



INSTRUCTIONS

BULLETIN 947290C

OILGEAR TYPE "M" ELECTRIC REMOTE MULTI-POSITION CONTROL FOR "A", "AN" & "PVA" UNITS

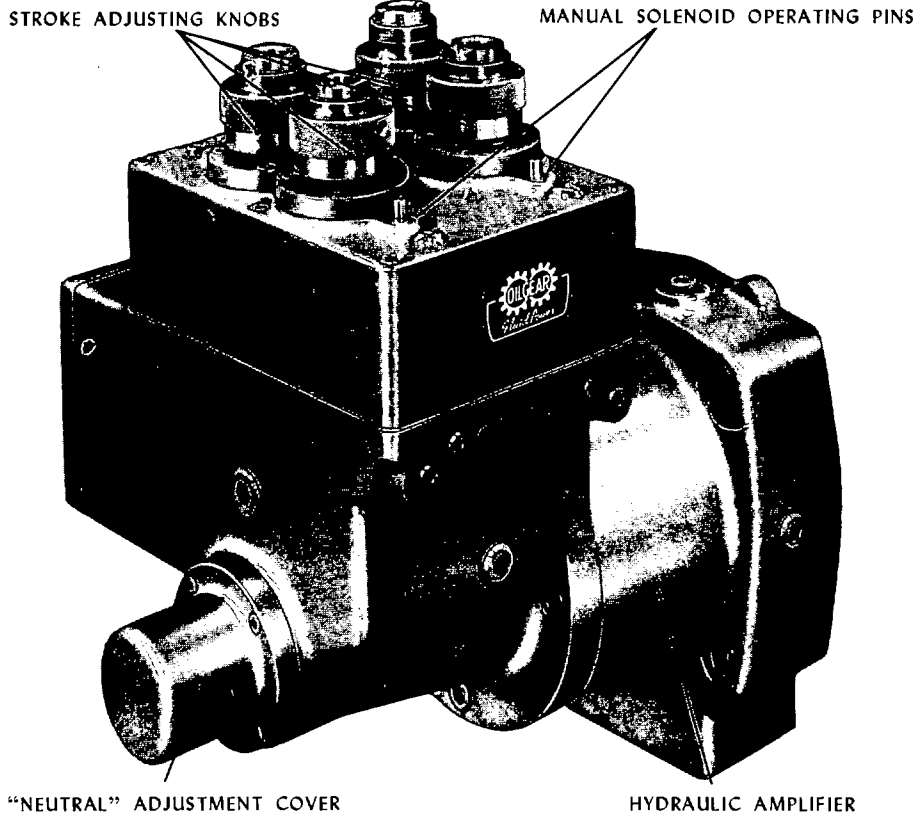


Figure 1. Oilgear Type "M-M" Control (54333R).

REFERENCE INSTRUCTION BULLETINS

| | |
|--------------------------------|--------|
| "A-8" Units w/o control----- | 947032 |
| "A-12" Units w/o control----- | 947040 |
| "AN-8" Units w/o control----- | 947055 |
| "AN-12" Units w/o control----- | 947060 |
| "PVA" Units w/o control ----- | 947065 |

TO THE USER AND OPERATOR OF OILGEAR "M" CONTROLLED UNITS:

These instructions are printed to simplify and minimize your work of operating and maintaining Oilgear "M" controlled units. Your acquaintance with the construction, principle of operation and characteristics of these units will assure satisfactory performance, reduce shutdowns and increase service life. We feel confident the unit will operate to your satisfaction if these instructions are adhered to. Some units have been modified from those described and other changes may be made without notice.

THE OILGEAR COMPANY
MILWAUKEE, WISCONSIN, U. S. A. 53204

BULLETIN 947290C

I. CONSTRUCTION

A. "M-M" CONTROL

This control consists basically of four solenoid operated control valves (348), four adjustable volume control knobs (322) and pistons (328), a positioning lever (376), a spring centering device (336) and a connecting rod (338) confined in a housing (340). This mechanism actuates a hydraulic force amplifier consisting of a pilot plunger (305), bushing (304) and a large control piston (301) confined in a housing (300).

B. "M-Y" CONTROL

This control is similar to the type "M-M" control but has only two solenoids and two adjustable volume control knobs.

Units are usually equipped with an opposing non-adjustable hydraulic control. See "Standard Opposing Operators." Some units may use other opposing controls to attain additional functions.

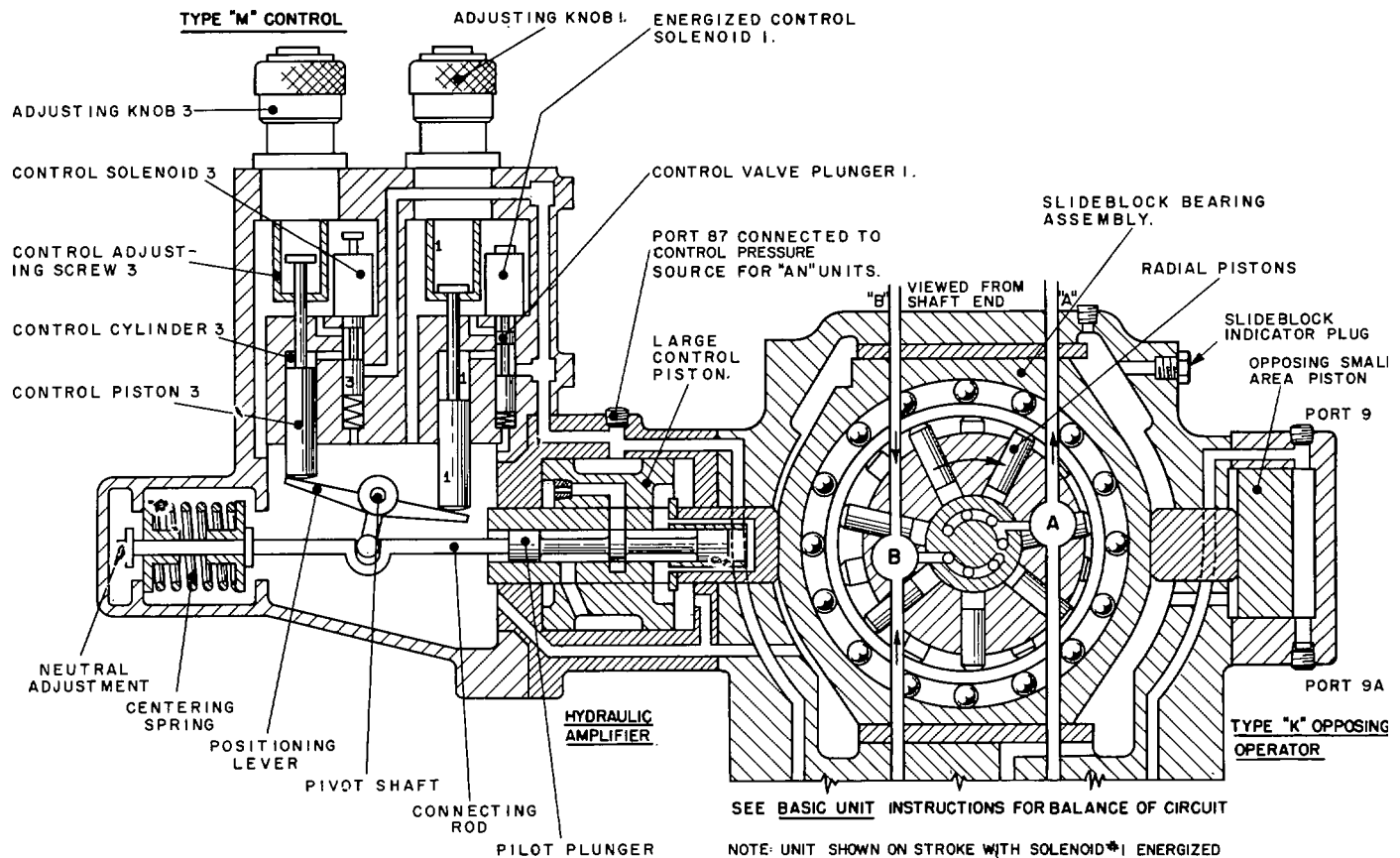


Figure 2. Schematic View of Typical "M" Control (5V-9906-L).

II. PRINCIPLE OF OPERATION

See figure 2. See reference bulletin for radial piston unit principle of operation. Standard controls on two-way units are designed for an equal number of adjustable slideblock positions on either side of neutral and a neutral position ("M-M" = 2-2; "M-Y" = 1-1). However, some "M-M" controlled units are built for 3-1 or 4-0 setting; "M-Y" for 2-0 setting.

Operation of standard controls. Control pressure is directed thru internal coring from the unit to the control on Type "A" and "PVA" units. Type "AN" units necessitate a separate auxiliary source for control pressure connected to port 87. Energizing solenoid 1 (as illustrated) depresses control valve plunger 1 and directs control pressure to control cylinder 1. Control piston 1 is forced downward until the collar

of the adjusting screw stops movement (rotating adjusting knob raises or lowers this collar). The downward force tilts the positioning lever moving the connecting rod and pilot plunger of force amplifier to the left. The pilot plunger directs fluid from behind the large control piston to drain, the smaller opposing control piston forces the slideblock and large control piston to the left until the port in the bushing and piston are sealed by the pilot plunger "land". On standard units, volume controls 1 and 2 position the slideblock on the control side of neutral. De-energizing solenoid 1 connects control cylinder to drain.

Energizing solenoid 3 directs control pressure to control cylinder 3 and applies a downward force on the control piston. This force tilts the positioning lever in the opposite direction and moves the connecting rod and pilot plunger to the right. The pilot plunger directs control pressure to the area behind

the large control piston which overcomes the smaller opposing piston and moves the slideblock to the right until the control piston and bushing again covers the pilot plunger "land" and seals. On standard units, volume controls 3 and 4 control the slideblock positions on the far side of neutral.

With solenoids de-energized (all control valves connect control cylinders to drain), the spring centering device returns the pilot plunger, hence, the slideblock to neutral.

III. SPECIFICATIONS

| | Size 8 | Size 12 | Size 054 |
|-------------------------|--------|---------|----------|
| Max. Ecc., in inches | 0.214 | 0.316 | 0.34 |

Aux. Control Source
for "AN" Units

| | | |
|-----|-----|-------|
| gpm | 1/2 | 1-1/8 |
| psi | 150 | 150 |

Solenoid Current

| A. C. Voltage | Amperes | | | |
|------------------|---------|-------|---------|-------|
| | Inrush | | Closing | |
| | 50 Hz | 60 Hz | 50 Hz | 60 Hz |
| 115 | 1.03 | 1.22 | .216 | .260 |
| 230 | .51 | .61 | .108 | .130 |

IV. MALFUNCTIONS & CAUSES

A. ERRATIC CONTROL ACTION

1. Defective solenoids or electrical system.
2. Low control pressure.
3. Binding control valve plunger or piston
4. Binding pilot plunger or large control piston.
5. Broken or defective centering spring.
6. Binding positioning lever or connector rod.
7. Choke needle (if used) clogged or screwed too far in.
8. Foreign matter in control fluid.
9. See instructions on radial piston unit w/o control.

V. TESTING & ADJUSTING

A. TESTING

1. Electrical.

Check each solenoid to see if it is operative by energizing solenoid and pushing down indicator stem (359) lightly. When solenoid is de-energized, stem should snap out. Check for loose connections. Check for proper input voltages. Check complete electrical circuit.

2. Hydraulic

Screw gages good for 1000 psi above units rating into auxiliary pressure ports, block main pressure lines (see unit instructions). For "PVA" and "AN" units, block line immediately following systems relief valve (not between pump and relief valve). Unit is usually set to go to neutral when all control solenoids are de-energized.* Start unit with all solenoids de-energized. Both gages should indicate identical

pressure. To change or correct the neutral setting, remove spring centering cover (333), loosen jam nut (396) or clamping collar screw (332A) and turn connector rod (338) while observing the gages until both read alike. Tighten jam nut without turning rod or nuts (394 & 395).

*NOTE: Some units are purposely set off of neutral.

Settings of each control knob can be checked by loosening set screw (323) and turning the knobs, one at a time, to indicated neutral (on graduated barrel) and depressing the corresponding solenoid pin (359). If gages do not read alike, stop unit. Remove retaining ring (354) in the top of knob and remove plug (355).

Remove screws (320A) and withdraw entire adjusting knob assembly with flange (320). Press out roll pin (383) in control piston (328) and slide adjusting knob assembly back into bore and secure flange (320) again. Start unit again and energize the solenoid that corresponds to the knob. Using a screw driver thru the plug hole in the top of the control knob, rotate control piston screw (325) until neutral is attained.

Once again remove screws (320A) and control knob assembly from its bore (do not allow screw (325) or piston (328) to turn). Redrill .094" hole in piston and screw, and insert roll pin. Once again slide assembly into bore and fasten to control housing cover.

B. ADJUSTING

Loosen set screws (323) in control housing cover before attempting to adjust volume control. Turning from one index number to the next moves slideblock setting .0083 inch.

1. Pumps, Transmissions and Tachometers. When facing the input shaft, the "M" control is normally on the left side and shaft rotation is clockwise. Rotating the adjusting knobs clockwise increases pump volume or transmission speed. Adjusting knobs 1 and 2 adjusts the slideblock movement toward the control (normally pump delivery from port "A" or transmission speed in one direction). Adjusting knobs 3 and 4 adjust slideblock movement away from control (normally pump delivery from port "B" or transmission speed in the other direction). However, some units are built with as many as four positions on one side of neutral and none on the other side. Reversing control sides reverses function.

VI. DISASSEMBLY

When disassembling control, tag all O-rings so they can be returned to their proper place on assembly. Remove terminal box cover (350) and disconnect all electrical leads and any piping to control.

Support control housing (340) during removal. Remove 1/2 inch pipe plug (367) and screw (340A) accessible thru plug hole. Remove the three remaining control housing screws (340A), and pull the control housing assembly straight out so the connector rod (338) and pilot plunger (305) do not become deformed or damaged.

†Roll pin (383) not used on later models so this step is unnecessary.

Remove the remaining force amplifier assembly. Be careful not to allow piston to drop from its bore. This assembly can be further disassembled by slipping the push rod (303) off of the bushing (304) and the bushing out of the piston (301) bore. The piston with rings (302) can be removed from housing (300).

To further disassemble the control, loosen jam nut (393) and unscrew pilot plunger (305) from connecting rod (338). On early model controls, drive out rollpin (308) from pilot plunger (305) and unscrew the plunger from connector rod (338). Remove Tru-seal nut (316) (if used), set screw (323), and nylon ball (317) (if used). Remove flange screws (320A) and pull up on flange (320). The complete control knob assembly with control piston (328) will come out with the flange. Mark each assembly by knob number and do not interchange them. Do not disassemble control knob assemblies any further unless absolutely necessary or readjustment of each will be required after assembly. If necessary, drive out pin († 383) and unscrew piston (328) from screw (325). Remove control cover (319). Solenoids (344) can be dismantled and solenoid pin (345), plungers (348), and springs (349) removed for inspection. Mark plungers with control numbers, do not interchange these plungers.

Remove 3/8" pipe plugs from either side of control housing and push out pivot shaft (362). Remove positioning lever (376) with shoes (353) and pin (352) from housing. Remove cover (333) and retaining ring (335) from housing. The connecting rod (338), sleeve (339 or 397) and spring centering device can be removed. Do not disassemble further unless replacement is necessary.

VII. INSPECTION

Clean all parts thoroughly and inspect them for signs of undue wear. Check fits between pilot plunger (305) and bushing (304), control piston (301) and housing (300), control valve plungers (348) and housing (340); control pistons (328) and housing (340). All fits should be smooth and all mating surfaces free from scratches. Lap, if necessary. Inspect all O'rings and seals for hardening and signs of deterioration. Be sure to remove chokes (330), clean, inspect and return.

Be sure to remove orifice (379) and chokes (330), (if used), clean, inspect and return.

VIII. ASSEMBLY

Be sure all O'rings and plugs are in their proper positions when assembling. Lubricate all pistons and plungers before assembling.

Insert control piston (301) with piston rings (302) into housing. See drawing to be sure piston is facing right. Slip bushing (304) into bore and place push rod (303) over bushing. Secure force amplifier assembly with O'rings in place to case of unit.

Place spring centering mechanism with sleeve (397 or 339) and connector rod (338) into control housing (340) and secure with retaining ring (335). Insert positioner lever (376) with pins (352) and shoes (353) into housing (340) so it engages the flats on sleeve (397 or 339) and the bore for pivot shaft (362) lines with holes for that shaft. Insert pivot shaft (362). The shaft must slide thru lever with a minimum of effort. Center shaft in housing and secure with pipe plugs (366). Secure cover (333) with O'ring (331) in place. (On size 8 units, slip adapter (313) with O'rings (312 and 314) into housing bore). Check connector rod movement for smoothness of operation. On early model controls, place retaining ring (310) and spacer (309) on shaft (338).

Screw pilot plunger (305) on shaft (338) to dimension shown on parts drawing and tighten jam nut (393). On early model controls, screw pilot plunger (305) on shaft until holes align and secure with roll pin (308). Guide this assembly into hydraulic amplifier carefully so as not to damage pilot plunger or connector rod. Secure control assembly to hydraulic amplifier with the four screws (340A). Insert and secure one screw thru 1/2" pipe plug hole, and replace pipe plug (367).

Insert control valve springs (349) and plungers (348) into their respective bores. Position solenoid pins (345) and secure solenoid assemblies (344) to housing. Check for free operation. Connect solenoid leads to terminal strip. Solenoid 1 to terminals 1 etc. Secure cover (319), with gasket (318) in place, to housing. Insert each control knob assembly with control piston into its respective bore and secure flange (320) to cover (319). Install nylon ball (317) (if used), set screw (323), and Tru-seal nut (316) (if used). If control piston (328) was replaced, or control knob assembly disassembled, it may be necessary to test and adjust as outlined in section V.

Connect unit to system, but do not connect electrical power to terminal strip. The unit can be tested and adjusted per Section V by manual actuation of solenoid pin (359). Then, connect electrical power to terminal strip and test operation of solenoids.

Parts list and drawing
on pages 6 and 7

Notes

IX. PARTS LIST

| Part No. | Description | Part No. | Description | Part No. | Description |
|----------|----------------------------|----------|--------------------------|----------|-----------------------------|
| 300. | Housing, Hyd. Ampl. | † 330A. | Lock Nut & Seal | 356. | Seal, O'ring |
| 300A. | Screw, Sock. Hd. Cap | 331. | Seal, O'ring | 357. | Seal, O'ring |
| 301. | Piston, Large Control | † 332. | Clamp, Neutral Adj. | 358. | Seal, O'ring |
| *302. | Ring, Piston | † 332A. | Screw, Sock. Hd. Cap | 359. | Pin, Sol. Push |
| 303. | Rod, Control Push | 333. | Cover, Centering Spring | 361. | Seal, O'ring |
| 304. | Bushing, Pilot Plunger | 333A. | Screw, Sock. Hd. Cap | 362. | Shaft, Pivot |
| 305. | Plunger, Pilot | 333B. | Washer, Lock | 363. | Plug, 1/16" Pipe |
| 306. | Seal, O'ring | † 334. | Spacer, Connect. Rod | 364. | Plug, 1/8" Pipe |
| 307. | Seal, O'ring | 335. | Ring, Retaining | 365. | Plug, 1/4" Pipe |
| † 308. | Pin, Roll | 336. | Spring, Centering | 366. | Plug 3/8" Pipe |
| † 309. | Spacer, Washer | 337. | Guide, Spring | 367. | Plug 1/2" Pipe |
| † 310. | Ring, Retaining | 338. | Rod, Connector | 369. | Ring, Retaining |
| 312. | Seal, O'ring | † 339. | Sleeve, Conn. Rod | 370. | Pin, Dummy |
| 313. | Adapter, Control | 340. | Housing, "M" Control | 371. | Flange, Blind Control |
| 314. | Seal, O'ring | 340A. | Screw, Sock. Hd. Cap | * 372. | Knob, Adj. Control (CCW) |
| 315. | Seal, O'ring | 341. | Ring, Retaining | * 373. | Screw, Control Piston (CCW) |
| † 316. | Nut, Tru-Seal | 342. | Spacer, Outer Cont. Knob | 374. | Marker, Terminal Strip |
| † 317. | Ball, Nylon | 343. | Screw, Control Adj. | 375. | Strip, Terminal |
| 318. | Gasket, Control Cover | 344. | Assembly, Solenoid | 375A. | Screw, Rd. Hd. Machine |
| 319. | Cover, Control | 344A. | Screw, Sock. Hd. Cap | 376. | Lever, Positioning |
| 319A. | Screw, Sock. Hd. Cap | 344B. | Washer, Lock | 377. | Spacer, Inner Cont. Knob |
| 320. | Flange, Adj. Knob | 345. | Pin, Solenoid Push | **379. | Plug, Orifice |
| 320A. | Screw, Sock. Hd. Cap | 346. | Feedthru | † 383. | Pin, Roll |
| 321. | Screw, Half Dog Pt. | 347. | Ring, Retaining | 384. | Shaft, Stub |
| 322. | Knob, Adj. Cont. (CW) | 348. | Plunger, Control Valve | 385. | Pin, Spring |
| 323. | Screw, Flat Point Set | 349. | Spring, Control Valve | 386. | Plate, Feed-thru |
| 324. | Screw, Adj. Stop | 350. | Cover, Terminal Box | 393. | Nut, Jam |
| 325. | Screw, Control Piston (CW) | 350A. | Screw, Sock. Hd. Cap | 394. | Nut, Hex. |
| 326. | Seal, O'ring | 351. | Gasket, Terminal Cover | 395. | Nut, Jam |
| 328. | Piston, Control | 352. | Pin, Shoe | 396. | Nut, Jam |
| 329. | Seal, O'ring | 353. | Shoe, Tilt Lever | 397. | Sleeve, Conn. Rod. |
| † 330. | Needle, Choke | 354. | Ring, Retaining | 398. | Plate, Name |
| | | 355. | Plug, Cont. Adj. Knob | 398A. | Screw, Drive |

*Parts numbered (372) and (373) are used in place of (322) and (325) for counterclockwise adjusting knobs.

†Used only on some early models.

**Not used on some controls.

NOTE: Parts used in this assembly are per Oilgear specifications. Use Oilgear supplied parts to insure compatibility with assembly requirements. When ordering replacement parts, include unit serial number, part number and bulletin number.

O'RING SIZES

Cross Section x O.D. Duro ± 5

| Part No. | Unit Size | | | |
|----------|---------------|----|---------------|----|
| | 8 | | 12 & 054 | |
| 306. | 3/32 x 3/4 | 70 | 3/32 x 13/16 | 70 |
| 307. | 1/16 x 1/2 | 70 | | |
| 312. | 1/8 x 3-1/2 | 70 | | |
| 314. | 1/8 x 2-1/2 | 70 | 1/8 x 3-7/8 | 70 |
| 315. | 1/16 x 9/16 | 70 | 1/16 x 9/16 | 70 |
| 326. | 1/16 x 3/4 | 70 | 1/16 x 3/4 | 70 |
| 329. | 3/32 x 2-1/8 | 70 | 3/32 x 2-1/8 | 70 |
| 331. | 1/8 x 2-1/8 | 70 | 1/8 x 2-1/8 | 70 |
| 346A. | 1/16 x 1/2 | 70 | 1/16 x 1/2 | 70 |
| 356. | 3/32 x 5/8 | 70 | 3/32 x 5/8 | 70 |
| 357. | 1/16 x 1 | 70 | 1/16 x 1 | 70 |
| 358. | 1/16 x 1/4 | 70 | 1/16 x 1/4 | 70 |
| 361. | 3/32 x 1-7/16 | 70 | 3/32 x 1-7/16 | 70 |

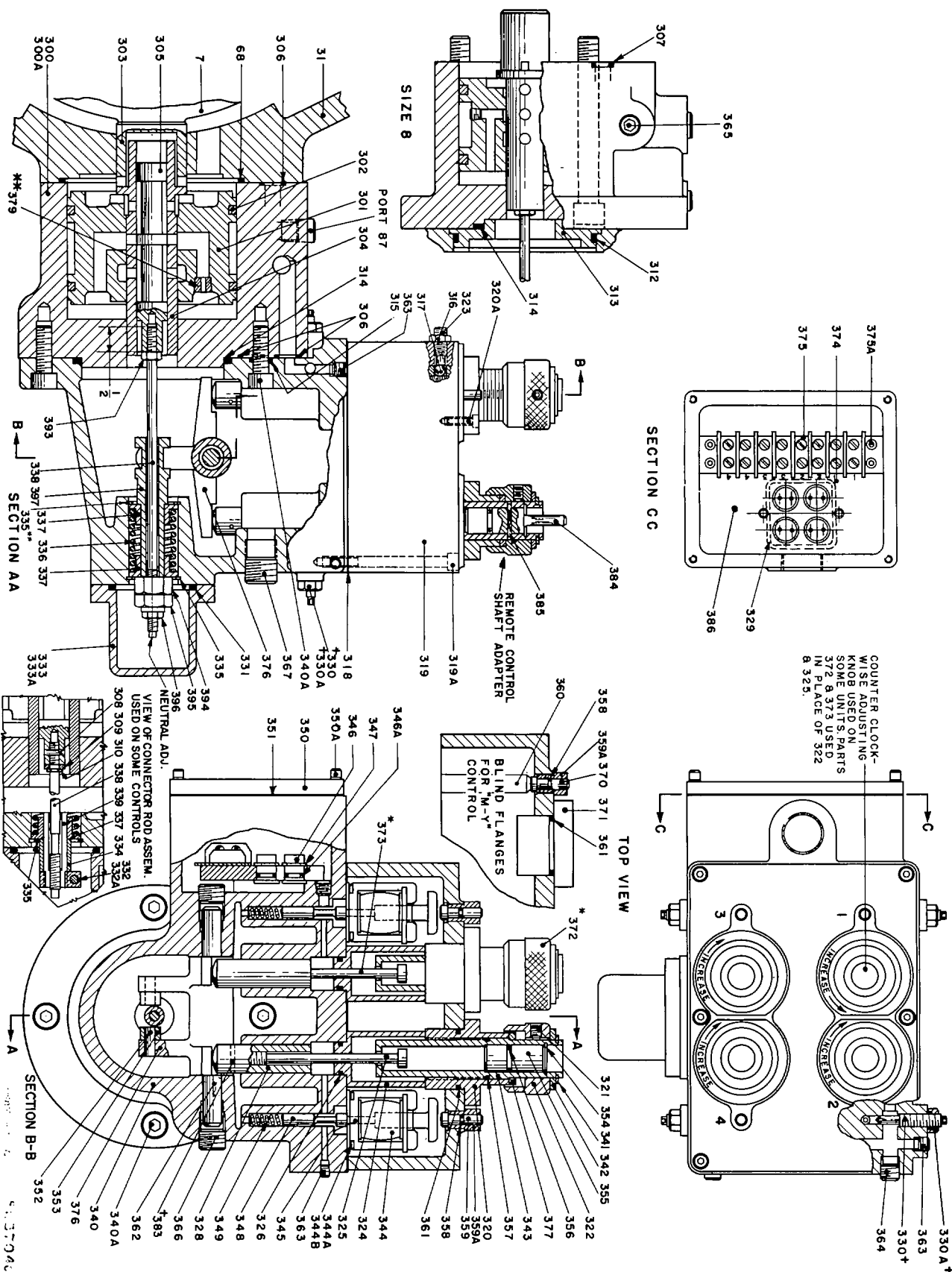


Figure 3. Parts Drawing, Oilgear Type "M" Control. DS-947290 C (503704 C).



KNOB ADJUSTMENT ASSEMBLIES & SOLENOID OPERATION FOR "M" CONTROLS

KEY
 Control Is Adjustable Over Range Indicated
 *Control Setting (Example) Indicated
 Standard Adjusting Knob Assemblies Indicated-----STD
 Special Adjusting Knob Assemblies Indicated-----SPE

*When two solenoids are energized simultaneously, special adjusting knob setting must be for a shorter stroke setting than the standard knob.

"M-M" CONTROLS (4 DELIVERIES & NEUTRAL)

| STYLE | KNOB ADJUST. ASSEMBLIES | | | | SOLENOIDS ENERGIZED (+) | | | | PUMP STROKE | | |
|----------------|-------------------------|-----|-----|-----|-------------------------|---|---|---|---------------|-------|---------------|
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | Port "A" Full | Neut. | Port "B" Full |
| I. | STD | STD | SPE | SPE | + | + | + | + | | | |
| II. | STD | STD | STD | SPE | + | + | + | + | | | |
| † III. STD. | STD | STD | STD | STD | + | + | + | + | | | |
| IV. | STD | SPE | STD | STD | + | + | + | + | | | |
| V. | SPE | SPE | STD | STD | + | + | + | + | | | |

† This combination will be furnished unless otherwise ordered.

"M-M" CONTROL (5-POSITION)

Adjustments will be the same as above except when no solenoids are energized the unit will go on stroke rather than neutral. This stroke can be adjusted throughout the range by removing control stem cover and repositioning the neutral adjustment.

"M-Y" CONTROLS (2-DELIVERIES & NEUTRAL)

| STYLE NO. | ADJUST. ASSEM. | | SOL. ENERG. | | PUMP STROKE | | |
|-----------|----------------|-----|-------------|---|---------------|-------|---------------|
| | 1 | 3 | 1 | 3 | Port "A" Full | Neut. | Port "B" Full |
| I | STD | SPE | + | + | | | |
| † II | STD | STD | | | | | |
| III | SPEC | STD | | | | | |

† This combination will be furnished unless otherwise ordered.

"M-Y" CONTROLS (3-DELIVERY)

Adjustments will be the same as above except when no solenoids are energized, the unit will go to stroke rather than neutral. This stroke can be adjusted throughout the range by removing control stem cover and repositioning the neutral adjustment.