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CRUTCHFIELD,D. Operating Reactors Branch 5

SUBJECT: Forwards info to suppl 820413 incident evaluation rept. Info updates Section 5.2, "Pressurized Power Operated Relief Valves," manufacturer bulletin for ASCO three-way solenoid valve & outline drawing of steam line safety valve.

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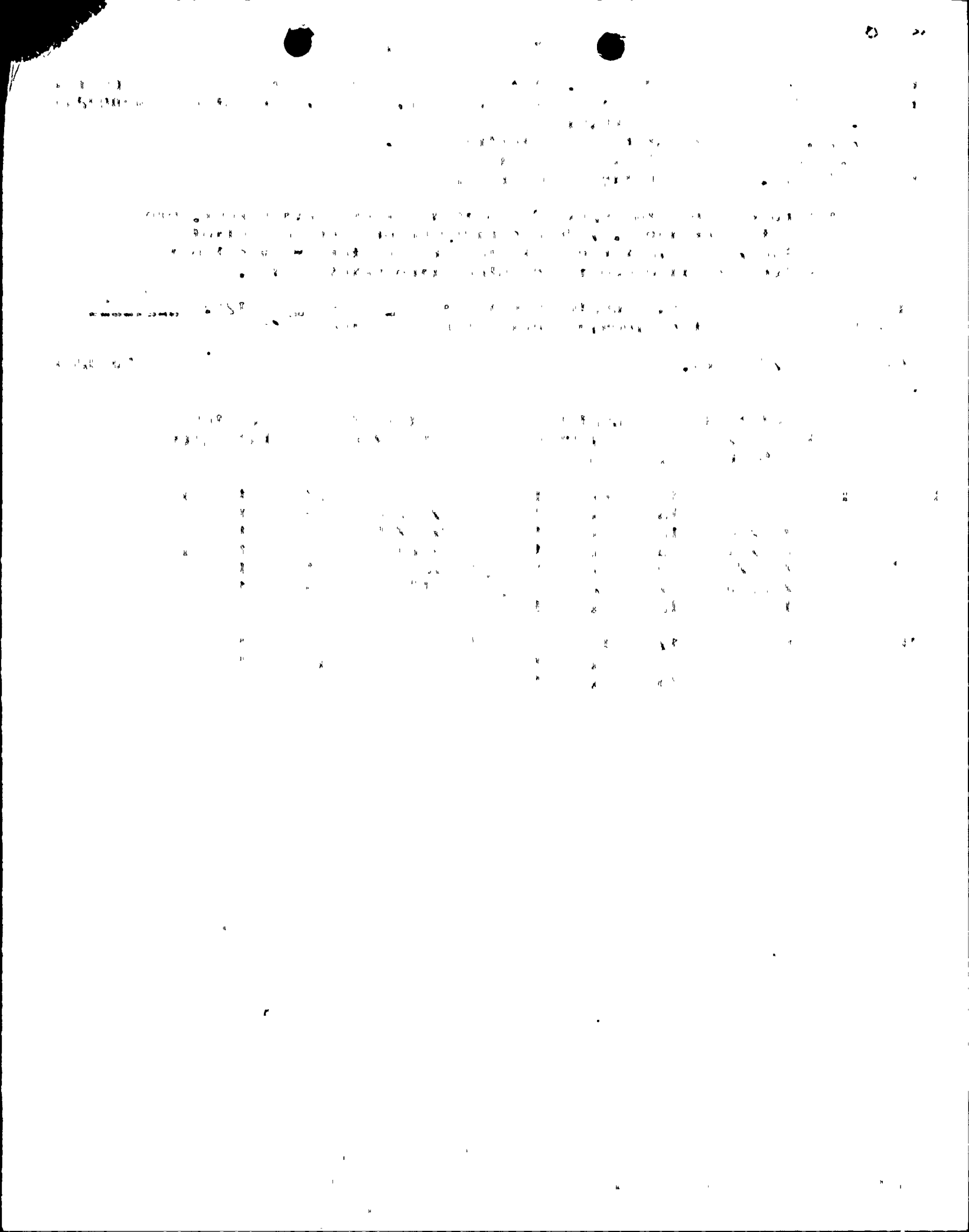

ROCHESTER GAS AND ELECTRIC CORPORATION • 89 EAST AVENUE, ROCHESTER, N.Y. 14649

JOHN E. MAIER
Vice President

TELEPHONE
AREA CODE 716 546-2700

April 26, 1982

Director of Nuclear Reactor Regulation
Attention: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Incident Evaluation
Steam Generator Tube Rupture Incident
R. E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Crutchfield:

This letter is in response to requests from members of the NRC Staff for information to supplement our Incident Evaluation Report, which was submitted by letter dated April 13, 1982. Attachment A supplements Section 5.2, Pressurizer Power Operated Relief Valves. Attachment B is the manufacturer's bulletin for the ASCO three-way solenoid valve discussed in Section 5.2. Attachment C is an outline drawing of the steam line safety valve, which is described in Section 5.4, B-Main Steam System.

Very truly yours,

John E. Maier

Attachments

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Attachment A

The following information supplements the discussion presented in Section 5.2 of the Incident Evaluation, Steam Generator Tube Rupture, submitted to the NRC by letter dated April 13, 1982.

(1) The instrument air system used in the EPRI PORV testing programs contained an ASCO NP 8316 with a C_v of 5.5. This solenoid valve was remotely mounted and is a model identical to valves SV 8620A&B used in the Ginna PORV instrument air system. The exhaust port on the solenoid valves in the EPRI system was not restricted.

(2) Ginna solenoid valve SV 8620A is located approximately 88 inches away from PORV PCV-430. Solenoid valve SV-8620B is located approximately 83 inches away from PORV PCV-431C.

(3) The elastomer used in the SV-8620 A&B solenoid valves is ethylene propylene.

(4) Following the initial removal of SV-8620A from the PORV air supply, the solenoid valve was disassembled, inspected and reassembled. All internal components were found to be in satisfactory condition and were re-used in the reassembly.

(5) The full travel of the solenoid valve diaphragm is approximately 1/32 of an inch. It is calculated that a change in temperature of 2°F is sufficient to cause a 1% movement (.0003") of the diaphragm due to solenoid valve body expansion.

(6) The instrument air system supply at Ginna consists of three oil free air compressors, with after coolers, air receivers, and instrument air dryers with prefilters and afterfilters. During normal operation one instrument air compressor provides sufficient air for the instrument services and normal air pressure should be between 100 to 125 psig. An automatic valve connects the service and instrument air system to provide a back-up supply in the event instrument air system pressure drops below 90 psig. The service air system compressor is not oil free, however, the prefilter ahead of the air dryer will remove 99% of all incident oil at those times when service air enters the instrument air system.

(7) The solenoid valve which had been installed in service as valve SV-8620A, and a similar valve from stock, were tested to investigate possible failure mechanisms. These tests are described in NUREG-0909, "NRC Report on the January 25, 1982 Steam Generator Tube Rupture at R. E. Ginna Nuclear Power Plant" on pages 7-23 to 7-27. Briefly, the testing which was performed is as follows.

a) The SV-8620A solenoid valve was tested in the Instrument & Control Shop using the same exhaust restriction when the valve was in place in the air system. Using this restriction and alternately energizing and de-energizing the solenoid, it was not possible to cause the valve to malfunction.

b) A small valve was then placed in the outlet of the solenoid valve exhaust port to further restrict the exhaust flow. The exhaust port flow was then progressively restricted until the solenoid valve malfunctioned. With this restriction, the de-energized solenoid valve would retain "cylinder" port pressure and was repeatable approximately 3 times out of 10.

c) The solenoid valve was reinstalled in the air supply to the PORV and the exhaust port restriction was replaced once again with a small valve. Results similar to the bench tests were obtained with the solenoid valve "cylinder" port pressure being retained, but with no increase in pressure. In all of these tests, a severely restricted exhaust was required to produce malfunction.

d) The next set of bench tests was performed on a similar model ASCO valve from stock. This valve was tested with an air chamber to simulate the PORV actuator and with a small valve to simulate the exhaust port restriction. The results of this testing were similar to that previously achieved with one significant additional observation. With the exhaust port outlet restriction open just enough to allow valve operation, the valve was de-energized. As soon as the valve began venting out the exhaust port, the port was further restricted. This caused the pressure in all ports to increase back to supply pressure. The valve remained in this condition until the exhaust port was re-opened to greater than the original restricted area. This type of action closely reassembled that which would be required to cause the PORV to start closed and then reopen.

INSTALLATION AND MAINTENANCE INSTRUCTIONS

3-WAY NUCLEAR POWER PLANT SOLENOID-OPERATED PILOT VALVES
NORMALLY CLOSED AND NORMALLY OPEN OPERATION
3/4 NPT – 11/16 ORIFICE
INSTRUMENT AIR SERVICE

BULLETIN 8316
ASCO
Form No. V5968R1

DESCRIPTION

Bulletin 8316 valves with Prefix "NP" in the catalog number are 3-way diaphragm-operated, pilot-controlled solenoid valves designed as nuclear power plant pilot valves. Valves are of brass construction with only four moving parts — a core assembly, two diaphragm assemblies and a disc holder sub-assembly. Internal valve parts are of stainless steel/ethylene propylene for oil-free, or stainless steel/VITON* construction for non-oil free instrument air service (Suffix "V"). Valves may have a Watertight, NEMA Type 6 Solenoid Enclosure, or they may be equipped with an Explosion-Proof/Watertight Solenoid Enclosure which is designed to meet NEMA Type 4 Watertight, NEMA Type 7 (C or D) Hazardous Locations — Class I, Groups C or D and NEMA Type 9 (E, F or G) Hazardous Locations — Class II, Groups E, F or G. Installation and Maintenance Instructions for this solenoid enclosure are shown on Form No. V5380.

OPERATION

Normally Closed

Solenoid De-energized: Flow is from Cylinder "A" to Exhaust "E." Pressure "P" connection is closed.

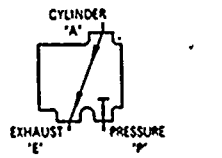
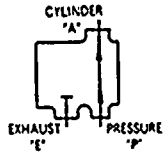
Solenoid Energized: Flow is from Pressure "P" to Cylinder "A." Exhaust "E" connection is closed.

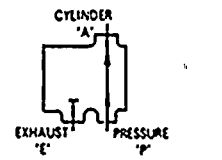
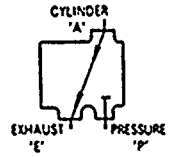
Normally Open

Solenoid De-energized: Flow is from Pressure "P" to Cylinder "A." Exhaust "E" connection is closed.

Solenoid Energized: Flow is from Cylinder "A" to Exhaust "E." Pressure "P" connection is closed.

NOTE: To change from normally closed operation to normally open operation, the brass pilot insert and disc holder spring must be replaced. Consult ASCO.

NORMALLY CLOSED FLOW DIAGRAMS	
DE-ENERGIZED	ENERGIZED
	

NORMALLY OPEN FLOW DIAGRAMS	
DE-ENERGIZED	ENERGIZED
	

IMPORTANT: A minimum operating pressure differential of 10 psi is required; however, valve vents to "0" psi.

MANUAL OPERATOR (Optional)

Manual operator allows manual operation during an interruption of electrical power or when otherwise desired. To operate valve manually, rotate manual operator stem clockwise 180°. Valve will now be in the same position as when the solenoid is energized. Rotate manual operator stem counterclockwise 180° before operating valve electrically.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

POSITIONING

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertical and upright so as to reduce the possibility of foreign matter accumulating in the core tube area.

MOUNTING

For mounting bracket hole dimensions refer to Figure 2.

*DuPont's registered trademark.

PIPING

Connect piping or tubing to valve according to markings on valve body. Refer to flow diagrams provided. CAUTION: Valves supplied for oil-free instrument air service are equipped with ethylene propylene elastomers which can be attacked by oils and greases. Wipe the pipe threads clean of cutting oils. This precaution does not apply to valves with Viton elastomers (Suffix "V" in catalog numbers). Piping to all valve ports should be oriented such that any accumulated moisture (particularly LOCA chemical spray) will not enter the internal areas of the valve. For applications where exhaust piping is not required, install a downward-directed street elbow in the valve exhaust port. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter the valve and cause operational difficulty. Pipe strain on valve body should be avoided by proper support and alignment of piping. When tightening connections, do not use valve body or solenoid as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point.

To insure proper operation of the valve, the pressure and exhaust lines must be full area without restriction. A minimum differential pressure as stamped on the nameplate must be maintained between pressure and exhaust at the moment of changeover. Air reservoirs must have adequate capacity to maintain this minimum pressure during changeover. To check pressure during changeover, install a pressure gauge in the pressure connection as close to the valve as possible.

IMPORTANT: For the protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending on service conditions. See Bulletins 8600 and 8601 for strainers.

As an additional precaution against malfunction on start-up, resulting from large particles of pipe scale, weld splatter, or other debris in pipe line, these valves have a large-mesh screen (not a filter) at inlet. This screen is not a substitute for the strainers or filters recommended above, whose function is to provide continuous straining or filtration of the line fluid.

FLOW CONTROLS (Speed or Metering Devices)

Flow Control Valves (Speed or Metering Devices) may be added to allow full unrestricted flow in one direction and controlled flow in the opposite direction. These flow control valves must be located in Cylinder "A" piping between the solenoid valve and the cylinder. IMPORTANT: Do not install Flow Controls (Speed or Metering Device) or any type of restrictive device in either the Pressure "P" (inlet) connection or the Exhaust "E" (outlet) connection of the valve. Restricting either of these lines may cause valve malfunction.

WIRING

Wiring must comply with all applicable Local and National Electrical Codes. Housings are provided with a 1/2 NPS or 3/4 NPT conduit connection. Connect wiring through a conduit of suitable quality for the expected environment to a vented electrical junction box located in the same area as the valve. The conduit/junction box system should be oriented such that any accumulated moisture or LOCA spray will not run into the solenoid enclosure. The watertight solenoid enclosure may be rotated to facilitate wiring. Refer to Form No. V5380 for the method used to rotate the explosion-proof/watertight solenoid enclosure.

NOTE: Alternating Current (A-C) and Direct Current (D-C) solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid, including the solenoid base sub-assembly and core assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous-duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power supply and depressurize valve before making repairs. It is not necessary to remove the valve from the pipe line for repairs.

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary depending on medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean valve strainer or filter when cleaning solenoid valve.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible. Use instrument quality air, oil-free for Suffix "E."
2. While in service, operate valve periodically to insure proper opening and closing.

Form No. V5968R1 PRINTED IN U.S.A. 1981 Automatic Switch Co.
ASCO Valves
FLORHAM PARK, NEW JERSEY 07932

3. Periodic inspection (depending upon medium and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.
4. The valves may require periodic replacement of the coil and all resilient parts during their installed life to maintain qualification. The exact replacement period will depend on ambient and service conditions. Spare Parts Kits and Coils are ordered separately (see Ordering Information). Consult ASCO for specific recommendations in connection with the replacement of parts.

IMPROPER OPERATION

1. Faulty Control Circuit: Check the electrical system by energizing the solenoid. A metallic click signifies solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open-circuited or grounded coil, broken lead wires or splice connections.
2. Burned-Out Coil: Check for open-circuited coil. Replace coil if necessary.
3. Low Voltage: Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating for A-C and non-battery operated D-C valves. Voltage must be at least 72% of nameplate rating for battery-operated D-C valves.
4. Incorrect Pressure: Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. Excessive Leakage: Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT

Refer to Form No. V5380 for Explosion-Proof/Watertight Solenoid Enclosure.

Turn off electrical power supply and disconnect coil lead wires. For A-C (Alternating Current) Construction, refer to Figure 2. For D-C (Direct Current) Construction, refer to Figure 1. Proceed in the following manner:

1. Loosen cover screws (3) and remove cover with screws, cover gasket and nameplate.
2. Unscrew and remove retaining clip from solenoid base sub-assembly.
3. For A-C construction, remove yoke containing spring washer, coil and insulating washers (2). For D-C construction, remove coil washers (2), coil and insulating washers (2). Insulating washers (2) are omitted when a molded coil is used.
4. Reassemble in reverse order of disassembly, paying careful attention to exploded view provided for identification and placement of parts.
5. When replacing retaining clip, tighten until retaining clip is not free to rotate, approximately 9/32 of an inch between screw head and nut.
6. Torque cover screws evenly to 10 inch-pounds [1,1 newton meters] to insure proper gasket compression.

CAUTION: Solenoid must be fully reassembled, as the housing and internal parts are part of and complete the magnetic circuit. Place an insulating washer at each end of coil, if required.

VALVE DISASSEMBLY (Refer to Figures 1, 2 & 3.)

Depressurize valve and turn off electrical power supply.

1. Disassemble valve in an orderly fashion, paying careful attention to exploded views provided for identification of parts.
2. Loosen cover screws and remove cover with screws, cover gasket and nameplate. For Explosion-Proof/Watertight Solenoid Enclosure, refer to Installation and Maintenance Instructions, Form No. V5380.
3. Unscrew and remove retaining clip from solenoid base sub-assembly.
4. For A-C (alternating current) construction, slip yoke containing spring washer, coil and insulating washers (2) off the solenoid base sub-assembly. For D-C (direct current) construction, slip coil washers (2), insulating washer, coil and insulating washer off the solenoid base sub-assembly. NOTE: Insulating washers (2) are omitted when a molded coil is used.
5. If the valve being serviced has a manual operator, (Suffix "MO" in catalog number) refer to paragraph "Manual Operator Disassembly."
6. Unscrew solenoid base sub-assembly with special wrench adapter supplied in Spare Parts Kit (Wrench Adapter Order No. 206-400-1).
7. Remove solenoid base sub-assembly, upper solenoid base gasket, housing, retainer gasket, retainer and core assembly with core spring and core guide (A-C construction only).
8. Remove solenoid base gasket from valve body.
9. A 4-40 machine screw provided in the Spare Parts Kit serves as a tool to remove insert from valve body. Turn the screw a few turns into the threaded hole located in the flat surface of insert. CAUTION: Do not damage center hole (pilot orifice) in raised surface of insert. Remove insert by using a pair of pliers on the head of screw.
10. Remove gasket (3) from insert. Tag each as it is removed so that it can be reassembled in the same location. Middle and lower insert gaskets are identical.
11. Remove disc holder sub-assembly and disc holder spring. The solenoid pilot is now completely disassembled.
12. Remove bonnet screws (4), valve bonnet, body passage gasket, retaining ring, diaphragm assembly and body gasket from each end of the valve body. NOTE: To familiarize yourself, compare diaphragm assembly identification with that in Figure 2 and notes after Step 3 under "Valve Reassembly."
13. All parts are now accessible for cleaning or replacement. Clean all internal passageways thoroughly before valve reassembly. Replace worn or damaged parts with a complete Spare Parts Kit for best results. When installing a complete Spare Parts Kit, it is recommended that the coil also be replaced.

VALVE REASSEMBLY

1. Reassemble in reverse order of disassembly, paying careful attention to exploded views provided for identification and placement of parts. Parts must be installed in the same location from where they were removed.
2. Lubricate all gaskets (except cover gasket) with a light coat of DOW CORNING® 550 Fluid lubricant (supplied in Spare Parts Kit).
3. Read "IMPORTANT" instructions below and install body gaskets, diaphragm assemblies, retaining rings and body passage gaskets in each end of valve body.

IMPORTANT: Valves per catalog numbers with Suffix "E" are provided with diaphragm assemblies and seals of ethylene propylene construction. The "PRESSURE DIAPHRAGM ASSEMBLY" has a wire in the eyeletted bleed hole for identification and must be installed on the pressure side of the valve body. The "EXHAUST DIAPHRAGM ASSEMBLY" has no wire in the eyeletted bleed hole and must be installed on the exhaust side of the valve body. If diaphragm assemblies are installed incorrectly, valve will malfunction.

IMPORTANT: Valves per catalog numbers with Suffix "V" are provided with diaphragm assemblies and seals of Viton construction. The "EXHAUST DIAPHRAGM ASSEMBLY" has a flat cut over one corner screw hole for identification and must be installed on the exhaust side of the valve body. The "PRESSURE DIAPHRAGM ASSEMBLY" has full radii on all screw holes and must be installed on the pressure side of the valve body. If diaphragm assemblies are installed incorrectly, valve will malfunction.

NOTE: On older valves with ethylene propylene construction (catalog numbers with Suffix "E"), the "EXHAUST DIAPHRAGM ASSEMBLY" has a flat cut over one corner screw hole for identification.

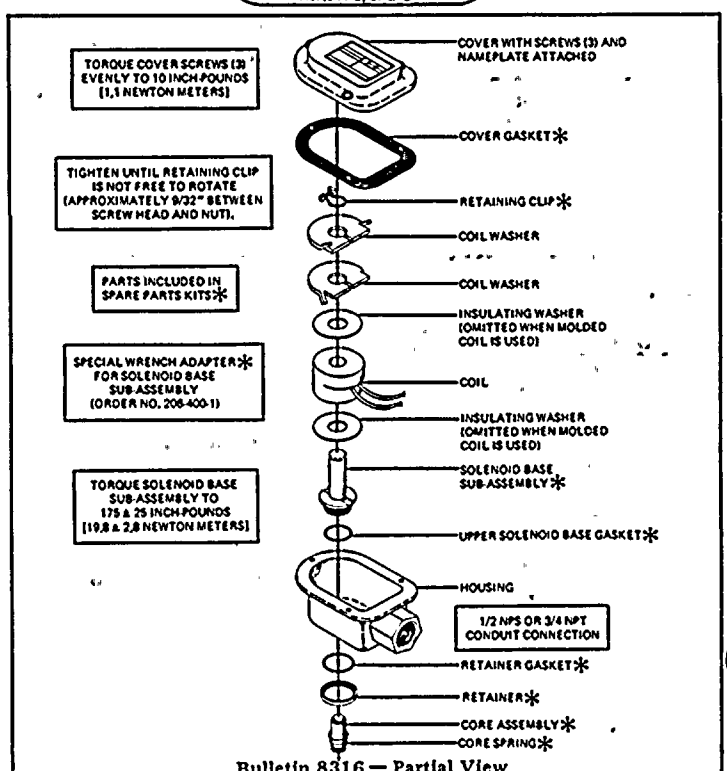
4. Replace valve bonnet and bonnet screws. Torque bonnet screws in a crisscross manner to 95 ± 10 inch-pounds [10,7 ± 1,1 newton meters].
5. Replace lower insert gasket in body recess, disc holder spring, disc holder sub-assembly and insert with upper and middle insert gaskets (these snap into grooves of insert). Middle and lower insert gaskets are identical.
6. Position solenoid base gasket on insert.
7. If the valve being rebuilt has a manual operator, refer to paragraph "Manual Operator Reassembly."
8. Install upper solenoid base gasket in solenoid base sub-assembly groove.
9. Position solenoid base sub-assembly in solenoid housing and install retainer gasket and retainer at base of solenoid base sub-assembly.
10. Place core assembly with core spring and core guide (A-C Construction Only) into solenoid base sub-assembly.
11. Install solenoid base sub-assembly using special wrench adapter provided in Spare Parts Kit (wrench adapter order No. 206-400-1). Torque solenoid base sub-assembly to 175 ± 25 inch-pounds [19,8 ± 2,8 newton meters].
12. For A-C (Alternating Current) Construction, replace insulating washers (one at each end of coil), coil and spring washer in yoke. Slip yoke over solenoid base sub-assembly. For D-C (Direct Current) Construction, replace insulating washer, coil, insulating washer and coil washers (2).
13. Replace retaining clip and tighten until retaining clip is not free to rotate, approximately 9/32 of an inch between screw head and nut.
14. Replace cover gasket and cover with nameplate and screws. Torque cover screws evenly to 10 inch-pounds [1,1 newton meters] to insure proper gasket compression.
15. After maintenance, operate the valve a few times to be sure of proper operation. A metallic click signifies the solenoid is operating.

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils, Specify Valve Catalog Number, Serial Number, Voltage and Hertz A-C, or D-C



Bulletin 8316 — Partial View

Figure 1. Showing D-C (Direct Current) Construction.

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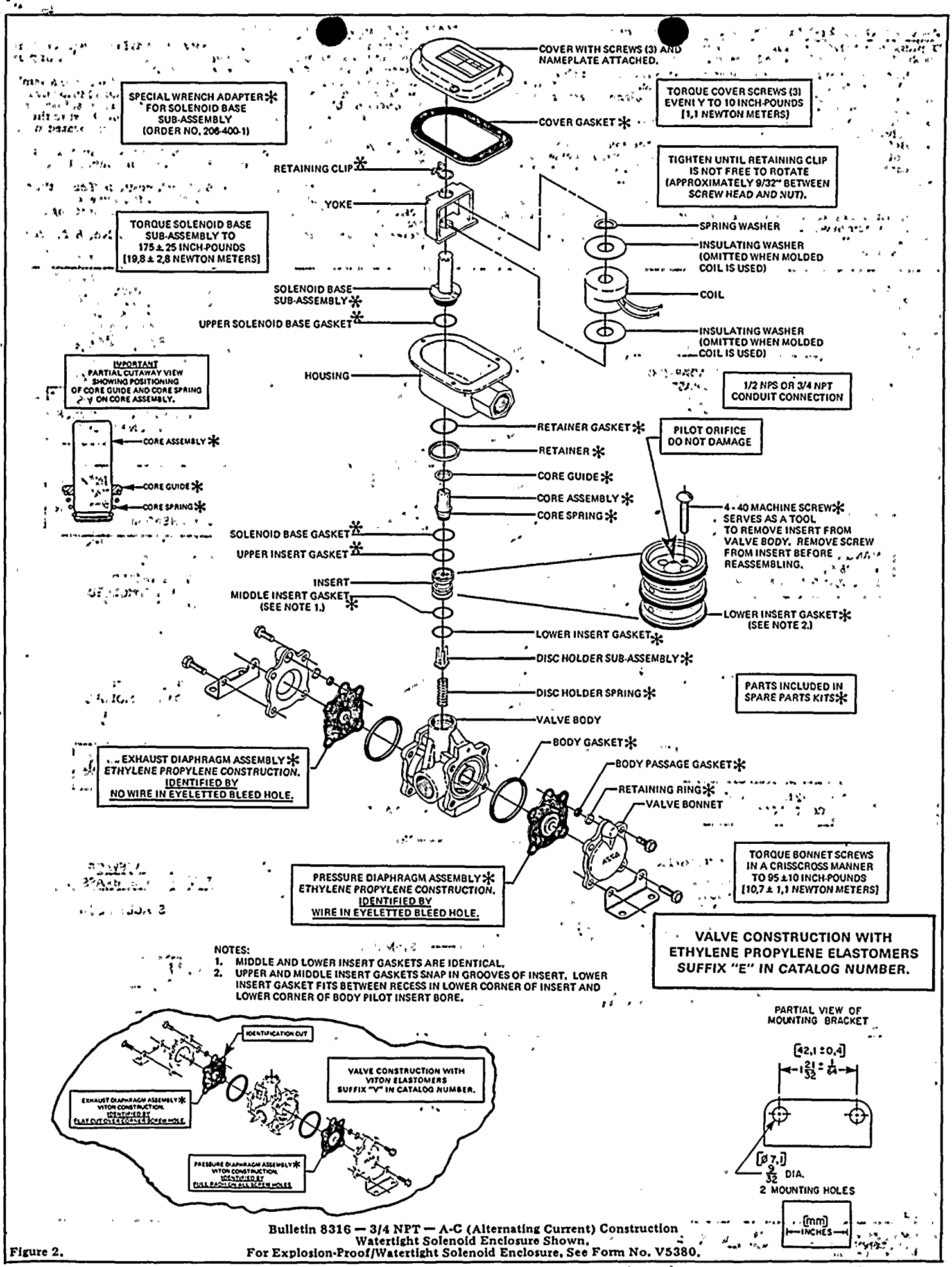

Bulletin 8316 — 3/4 NPT — A-C (Alternating Current) Construction
Watertight Solenoid Enclosure Shown.
For Explosion-Proof/Watertight Solenoid Enclosure, See Form No. V5380.

Figure 2.

MANUAL OPERATOR DISASSEMBLY (Refer to Figure 3)

Depressurize valve and turn off electrical power supply. Refer to Paragraphs 1 through 4 of "Valve Disassembly" then proceed:

1. Unscrew solenoid base sub-assembly with special wrench adapter supplied in Spare Parts Kit (Wrench Adapter Order No. 206-400-1).
2. Remove solenoid base sub-assembly, upper solenoid base gasket, housing, retainer gasket and retainer.
3. Unscrew manual operator body and remove body gasket from main valve body.
4. Before removing the stem retainer from the manual operator body, note location of captive spacer on the stem/lever sub-assembly. The captive spacer will be on the outside of the fork on the stem retainer. Location of this spacer is important for reassembly. Remove stem retainer and slip the stem/lever sub-assembly from the manual operator body. Remove core assembly with core spring and core guide (A-C construction only) from manual operator body. Remove stem gasket from stem/lever sub-assembly.
5. Refer to "Valve Disassembly" instructions Step No. 8 for further disassembly.

MANUAL OPERATOR REASSEMBLY

1. Reassemble in reverse order of disassembly, paying careful attention to exploded view provided for identification and placement of parts.
2. Replace stem gasket on stem/lever sub-assembly.
3. Preassemble manual operator parts as follows: Position core assembly with core spring and core guide (A-C construction only) into the manual operator body from the bottom. Install stem/lever sub-assembly into manual operator body. Install stem retainer, and be sure the captive spacing washer on the stem/lever sub-assembly is located on the outside of the fork on the stem retainer.
4. Screw manual operator body sub-assembly into main valve body. Torque manual operator body to 175 ± 25 inch-pounds [19,8 ± 2,8 newton meters].
5. Turn manual operator lever to the 9 o'clock position. This is the position of the operator for electrical operation of the valve.
6. Position solenoid base gasket over core assembly and into manual operator body.
7. Refer to "Valve Reassembly" instructions, Step No. 8 for further reassembly.

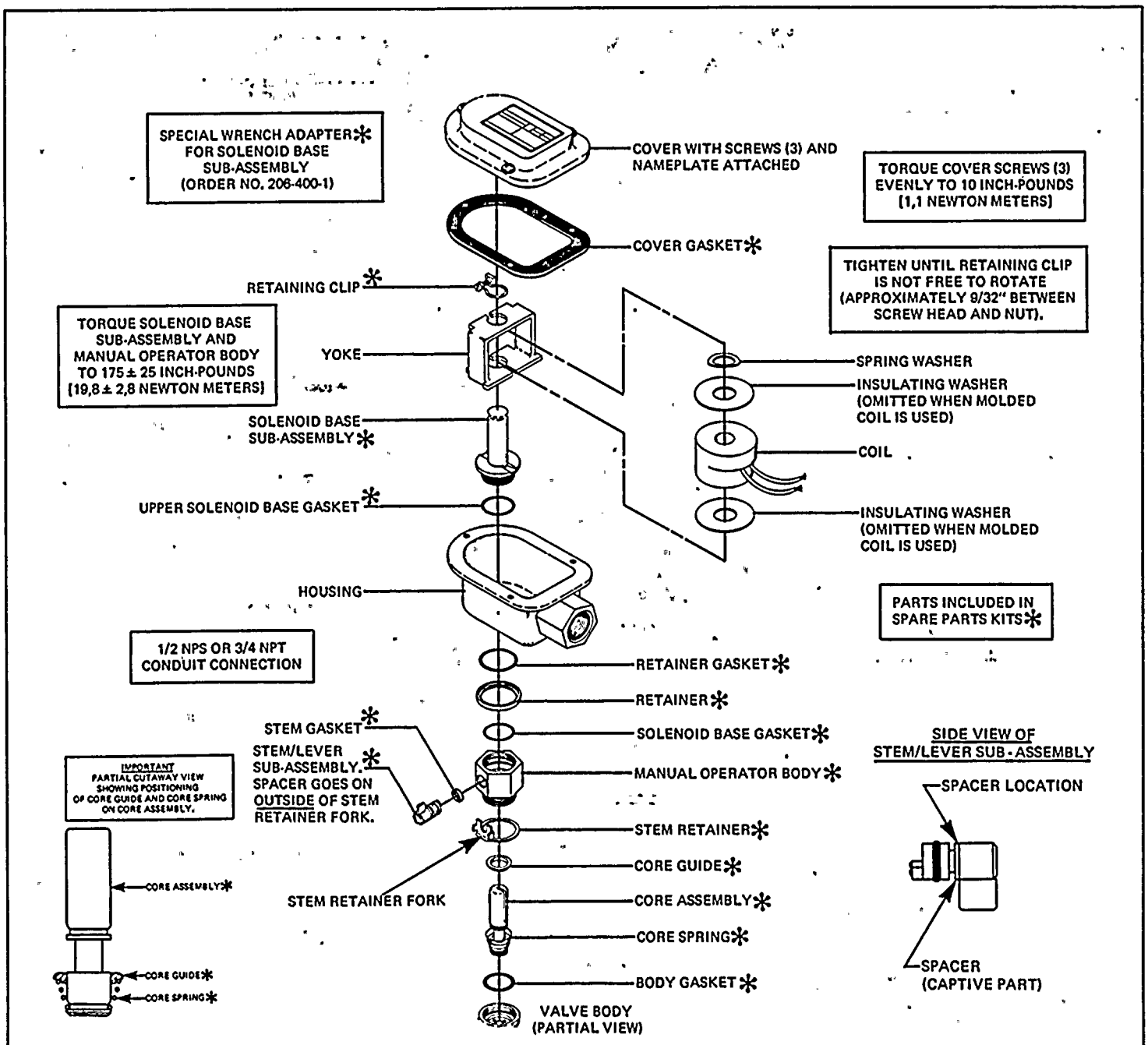

Figure 3. Manual Operator (Optional Feature)

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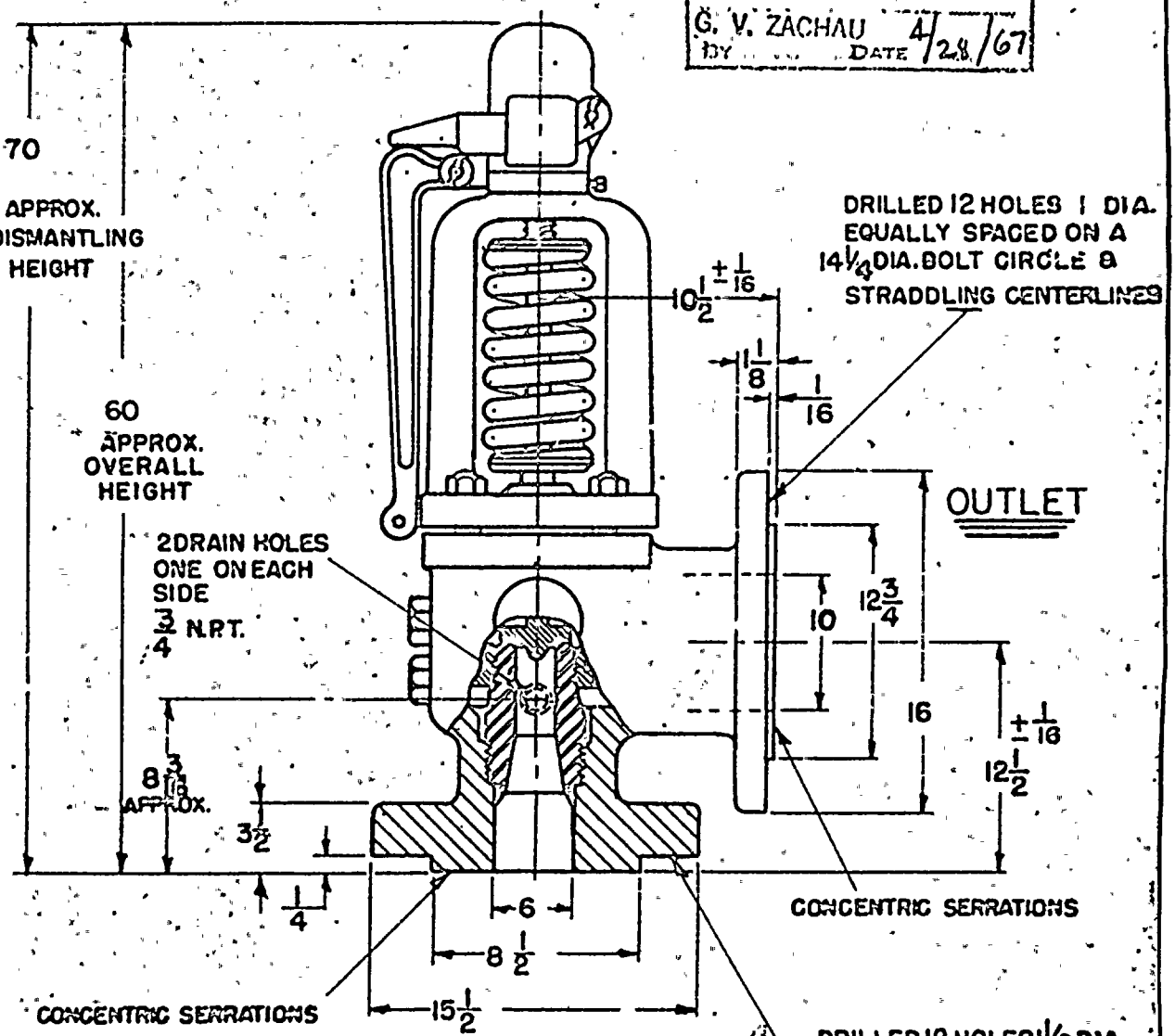

MASTER
9385

INLET FLANGE 1500 LB. ASA STD.
OUTLET FLANGE 150 LB. ASA STD.

Tag No.	Set Press
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RN-50	1140

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SAFETY VALVE	
SIZE 6 R 10	DRAWING NO. G-50486-3
STYLE HC-65	