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OPERATING & MAINTENANCE MANUAL SERIES 1406, TYPE 71-06

GENERAL DESCRIPTION

The 71-06 Series 1, 2, 3 & 6 are liquid level sensors that use a displacement sensing element. A level change creates an apparent displacer weight change according to the variable submergence of the element. This weight change transmitted through an inconel torque tube indicates the proportional change in level. Pneumatic or electronic controllers mounted to the level sensor provide an output to a control valve actuator to maintain a process level, and/or level indication.

The series options differ only in the manner in which they mount to the vessel. Each consists of a Displacement Element, a Cage Housing and a Torque Tube. Series 1, illustrated in Fig. 1, is top mounted with the Displacement Element extending into the vessel. Series 2 and 6, illustrated in Fig. 2, are available for applications requiring the Displacement Element to be self contained and mounted in Chambers outside the vessel. Chambers are available with either NPT or ANSI flanged process connections. Series 3, shown in Fig. 3, mounts directly to the side of the vessel.

A fabricated Torque Tube Housing, Figure 4, contains the Torque Tube Assembly (see Figure 5 for a cutaway view). The Connector Block end of the Torque Tube Housing mounts to the Cage Housing. A mounting plate for attaching the Controller Enclosure

is at the opposite end. The rotational center shaft connects directly to the controller. Manuals for both electronic and pneumatic controllers detail their operation and maintenance.

CONSTRUCTION

There is no requirement for stuffing boxes or packing glands for transmission of the rotational movement of the Torque Tube. The unit is of welded construction, frictionless, free from freezing or clogging, and all of its parts exposed to the vessel contents are inconel.

Orientation of the Torque Tube Housing to the Cage Housing is reversible, either right or left hand mounting, without additional parts or dismantling. See figures 1, 2, and 3 for examples of right hand mounts.

ORDERING PARTS

To order spare parts, specify the serial number and type number stamped on the name plate. Also required are the item number and part name obtained from Figures 1, 2, and 3.

SHIPPING PROCEDURE

A red Support Cup, inserted inside the Torque Tube Housing before shipment and secured by the Inspection Flange, protects

Caution: Before disassembly or maintenance, all pressures in this device must be relieved. Failure to relieve pressures may result in personal injury or device damage. The resulting uncontrolled venting or spilling of line fluids may cause personal injury, loss of process control or environmental contamination.

the Clip Spring during transit. The Series 1 and 3 units do not have Chambers to protect the Displacers and Torque Arms and require separate packing. Controllers, Pneumatic or Electronic, are shipped integrally connected to the Torque Tube Housing Flange.

INSTALLATION

1. After unpacking the unit, inspect it for any evidence of shipping damage. Any claims for damage due to shipping must be filed with the carrier who handled the shipment.

CAUTION: WHEN MAKING CONNECTIONS TO THE VESSEL, OBSERVE ALL SAFETY REQUIREMENTS OF THE AREA WHERE THE WORK IS TO BE DONE. BE ESPECIALLY CAREFUL OF PRESSURE VESSELS.

2. Remove the Inspection Cover Flange and remove and discard the red Shipping Support Cup (See Figure 4).

3. Install a Gasket (item 13), furnished in the attached envelope, to the Inspection Cover Flange. Secure the Inspection Cover Flange by uniformly torquing the six (6) 1/2-13 bolts to 34 ft lbs.

4. Install the Displacement Element on Series 1 and 3 units.

5. Verify the Displacement Element is hanging vertically and completely free of the vessel wall or other obstructions that might dampen its free response to changes of liquid level. The Displacement Element must not contact swirling, turbulent liquids.

CAUTION: Excessive weight may overstress the torque tube or Clip Spring. Standard element weight for Type 71-06 Series 1 and 2 is six (6) pounds. Series 3 standard element weight is three (3) pounds.

TROUBLESHOOTING

Check the entire installation when trouble occurs. Visual inspection pinpoints the source of many malfunctions.

TROUBLE	CAUSE	REMEDY
Sluggish Response	Obstructions around displacement element or in housing.	Disassembly and clean all parts.
Negligible response to change in level	Over stressed Torque Tube.	Readjust or replace Torque Tube.
	Leaking Displacement element.	Replace element.

DANGER: Vent pressure from the level sensor chamber or vessel before proceeding with disassembly.

Support the Displacement Element (item 1) in a fixed position when disassembling and repairing the Type 71-06 Level Sensor. Center the Torque Arm Assembly (item 14) in the float cage housing.

TORQUE TUBE ASSEMBLY (item 12) ADJUSTMENT

1. Clean out all connecting piping to remove any scale or rust that may be present.

2. Remove the Inspection Cover Flange (item 3).

a. Check for correct Clip Spring (item 8) seating and that screws (item 6) are tight.

b. Insert a screw driver blade through the inspection opening to lift and drop the Torque Arm Assembly (item 14). The Displacement Element should bounce or oscillate up and down freely.

3. If the Displacement Element fails to respond properly perform the following:

a. Remove the Controller Case (item 2) from the Torque Tube Assembly. See the Removal Instructions listed below for the type of Controller being serviced.

b. Loosen the Cap Screws (item 10) that hold the Torque Tube Housing (item 11) to the Torque Tube Housing Flange (item 9).

c. Place a 5/8" open end wrench on the exposed end of the Torque Tube assembly (item 12) and rotate to assume the full weight of the Displacement Element. Center the Torque Arm Assembly (item 14) in the Cage Housing (item 2). The Displacement Element should be free of obstructions.

d. While holding the wrench on the Torque Tube to maintain its position, uniformly tighten the Cap Screws (item 10). Tighten the bolts to 34 ft lbs and again check the Torque Arm Assembly bounce.

e. Replace all parts previously removed and return the unit to service.

REMOVAL -- PNEUMATIC LEVEL CONTROLLER

Refer to the Series 1400 Pneumatic Level Controller Operating and Maintenance Manual for item identification.

CAUTION: FULLY VENT PRESSURIZED VESSELS BEFORE PROCEEDING.

a. Adjust the liquid level for safe removal of the level sensor.

b. Shut off the supply air to the controller and disconnect the tubing from the case.

c. Disconnect the linkage between the Grav-O-Dex (item 21) and the Curve Piece (item 9).

d. Loosen the set screw that holds the Grav-O-Dex to the Torque Tube Assembly (item 12) and remove the Grav-O-Dex.

e. Remove the four (4) screws that hold the Controller Case (item 2) to the Torque Tube Housing Flange (item 9) and lift off the Controller Case.

f. Remove the Cap Screws (item 10) from the Inspection Cover Flange (item 3) and both ends of the Torque Tube Housing (item 11).

g. Remove the Torque Tube Assembly (item 12). If corrosion prevents easy separation of the Torque Tube from the Connector Block (item 7), tap the rounded end of the Torque Tube lightly to loosen.

h. If necessary, replace the Clip Spring (item 8) by loosening the top and bottom screws (item 6) and removing the spring from the Connector Block.

REMOVAL -- ELECTRONIC LEVEL CONTROLLER

Refer to the Series 1600 Electronic Level Controller Operating and Maintenance Manual for item identification.

CAUTION: FULLY VENT PRESSURIZED VESSELS BEFORE PROCEEDING.

a. Adjust the liquid level for safe removal of the level sensor.

b. Turn off the supply power and disconnect the current loop wires at the terminal strip inside the controller enclosure. Remove the conduit fittings and pull the current loop wires free of the enclosure.

c. Remove the Cap Screws (item 10) from the Inspection Cover Flange (item 3) and both ends of the Torque Tube Housing (item 11).

d. Insert a screw driver blade through the inspection opening to lift and hold the Torque Arm Assembly at its' approximate mid level point. Insert the Transducer Locking Pin into the hole at the bottom face of the Transducer Enclosure. This protects the transducer during servicing of the torque tube assembly.

e. Locate the ribbon cable at the top of the transducer assembly. Carefully unplug the ribbon cable connector from the electronic circuit.

f. Remove the four (4) screws that hold the controller case to the Torque Tube Housing Flange (item 9) and lift off the controller case.

g. Loosen the (4) set screws that hold the transducer assembly to the torque tube assembly and the set screw that attaches the transducer's flexible coupling to the torque tube shaft. Remove the transducer assembly.

h. Remove the Torque Tube Assembly (item 12). If corrosion prevents easy separation of the Torque Tube from the Connector Block (item 7), tap the rounded end of the Torque Tube lightly to loosen.

i. If necessary, replace the Clip Spring (item 8) by loosening the top and bottom screws (item 6) and removing the spring from the Connector Block.

SERVICE AND REASSEMBLY

Clean the Torque Tube Housing and Inspection Cover flange and check for scratches on the gasket surfaces. Replace the gasket(s) if they appear damaged. Clean out any sediment deposits that may have accumulated in the housing and remove corroded particles from all parts.

a. Insert the bayonet end of the Torque Tube Assembly into the Connection Block. Make

sure the Torque Tube pin fully seats into the slot in the Connection Block.

b. Replace the Torque Tube Housing Flange and hand-tighten the Cap Screws.

c. Place a 5/8" open end wrench on the exposed end of the Torque Tube assembly (item 12) and rotate to assume the full weight of the Displacement Element. Center the Torque Arm Assembly (item 14) in the Housing (item 2). The Displacement Element should be free of obstructions.

d. To complete re-assembly, reverse the disassembly steps for the appropriate Controller type.

NOTES:

PNEUMATIC CONTROLLERS: Before connecting the controller linkage to the end of the Torque Tube, make sure the liquid level is not in contact with the Displacement Element.

ELECTRONIC CONTROLLERS: Retain the Transducer Locking Pin. It provides protection for the Transducer and Torque Tube during servicing and handling. Refer to the Series 1600 Operating & Maintenance manual for calibration instructions.

e. Verify Controller calibration before returning the system to service.

FIGURE 1. 71-06 Series 1

TYPE 71-06 LIQUID LEVEL
CONTROLLER

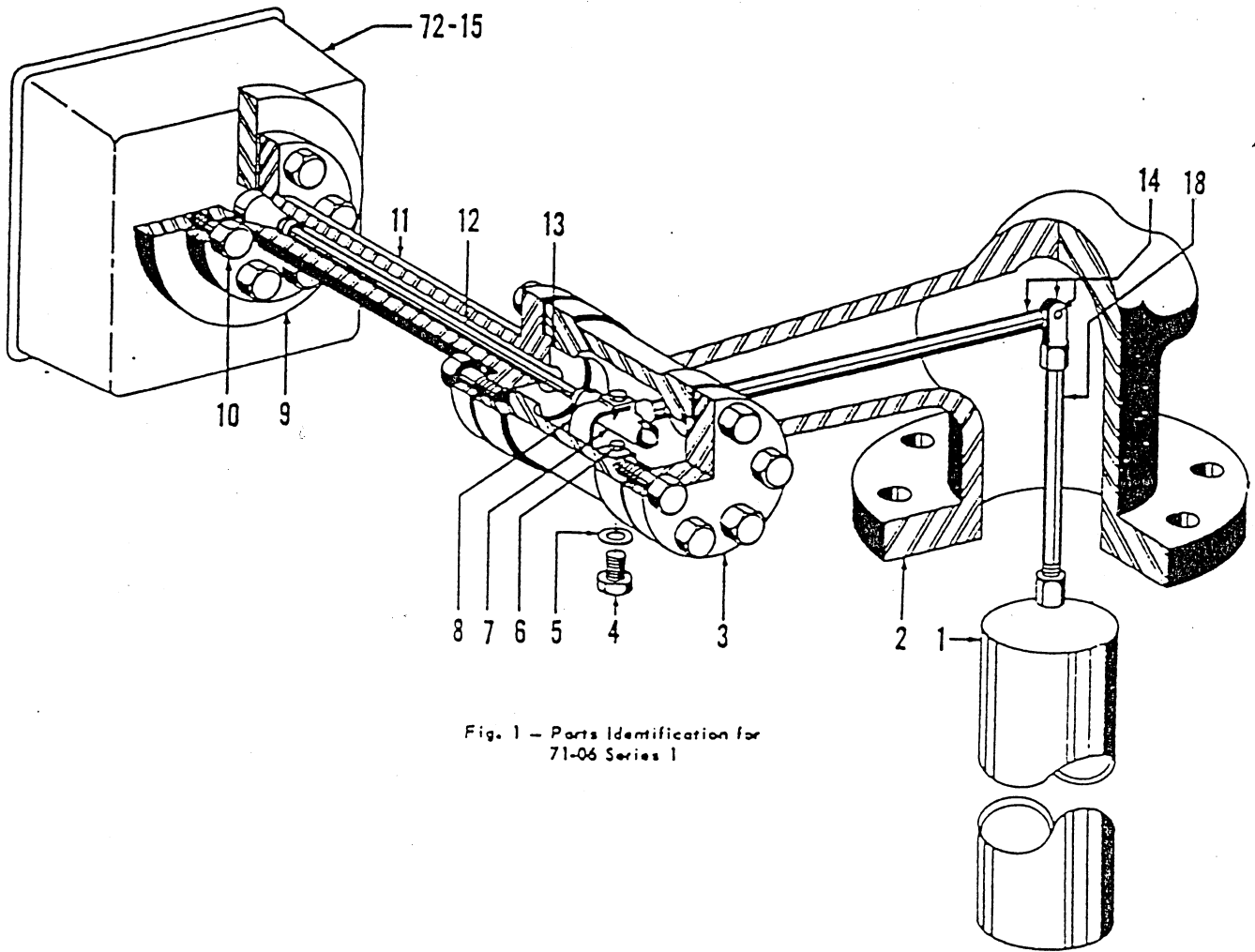


Fig. 1 - Parts Identification for
71-06 Series 1

ITEM	PART NAME
1	Displacement Element
2	Housing
3	Inspection Flange
*4	Clip Stud
*5	Clip Stud Gasket
6	Machine Screw
7	Connector Block
*8	Clip Spring
9	Torsion Tube Housing Flange
10	Cap Screw
11	Torsion Tube Housing
*12	Torque Tube Assembly
*13	Torsion Tube Housing Gasket
14	Torque Arm Assembly
15	Cage
16	Studs and Nuts (Series 2 Only)
*17	Body Gasket
18	Hanger (Series 1 Only)

*Recommended Spare Parts

FIGURE 2. 71-06 Series 2

TYPE 71-06 LIQUID LEVEL
CONTROLLER .

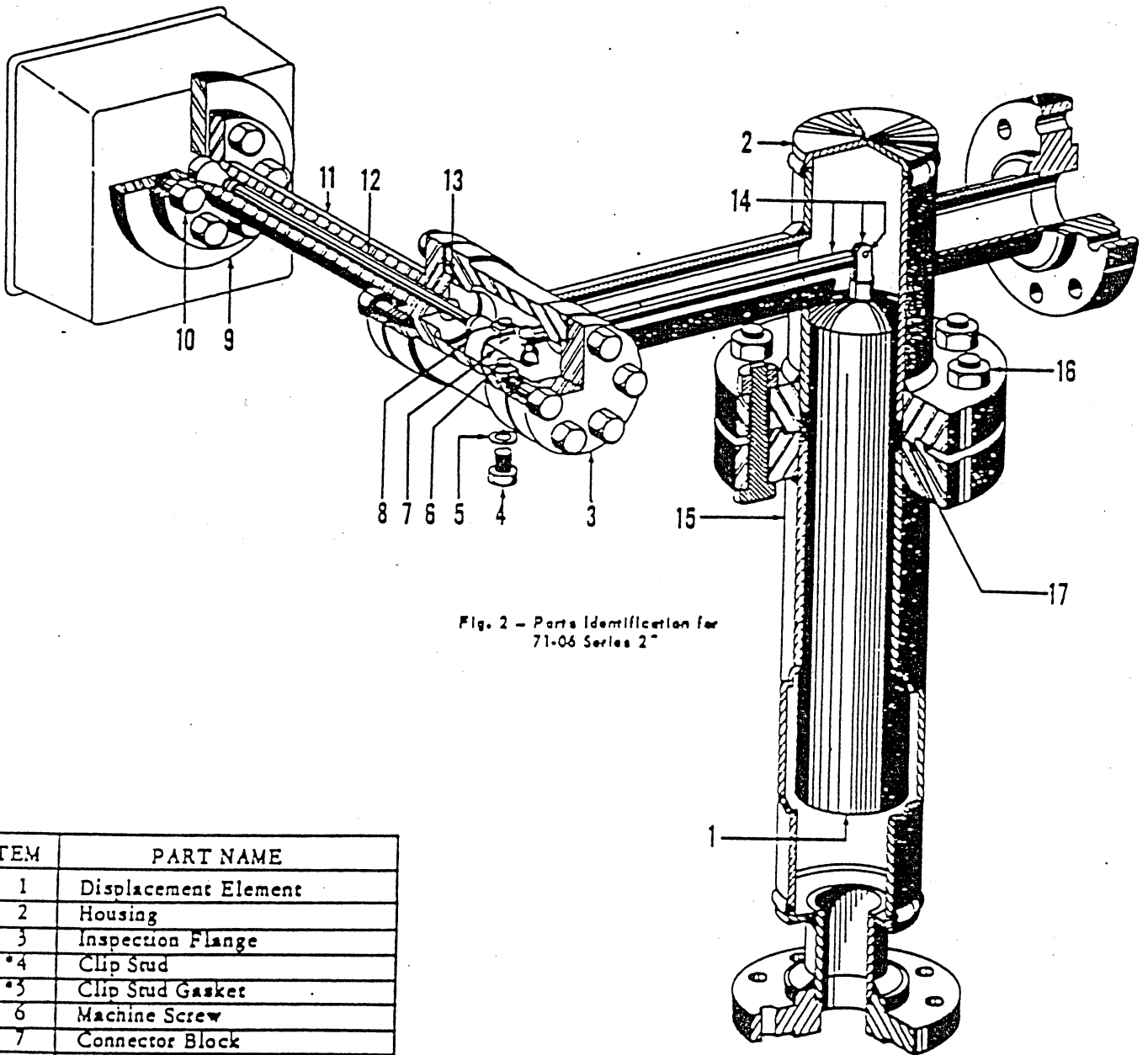


Fig. 2 - Parts Identification for
71-06 Series 2

ITEM	PART NAME
1	Displacement Element
2	Housing
3	Inspection Flange
*4	Clip Stud
*5	Clip Stud Gasket
6	Machine Screw
7	Connector Block
*8	Clip Spring
9	Torsion Tube Housing
10	Cap Screw
11	Torsion Tube Housing Flange
*12	Torque Tube Assembly
*13	Torsion Tube Housing Gasket
14	Torque Arm Assembly
15	Cage
16	Studs and Nuts (Series 2 Only)
*17	Body Gasket
18	Hanger (Series 1 Only)

* Recommended Spare Parts

FIGURE 3. 71-06 Series 3

TYPE 71-06 LIQUID LEVEL
CONTROLLER

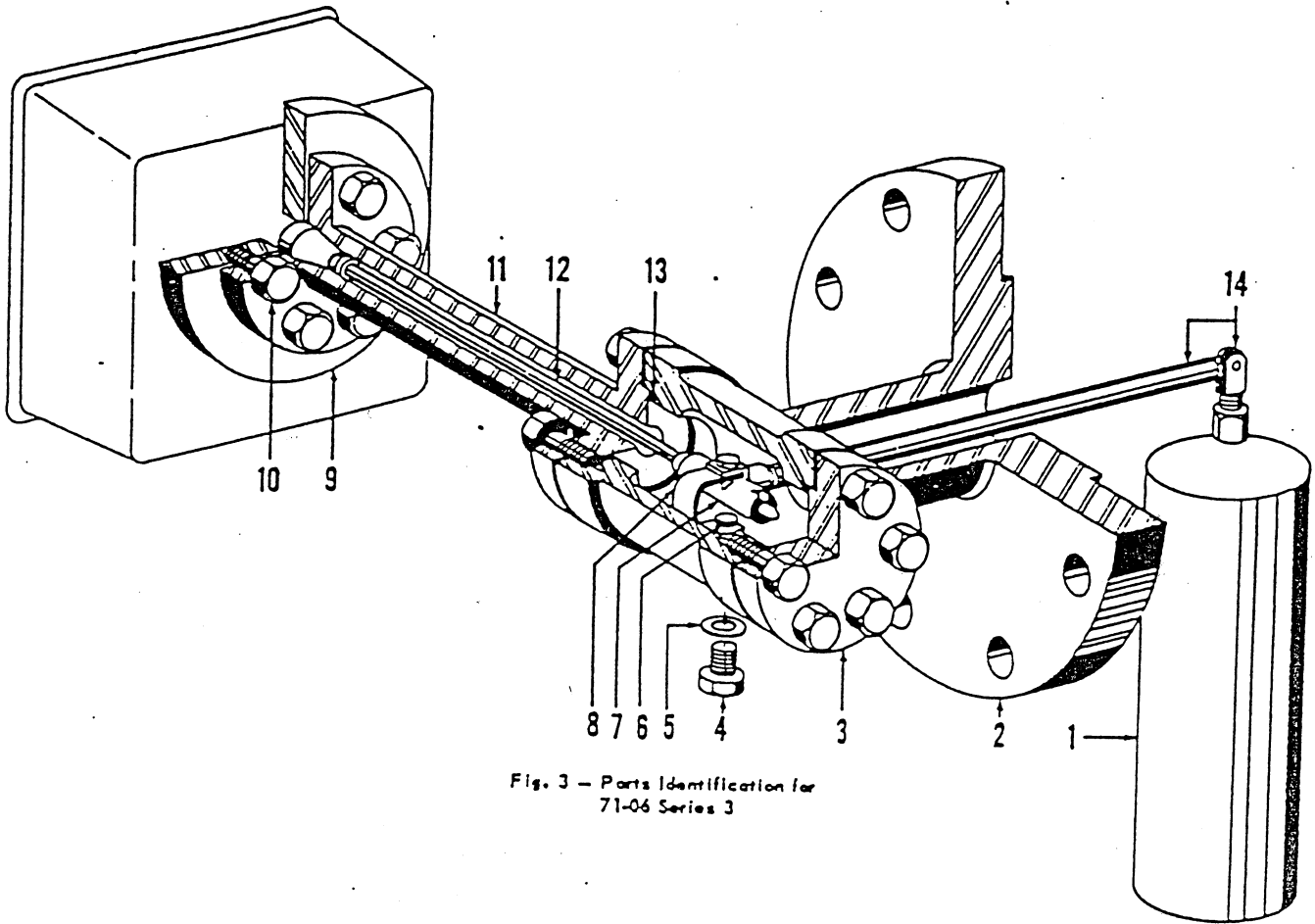


Fig. 3 - Parts Identification for
71-06 Series 3

ITEM	PART NAME
1	Displacement
2	Housing
3	Inspection Flange
*4	Clip Stud
*5	Clip Stud Gasket
6	Machine Screw
7	Connector Block
*8	Clip Spring
9	Torsion Tube Housing Flange
10	Cap Screw
11	Torsion Tube Housing
*12	Torque Tube Assembly
*13	Torsion Tube Housing Gasket
14	Torque Arm Assembly
15	Cage
16	Studs and Nuts (Series 2 Only)
*17	Body Gasket
18	Hanger (Series 1 Only)

* Recommended Spare Parts

FIGURE 4 and FIGURE 5

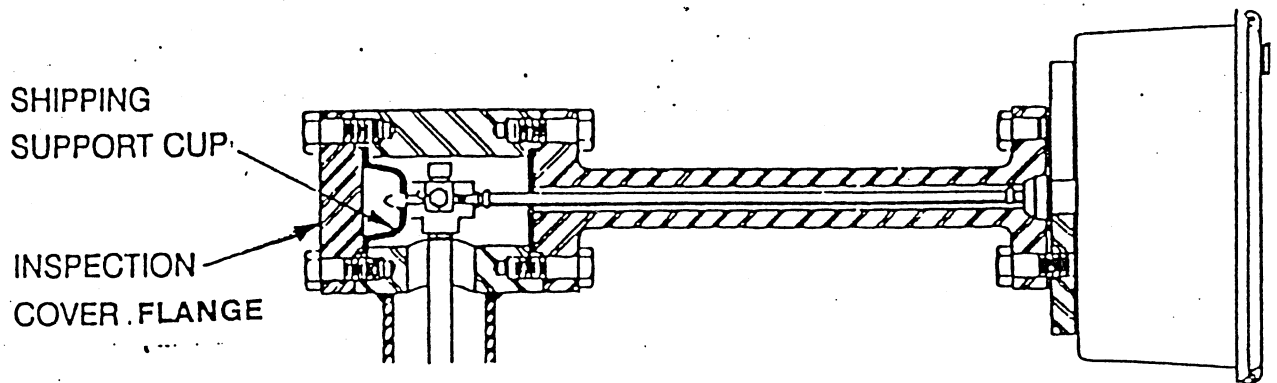


Fig. 4

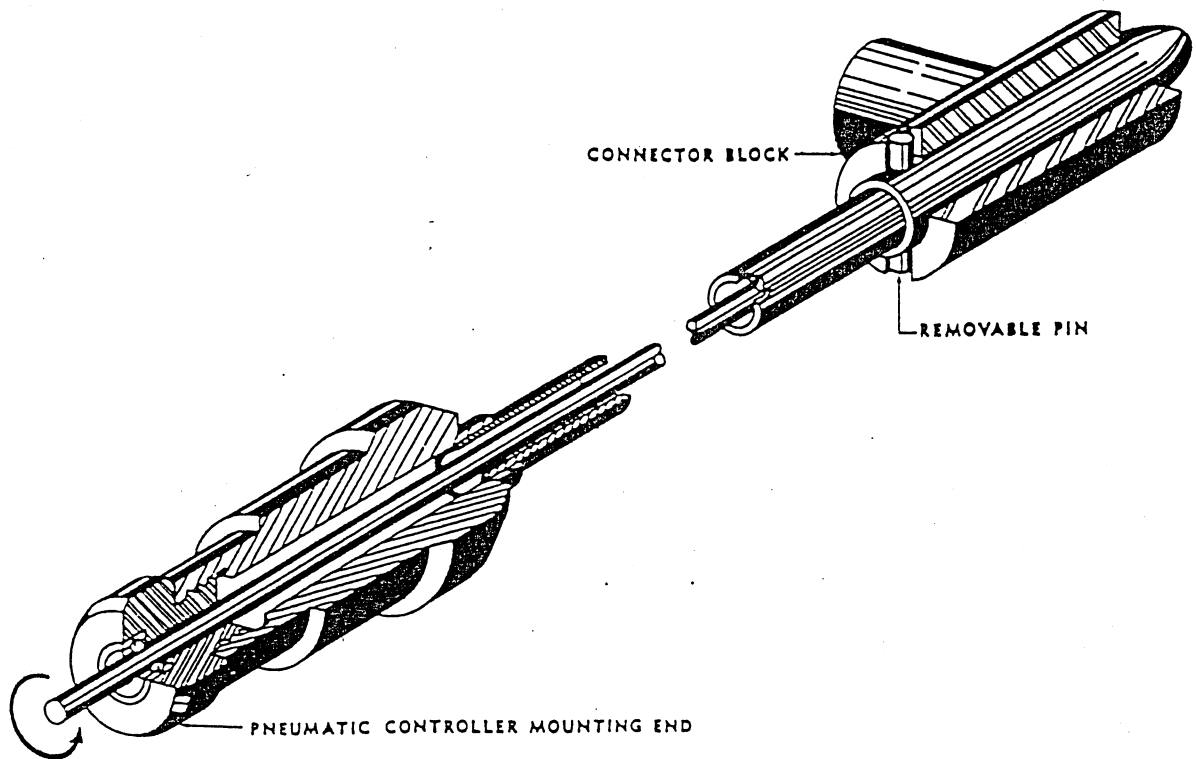


Fig. 5—Torque Tube for Level Controller