



**UNITED
TECHNOLOGIES
CARRIER**

Commercial Division
Carrier Corporation

BULLETIN: CA-SB-17-77-29

DATE: 4/15/77

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SERVICE BULLETIN

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SUBJECT: 17 SERIES SUCTION DAMPER ACTUATOR ASSEMBLY

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W A R N I N G

THE 17R6-4032 ACTUATOR CONTAINS A SPRING PRELOADED TO 2000 POUNDS. EXTREME CAUTION MUST BE USED. FOLLOW ALL INSTRUCTIONS CAREFULLY. DO NOT ATTEMPT TO SERVICE, DISASSEMBLE OR DISPOSE OF THIS PART BEFORE READING THE INSTRUCTIONS.

* * * * *

PURPOSE

To provide instructions to troubleshoot a damper actuator assembly including disassembly, re-assembly and adjustment procedures.

MACHINES AFFECTED

All 17M, P, S Size 30 and 40 and 17MA, PA, SA Size 40 compressors equipped with the 17R6-4032 suction damper actuator.

BACKGROUND

The actuator consists of an air diaphragm head manufactured by W-K-M (Division of ACF Industries, formerly Black, Sivals & Bryson (BS & B) and a Moore 72LN315 positioner. The actuator uses an air-to-open signal and a spring to insure quick closing. This provides a fail-safe condition at machine shutdown. The actuator is coupled to the damper by means of the motor damper control link, 17Q5-5362. To insure that the damper closes, the actuator is equipped with a spring that is preloaded to 2000 lb. (Sketches 5 and 6).

CAUTION:

SINCE THIS SPRING REPRESENTS A STRONG FORCE, DISMANTLING THE ACTUATOR MUST BE UNDERTAKEN WITH EXTREME CAUTION!

On occasion, a suction damper may operate in an erratic manner due to malfunctioning of the actuator. Once a visual inspection of the damper linkage reveals no apparent damage, dismantling the actuator will be necessary.



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The damper actuator may be tested by applying air pressure to the actuator positioner (30 psi air pressure maximum supply and 15 psi air pressure maximum controller output) and observing the actuator stem travel. Be sure the air vents in the diaphragm lower case (18)* are not plugged. No stem travel or only slight movement indicates a ruptured diaphragm.

NOTE: A secondary test to insure that we do not have a Moore positioner problem is to disconnect the tubing at the actuator head and apply 30 psi air pressure maximum to the diaphragm. If the actuator stem moves its full travel ($2" \pm 1/8"$), we now have an indication that the trouble is in the Moore positioner assembly. (See Adjustment Instruction 6.2.)

If the diaphragm is not ruptured, the valve stem will make its full travel ($2" \pm 1/8"$). Next, remove all air pressure (zero psi supply, zero psi controller output), and observe the return action. If the damper fails to return to its starting position, a broken or binding upper or lower stem or a broken return spring is indicated.

1.0 DISASSEMBLY PROCEDURE

CAUTION!

THE ACTUATOR ASSEMBLY CONTAINS A COIL SPRING WHICH IS COMPRESSED TO A 2000 LB PRELOAD PRESSURE. EXTREME CAUTION MUST BE USED WHEN DISASSEMBLING AND ASSEMBLING THIS UNIT TO PREVENT INJURY TO PERSONNEL OR OTHER PHYSICAL DAMAGE. DO NOT LOOK OR REACH INTO THE SPRING CASING WHEN THE CAP IS REMOVED.

IT IS MANDATORY THAT THE ACTUATOR ADJUSTING ASSEMBLY BE USED TO RELIEVE THE SPRING TENSION DURING DISASSEMBLY AND INSTALLATION OF THE SPRING. FAILURE TO RELIEVE SPRING TENSION CAN RESULT IN A STEM FAILURE, ALLOWING THE SPRING TO SUDDENLY RELEASE ITS ENERGY AND ACT AS A PROJECTILE WITH RESULTANT POSSIBLE PERSONAL INJURY.

BEFORE REMOVING THE CAP, A 2 FT SQ X 1/2" THICK PLYWOOD PROTECTOR Baffle SHOULD BE POSITIONED APPROXIMATELY TWO FEET FROM THE END OF THE SPRING CASING AS AN ADDED SAFETY PRECAUTION.

*Parenthetical numbers refer to Sketch 1, unless otherwise designated.



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To determine which one of the disassembly instructions to use:

- 1.1 When damper fails to open, see 2.0.
- 1.2 When damper fails to close (lower stem failure), see 3.0.
NOTE: Determine whether the lower stem is broken by disconnecting the motor damper control link (25), 17Q5-5362, and trying to rotate and/or pull the lower stem (20) out of the actuator.
- 1.3 When damper fails to close (upper stem failure), see 4.0.

2.0 DAMPER FAILS TO OPEN, DISASSEMBLY INSTRUCTIONS

- 2.1 Remove air pressure to the diaphragm (15) by closing off the supply air to the Moore positioner and removing the air line to the spring casing (16).
- 2.2 Remove the pipe cap (1) and IMMEDIATELY replace it with the actuator adjustment assembly (Sketch 2), making sure that the three jack screws are backed out at least four inches.
- 2.3 Hand-tighten each of the three jack screws until contact is made with the spring guide (3). Tighten each jack screw slightly to remove the pressure from the nut (24). The nut can now be removed by using a 5/8" deep well socket.
- 2.4 Evenly turn out the three jack screws until all of the tension has been removed from the spring (4). Remove the actuator adjustment assembly (Sketch 2), the spring guide (3), and the spring (4) from the case.
- 2.5 Disassemble the actuator housing by removing the 18 bolts and nuts (9) and (10), then remove the spring case (16).
NOTE: The solenoid valve wiring and the bracket that is bolted to the damper frame will also have to be disconnected.
- 2.6 The upper stem may now be removed by loosening the retaining nut (2) and turning the upper stem out of the lower stem (20).
NOTE: The diaphragm plate (17) weighs approximately 25 lb.
- 2.7 The diaphragm can now be replaced and the actuator re-assembled.
(See Assembly Instructions, 5.0.)

3.0 DAMPER FAILS TO CLOSE (LOWER STEM FAILURE), DISASSEMBLY INSTRUCTIONS

- 3.1 Remove the air pressure to the diaphragm (15) by closing off the supply air to the Moore positioner and removing the air line to the spring casing (16).
- 3.2 Remove the pipe cap and IMMEDIATELY replace it with the actuator adjustment assembly (Sketch 2), making sure that the three jack screws are backed out at least four inches.
- 3.3 Hand-tighten each of the three jack screws until contact is made with the spring guide (3). Tighten each jack screw slightly to remove the pressure from the nut (24). The nut can now be removed by using a 5/8" deep well socket.
- 3.4 Evenly turn out the three jack screws until all of the tension has been removed from the spring (4). Remove the actuator adjustment assembly (Sketch 2), the spring guide (3), and the spring (4) from the case.



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- 3.5 Remove the solenoid valve wiring and unbolt the support bracket that is bolted to the damper frame.
- 3.6 Remove the 18 bolts and nuts (9) and (10) from the actuator housing.

CAUTION: The lower stem, if broken, will no longer support the upper stem and diaphragm plate (17). Caution is advised when removing the spring case (16).

- 3.7 Separate the lower stem from the upper stem by loosening the retaining nut (2) and turning the upper stem out.
- 3.8 The lower stem can not be replaced and the actuator re-assembled. (See Assembly Instructions, 5.0.)

4.0 DAMPER FAILS TO CLOSE (UPPER STEM FAILURE), DISASSEMBLY INSTRUCTIONS

- 4.1 Remove air pressure to the diaphragm (15) by closing off the supply air to the Moore positioner and removing the air line to the spring casing (16).
- 4.2 Remove the pipe cap (1) and IMMEDIATELY replace it with the actuator adjustment assembly (Sketch 2), making sure that the three jack screws are backed out at least four inches.

NOTE: At this point, determine what caused the failure by trying to turn the nut (24) with a deep well socket. If loose, indication is a broken upper stem. Proceed to Step 4.4.

If the nut is not loose, jamming is apparent between the spring guide (3) and the housing.

- 4.3 Hand-tighten each of the three jack screws until contact is made with the spring guide (3). Tighten each screw only until all three are equally engaged. This tightening will straighten the spring guide in the housing and relieve the jamming. Evenly turn out the three jack screws until all of the tension has been removed from the spring (4).
- 4.4 Remove the actuator adjustment assembly (Sketch 2), the spring guide (3), the spring (4), and the partial upper stem, if broken.
- 4.5 ~~Disassemble the actuator housing by removing the 18 bolts and nuts (9) and (10), then remove the spring casing (16).~~

NOTE: The solenoid valve wiring and the bracket that is bolted to the damper frame will also have to be disconnected.

- 4.6 Remove the remaining upper stem, if broken, by loosening the retaining nut (2), and turning it out of the lower stem (20).
- 4.7 The upper stem (5) can now be replaced and the actuator re-assembled. (See Assembly Instructions, 5.0.)



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5.0 ASSEMBLY INSTRUCTIONS

- 5.1 Install the new upper stem (5), diaphragm plate (17), and diaphragm (15) by turning the upper stem all the way into the lower stem (20) and then locking the upper stem into place with the nut (2).
- 5.2 Slide the spring case (16) over the upper stem (5) and assemble the actuator housing by using the 18 bolts and nuts (9) and (10).
- 5.3 Slide the spring (4) into the upper case (16), slip the spring guide (3) over the upper stem (5), and ONLY FINGER TIGHTEN THE NUT (24) against the spring guide.
- 5.4 Install the actuator adjustment assembly as shown in Sketch 2. Hand-tighten the jack screws until all three make contact with the spring guide (3). From that point, the screws are to be evenly tightened a distance of 2-3/8" to produce the proper preload of 2000 lb on the spring (4).
- 5.5 Tighten the nut (24), using a 5/8" deep well socket until contact is made with the spring guide (3).
- 5.6 Back off the three jack screws, remove the actuator adjustment assembly and then install the pipe cap (1). Be sure to seal the threads on the pipe cap since the cap is under diaphragm air pressure.
- 5.7 Reconnect the diaphragm air line, the brace from the damper, the solenoid wiring, and the linkage to the damper shaft. Assembly is now complete.

6.0 ADJUSTMENT INSTRUCTIONS

6.1 Damper Blade (See Sketch 4)

Check position of the damper blade when the assembly is completed and in the closed position. The blade must be positioned at 5° as shown in Sketch 4. Adjust the connector (22) as required.

NOTE: The scribe line found on the damper shaft is parallel to the damper blade.

6.2 Moore Positioner (See Sketch 7)

- 6.2.1 Disconnect the tubing from the positioner to the actuator head. Connect the supply air (30 psi air pressure maximum supply) directly to the actuator head.
- 6.2.2 Determine total actuator stroke by measuring the length of travel when 30 psi air pressure is placed on the diaphragm. Record measurement.
- 6.2.3 Reconnect air line from positioner to actuator head.
- 6.2.4 Loosen clamping screw (10) in center of slider (9) and turn pinion screw (11) to set the slider at total actuator stroke as determined in 6.2.2. Tighten clamping screw.

NOTE: Do not set at more than 25% below the actual actuator travel.

- 6.2.5 Apply both supply and instrument air to the positioner. With instrument air at 9 psi, the actuator should be at one-half of its total stroke as determined in 6.2.2. If this does not occur, loosen the knurled locknut (16) and adjust by turning the knurled spring retainer nut (45). When adjustment is completed, tighten the knurled locknut (16).
- 6.2.6 Change the instrument air pressure through its full range (3 to 15 psi air pressure) to check operation.

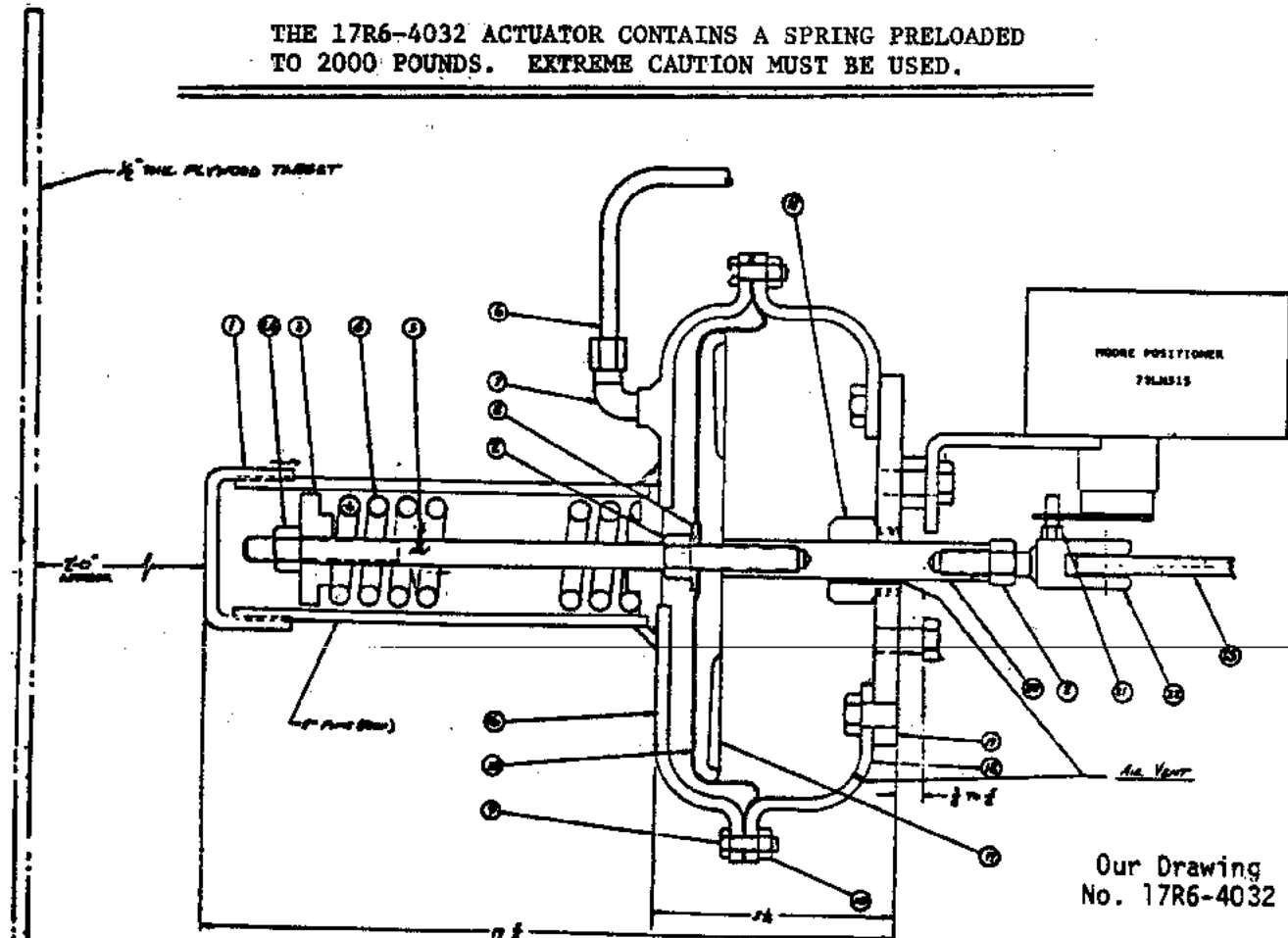
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Item No.	Description	Item No.	Description
1	Pipe Cap, 5"	15	Diaphragm
2	Nut, Hvy. Hex Hd., 1/2 UNC	16	Spring Case & Case Assy.
3	Guide, Spring	17	Plate, Diaphragm
4	Spring	18	Case, Lower
5	Stem, Upper	19	Plate, Adaptor
6	Tubing	20	Stem, Lower
7	Elbow	21	Pin, Trip
8	Washer, Diaphragm	22	Connector
9	Bolt Hex Hd., 5/16 x 1" long	24	Nut, Hvy. Hex Hd., 5/8 UNC
10	Nut Hex Hd., 5/16"	25	Motor Damper Control Link, 17Q5-5362
11	Bushing Guide		

WARNING

THE 17R6-4032 ACTUATOR CONTAINS A SPRING PRELOADED TO 2000 POUNDS. EXTREME CAUTION MUST BE USED.



Our Drawing
No. 17R6-4032

Sketch 1. Actuator Assembly



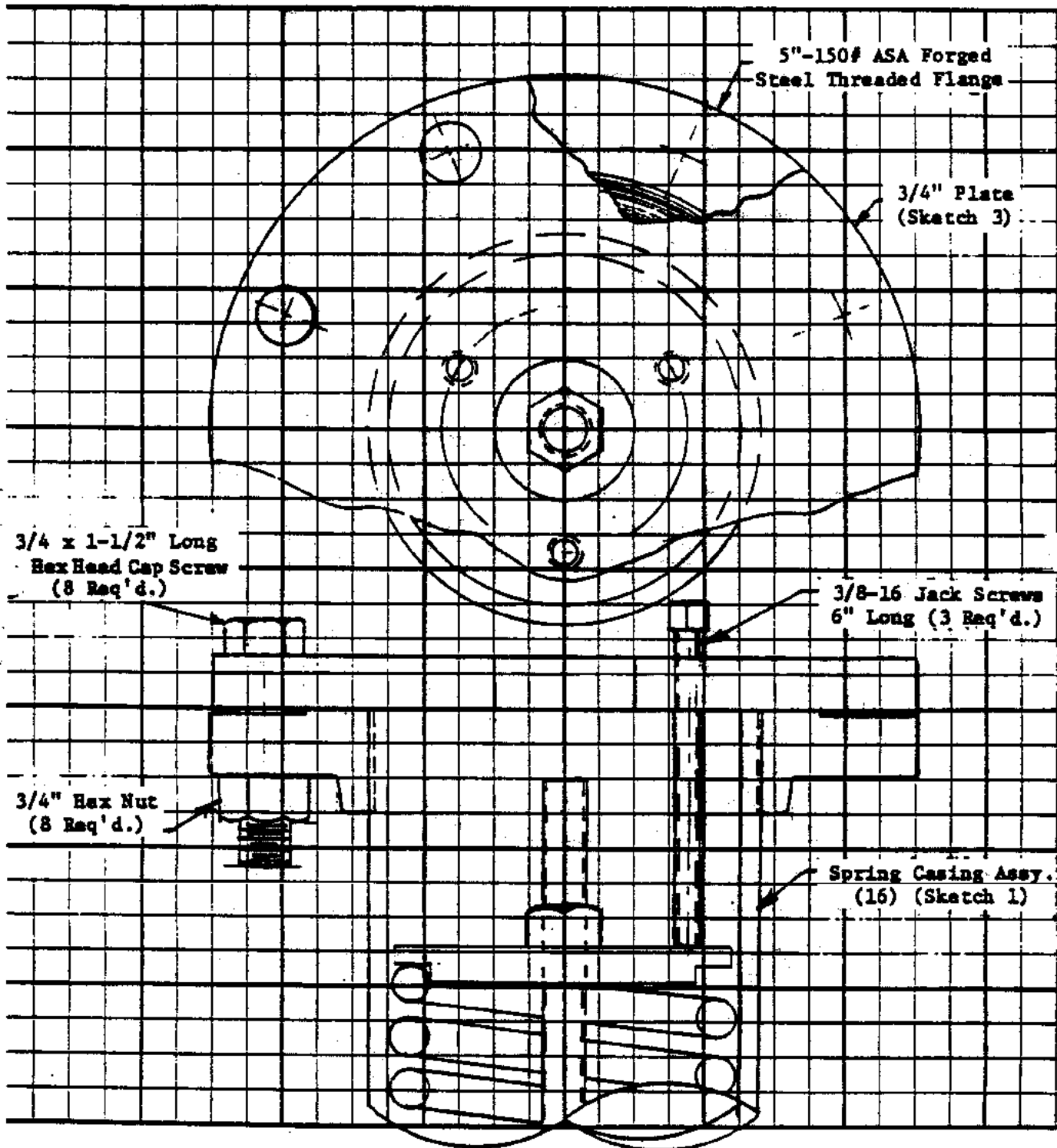
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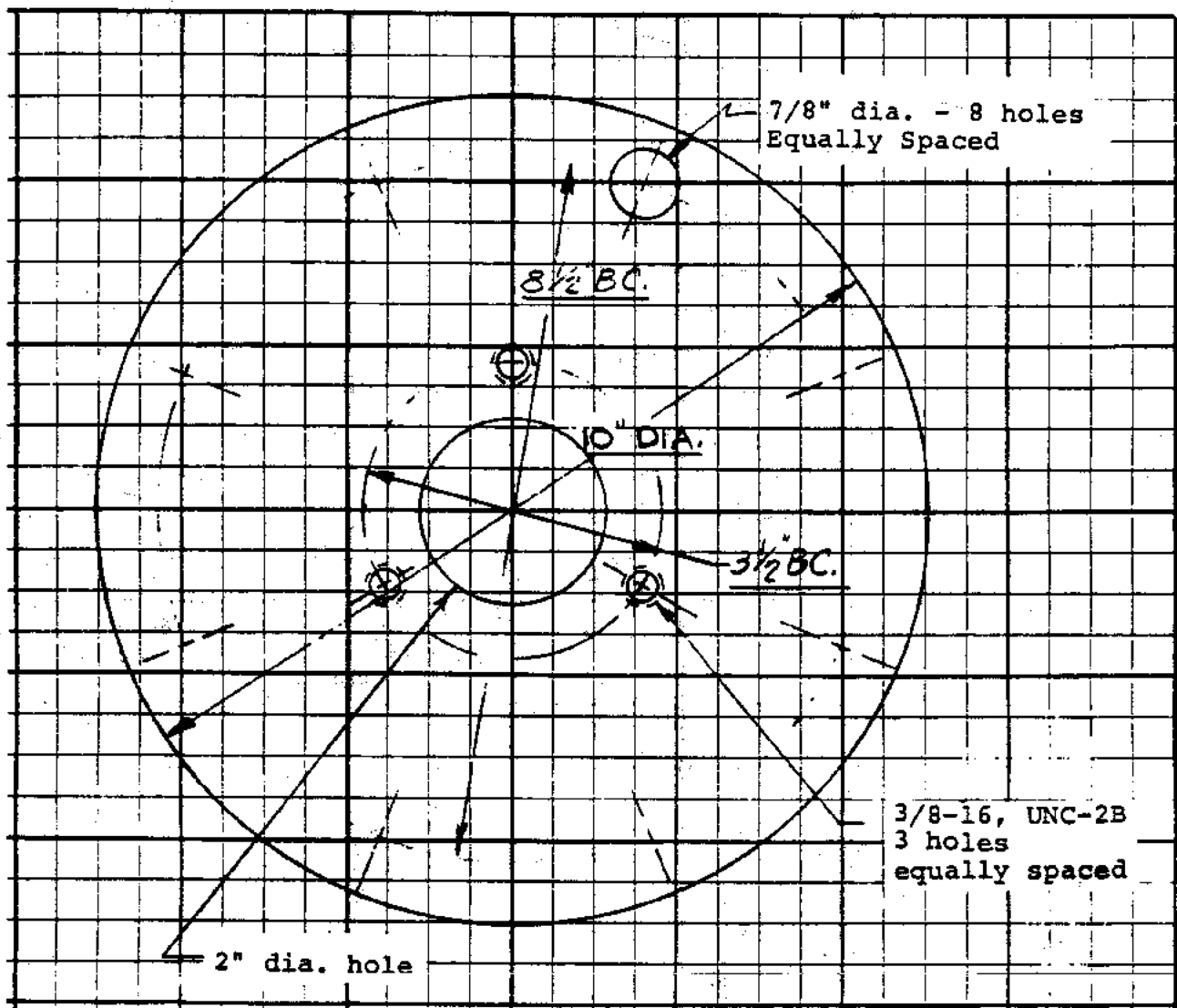
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Material: 3/4" thk. Hot-Rolled Steel
Flange, modified as shown.

or 5"-150 lb ASA Forged Steel, Blind

Sketch 3. Adapter Plate for
Actuator Spring Adjustment



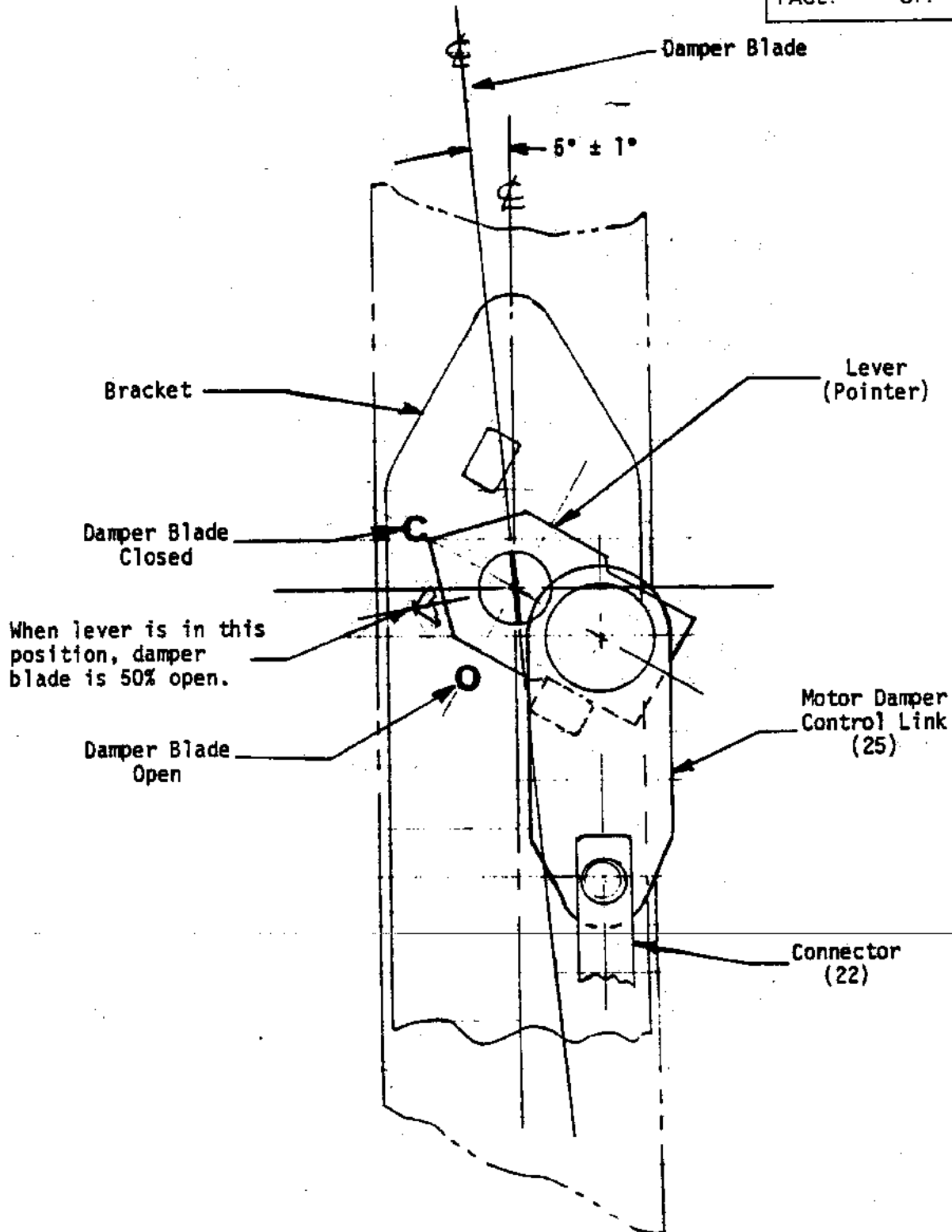
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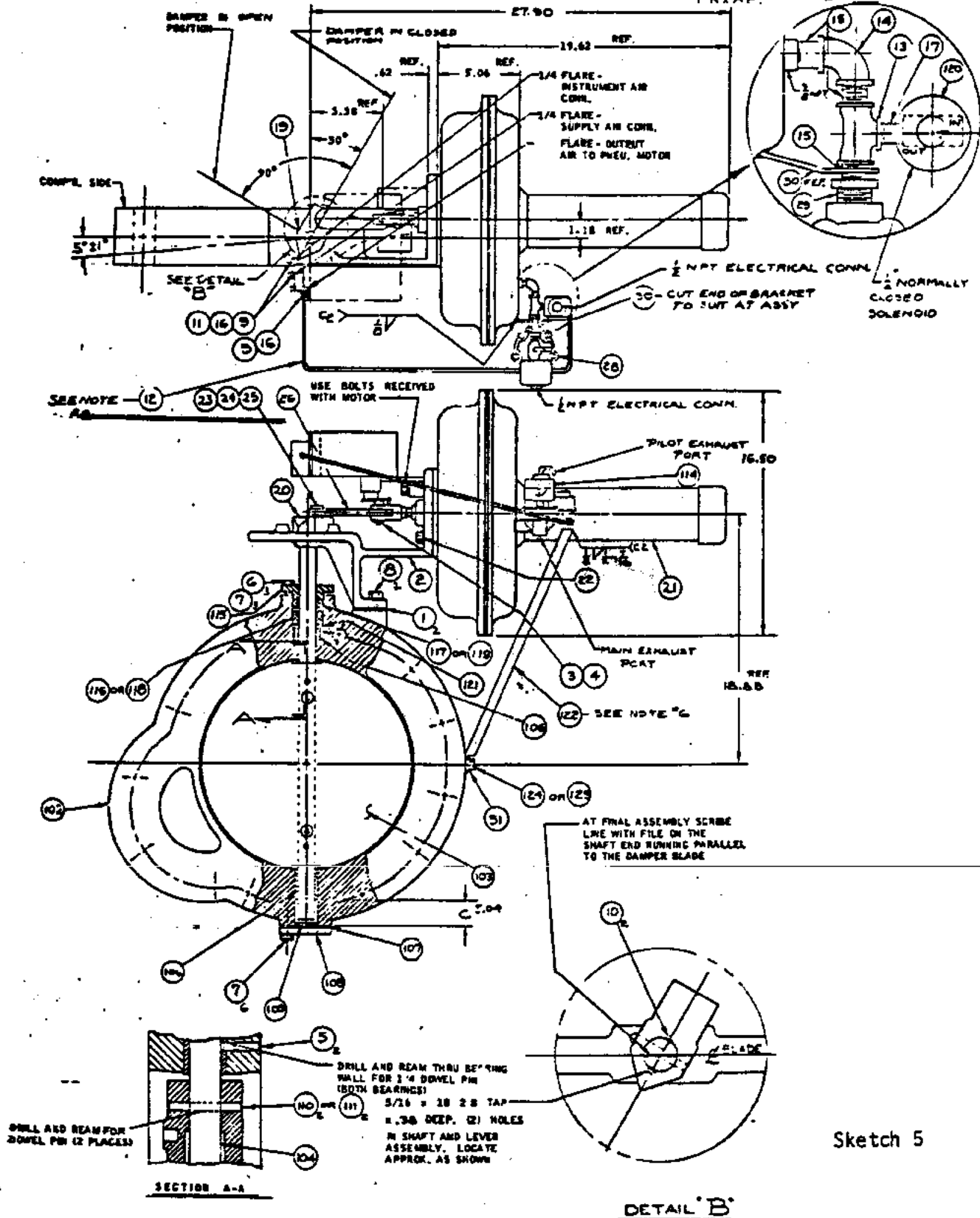
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Sketch 5



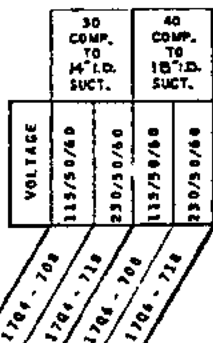
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ITEM	PART NO.	REQ'D		DESCRIPTION
		30 COMP. TO 1/2" I.D. SUCT.	40 COMP. TO 1 1/2" I.D. SUCT.	
101	1704 - 678	1	1	COMMON PARTS
102	1704 - 2294	1	1	DAMPER FRAME
	1706 - 2294		1	
103	1704 - 2204	1	1	DAMPER BLADE
	1706 - 2204		1	
104	1704 - 3462	1	1	DAMPER SHAFT
	1706 - 4062		1	
106	1704 - 4481	2	2	BEARING
	1706 - 4481		2	
107	1704 - 4541	1	1	GASKET
	1706 - 4541		1	
	1704 - 4491	1	1	
109	1704 - 4491		1	COVER PLATE
	1706 - 4501	2	2	
110	1704 - 4501		2	SHIM
	1706 - 4501	2	2	
110	AX11AR707	2	2	5/16 OVERSIZED DOWEL PIN x 2-1/2 LG.
111	AX11AR757		2	3/8 OVERSIZED DOWEL PIN x 2-1/2 LG.
114	1704 - 648	1	1	SOL. VALVE (EXP. PROOF) 1 1/2" 50/60
	1704 - 658	1	1	
115	1704 - 4022	1	1	PACKING FLANGE
	1706 - 4022		1	
116	KK71HT019	1	1	V - RING SET
117	KK71HT018	1	1	V - RING SET
118	KK71HT027		1	V - RING SET
119	KK71HT026		1	V - RING SET
120	1704 - 4102	1	1	SOL. VALVE (EXP. PROOF) 1 1/2" 50/60
	1704 - 4102		1	
121	1704 - 5591	1	1	SUCTION DAMPER PACKING SPACER
	1706 - 5591		1	
122	1704 - 2473	1	1	SUCTION DAMPER MOTOR REINFORCEMENT BRACKET
	1706 - 2473		1	
124	AA06BR220	2	2	5/8-11 HEX. HD. SCREW

COMMON PARTS 1704 - 678 (ITEM NO.)			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	1706 - 4591	2	GASKET
2	1704 - 904	1	BRACKET
3	1705 - 4731	1	CLEVIS PIN
4	AU11AR301	1	1/2 STD. WASHER
5	AX11AR171	2	1/4 DOWEL PIN x 1-1/8 LG.
6	AU11AR242	3	3/8 STD. WASHER
7	AA06BR232	9	HEX. HD. CAP SCREW 3/8 - 16 x 1-1/4" LG.
8	AA06BR294	2	HEX. HD. CAP SCREW 1/2 - 13 x 1-3/4" LG.
9	DD07DA051	3	HALF CPLG. 1/4 MPT x 1/4 DOT
10	AE21AT192	2	CUP POINT SET SCREW, 5/16 - 18
11	DD21FA051	2	1/4 FLARED SEAL BONNET
12	SEE NOTE #4	1	1/4" x 1.022W TUBING x 24" LG.
13	CE20RA102	1	REDUCING TEE 3/8 x 3/8 x 1/2 4" W/LEAK 1/2" IN
14	CA05RA101	1	ELBOW, 90° W/LEAKABLE IRON
15	CA01CA102	3	3/8 NIPPLE, PIPE, FULL x 1" LG.
16	DD01CA051	4	1/4 FLARE NUT
17	CA01CA051	1	1/4 NIPPLE, PIPE FULL 7/8 LG.
18	DD10CA052	1	1/4 HALF UNION ELBOW x 90°
19	AX15AA234	1	#6 TAPER DOWEL PIN x 1-3/4" LG.
20	1705 - 4651	1	LEVER
21	1706 - 4032	1	MOTOR AND POSITIONER
22	AU11AR301	4	LOCKWASHER, 1/2
23	AU01AA491	1	WASHER
24	AX01AB051	2	COTTER PIN
25	1705 - 4641	1	CLEVIS PIN
26	1705 - 5562	1	MOTOR DAMPER CONTROL LINK
27	LF39RZ011	2	PROTECTIVE CAP (SEE NOTE #2)
28	1704 - 4112	1	2-WAY PILOT VALVE
29	CA53AA203	1	REDUCING BUSHING 3/4 MPT. x 1/2 MPT.
30	1704 - 4122	1	BRACKET
31	AU11AR301	2	5/8-11 LOCKWASHER

NOTES:

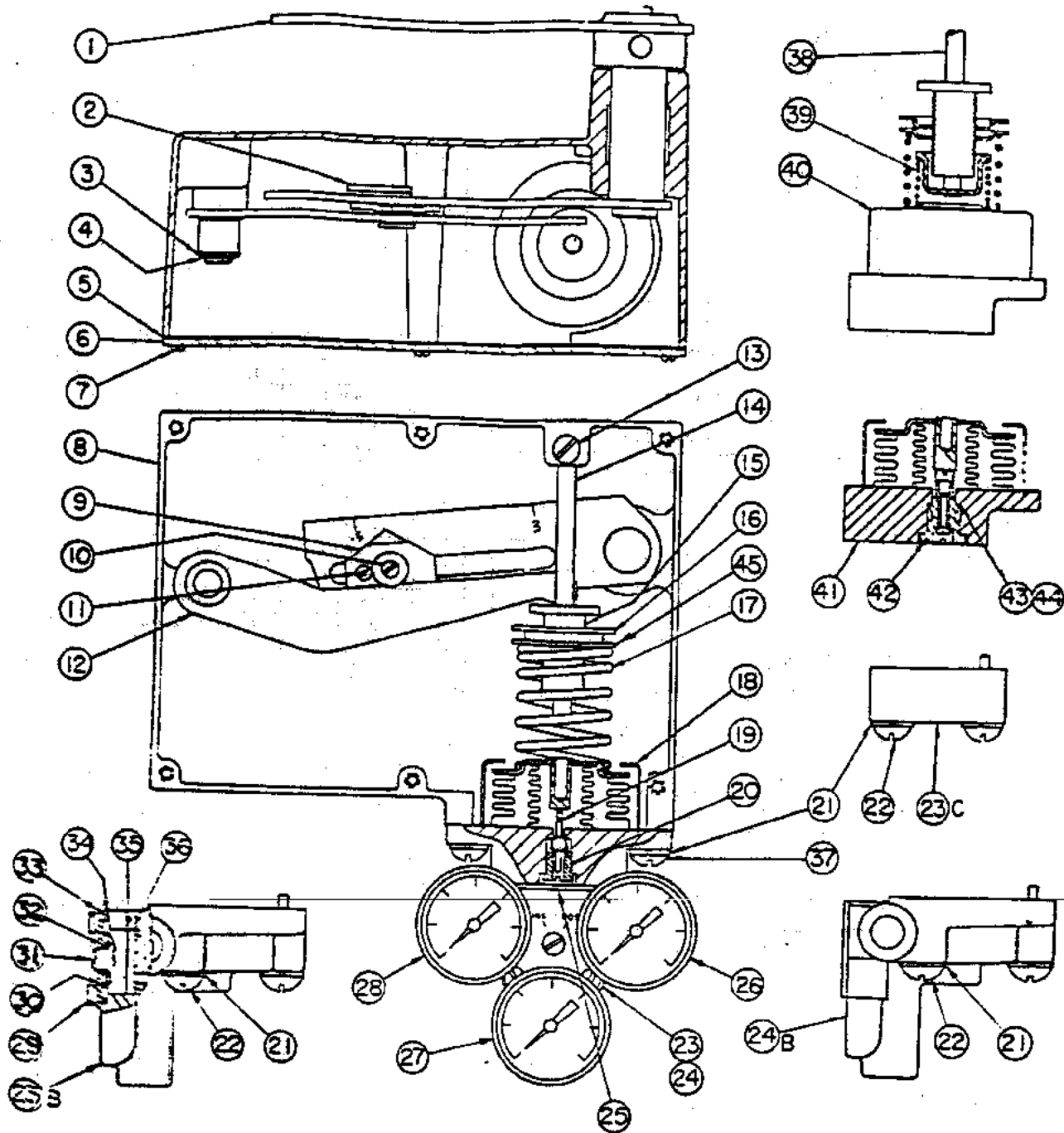
- DRILL AND REAM SHAFT AND LEVER ON ASSEMBLY FOR #6 TAPER DOWEL PIN. WHEN LEVER AND DAMPER ARE IN POSITION SHOWN, DAMPER SHAFT MUST NOT EXTEND ABOVE SURFACE OF LEVER. ADJUST CONTROL ARM SO FULL RANGE OF DAMPER CONTROL MAY BE UTILIZED.
- FURNISH ITEMS 12 AND 16 LOOSE FOR FIELD INSTALLATION. INSTALL CAPS (ITEM #27) OVER CONN'S. FOR SHIPMENT.
- AFTER ASSEMBLY, DAMPER OPERATOR TO BE CONNECTED TO 30 PSIG. AIR TO OPEN DAMPER. WHEN AIR IS DISCONNECTED, DAMPER MUST CLOSE IN 2 TO 3 SECONDS. AIR OPERATOR SPRING TENSION TO BE ADJUSTED TO CLOSE DAMPER IN 2 TO 3 SECONDS AFTER AIR IS RELEASED.
- CUT, FLARE AND BEND TUBING TO SUIT AT ASSEMBLY.
- ITEM #122 SHOULD BE BOLTED IN PLACE BEFORE FINAL WELDING.

Sketch 6

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Order parts by drawing and part numbers.



NOTE: Items 26, 27, and 28 are optional.

Sketch 7. Valve Positioner (External Lever Type)