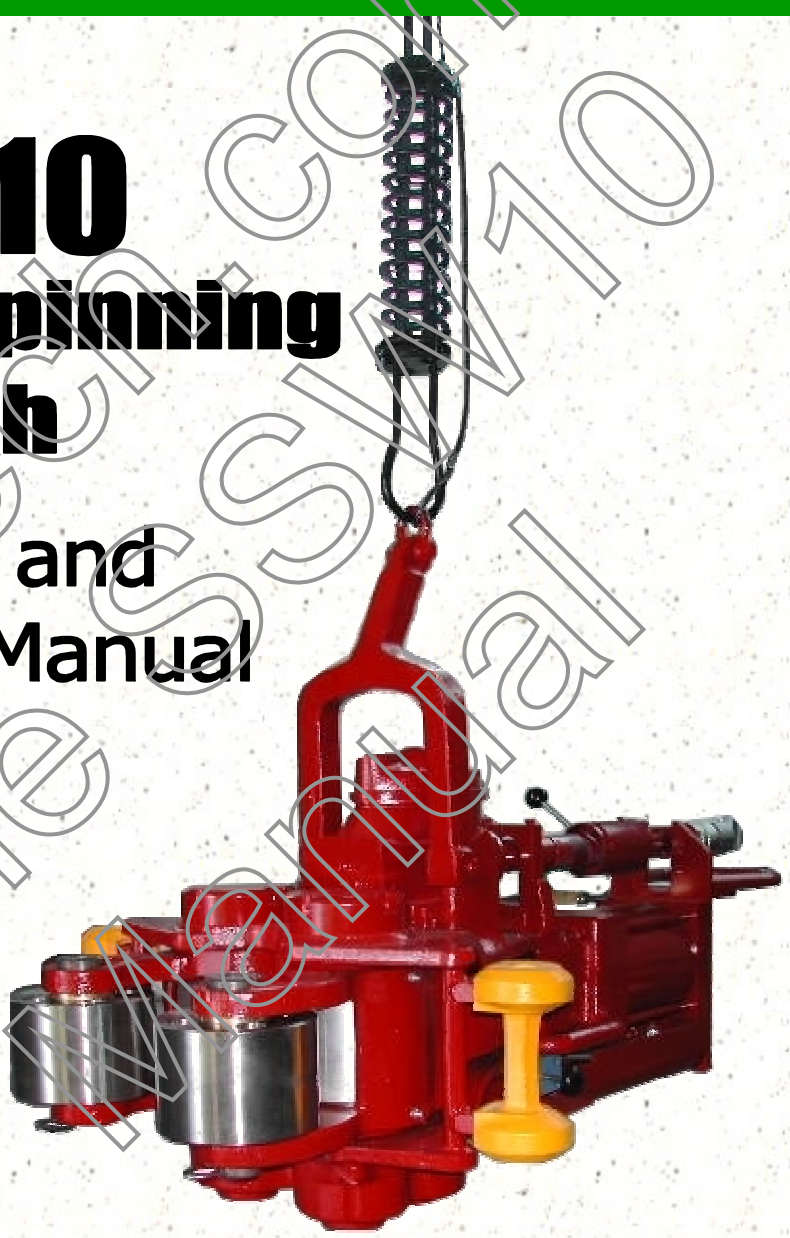
Cam-Tech Products, Inc.

SSW-10
Pneumatic Spinning Wrench

Installation and Maintenance Manual



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CAM-TECH PRODUCTS, Inc.

Cam-Tech is dedicated to providing the drilling industry quality pipe handling equipment, excellent service, and competitive prices. Our sales representatives and agent network are qualified and respected with many years of experience and are capable of handling the most complex situations.

CAM-TECH current products include ...

- Kelly Bushings — Pin and Square Drive
- Kelly Bushing Safety Drive Pin
- Master Bushings — Solid, Hinged, and Split
- Casing Bowls — through 30"
- Rotary Slips — Short, Medium, and Long
- Safety "Flex" Handles for Manual Slips
- AS-16 Air Slips (Gorilla Grip)
- Drill Collar Slips — Short, Regular, and Long
- Casing Slips — through 30"
- Safety Clamps — through 30"
- SSW-10 Spinning Wrenches and parts
- SSW-30 Spinning Wrenches and parts
- SSW-40 Spinning Wrenches and parts
- Hydraulic Power Units

CAM-TECH reconditioned equipment include ...

- Kelly Bushings
- Master Bushings and Bowls
- Rotary Slips
- Drill Collar Slips
- Spinning Wrenches
- Kelly Spinners
- TW-61 Torque Wrenches
- Iron Roughnecks
- Spring Slips (PS-15)
- Power Slips (PS-16)

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GENERAL SPECIFICATIONS

Description

The Safety Spinning Wrench SSW-10 is a pneumatically powered tool for spinning drill pipe from 3-1/2" to 5 1/2" O.D. Using the proven principle of friction drive contact, the spinning wrench can spin drill pipe in or out quickly and efficiently without damage to the drill pipe and without the hazards of a spinning chain.

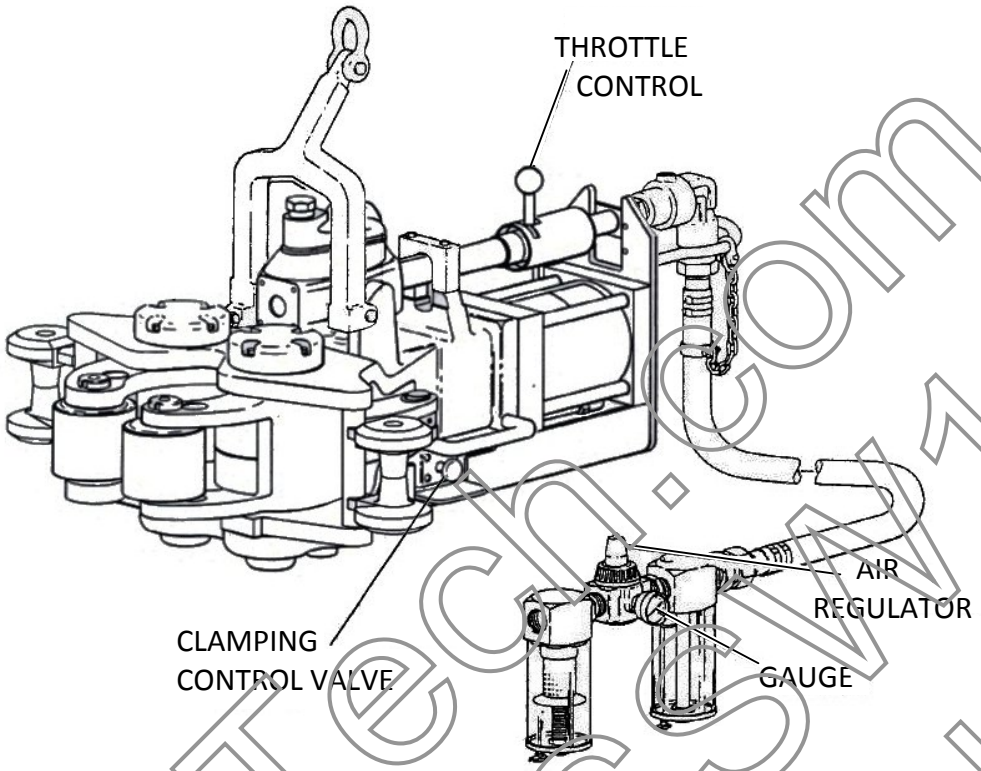
Theory of operation

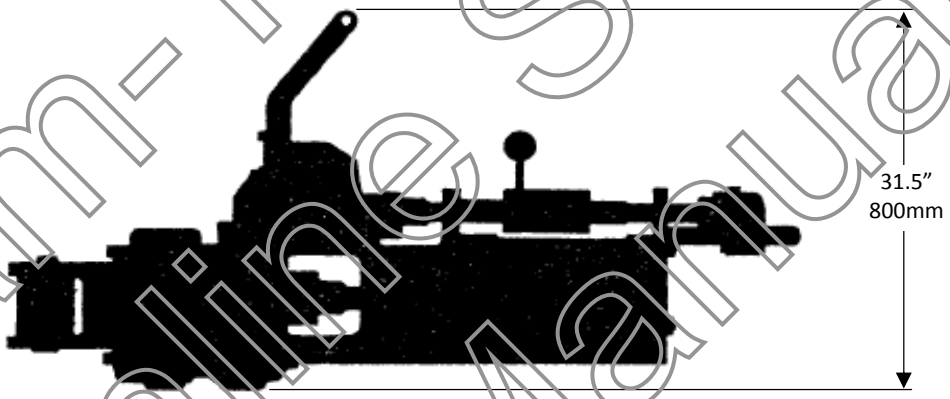
During a typical spin up procedure, the wrench is swung onto the drill pipe above the pipe upset. The clamping control is actuated and the pressure rollers clamp and lock onto the drill pipe. The pipe is now tight against the two aluminum drive rollers. The operator can now turn the throttle control to operate the variable speed drive motor and spin the pin into the box. After the pipe is spun in, the joint formed by the pin and box can be torqued using the proper torquing device. For spinning out drill pipe, the operation is repeated in a reverse of spin in.

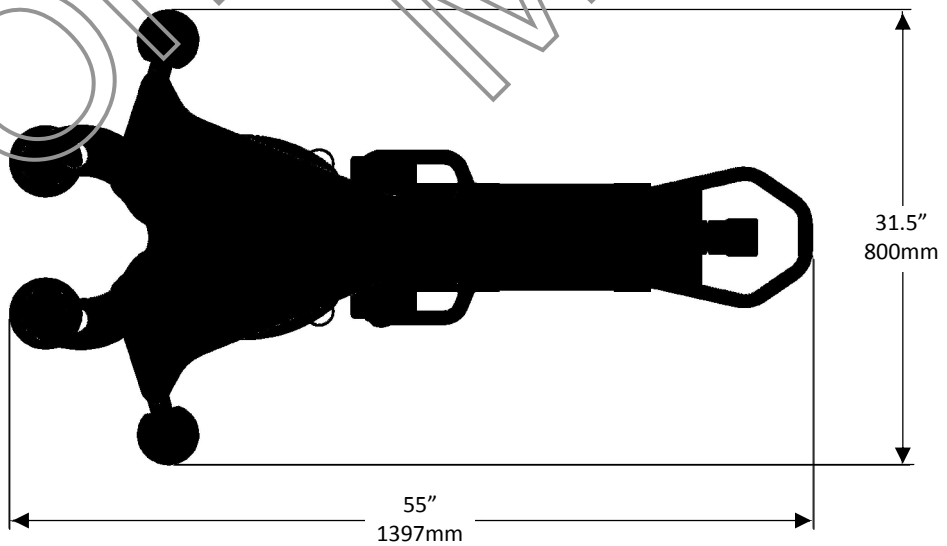
Specifications

Part	Part Number
SSW-10 assembly with 3-1/2" rollers	C-10426-35
SSW-10 roller assembly, pressure 3-1/2"	12035
SSW-10 assembly with 4" rollers	C-10426-40
SSW-10 roller assembly, pressure 4"	12040
SSW-10 with 4-1/2" rollers	C-10426-45
SSW-10 roller assembly, pressure 4-1/2"	12045
SSW-10 assembly with 5" rollers	C-10426-50
SSW-10 roller assembly, pressure 5"	12050
SSW-10 with 5-1/2" rollers	C-10426-55
SSW-10 roller assembly, pressure 5-1/2"	12055

Specifications	SSW-10
Size range	3-1/2" to 5-1/2"
Air pressure	90 - 125 PSI (650 KPa - 860 KPa)
Air consumption	240 cfm (113 l/s)
Oil pressure	n/a
RPM (5" pipe)	80-100
Stall Torque	1,000 Lbs-Ft (1,350 Nm) @125 psi (860KPa)
Weight	810 Lbs (368 Kg)
Height	31.5" (800 mm)
Length	55" (1397 mm)
Width	31.5" (800 mm)







LUBRICATION & MAINTENANCE

Recommended General Purpose EP grease

Lube code description	Above -20° C	Below -20° C
Castrol	MP grease	n/a
Chevron	Avi-Motive	Avi-Motive W
Exxon	Lidok EP2	Lidok EP1
Gulf	Gulfcrown EP2	Gulfcrown EP1
Mobil	Mobilux EP2	Mobilux EP1
Shell	Alvania EP2	Alvania EP1
Texaco	Multifak EP2	Multifak EP1
Union	Unoba EP2	Unoba EP1

WARNING!! *Make sure that all pneumatic supply is isolated before ANY work is carried out on the Spinning Wrench. Shut off the Power Unit, close the valves.*

WARNING!! *Do not use casing and tubing lubricant. Thread compound (pipe dope) must be applied to the tool joint every time it is made up.*

Procedure daily maintenance & lubrication (when in use) -- see Figure L-1

Daily lubrication	No. of lube points	Application	Lube Cycle
1 Lubricate the swivel	2	Apply multipurpose grease: Apply until fresh grease can be seen	Every trip
2 Air motor	2	Multipurpose grease	Every trip
3 Pressure rollers	2	Multipurpose grease	Every trip
4 Drive roller bearing	4	Multipurpose grease	Every trip
5 Adjustable links	2	Multipurpose grease	Every trip
6 Cylinder rod end pin	1	Multipurpose grease	Every trip
7 Throttle control valve	1	SAE 10	Every trip
❽ Lubricator	1	See Service -- page 6	Every trip
❾ Filter	1	See Service -- page 7	Every trip
❿ Gear case	1	See Service -- page 5	Every 3 months

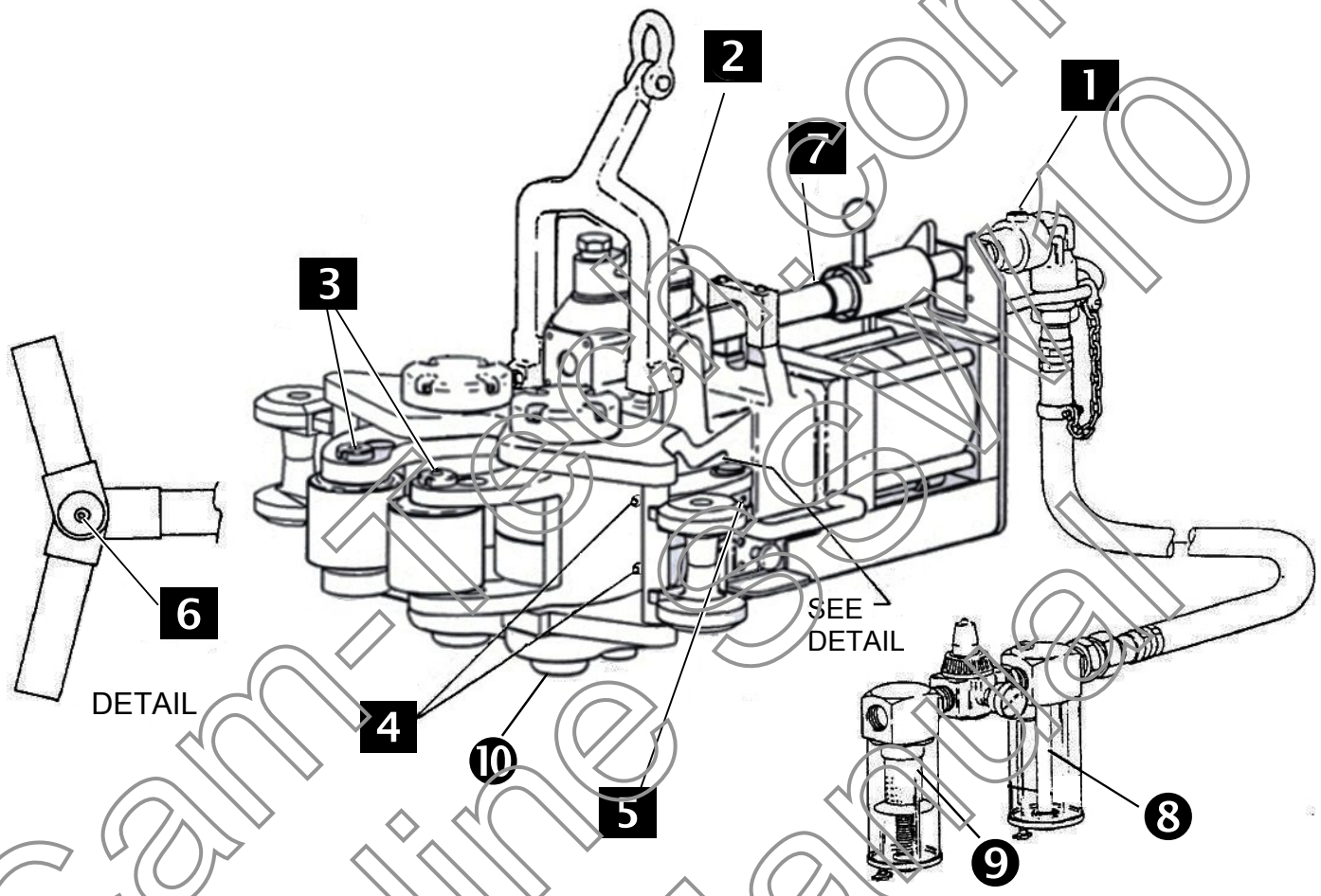
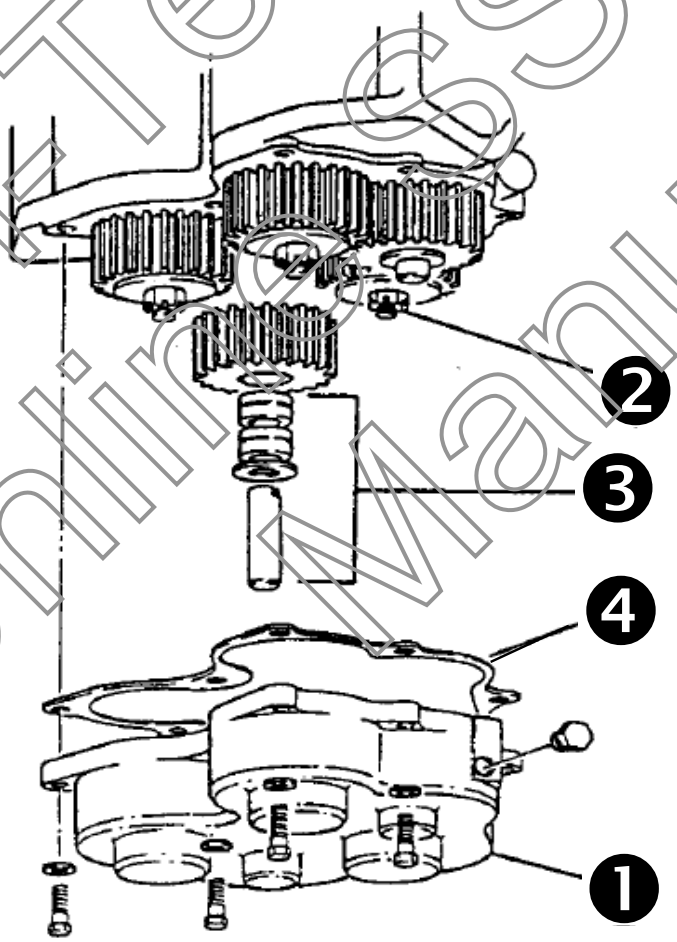


FIGURE L-1
■ Numbers Indicate Lube Point

SERVICE -- GEAR CASE AND OIL CHANGE INSPECTION

Procedure

- Remove gear case ❶ and drain oil.
- Clean case.
- Check the socket head bolts holding the air motor to wrench housing located under drive gears. Torque to 110 Lbs-Ft (149 Nm).
- Check castle nut ❷ holding gear on motor shaft is tight.
- Check idler gear bearing and shafts ❸. If either shows wear, replace.
- Reinstall the gear case with a new gasket ❹.
- Fill case with 2 quarts (1.9L) SAE W90 transmission oil.



SERVICE -- LUBRICATOR

Procedure

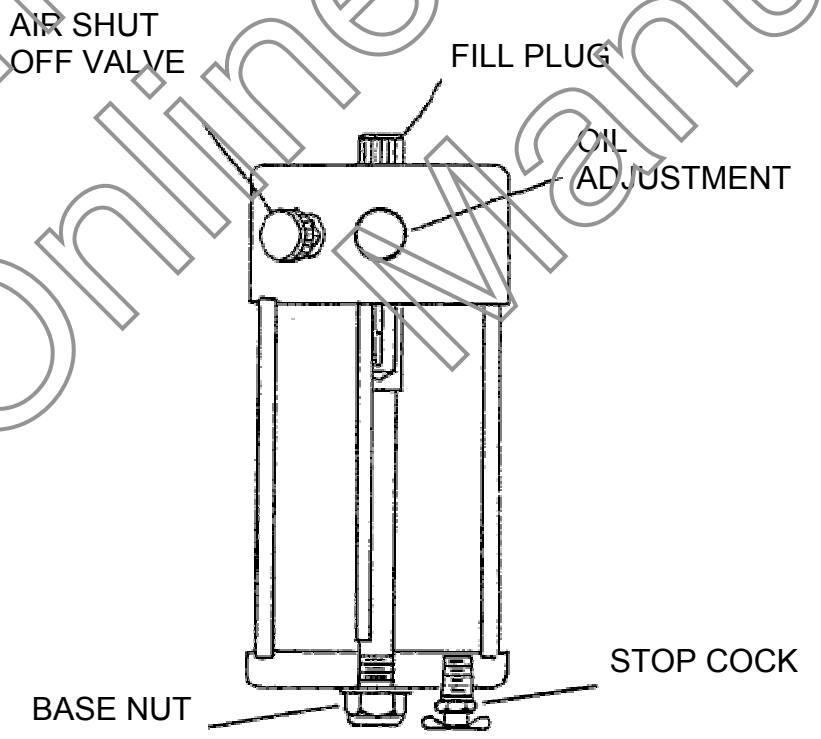
Fill lubricator with SAE 10 oil.

Reservoir can be filled with-out turning off the inlet supply pressure as follows:

1. Close air shut-off valve by turning clockwise.
2. Remove self-venting fill plug.
3. Fill to bottom of sight tube with hydraulic oil (approx. 80 to 150 SSU at 100°F e.g. SAE 5 or 10).

   NOTE: Drip rate is factory set and must not be changed.
4. Replace fill plug hand tight and fully open air valve.
5. **If replacing filter, set drip rate according to instructions given with unit.**

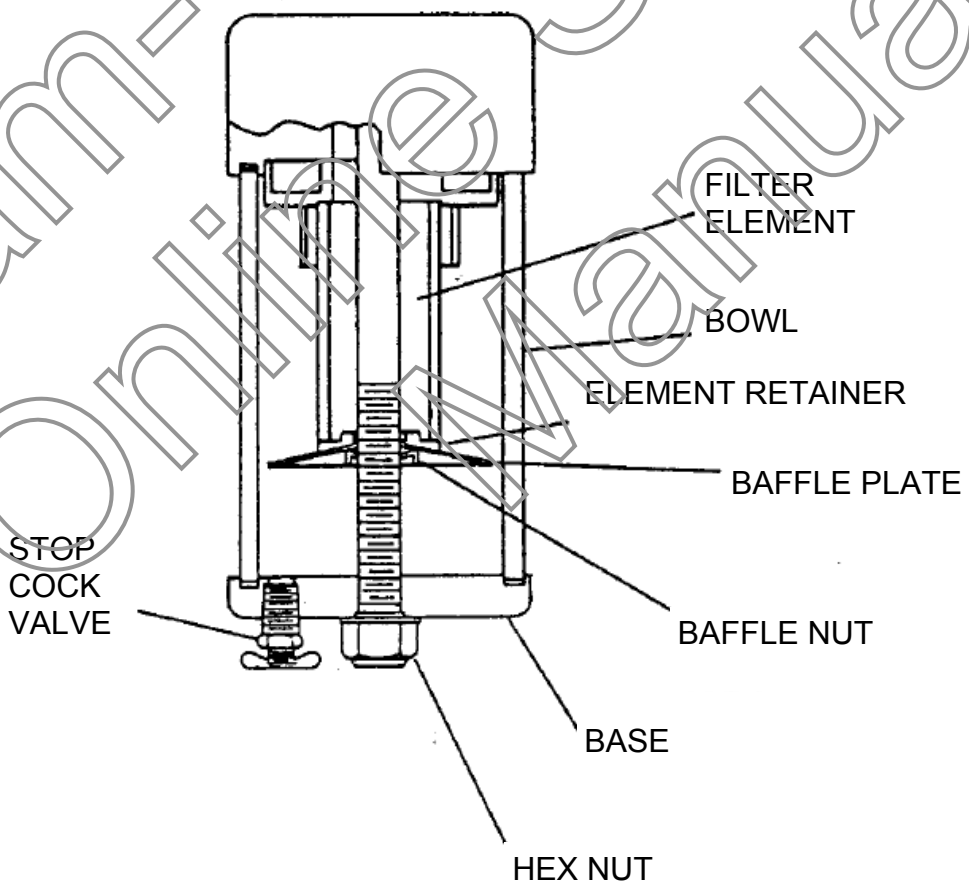
CAUTION!! Avoid exposing plastic bottles to any chemicals that would deteriorate plastic, such as solvents, thinners and carbon tetrachloride.



SERVICE -- FILTER

Procedure

- Shut off power supply and open cock valve to vent pressure.
- Remove hex nut, base and bowl.
- Bowl can be cleaned with mild soap and water, or kerosene.
- Do not use solvents, thinner or carbon tetrachloride.
- Unscrew baffle nut and baffle plate, and remove element and element retainer.
- Install new element and element retainer.
- Screw baffle plate up hand tight and secure with baffle nut wrench tight.



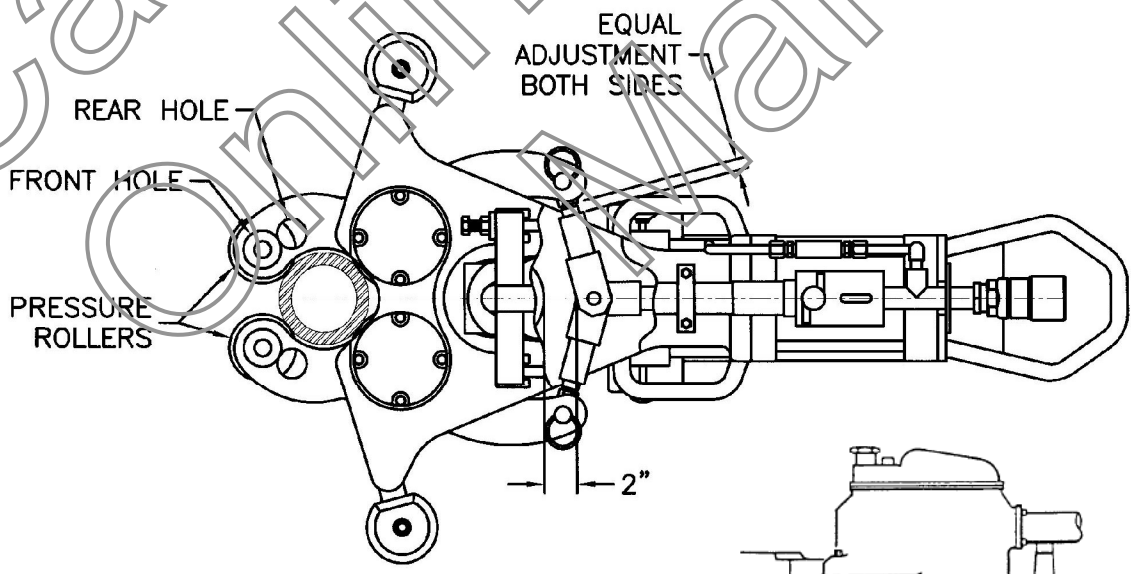
SERVICE -- ADJUSTMENTS

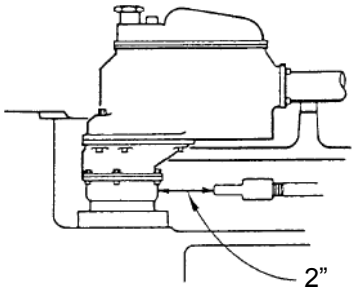
Change rollers as follows:

- Select proper roller size for drill pipe size as indicated in chart below.
- Place roller in proper hole in roller arm and secure roller pin with clips provided.
- Adjust the pressure arm with adjustable links to 2" as shown for Chicago Pneumatic motor. Links must be adjusted equally on both sides.

NOTE: Adjustments must be performed when wrench is NOT clamped onto drill pipe.

Front Rollers			Rear Rollers		
Drill Pipe OD	*Roller diameter*	*Roller P/N*	*Drill Pipe OD*	*Roller diameter*	*Roller P/N*
5"	5"	12050	3-1/2"	6-5/8"	12035
5-1/2"	4"	12055	4"	5-3/4"	12040
			4-1/2"	4-3/4"	12045





INSTALLING THE SPINNING WRENCH -- See Figure I-1

There are two (2) methods of hanging the spinning wrench:

- ❑ A fixed line method; or
- ❑ The preferable using a counter balanced line

FIXED LINE METHOD

1. Attach a 1/2" or 5/8" cable in the derrick at a height that will allow a free easy swing. The higher the fixed line the easier it will be to move the wrench onto the pipe.
2. Attach the cable at a cross member approximately 2 1/2 feet (0.75 m) from drill pipe centerline as shown, and position the wrench across from the driller where the chainman normally would stand.
3. Suspend the wrench approx. 5 feet (1.5 m) above the floor.

COUNTER BALANCE METHOD

1. Attach the pulley assembly in the derrick at the same point as shown in the fixed line installation.
2. Attach a counterweight equal to the weight of wrench on free end of cable.

BACK UP CABLES

1. Attach two back up cables to the rear of the wrench to restrict movement to 1 foot (0.3 m) in either direction.

CAUTION!! If only one back up line is attached, the wrench can rotate into the Operator and cause injury.

CONNECTING AIR LINES

- The wrench requires 240 cfm @ 90 Psi (113 l/m @ 620 KPa).
- It is equipped with a regulator to prevent damage from excessive air pressure.

NOTE: During installation use as few pipe fittings as possible and route the air line direct from the air supply, keeping distance as short as possible.

1. Run a 1-1/2" air supply line up to the rig floor in a protected area easily accessible for maintenance.
2. Install a 1-1/2" shut off valve to the air supply line (as shown) to allow maintenance of the tool.
3. Attach the filter end of the filter/regulator/lubricator assembly to the shut off valve.
4. Connect the 25 foot (7.6 m) air hose assembly provided to the lubricator end of the filter/regulator/lubricator assembly.
5. Blow out air line to remove any trapped moisture and debris.
6. Pour 1/2 pint (0.47 l) SAE 10 oil into the 25 foot (7.5 m) hose, then connect to spinning wrench swivel fitting.
7. Level tool with the rig floor using the hanger adjustment screw provided.

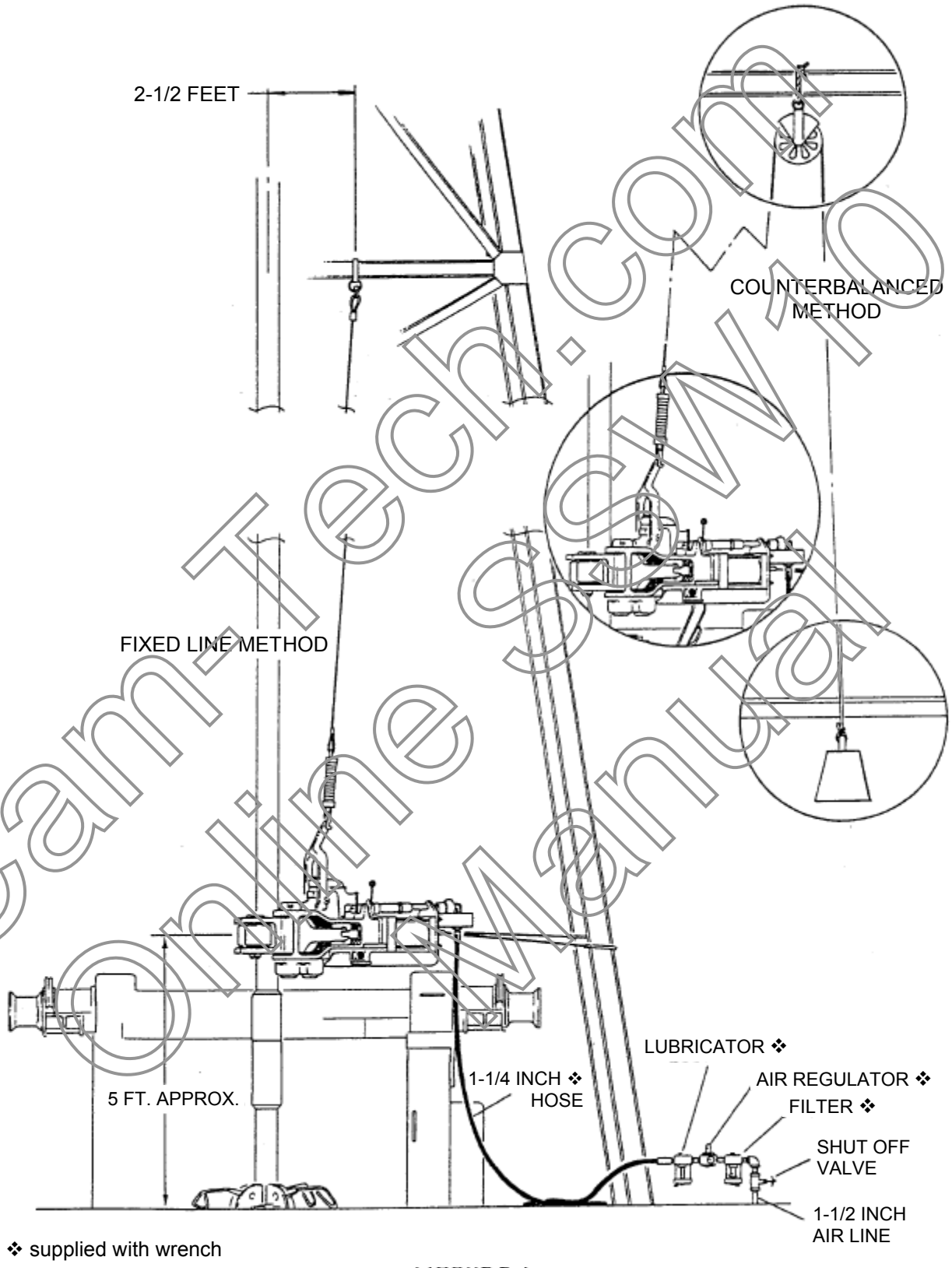


FIGURE I-1

NORMAL USAGE

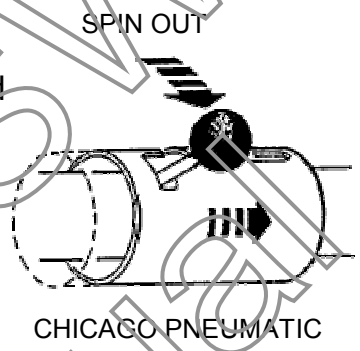
The spinning wrench is designed to:

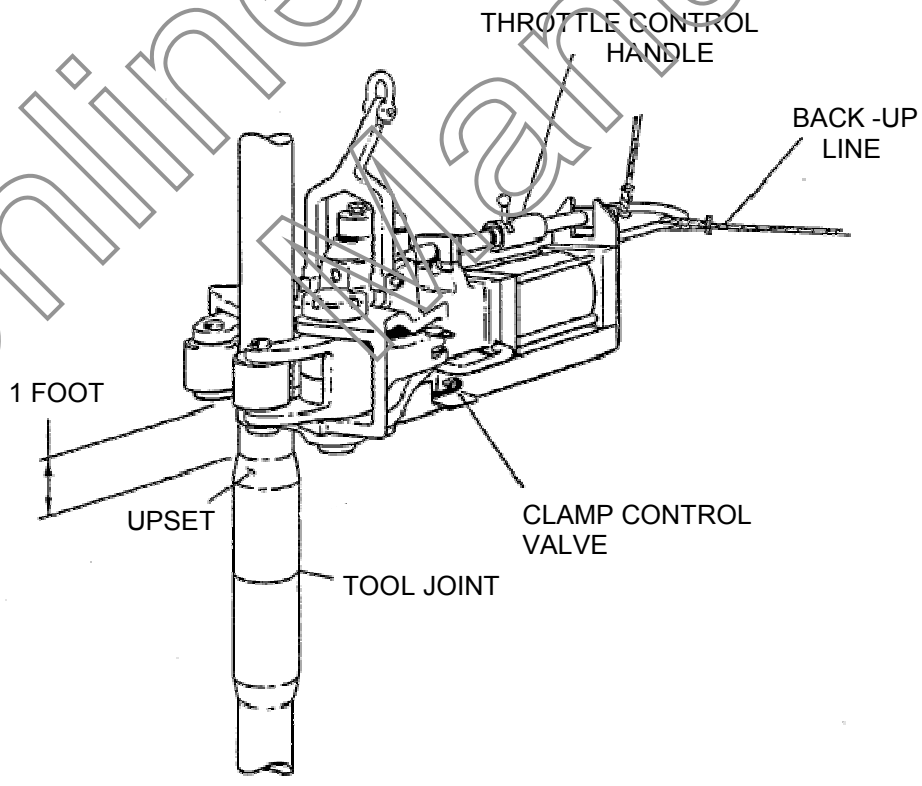
- Spin in and spin out various types of tubing and casing

CAUTION!! *Back up lines must be attached to limit rotational movement to one foot (0.3m) in each direction.*

PROCEDURE

1. Swing wrench onto drill pipe approximately one foot (0.3m) above the tool joint.
2. Do not operate the wrench on pipe upset or tool joint.
3. To clamp wrench to pipe, actuate clamp control valve located on wrench body.
4. To spin pipe, rotate throttle control handle in the direction of spin required.
5. To release wrench from pipe, actuate clamp control valve.





CONTROLS and INDICATORS

1) Clamping control

This is a two position directional control valve that clamps and unclamps the pressure rollers on the drill pipe

2) Throttle control (spin in, spin out)

This is a shift type control that operates the variable speed drive motor to power the aluminum drive rollers and spins in or spins out the drill pipe. This control is equipped with a lock out device to prevent accidental shifting to the wrong direction.

3) Air regulator/gauge

This is a combination air regulator and gauge that indicates the input line pressure from 0 - 160 PSI (0 - 1,100 KPa) and prevents premature wear. The air regulator is factory set and should not be reset.

TIPS ON OPERATION

1. Pin should be stabbed into the box as vertical as possible. Spinning wrench can not spin an improperly aligned connection

2. Spin pin into box until pin and box are just shouldered together; at this point stop and torque joint with the torque wrench. Do not use the spinning wrench to torque joints.

3. Keep clamping arms adjusted. Slipping rollers will cause rollers to wear. If drive rollers start to slip on the pipe, check the pressure roller adjustment and adjust equally on both sides. See adjustment procedure.

4. Replace worn drive rollers. If the drive rollers start to slip and the roller arms have been adjusted to maximum, this may indicate drive rollers require replacement.

TIPS ON HANDLING THE DRILL STEM

Picking up and laying down the drill stem

- Use thread protectors when available. When threads and shoulders are unprotected, do not permit the tool joints to strike steel surfaces such as walks, stairs, steel floors, or machinery. Use wood surfaces where the tool joint may hit.

Cleaning and lubrication (thread compounds)

- Pin and box threads and shoulders should be thoroughly cleaned.
- Use solvent and wipe dry with a clean rag.
- Inspect carefully for any burrs or nicks on the shoulders or threads.
- Damaged connections should never be run in the hole.
- After cleaning, apply tool joint thread compound to threads and shoulders with a round, stiff bristle brush.
- Use thread compounds containing 40% to 50% by weight of finely powdered metallic zinc.

CAUTION!! *Never, under any circumstances, use casing and tubing lubricant. Thread compound must be applied to the tool joint every time it is made up.*

Stabbing and spinning the drill stem

- Do not allow the ends of the pin to strike the box shoulders. The shoulder must not be nicked or otherwise damaged.
- Before spinning the pipe, make sure connections are in alignment.
- Do not rotate the pipe too fast, especially when wobbling or binding occurs.
- Extra care is necessary when a power operated spinner is used.

TIPS ON HANDLING THE DRILL STEM

Making up the drill stem (torque)

- Torque measuring equipment must be used.
- When using tongs, it is important that line pull be measured when the line is at right angles or 90° to the tong handle.
- When applying line pull, do not jerk the tongs.
- Over-torque can be just as damaging as under-torque.
- Use both tongs (when tongs are used) when making up tool joints.
- Do not make up pipe using spinners only. Torquing devices must be used.

Breaking in new connections

- Initial makeup is most critical and extra care is essential for long trouble-free service.

  Follow these steps:

  - Inspect threads and shoulder for any damage.
  - Clean and lubricate as indicated above.
  - Walk in or slowly rotate joints together.
  - Makeup to recommended torque.
  - Breakout and slowly spin out.

Breaking and spinning out the drill stem

- When breaking out the joint, use both tongs (when using tongs). Always follow these steps:
- Do not let the end of the pipe strike the box shoulder.
- Come out of the hole on a different break each trip so that every connection can be periodically broken and its condition and torque checked.
- When standing the pipe back, be sure the set back area is clean where the pin will rest.

TROUBLESHOOTING

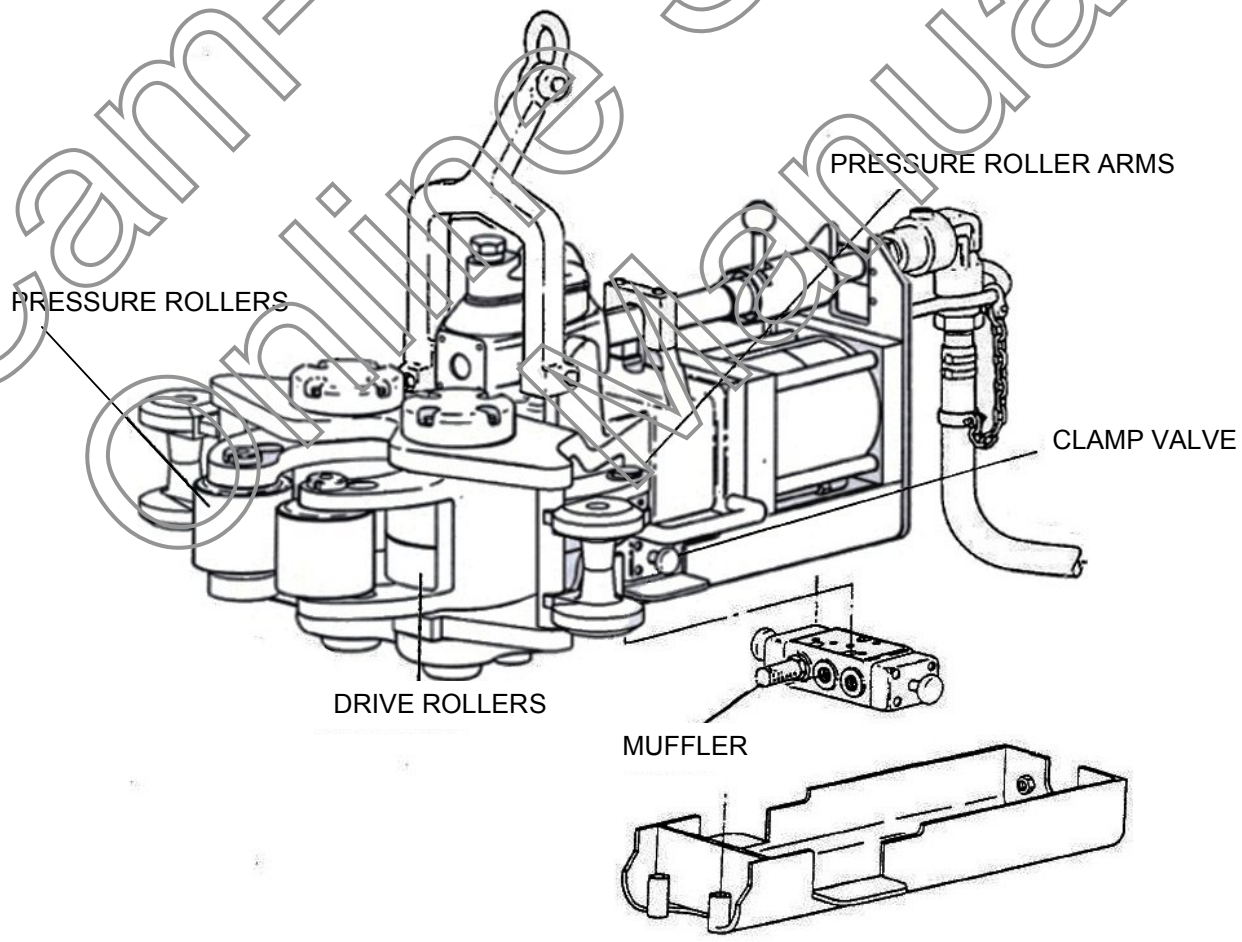
If a problem with the spinning wrench cannot be solved after following this section on troubleshooting, contact an authorized Cam-Tech representative.

WARNING!! *Make sure the pressure line valve is fully opened before pressurizing the Spinning Wrench.*

GENERAL SYMPTOMS

When troubleshooting the wrench, the following symptoms should be checked first:

1. Air pressure -- this should be 90 to 125 psi at regulator with air consumption at 240 cfm or 16 cubic feet per connection.
2. Hoses -- check that hoses are free and not kinked or pinched.
3. Connections -- check all connections are secure and do not leak air or that any connections have not been made that would reduce the line I.D. thereby restricting air flow.
4. Lubricator -- check lubricator is full (SAE 10 oil).
5. Filter -- check and drain as required.
6. Muffler -- check mufflers are not blocked with mud, etc.
7. Control valve -- check valve is functioning properly.



SOLUTIONS

SYMPTOM	PROBABLE CAUSE	SOLUTION
Wrench fails to spin or clamp onto drill pipe	No air pressure	Check general symptoms
Wrench fails to clamp onto drill pipe	No air pressure	Check general symptoms
	Dirty or clogged air exhaust mufflers	Clean and/or replace mufflers
	Faulty clamp valve	Replace valve or install seal kit if unit indicates leaky seals. Kit shown in parts list.
Wrench drive rollers slip on drill pipe	Pressure arms out of adjustment	Re-adjust arms as indicated in Service section of "Lubrication & Maintenance"
	Drive rollers are worn and will not contact pipe adequately	Check rollers and replace as required
	Drive roller gears, idler gears and/or gear is worn excessively	Check these gears as noted in the disassembly procedures and inspect all affected parts for excessive wear and replace as required.
	Wrench is not equipped with check valve. This valve prevents pressure decay in the air lines.	Check if wrench is equipped with check valve. If not, install.
Air motor does not operate, or operates slowly and drive rollers will not rotate.	Insufficient air pressure	See General Symptoms
	Throttle control handle is frozen	Lubricate control handle front and back
	Drive shaft or drive key is broken. Possible damage to drive gear and idler gear.	Disassemble wrench and replace shaft and/or gears. It is recommended to replace all seals and check bearings when replacing gears at all times.
	Air motor is frozen up.	Remove air motor and check internal mechanisms and replace damaged components.
	Cap screw and lock washer used to retain main drive gear on air motor has come loose and has caused misalignment and damage.	Lower gear box, and check drive gear. If cap screw has come loose, it is recommended that it be replaced.
Wrench slips on drill pipe but drive rollers and motor operate.	Pressure roller is worn.	Replace pressure rollers and bearings.
	Pressure roller arms have a metal fatigue	Check both arms for cracks between the drive roller and pressure mounting holes.
	Spool valve has leaking seals and will not hold required pressure.	Replace valve and/or seals.

Figure 2 -- SPINNING WRENCH ASSEMBLY

Item	Cam-Tech Part No.	Description	Qty
	C-10426-35	SSW-10 ASSEMBLY with 3-1/2" Rollers	Ref.
	C-10426-40	SSW-10 ASSEMBLY with 4" Rollers	Ref.
	C-10426-45	SSW-10 ASSEMBLY with 4-1/2" Rollers	Ref.
	C-10426-50	SSW-10 ASSEMBLY with 5" Rollers	Ref.
	C-10426-55	SSW-10 ASSEMBLY with 5-1/2" Rollers	Ref.
1	6987	ANCHOR, Shackle	1
2	51402-10	PIN, Cotter	2
3	10445	PIN, Hanger	2
4	15060	SPRING HANGER	1
5	50005-28-C8	SCREW	2
6	50905-C	LOCK WASHER	2
7	15144	SUPPORT, Handle	1
8	52820-16-G	BUSHING, Pipe Reducing	1
9	11934	SWIVEL JOINT	1
15	10659	AIR HOSE ASSEMBLY (includes safety chain assembly)	1
16	52824-20-G	BUSHING, Pipe Reducing	1
17	6598	LUBRICATOR	1
18	52824-20-G	BUSHING, Pipe Reducing	2
19	53920-G	NIPPLE	2
20	14119	REGULATOR ASSEMBLY (same as P/N 14073)	1
21	6599	FILTER	1
22		SPINNING WRENCH ASSEMBLY - Fig 2A (see Figure 2A for breakdown)	Ref.
23	50010-16-C8	SCREW, Socket Head Cap	1
24	50310-C	NUT, Hex, Jam	1
25	10452	HANGER	1
26	C-94061	SAFETY HANDLE	2
27	C-94015	SCREW, Hex Head Cap	4
28	C-94016	LOCK WASHER	4
29	C-90141	FLAT WASHER	4

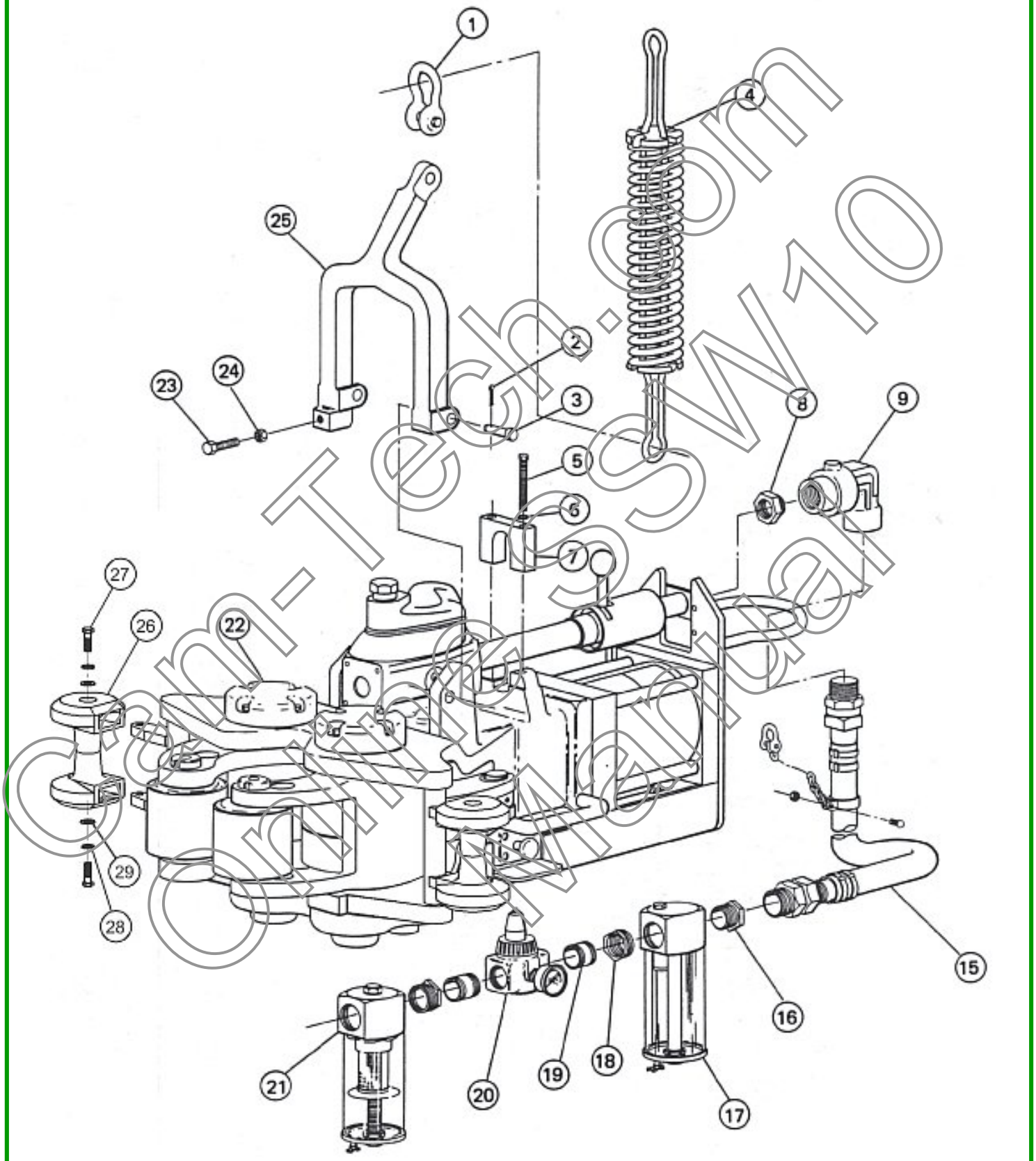


FIGURE 2 -- Spinning Wrench Assembly

Figure 2A -- SPINNING WRENCH ASSEMBLY

Item	Cam-Tech Part No.	Description	Qty
		SPINNING WRENCH ASSEMBLY - Fig 2A (see Figure 2 for next higher assembly)	Ref.
1	56501-8-8-S	CONNECTOR, 37° External Pipe	1
3	10447	NIPPLE	1
	10448	BRACKET ASSEMBLY - Consisting of	1
4	15180	• BRACKET WELDMENT	1
5	14776	• SUPPORT, Pipe	1
6	50805-R-C	• FLAT WASHER	2
7	50905-C	• LOCK WASHER	2
8	50005-6-C8	• SCREW, Hex Head	2
9	50910-C	LOCK WASHER	4
10	56501-8-8-S	CONNECTOR, 37° External Pipe	2
11	10469	AIR LINE, Cylinder, Short	1
12	56506-12-8-S	ELBOW, 90 degree, 37° External Pipe	2
13	10470	AIR LINE, Cylinder, Long	1
17	52408-G	ELBOW, Male/Female	2
18	51104-C	LOCK WASHER, Hi-Collar	3
19	50104-18-C	SCREW, Socket Head Cap	3
20	12070	VALVE, Direction Control (see Figure 3 for breakdown)	1
21	10743	MUFFLER	2
22	11152	GUARD	1
23	50008-26-C8	SCREW, Hex Head Cap	5
24	50908-C	LOCK WASHER	12
25	50008-12-C8	SCREW, Hex Head Cap	5
26	50908-C	LOCK WASHER	12
27	10429	COVER, Gear	1
28	10475	GASKET, Gear Cover	1
29	51403-12	PIN, Cotter	2
30	50512-C	NUT, Hex, Slotted	5
31	10664	WASHER, Retaining	3
32	10628	GEAR, Drive	3
33	10451	SPACER	4
34	55110-20-CA	SCREW, Socket Head Cap	4
35	51110-C	LOCK WASHER, Hi-Collar	4
36	10630	SHAFT, Idler Gear	2
37	51205-14	PIN, Dowel	2
38	10658	ROLLER BEARING, Idler Gear	4
39	10629	GEAR, Idler	2
40	10660	WASHER, Thrust	4
41		SPINNING WRENCH ASSY - Fig 2B (See Figure 2B for breakdown)	Ref.
42	10632	GASKET, Air Motor	1
43	10454	KEY, Drive Gear	1
44	14855	MOTOR ASSEMBLY, Air - Chicago Pneumatic (see Figure 4 for breakdown)	1
45	16978	TUBE, Valve	1
46	17021	VALVE, Check-Inline	1
47	56501-6-8-S	CONNECTOR, 37° External Pipe	2
48	17001	TUBE, Valve	1
49	56506-8-8-S	ELBOW, 37° External Pipe	1
50	50008-16-C5	SCREW, Hex Head Cap	2
51	72918	PLUG, DRAIN (not shown)	1

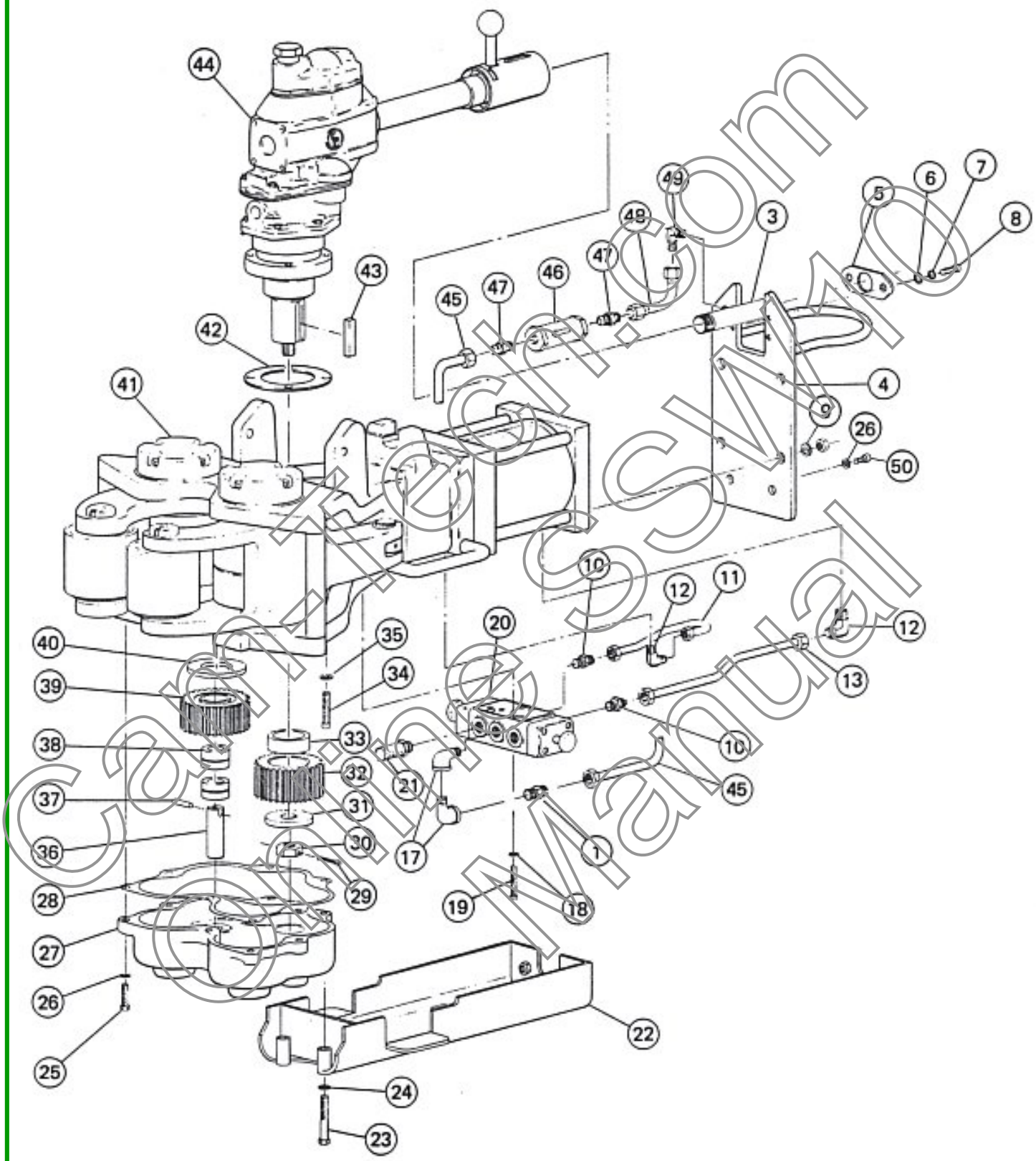


FIGURE 2A -- Spinning Wrench Assembly

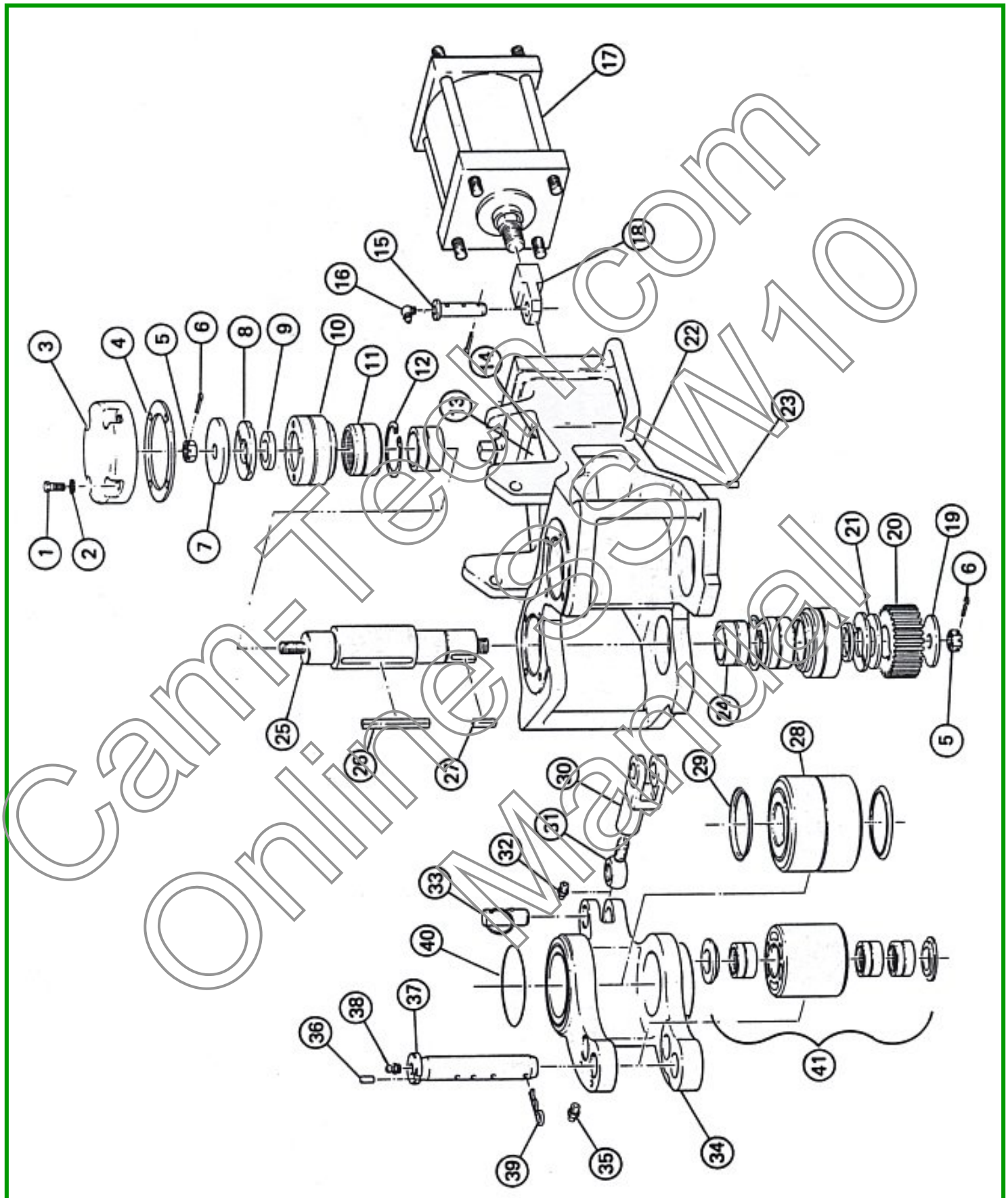


FIGURE 2B -- Spinning Wrench Assembly

Figure 2B -- SPINNING WRENCH ASSEMBLY

Item	Cam-Tech Part No.	Description	Qty
1	50005-10-C5	SCREW, Hex Head	8
2	50905-C	LOCK WASHER	12
3	12053	COVER, Bearing	2
4	10882	GASKET, Bearing Cover	2
5	50512-C	NUT, Hex, Slotted	4
6	51403-12	PIN, Cotter	5
7	12082	WASHER, Retaining, Large	2
8	12083	BEARING, Thrust	4
9	12088	SPACER, Drive Shaft	4
10	12081	HOUSING, Bearing	4
11	12047	BEARING, Roller	4
12	53500-325	RING, Retaining	4
13	10631	NAMEPLATE	1
14	53301-10-6	SCREW, Drive	4
15	11933	PIN, Link with Grease Fitting	1
16	53203	• GREASE FITTING	1
17	10462	CYLINDER, Air (see Figure 7 for breakdown)	1
18	10432	CYLINDER, Rod End	1
19	10664	WASHER, Retaining	2
20	10628	GEAR, Driven	2
21	12084	SPACER, Gear	2
22	C-11950	BODY ASSEMBLY	1
23	51206-7	• DOWEL PIN	2
	13068	DRIVE ROLLER SHAFT ASSEMBLY - Each Consisting of:	2
24	12051	• INNER RACE	2
25	12054	• SHAFT, Drive Roller (not available separately, see P/N 13068)	1
26	10453	KEY, Drive Roller	2
27	13180	KEY, Roller Drive	2
28	10435	DRIVE ROLLER	2
29	10742	SEAL, Drive Roller	4
30	10431	CLEVIS LINK	2
31	11932	ADJUSTABLE LINK ASSEMBLY with Grease Fitting	2
32	53204	• GREASE FITTING, Str	1
33	10549	DETENT PIN, Roller Arm	2
	11930	ROLLER ARM ASSEMBLY - Each Consisting of:	2
34	10428	• ROLLER ARM	1
35	53201	• GREASE FITTING, Str	2
36	51204-6	• DOWEL PIN	4
37	15126	PIN, Pressure Roller with Grease Fitting (replaces P/N 10438)	2
38	53201	GREASE FITTING, Str	2
39	10576	CLIP, Hinge Pin	2
40	51300-347-B	O-RING, Arm	4
41	12035	ROLLER ASSEMBLY, 3-1/2" Drill Pipe	1
	12040	ROLLER ASSEMBLY, 4" Drill Pipe	1
	12045	ROLLER ASSEMBLY, 4-1/2" Drill Pipe	1
	12050	ROLLER ASSEMBLY, 5" Drill Pipe	1
	12055	ROLLER ASSEMBLY, 5-1/2" Drill Pipe	1
	72380	• BEARING, Set of 3	1
	10439	• THRUST WASHER	2

Figure 3 -- DIRECTIONAL CONTROL VALVE, HEAVY DUTY

Item	Cam-Tech Part No.	Description	Qty
	12070	VALVE ASSEMBLY, Directional Control, Heavy Duty (see Figure 2A for next higher assembly)	Ref.
	13000	KIT, Button Operator, Heavy Duty Valve - Each Consisting of	2
1	12070-1	• BUTTON	1
2	12070-2	• SHAFT	1
3	50104-10-S	• SCREW	4
4	50904-C	• WASHER	4
5	12070-4	• END COVER	1
6	50103-5-C	• CAP SCREW	1
7	12070-5	• ADAPTER	1
8	12070-3	• PISTON, Cushion	1
9	51300-123-B	• O-RING	1
10	12070-7	BODY	1
	13001	KIT, Body Seal - Each consisting of	1
11	12070-9	• SPACER	1
12	12070-6	• RING, Spacer Sealing	6
13	12070-10	GUIDE END	2
14	12070-8	SPOOL	1

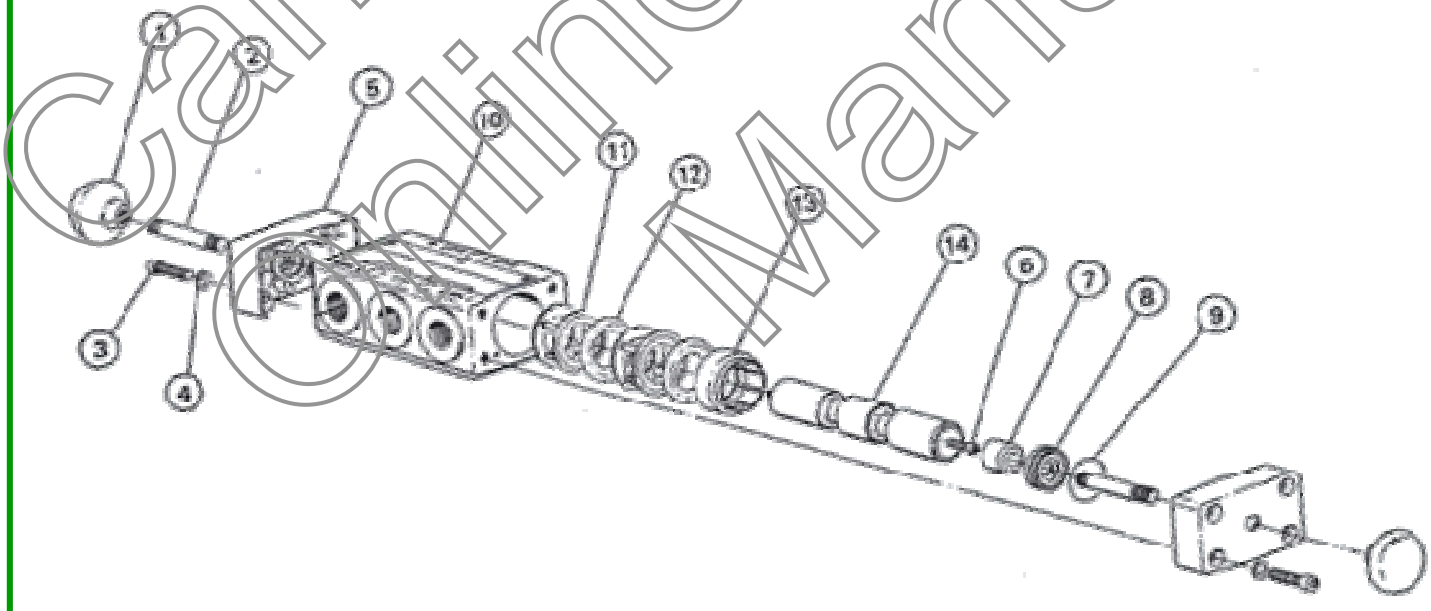
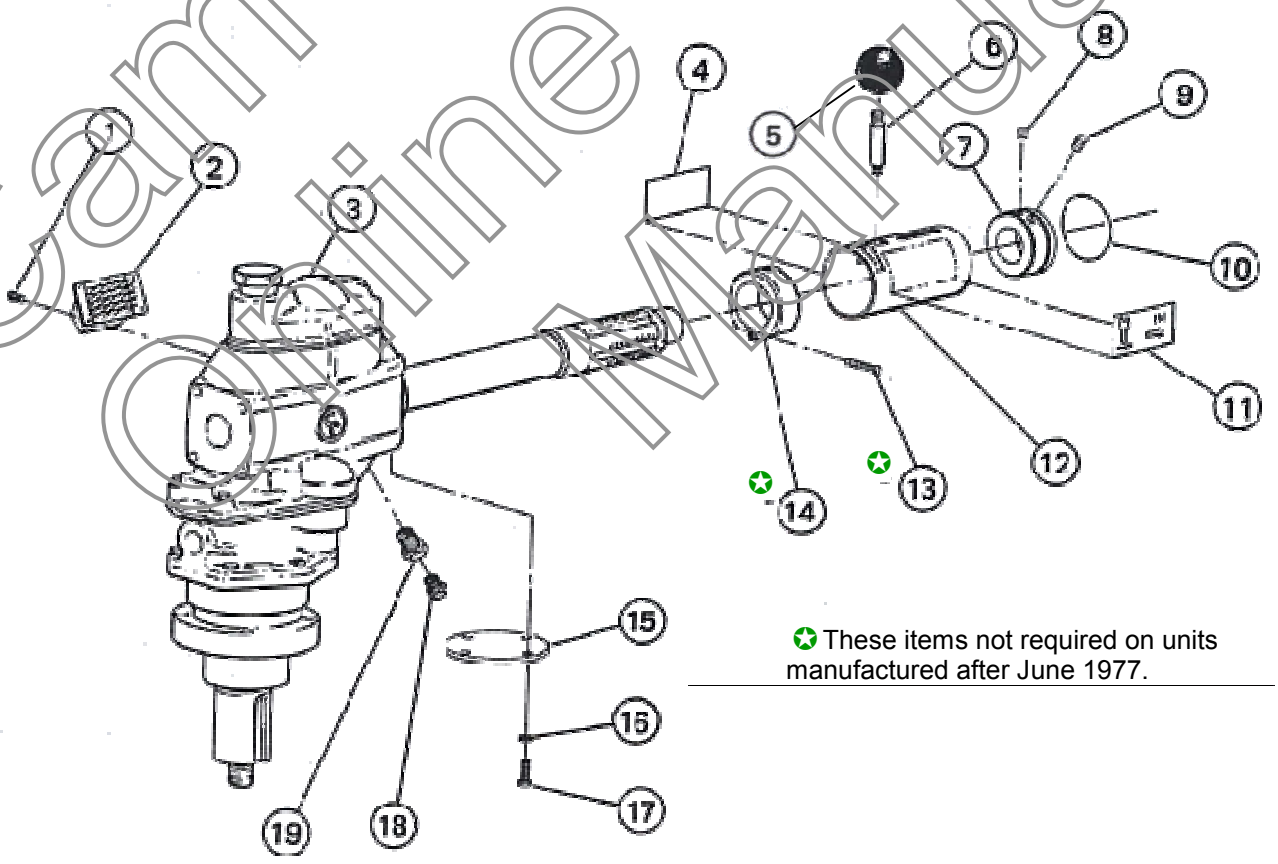


FIGURE 3 -- Directional Control Valve, Heavy Duty

Figure 4 -- AIR MOTOR ASSEMBLY (Chicago Pneumatic)

Item	Cam-Tech Part No.	Description	Qty
	14855	MOTOR ASSEMBLY, Air, Chicago Pneumatic (see Figure 2A for next higher assembly)	Ref.
1	14857	SCREW, Sheetmetal	4
2	15063	MUFFLER	1
3	14694	AIR MOTOR, Chicago Pneumatic (see Figure 5 for breakdown)	1
4	16041	LABEL, Direction, Caution, RH	1
5	11915	KNOB	1
6	15255	SHAFT	1
7	15333	COLLAR, Aft	1
8	50706-7-A	SET SCREW, Socket Head	1
9	50706-4-A	SET SCREW, Socket Head	2
10	51300-333-B	O-RING	1
11	16042	LABEL, Direction, Caution, LH	1
12	15335	SLEEVE, Directional Control	1
13	50103-5-C	*SCREW, Socket Head Cap ✪	1
14	15334	*COLLAR, Front ✪	1
15	14856	COVER, Air Motor	1
16	50905-C	LOCK WASHER	4
17	50005-6-C5	SCREW, Hex Head Cap	4
18	6581	VALVE, Relief	1
19	52804-2-G	BUSHING, Reducing	1



✪ These items not required on units manufactured after June 1977.

FIGURE 4 -- Air Motor (Chicago Pneumatic)

Figure 5 -- AIR MOTOR (CHICAGO PNEUMATIC)

Item	Cam-Tech Part No.	Description	Qty
	14694	AIR MOTOR ASSEMBLY (see Figure 4 for next higher assembly)	Ref.
1	14694-23	PLUG, Oil	1
2	51300-112-B	O-RING	1
3	14694-22	NUT, Feed Post	1
4	50105-12	SCREW	7
5	51105	LOCK WASHER	11
6	14694-24	COVER, Housing	1
7	14694-25	GASKET, Cover	1
8	14694-32	SCREW, Bearing Clamp	1
9	14694-34	NUT, Bearing Clamp	1
10	14694-37	BEARING	2
11	14694-19	HOUSING, Motor (includes reverse valve bushing P/N 14694-27)	1
12	14694-28	NUT, Fiber Insert	12
13	14694-29	GASKET	1
14	14694-66	BEARING, Ball	1
15	14694-55	PLATE, Transfer	1
16	14694-30	BOLT	2
17	14694-65	GASKET, Gear Case	1
18	55005-10	SCREW, Hex Head Cap	5
19	14694-68	CASE, Gear	1
20	14694-69	BEARING, Roller	1
21	14694-70	SEAL, Oil	1
22	14694-51	GEAR, Spindle (47 teeth)	1
23	14694-54	SPACER, Gear	1
24	14694-47	BEARING, Ball	1
25	14694-20	POST, Feed	1
26	14694-57	SPINDLE	1
27	14694-58	KEY, Ring Gear	1
28	14694-64	SHAFT, Pinion	3
29	14694-63	BEARING, Sleeve Needle	3
30	71122	PINION ASSEMBLY	3
31	14694-59	BEARING, Ball	1
32	14694-53	SPINDLE, Gear (18 teeth)	1
33	14694-60	BEARING, Ball	1
34	14694-52	BEARING, Ball	1
35	14694-50	PINION (14 teeth)	1
36	14694-49	GEAR, 1st	1
37	14694-48	BEARING, Ball	1
	14694-71	CP THROTTLE ASSEMBLY - Consisting of all items on this parts list marked with "•"	1
38	14694-12	• SLEEVE, Reverse Valve	1
39	14694-14	• SET SCREW	1
40	14694-4	• VALVE, Throttle	1
41	14694-3	• SPRING, Throttle	1
42	14694-11	• SLEEVE, Retainer	1
43	14694-2	• SLEEVE, Throttle	1
44	14694-1	• CAP, Throttle	1
45	14694-10	• ROLLER, Throttle Stem	1
46	14694-9	• PIN, Roller	1
47	14694-16	• HANDLE, Live Air	1
48	51300-216-B	• O-RING	2

Figure 5 -- AIR MOTOR (CHICAGO PNEUMATIC) ... continued

Item	Cam-Tech Part No.	Description	Qty
49	14694-13	• SLEEVE, Reversing	1
50	14694-15	• UNIVERSAL JOINT	1
51	14694-18	VALVE, Reverse	1
52	14694-28	NUT, Fiber Insert (Qty Included in Item 12)	
53	14694-17	GASKET, Throttle	1
54	14694-41	PLATE, Lower End	1
55	14694-39	BLADE, Rotor	6
56	14694-38	ROTOR (9 teeth)	1
57	14694-40	SPACER, Bearing	1
58	14694-35	LINER	1
59	14694-33	PLATE, Upper End	1
60	14694-36	PIN, Liner Dowel	1
61	14694-7	• SEAL, Throttle Valve	1
62	14694-67	GEAR, Ring (48 teeth)	1
63	51300-212-B	• O-RING	1
64	14694-5	• NUT, Fiber Insert	1
65	14694-6	• WASHER, Seal	1
66	14694-8	• VALVE, Seat	1
67	14856	COVER PLATE	1
68	50005-6-C	SCREW, Hex Head Cap	4

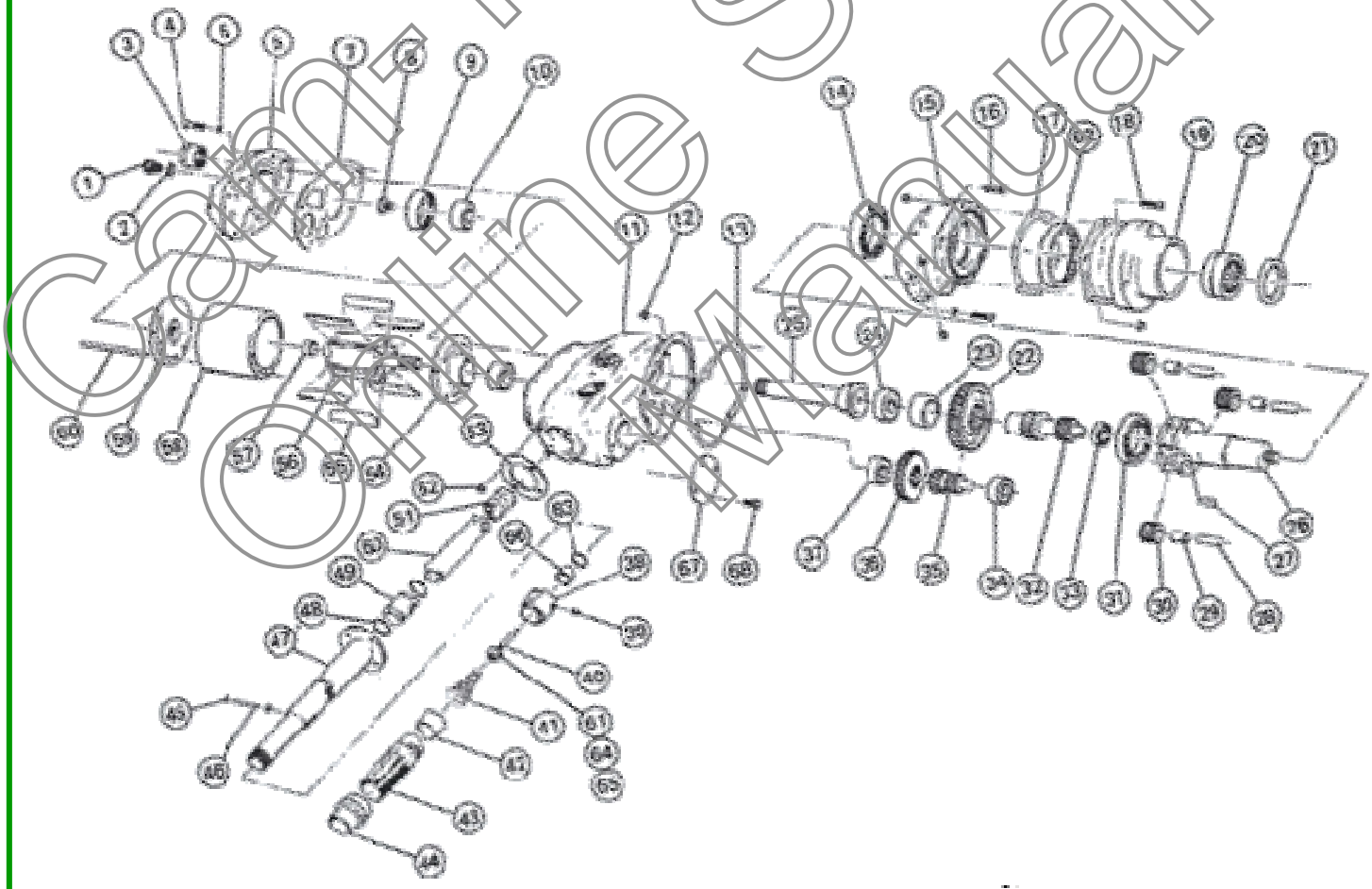


FIGURE 5 -- Air Motor (Chicago Pneumatic)

Figure 7 -- AIR CYLINDER

Item	Cam-Tech Part No.	Description	Qty
	10462	AIR CYLINDER ASSEMBLY (see Figure 2B for next higher assembly)	Ref.
1	55410-C	NUT, Tie Rod	8
2	10462-12	HEAD, Blind End	1
3	10462-11	LOCKNUT, Piston Rod	1
4	10462-10	PISTON	1
5	10462-14	ROD TIE	4
6	10462-9	BODY, Cylinder	1
7	10462-8	ROD, Piston	1
8	10462-13	HEAD, Rod End	1
9	10462-4	PACKING ADAPTER	1
10	10462-16	BEARING	1
11	10462-15	RETAINER, Bearing	1
12	10462-2	NUT, Packing (used only on old cylinders with threaded rod end heads)	1
13	55004-5-H	BOLT, Hex Head	6
	13652	SEAL KIT, Standard - Consisting of	1
14	10462-1	• SCRAPER, Rod Assembly - 3 piece kit	1
15	10462-3	• PACKING, Rod	3
16	51300-016-B	• O-RING, Piston to Rod Seal	1
17	10462-7	• PACKING, Piston	2
18	51300-167-B	• O-RING, Body to Head Seal	2

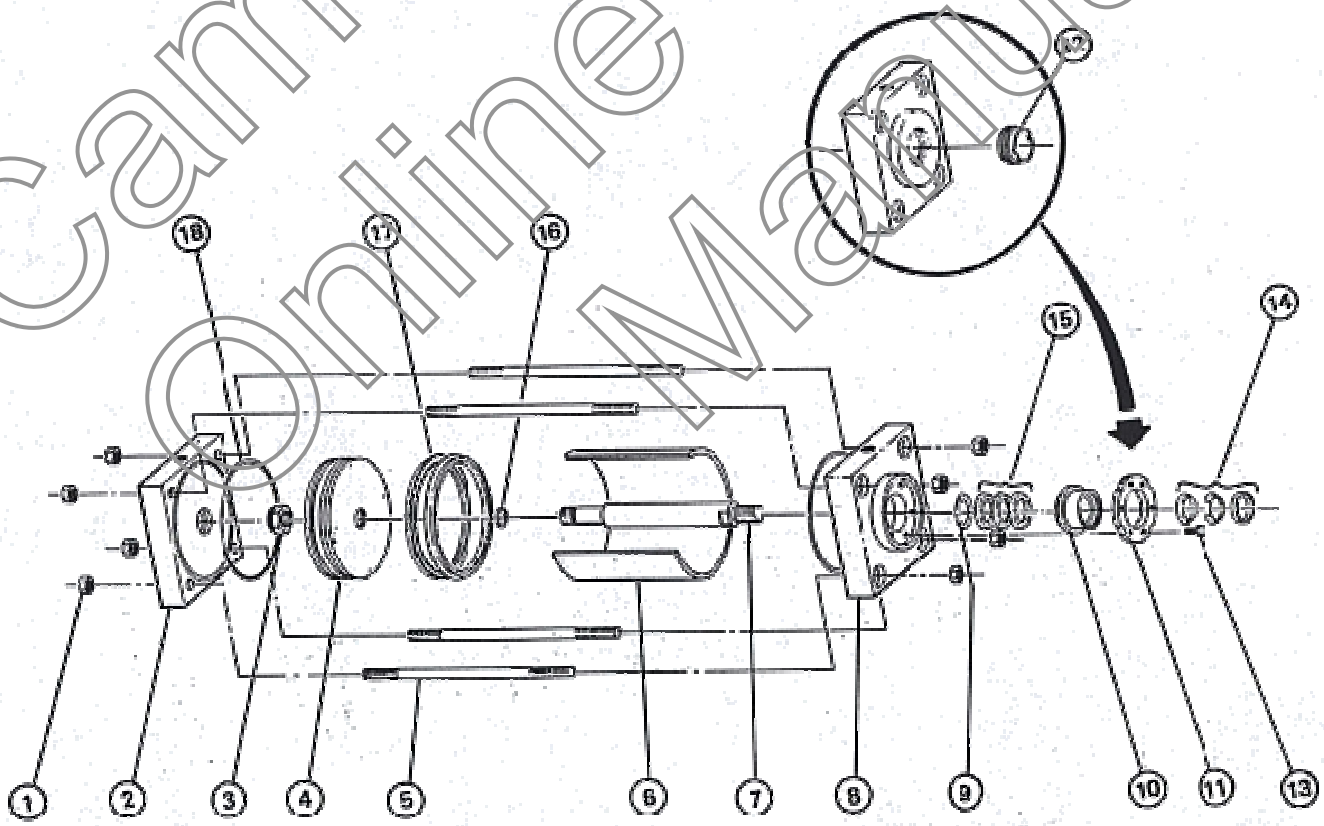


FIGURE 7 --Air Cylinder

FOREIGN SPARE PARTS KIT

Item	Cam-Tech Part No.	Description	Qty
	15953	**ONE YEAR's FOREIGN SPARE PARTS KIT For SSW-10 less Air Motor**	1
		Consists of the following:	
1	10435	. ROLLER, Drive	2
2	10576	. CLIP, Hitch Pin	6
3	10549	. PIN, Detent	2
4	15126	. PIN, Pressure Roller w/o Grease Fitting	2
5	10439	. WASHER, Thrust	4
6	72380	. BEARING, Pressure Roller	6
7	12047	. BEARING, Drive Shaft	4
8	12083	. WASHER, Thrust	4
9	10882	. GASKET, Bearing Cover	4
10	12051	. RACE, Bearing, Inner	4
11	10475	. GASKET, Gear Case Cover	1
12	10632	. GASKET, Air Motor Body	1
13	51300-347-B	. O'RING, Arm	4
14	10742	. SEAL, Drive Roller	4
15	13000	. KIT, Button Operator	1
16	13001	. KIT, Body Seal	1
17	12070-8	. SPOOL	1
18	10743	. MUFFLER	1

Item	Cam-Tech Part No.	Description	Qty
	15955	**ONE YEAR's FOREIGN SPARE PARTS KIT For SSW-10 Chicago Pneumatic Air Motor**	**1**
		Consists of the following:	
1	14694-25	. GASKET, Cover	2
2	14694-37	. BEARING, Ball	2
3	14694-39	. VANE	6
4	14694-49	. GEAR, 1st (52 teeth)	1
5	14694-50	. PINION (14 teeth)	1
6	14694-70	. SEAL, Oil	1
7	14694-66	. BEARING, Ball	1
8	14694-69	. BEARING, Roller	1