure 5 shows a cross sectional view of the motor. Another assembly drawing included with this manual shows all fan parts and their part numbers. It also gives the complete motor part number. When ordering repair fan parts, give the fan model number and serial number (obtained from the name plate on fan casing) along with the part number and complete description of part required. When ordering motor parts, give the complete motor part number (obtained from the fan assembly drawing) and a full description of the part from figure 5. If further information is desired, consult your nearest Joy Office.

4. FAN MOTOR

All motors used on the Joy Series 1000 fans are furnished either open protected or totally enclosed. Underwriters Approved, Class I, Group D enclosures are also available as well as for Class B insulation for high temperature (Air temperature above 110°F. and below 150°F.). All motors are flange mounted to assure proper alignment when assembled or when servicing the fan after it is installed.

Motors are furnished with standard voltages of 220/440 volts or 208/416 volts and for operation on three phase, sixty cycle, A.C. power. Special voltages or cycles can be furnished on request.

FAN INSTALLATION RECOMMENDATIONS

1. Fan mounted with duct ahead of the fan.

No inlet bell nor screen required. Fan supports bearing the weight of the complete fan can be mounted horizontally on the floor or hung from the ceiling. Special supports for vertical mounting are required for the larger fan sizes. When connecting the fan to duct work, care should be taken to avoid twisting or deforming the housing as this may cause the blades to strike the fan casing. When duct work is mounted ahead of the fans 90° elbows directly ahead should be avoided wherever possible. If an elbow must be used, turning vanes should be installed to provide a minimum of turbulance to the air entering the fan. A bad inlet condition will reduce the fan efficiency and cause an increase in the fan noise level.

2. Fan installed to draw air from a plenum.

An inlet bell insures rated performance and, for safety, an inlet bell screen should be used in this application. Specially-designed inlet bells and screens are available to fit each model of the Joy Series 1000 fans. There should be a distance of at least two fan diameters from the face of the inlet bell to an obstruction such as a wall or building. The minimum free distance from the inlet bell to either side and roof should be one fan diameter. Should it be impossible to conform to these recommendations your Joy representative will be happy to help you solve your installation problems.

3. Electrical Connections.

All electrical connections can be made in the conduit box which is provided on the outside of the fan casing. Motor leads are brought out to, and terminate in, the conduit box.

4 Sound Installation.

Fan vibration and sound will be reduced when the fan is isolated from the supporting structure and duct-system by some resilient material such as cork, canvas or rubber. Metal to metal connections at the fan should be avoided wherever possible.

BLADE ADJUSTMENT

The adjustable blade of the Joy Series 1000 AXIVANE Fan allows the volume and pressure to be increased or decreased at any time. Figure 2 below shows a cut-away view of the adjustable blade. All fans are shipped from the factory with the blades set in a predetermined position based on the required performance. Field adjustments may be made within a predetermined range, depending on the fan diameter and motor capacity.

To adjust the blades, the following procedure should be used:

A. Remove the spun aluminum nose piece.

B. Loosen the blade locknut (No. 1).

C. Set the blade at the new position by the use of the markings at the blade root (No. 2).

D. Tighten the locknut (No. 1) when holding the blade to make sure the position does not change.

E. After changing all blades, check all blade positions to make sure they are all identical.

F. Replace the nose piece securely.

When securing the position of the blades, the locknut should not be tightened more than necessary to hold the blades at the proper angle. A permanent blade stop (No. 3), an integral part of each blade, eliminates blade setting which overloads the motor installed.

0034205

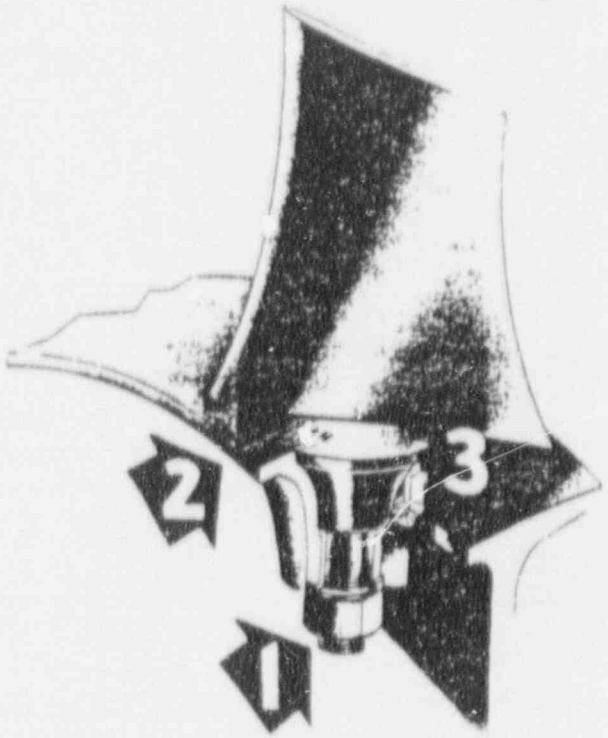


Figure 2

DISMANTLING INSTRUCTIONS

Remove the fan from the duct work and/or fan supports. After this is done, the following steps should be followed:

A. Unscrew the locknut and remove the lockwasher from the motor shaft.

B. Pull the complete rotor assembly from the motor shaft. If binding occurs here, penetrating oil may free it or the prop ring can be unbolted and removed to gain access to the rotor. The machined steel hub insert is fitted with drilled and tapped holes to allow the attachment of a wheel puller facing against the motor shaft to also aid in removing the rotor.

C. Remove the motor conduit pipe and nut, taking care not to damage the motor leads.

D. Unscrew the motor mounting screws to remove the motor itself. (*Be sure* to support the motor to prevent it from dropping when its mounting screws are removed).

E. If the rotor blades are worn or broken, the entire rotor assembly should be replaced to insure a properly balanced fan.

F. After disassembly, inspect all parts and replace any which are excessively worn.

MAINTENANCE INSTRUCTIONS. This AXIVANE® FAN was carefully inspected, operated, and balanced before leaving our factory. To ensure years of quality performance, read this instruction sheet and retain it with the fan for installation, operation and maintenance reference.

WARNING

0034206

TO UNLOADER, MOVER, STORAGE PERSONNEL & CONTRACTOR

FAILURE TO COMPLY WITH THESE INSTRUCTIONS COULD CAUSE SERIOUS BODILY HARM OR PROPERTY DAMAGE.

RECEIVING & UNLOADING

Upon unloading this equipment, inspect it for damage. If damage has occurred, file a claim immediately against the carrier. Shortages should be reported to Seller's Fan Order Service Dept. at New Philadelphia, Ohio within fifteen (15) days from receipt of shipment at destination.

HANDLING

Use a sling around large fan casings, or install eye bolts in the flanges for lifting the smaller fan units. Severe impacts could distort the casing or possibly damage the bearings.

STORAGE

If not installed immediately, this fan should be protected to remain dry at all times.

(1) Use a storage area which is dry, protected from low temperature, rapid and extreme changes in humidity, and free from any vibration.

(2) For extended storage and negotiated extended warranty, the following instructions must be followed: If stored for a long period of time, every 90 days the rotor should be turned several revolutions. If your fan is a Controllable Pitch unit, the Controllable Pitch mechanism should be actuated full stroke at the same time.

When fans are in storage for six (6) months, the rotors are to be rotated manually again and additional grease is to be added.

If motors are equipped with space heaters, they are to be made operable.

Motor windings are to be megg- at time of storage and at time of removal from storage. The resistance reading must not have dropped more than 50% of the initial reading. If the drop is below 50%, then the fan motor must be dried electrically or mechanically.

(3) Upon removal from storage, fan motor bearings are to be regreased.

INSTALLATION

All supporting points must be uniformly located so there is no twisting or distortion through the fan unit. Also, the intake should be carefully arranged to direct a smooth and uniform air flow into the fan rotor.

START-UP

Before start-up, be sure the rotor turns freely and all material has been removed from duct or the area in front of the fan intake. The rotor should rotate counterclockwise when looking into the intake. As soon as fan is up to speed, check the motor amperage on each phase for balance and correct motor load. The full load amps are stamped on the fan nameplate, which is located on the outside of the fan casing, and must not be exceeded.

BLADE ANGLE

On all except Controllable Pitch fans, the blade angles have been set at the factory for the duty required. The blade index range is numbered from 0-6 for 2000 Series Fans and 0-16 for 3000 Series. The number 0 is the highest angle of attack in both fan series and requires the greatest horsepower. As the index setting number is moved toward 6 or 16, the flow, pressure and horsepower are reduced. If it is necessary to readjust the blades, be sure each blade is set at the same index number and always check the motor amperage to prevent motor overload. Also after each adjustment, turn rotor by hand to make sure blades are not striking the casing or motor support.

Due to the fact that only one half hour to one hour of labor is required to change the blade angle setting of any adjustable pitch fan, it is the responsibility of the customer to adjust or change the blade angles on an adjustable pitch fan. The motor nameplate current is not to be exceeded when the ventilated system is operated at its highest possible pressure.

BALANCE

This unit was operated and dynamically balanced to a precise degree during assembly.

If you place your hand or finger upon the outside of this unit, its operation should feel smooth and free of vibrations. This balance must always be maintained to assure long, faithful service. If operation is not smooth, contact our Fan Field Service Dept. at New Philadelphia, Ohio, advising fan serial number (stamped on the nameplate) and the fan model number.

LUBRICATION (Detailed instructions – reverse side)

This fan has been lubricated prior to shipment from the factory and should be relubricated per the proper schedule after the start of operation with Chevron SRI #2 grease or equivalent. There are two (2) ball bearings in the motor. If the motor is mounted inside the fan, two (2) grease leads extend through to the outside of casing. Fill each of these fittings with one (1) cubic inch of grease for 7.5 to 15 HP; two (2) cubic inches for 20 to 100 HP; and three (3) cubic inches for 125 HP and higher.*

If your fan has a Controllable Pitch rotor, there is a set of bearings in the adjusting mechanism. A grease lead extends from these bearings along the adjusting lever to the outside of the fan at the intake. The adjusting lever should be moved toward the fan rotor as much as possible or to the highest blade angle when the grease is added through this fitting. See reverse side of this sheet for detailed lubrication instructions.

If the fan is handling contaminated air, the rotor should be disassembled, cleaned, inspected and lubricated periodically, the frequency depending upon the degree of contamination.

If the fan is a Belt Driven unit, the shaft bearings will have extended grease leads and these should be lubricated in accordance with instructions (reverse side of this sheet).

*If a motor lubrication instruction plate is mounted on the outside of the fan near one of the [illegible]

LUBRICATION

0034207

WARNING! DISCONNECT ALL POWER SOURCES FROM FAN TO AVOID ELECTRICAL SHOCK AND PERSONAL INJURY FROM ROTATING PARTS

Good preventive maintenance requires proper lubrication practices. Use only the recommended lubricants specified below. Follow the lubrication schedules as listed.

All bearing cavities and grease leads have been properly loaded by Joy prior to shipment. Fans which are to be installed promptly upon delivery require no additional lubrication.

From the lubrication schedules furnished below, determine the proper time for lubrication and grease all fittings with lubricant as specified within the following paragraphs. Use a hand operated grease gun only. **Do not overgrease as this can be as harmful as too little grease.** If unable to obtain the specified lubricant, contact the nearest Joy sales representative.

(1) **Motors** furnished in all Joy Series 800/1000/2000 fans require Chevron SRI #2 lubricant. All motors are factory equipped with spring loaded grease relief fittings. Fan rotor should be hand rotated during lubrication. Pump in grease until one (1) cubic inch of grease for 7.5 to 15 HP, two (2) cubic inches of grease for 20 to 100 HP, and three (3) cubic inches of grease for 125 HP and higher has been displaced by hand grease gun.

Some high horsepower motors have special bearings. These fans have a motor lubrication instruction plate mounted on the outside of the fan near one of the grease fittings. Follow the instructions on this plate in lieu of the standard instructions printed here.

(2) **Controllable pitch fans** require periodic lubrication for fan pitch control mechanisms and blade bearings (depending upon hub size) in addition to the fan motor bearings. Controllable pitch fans serialized SF-28530 and lower contain two (2) external grease leads for motor lubrication and two (2) internal grease fittings for the pitch control mechanism. Later fans serialized higher than SF-28530 contain two (2) motor and one (1) pitch control mechanism external grease leads.

(3) **Pitch control mechanisms** in controllable pitch fans require Chevron SRI #2 lubricant. Frequency of lubrication depends upon service duty. An external grease fitting is located on the end of the actuating bar of the lever assembly. Prior to lubrication, move the actuating bar toward the rotor assembly in order to adjust the blades to the highest angle setting. The grease relief cup should be held closed during the greasing operation. Pump in grease until it is seen oozing between the bearing housing and the adjusting disc. The purpose of this procedure is to properly lubricate the 2nd row of the double row bearing. The greasing must be done slowly with a **hand grease gun** to prevent rupture of the bearing shield.

(4) **Blade bearings** in controllable pitch fans require special Lubriplate #630AA lubricant. Frequency of lubrication depends upon service duty. The type of blade bearings depend upon the hub size. All controllable pitch fan blades have some type of thrust bearing and needle bearing to maintain blade radial position. The **17" hub** has Teflon type thrust and radial bearings which require no lubrication. The **26" hub** has Timken roller thrust bearings and McGill needle radial bearings which should be re-lubricated every 12 to 24 months depending upon service duty. This relubrication requires rotor disassembly. **Textile service and 30" hub** rotor assemblies utilize grease fittings at each blade socket, and these assemblies should be relubricated at least once per year.

(5) **Belt Drive fans** are equipped with Link-Belt Pillow Block type 300 Series Ball or 6800-6300 Series Spherical Roller Bearings, depending upon the fan shaft diameter. Extended grease leads are brought to the outside of the fan casing.

After lubrication, always operate motor for several minutes (at low blade angle for CP fans) to check for any unusual bearing noise. On controllable pitch fans, actuate the pitch control mechanism several cycles without motor on to observe smooth operation or bearing noise, and to purge excess grease. Wipe up any grease that may have been purged during lubrication.

LUBRICATION SCHEDULE

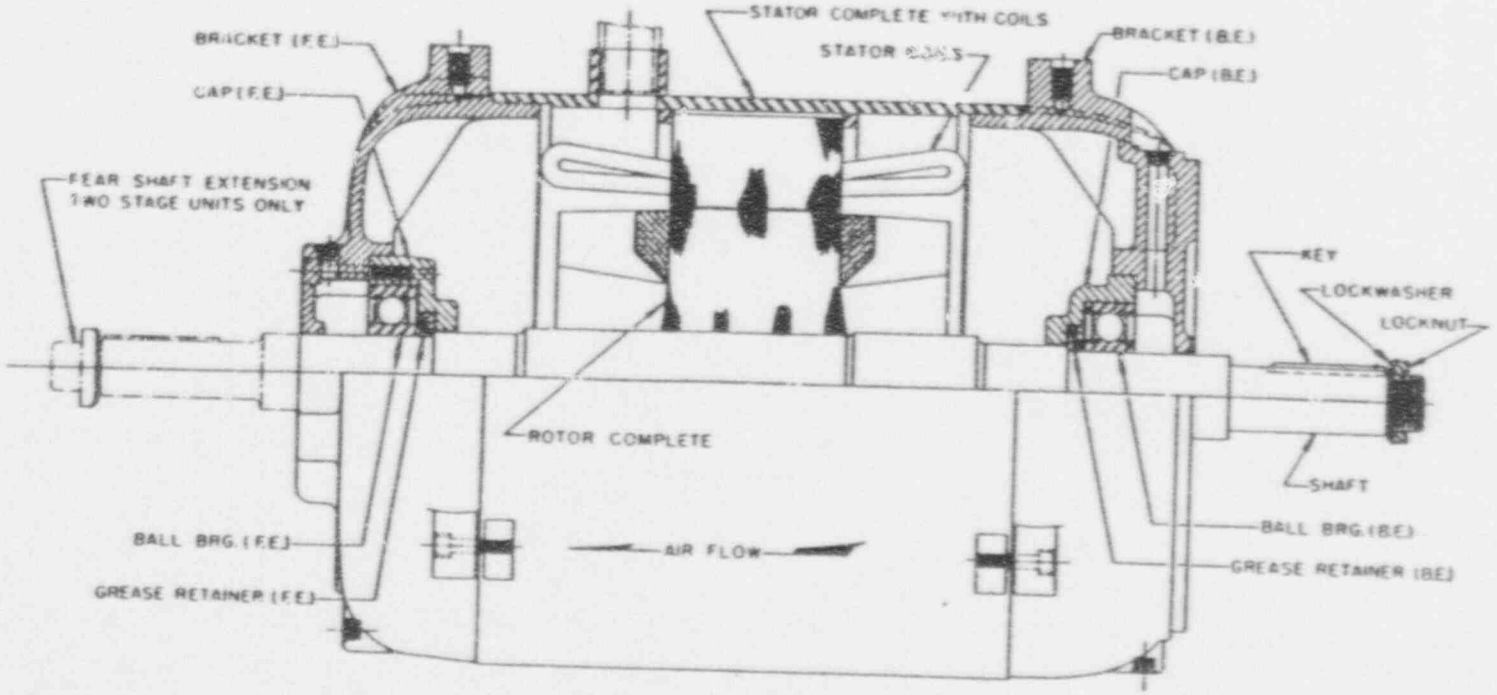
MOTOR HP	DIRECT DRIVE FANS (Internal Motor) — MOTOR BEARINGS — DUTY HRS/DAY & RPM							CONTROLLABLE PITCH FANS					BELT DRIVE FANS				
	STANDARD 8 HOUR DAY				SEVERE 24 HOURS			PITCH CONTROL MECH				BLADE BEARINGS	FAN SHAFT SIZE, DIA.	FAN SHAFT BEARINGS			
								STANDARD		SEVERE				STANDARD		SEVERE	
	690 & 870	1170	1770	3500	690 & 870	1170 & 1770	3500	(-) 1170	(+) 1170	(-) 1170	(+) 1170			(-) 1770	(+) 1770	(-) 1770	(+) 1770
7½	3 Yrs				1 Yr		3 Mos	6 Mos	3 Mos		1½ Mos	See Para. #4 Above	1-15/16"	6 Mos	3 Mos		1½ Mos
10																	
15	2 Yrs												2-7/16"				
20																	
25													2-15/16"				
30	1 Yr				6 Mos												
40																	
50								3 Mos	1½ Mos				3-1/2"				
60																	
75																	
100	6 Mos												3-15/16"				
125+																	

The following recommended lubricants have been selected for use with Joy Series 1000/2000 AXiVANE Fans. Joy does not recommend substitution of other manufacturing brands without first consulting our factory.

AMBIENT TEMPERATURES – MINUS 20 FAHR. TO 250 FAHR.

MOTORS, PITCH CONTROL MECHANISM & FAN SHAFT BEARINGS — CHEVRON SRI #2 (OR EQUIVALENT) — STANDARD OIL COMPANY OF CALIFORNIA, WEST; CALIFORNIA OIL COMPANY OF SYRACUSE, N.Y.

FAN BLADE BEARINGS ONLY — LUBRIPLATE 630AA — FISKE BROS. REFINERY, TOLEDO, OHIO



00034208

Figure 5

MOTOR NOMENCLATURE

FOR PARTS AND SERVICE FOR YOUR JOY EQUIPMENT PLEASE CONTACT THE JOY OFFICE NEAREST YOU

0034209

JOY MANUFACTURING COMPANY

GENERAL PRODUCTS GROUP

338 South Broadway • New Philadelphia, Ohio 44663

Your Local Representative is:

IN CANADA

Alberta, Calgary	330 9th Ave.
B. C., Vancouver	8427 Ontario St.
Manitoba, Winnipeg	118 Midland St.
Newfoundland, St. John's	Argyle Bldg. Argyle St.
Nova Scotia, Sydney	87 Charlotte St.
Ontario, Galt	175 Beverly St.
Ontario, Kirkland Lake	56 Main St.
Ontario, Sudbury	371 Spruce St.
Ontario, Cooksville	3156 Lenworth Dr.
Quebec, Montreal 9	8285 Mountain Sights Ave.

IN MEXICO

Mexico, D. F., Mexico 14	Calle Poniente 140 No 526

EXPORT OFFICES

Australia, N.S.W., Mascot	78-86 Kent Rd.
Belgium, Brussels 5	115 rue Defacqz
England, London	Joy-Sullivan, Ltd., 7 Harley St.
France, Paris	Joy Ville-Gozet, S.A., 30 Rue de Chabrol
Morocco, Casablanca	Cie Marocaine Joy, 299 Blvd. Mohammed V
Peru, Lima	Casilla 3111
Scotland, Greenock	Joy-Sullivan, Ltd., Cappielow
South Africa, Johannesburg	Joy-Sullivan (Africa) (Pty.) Ltd., 1 Steele St., Steeledale

When Writing About Your Equipment
Always Include This Machine Reference with Your Inquiry

TYPE_____ MODEL_____

SIZE_____ SHOP NO._____

BM 071867

PRINTED IN U. S. A.