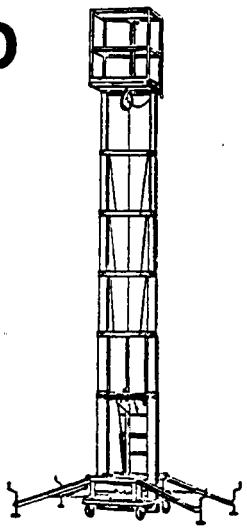
MARKPAL

Marklifts.® A Product of Mark Industries

TELESCOPING PUSH-AROUND



OPERATION MAINTENANCE AND PARTS MANUAL

THIS TECHNICAL MANUAL APPLIES TO THE FOLLOWING

MODELS: P15 P19 P20 P25 P30

MARK INDUSTRIES
P.O. Box 2255
Brea, California 92622
(714) 879-6275
TOLL FREE (800) 488-MARK
TELEX 194402 FAX NO. (714) 879-8884

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MARKPAL TELESCOPING PUSH-AROUND

OPERATION MAINTENANCE AND PARTS MANUAL

The purpose of this Manual is to provide the customer with operation maintenance and parts information that will enhance the reliable performance of the MarkPal. Schematic and vendor information is also furnished.

WARNING: IMPROPER USAGE OF THIS MACHINE MAY RESULT IN SERIOUS PERSONNEL INJURY. TO PROTECT YOURSELF AND THE EQUIPMENT, STUDY THIS MANUAL BEFORE STARTING OPERATIONS.

The model capacity, pressure setting and serial number can be found on the ID Plate mounted on the front driven column cross-arm.

The serial number must be used when ordering parts. This will help our Parts Department in giving prompt and accurate service.

If additional information or service is needed, we urge the customer to contact his local dealer. If this is not possible, please get in touch with the Mark Industries Service Department.

All Markpals are tested and operated to assure their proper operating condition before shipment. At this time all necessary adjustments are made and an overall physical inspection is conducted. After the unit is delivered, some final minor adjustments and inspections may be required prior to putting the unit in service. These functions are outlined in the inspection and checkout instructions in the operation section of this Manual.

MARKPAL TELESCOPING PUSH-AROUND

	P15	P20	P25	P30
COLLAPSED HEIGHT	6'2"	6"6"	6'8"	6'11 3/4"
EXTENDED HEIGHT	14'8"	18'9"	24'	28'5"
WORKING HEIGHT	20'	25'	30'	35'
GUARD RAIL HEIGHT	42"	42"	42"	42"
PLATFORM SIZE	30"x30"	30"x30"	30"x30"	30"x30"
BASE WIDTH	30"	31½"	32½"	33½"
BASE LENGTH	64"	65"	66"	79"
CASTER SIZE	6"	6"	6"	6"
LOAD CAPACITY	500#	500#	500#	500#
WEIGHT (MANUAL)*	702#	855#	1065#	1281#

*Add 40# for electric units.

	P19DC	P30 (APRIL 1983)
PLATFORM HEIGHT (MAX.)	19'6" (5.94m)	28'5" (8.66m)
WORKING HEIGHT (MAX.)	25'6" (7.77m)	35' (10.67m)
PLATFORM HEIGHT (MIN.)	77" (1.96m)	83 3/4" (2.13m)
GUARD RAIL HEIGHT	42" (1.28m)	42" (1.28m)
PLATFORM SIZE	24"x46" (.61m x .66m)	30"x30" (.76m x .76m)
OVERALL WIDTH (WITH 4 OUTRIGGERS)	29" (.74m) 82" (2.08m)	33½ (.85m) 94" (2.39m)
OVERALL LENGTH	38" (.97m)	79" (2.01m)
CASTERS	4" (.10m)	6" (.15m)
LOAD CAPACITY	350 LBS. (158.76 kg)	500 LBS. (226.80 kg)
WEIGHT	700 LBS. (317.51 kg)	1281 LBS. (581.80 kg)
LIFT/LOWER SPEED	24/30	45/35
POWER SOURCE	1 HP DC Motor	1 HP DC Motor 1.5 HP AC
BATTERY	75 AMP/HR	105 AMP/HR
BATTERY CHARGER	10 AMP	20 AMP

MARKPAL TELESCOPING PUSH-AROUND

OPTION	TITLE
1.	30 X 60 PLATFORM FOR P25 & P30 ONLY
2.	110 VAC WIRING & OUTLET FOR POWER AT PLATFORM
3.	LARGE RESERVOIR - 2½ GALS. (STANDARD FOR P30 MODEL)
4.	BATTERY CHARGER - 1220A-2 (OVERSEAS SHIPMENTS ONLY)
5.	50 CYCLE AC MOTOR (OVERSEAS SHIPMENTS ONLY)
6.	HEAVY DUTY CASTERS FOR P19
7.	8" CASTERS FOR P25 & P30
8.	105 AMP/HR BATTERY WITH 20 AMP CHARGER FOR P19 ONLY

MARK PAL TELESCOPING PUSH-AROUND

OPERATION MAINTENANCE AND PARTS MANUAL

When a revision is added to this manual, enter date inserted and initial.

REV. DATE	PAGE NUMBERS	DATE INSERTED	BY	REV. DATE	PAGE NUMBERS	DATE INSERTED	BY
REV.1 4-83	FRONT						
	TITLE PAGE						
	ii,iii,iv						
	PARTS INDEX						
	i,ii						
	3.1,3.2,3.3						
	12.1, THRU						
	12.28						
	17.1, THRU						
	17.6						
	29.1, THRU						
	29.10,34.1						
	35.1,36.1						
	36.2,37.1						
	THRU 37.9						

MANUFACTURERS' LIMITED WARRANTY

MARK INDUSTRIES makes no warranty, express or implied, on any product manufactured or sold by MARK INDUSTRIES except for the following limited warranty against defects in materials and workmanship on products manufactured by MARK INDUSTRIES.

> MARK INDUSTRIES warrants the products manufactured by MARK INDUSTRIES to be free from defects in material and workmanship under normal use and service for a period of six (6) months from the date of shipment. This limited warranty does not extend to any product of another manufacturer or to any part, component, accessory or attachment not manufactured by MARK INDUSTRIES, The warranty, if any, with respect to any product of another manufacturer or to any part, component, accessory or attachment not manufactured by MARK INDUSTRIES is limited to the warranty, if any extended to MARK INDUSTRIES by the manufacturer of the other product, part, component, accessory or attachment.

This limited warranty does not extend to any product (or any part or parts of any product which has been subject to improper use or application, misuse, abuse, operation beyond its rated capacity, repair or maintenance except in accordance with the sales and service manuals and special instructions of MARK INDUSTRIES, or modification without the prior written authorization of MARK INDUSTRIES (whether by the substitution of nonapproved parts or otherwise).

The sole obligation and liability of MARK INDUSTRIES under this limited warranty (and the exclusive remedy for any purchaser, owner or user of MARK INDUSTRIES products) is limited to the repair or replacement, at the option of MARK INDUSTRIES, of any product (or any part or parts of any product) manufactured by MARK INDUSTRIES which, within six (6) months from the date of shipment, shall have been returned to the MARK INDUSTRIES facility in Brea, California (or any other location within the United States as shall be designated by MARK INDUSTRIES), at no expense to MARK INDUSTRIES, and demonstrated to the satisfaction of MARK INDUSTRIES as being defective in material or workmanship.

To make a claim under this limited warranty, contact MARK INDUSTRIES or the MARK INDUSTRIES distributor from whom the product was originally purchased. A statement giving the model and serial number of the allegedly defective product, the date and a description of the alleged defect, the date of the purchase and proof of the purchase and purchase date must accompany the returned product (or any part or parts of any product). Any product (or any part or parts of any product) determined by MARK INDUSTRIES to be defective will be repaired or replaced, at the option of MARK INDUSTRIES, free of charge, f.o.b. Brea, California. No credit will be given for any allegedly defective product (or any part or parts of any product) not returned to MARK INDUSTRIES.

There are no other warranties, express or implied, in addition to this limited warranty. **This limited warranty is exclusive and in lieu of all other warranties, express or implied (in fact or by operation of law or otherwise), including the implied warranties of merchantability and fitness for a particular purpose.**

MARK INDUSTRIES shall not be liable for any special, indirect or consequential damages. Further, no representation or warranty made by any person, including any representative of MARK INDUSTRIES, which is inconsistent or in conflict with, or in addition to the terms of the foregoing limited warranty (or the limitations of the liability of MARK INDUSTRIES as set forth above) shall be binding upon MARK INDUSTRIES unless reduced to writing and approved by an officer of MARK INDUSTRIES.

Tires, batteries, filter elements and electrical components are specifically excluded from this limited warranty.

Mark Industries
P.O. BOX 2255 Brea, CA 92622-2255
714-879-6275 800-448-MARK
TELEX 194402 FAX 1-714-879-8884

NEW EQUIPMENT CONDITION REPORT

(WARRANTY REGISTRATION)

PAL	YES	NO
1. CAPACITY DECAL IS _____		
2. ALL APPLICABLE WARNING DECALS ARE INSTALLED		
3. EMERGENCY DESCENT VALVE FUNCTIONS PROPERLY		
4. OPERATORS INSTRUCTIONS ARE PROPERLY INSTALLED		
5. OPERATION MAINTENANCE AND PARTS MANUAL RECEIVED		
6. ALL CONTROLS (UPPER & LOWER) ARE IDENTIFIED & OPERATE PROPERLY		
7. STOP SWITCHES OPERATE PROPERLY		
8. CONDITION OF PLATFORM GUARD RAILS		
9. BASKET ACCESS GATE WORKS PROPERLY		
10. HORN OPERATES PROPERLY		
11. CIRCUIT BREAKERS OPERATE PROPERLY		
12. HYDRAULIC CYLINDER IS FREE OF LEAKS		
13. HYDRAULIC CYLINDER ROD IS FREE OF PAINT/SCRATCHES		
14. HYDRAULIC PUMP IS FREE OF LEAKS		
15. DRIVE GEAR BOX OIL LEVEL IS _____		
16. LUG NUTS ON WHEEL ARE TORQUED AT _____FT. LBS.		
17. BATTERY FLUID LEVEL IS FULL		
18. HYDRAULIC HOSES & FITTINGS ARE TIGHT & FREE OF LEAKS		
19. AIR PRESSURE IN TIRE IS _____PSI		
20. HYDRAULIC OIL LEVEL IS _____		
21. LIFTING ARM CABLE TENSION CHECKED		
22. HYDRAULIC TANK AND FITTINGS FREE OF LEAKS		
23. ALL ELECTRICAL CONNECTIONS ARE TIGHT		
24. ROTATING BEACON OPERATES PROPERLY (OPTION)		

MODEL NUMBER _____ SERIAL NUMBER _____

OPTIONS _____

INSPECTOR # _____

PURCHASER

_____
COMPANY NAME

_____
ADDRESS

_____
CITY STATE ZIP CODE

( ) _____
AREA CODE TELEHONE NUMBER

DATE OF INVOICE _____ DATE SHIPMENT RECEIVED _____

DATE UNIT PUT INTO SERVICE _____

☐ UNIT WILL BE USED IN RENTAL FLEET

☐ UNIT WILL BE SOLD; THE INITIAL WORK APPLICATION WILL BE:

INSPECTION _____	GEN'L MAINTENANCE _____	PAINTING/SANDBLASTING _____
MINING _____	HEATING/AIR COND. _____	STEEL FABRICATION _____
WELDING _____	CARPENTRY _____	RIGGING _____
CONSTRUCTION _____	PLUMBING _____	ROOFING _____
SCAFFOLDING _____	ELECTRICAL _____	GLAZING _____
MECHANICAL _____	SPRINKLER _____	OTHER _____

COMMENTS:

INSPECTION COMPLETED BY: _____
(Please print legibly)

WARRANTY WILL BE VOID UNLESS THIS INSPECTION REPORT IS POSTMARKED TO MARK INDUSTRIES NOT MORE THAN 14 DAYS FROM DATE SHIPMENT RECEIVED.

MARKPAL TELESCOPING PUSH-AROUND

UNLOADING

Before unloading the MARKPAL, inspect for any physical damage. Note any such damage on the freight bill before signing, and report same to carrier.

A forklift must be used for unloading and loading. Make sure that the forklift has forks as long as the MARKPAL is wide. DO NOT attempt to lift the machine from either the front or rear. ALWAYS LIFT THE MACHINE FROM THE SIDE.

If a rollback truck with a winch is used, attach the winch cable to the tie down brackets and pull the unit on to the truck. For unloading, reverse procedure.

As machine is shipped from factory without casters in place, it will be necessary to install them at this time.

TRANSPORTING

When securing the MARKPAL to the truck, put the chains through the tie down brackets ONLY.
DO NOT CHAIN OR STRAP OVER the platform or guard rails. Severe damage may result from excess pressure due to securing the machine over the top of the platform.

NOTE: The emergency lowering valve must be OPEN whenever the MARKPAL is transported. This will prevent damage to the unit if a short occurs in the electrical system. This Manual valve is located inside base between the lift cylinder and right hand column.

MARKPAL TELESCOPING PUSH-AROUND

All MARKPAL units are tested and operated to assure their proper operating condition before shipment.

At this time, all necessary adjustments are made and an overall physical inspection is conducted. After the unit is delivered, some minor adjustments and inspections may be required before putting the unit into service.

The following items should be reviewed:

1. Perform complete charging of batteries. (See battery care page 28).
2. Check electrical system by actuating proper controls for following movements.
   - A. Up
   - B. Down
3. Inspect all electrical connections.
   - A. See B. Feel C. Tighten
4. Check hydraulic system.
   - A. Hydraulic fluid level-fill if required.
   - B. Hydraulic lines-tighten if loose.
   - C. Hydraulic pump.
   - D. Hydraulic cylinder.
   - E. Emergency lowering valve-for function.
5. Structural connnections and fittings.
   - A. Check all nuts and bolts for tightness.
   - B. Check for cracked welds.

MARKPAL TELESCOPING PUSH-AROUND

Every operator of the MARKPAL must know, understand and follow the safety rules set forth herein.

1. The MARKPAL TELESCOPING PUSH-AROUND Aerial Lift is a personnel lifting device, and it is essential that it be properly maintained and operated to perform all functions with maximum safety and efficiency.

2. The operation of any new and unfamiliar equipment can be hazardous in the hands of untrained operators. Only trained operators must be assigned to operate the MARKPAL.

3. It is the responsibility of the operator to be familiar with this manual and to follow all recommendations made. Never exceed manufacturer's recommended platform load capacity of 500 lbs.

4. Although the MARKPAL conforms to specified ANSI & OSHA requirements, it is the responsibility of the owner to instruct the operators with safety requirements made not only by Mark Industries, but by the various safety boards in your area, as well as additional requirements set forth by ANSI & OSHA.

5. The MARKPAL is a non-insulated personnel carrier and must not be operated with in 10 feet of a 50,000 volt line. (See page 7 & 8 articles)

6. Remember, the load capacity of the MARKPAL is total combined weight of personnel and tools, fixtures, accessories, etc.

7. Always distribute load evenly over platform floor area.

8. Make sure platform gate is closed & latched before operating unit.

9. It is recommended that head gear (Hard Hats) be worn by all personnel in the work platform.

10. Under no condition should horseplay be tolerated. Report any misuse of equipment to the proper personnel.

11. The MARKPAL structure must not be used as a welding ground. Disconnect both battery leads prior to performing any welding operations.

12. DO NOT lean over platform guard railings to perform work.

13. DO NOT use ladders or scaffolding on the platform to obtain greater height.

14. Battery sulphuric acid can cause a serious burn. Flush away acid with water.

15. Hydrogen and oxygen gases are produced during normal battery operation. This gas mixture can explode if flames or sparks are near battery vents.

16 Monitor battery during charging. DO NOT allow battery to overcharge and boil.

17. DO NOT override any hydraulic, mechanical, or electrical safety devices.

18. DO NOT position on uneven, sloping or soft terrain, as this is hazardous and must be avoided.

19. DO NOT work on platform if your physical condition is such that you feel dizzy or unsteady in any way.

20. DO NOT jump start other vehicles using MARKPAL battery.

21. Units shall be repaired immediately when damaged or weakened from any cause. They shall NOT be used until repairs are completed.

22. Employees shall NOT work on units when exposed to high winds, storms, or when they are covered with ice or snow (until all ice and snow has been removed)

23. Where moving vehicles are present, the work area shall be marked with warnings such as flags, roped off areas, or other effective means of traffic control shall be provided.

24. Unstable objects such as barrels, boxes, loose brick, tools, debris, shall not be allowed to accumulate on the work platform.

25. In operations involving production of small debris, chips, etc., and the use of small tools and materials, and where persons are required to work or pass under equipment, screens shall be required between toeboards and guardrails. The screen shall extend along the entire opening and shall consist of No.18 gage U.S. Standard Wire ½ inch mesh, or equivalent.

26. DO NOT affix any extensions or fabrications to the platform, handrails or gate.

27. Employees climbing or descending vertical ladders shall have both hands free for climbing.
NOTE: Employees should remove foreign substances such as mud or grease from their shoes.

28. Employees shall be prohibited from riding on units while they are being moved, and materials, tools, or equipment shall not be stored on the units while they are being moved.

Article 86. Provisions for Preventing Accidents Due to Proximity to Overhead Lines

2946. Provisions for Preventing Accidents Due to Proximity to Overhead Lines. (a) **General.** No person, firm, or corporation, or agent of same, shall require or permit any employee to perform any function in proximity to energized high-voltage lines; to enter upon any land, building, or other premises and thereto engage in any excavation, demolition, construction, repair, or other operation; or to erect, install, operate, or store in or upon such premises any tools, machinery, equipment, materials, or structures (including scaffolding, house moving, well drilling, pile driving, or hoisting equipment) unless and until danger from accidental contact with said high-voltage lines has been effectively guarded against.

(b) **Clearances or Safeguards Required.** Except where electrical distribution and transmission lines have been de-energized and visibly grounded or effective barriers have been erected to prevent physical and arcing contacts with the high-voltage lines, the following provisions shall be met:

(1) **Over Lines.** The operation, erection, or handling of tools, machinery, apparatus, supplies, or materials, or any part thereof, over energized high-voltage lines shall be prohibited.

(2) **Equipment and Materials in Use.** The operation, erection, or handling of tools, machinery, equipment, apparatus, materials, or supplies, or any part thereof within the minimum clearances from energized lines set forth in Table X shall be prohibited.

Table X
Required Clearances from Overhead High-Voltage Lines

Nominal voltage (Phase to Phase)	*Minimum Required Clearance (Feet)*
750 - 50,000	10
over 50,000 - 75,000	11
over 75,000 - 125,000	13
over 125,000 - 175,000	15
over 175,000 - 250,000	17
over 250,000 - 370,000	21
over 370,000 - 550,000	27
over 550,000 - 1,000,000	42

(3) **Transportation or Transit.** The transportation or transit of any tool, machinery, equipment, or apparatus, or the moving of any house or other building in proximity to overhead high-voltage lines shall be expressly prohibited if at any time during such transportation or transit such tool, machinery, equipment, apparatus, or building, or any part thereof, can come closer to high-voltage lines than the minimum clearances set forth in Table Y.

Article 86. Provisions for Preventing Accidents

Except where the boom of boom-type equipment is lowered and no load is imposed thereon, the equipment in transit shall conform to the minimum required clearances set forth in Table X.

Table Y
Required Clearances from Energized High-Voltage Conductors
(While in Transit)

Nominal Voltage (Phase to Phase)		*Minimum Required Clearance (Feet)*
750–	50,000	6
over 50,000–	345,000	10
over 345,000–	750,000	16
over 750,000–	1,000,000	20

(4) Storage. The storage of tools, machinery, equipment, supplies, materials, or apparatus under, by, or near energized high-voltage lines is hereby expressly prohibited if at any time during such handling or other manipulation it is possible to bring such tools, machinery, equipment, supplies, materials, or apparatus, or any part thereof, within the minimum required clearances from high-voltage lines as set forth in Table X.

(c) The specified clearance shall not be reduced by movement due to any strains impressed (by attachments or otherwise) upon the structures supporting the high-voltage line or upon any equipment, fixtures, or attachments thereon.

(d) Insulated cage-type boom guards, boom stops, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the required clearances set forth in Table X.

(e) Any overhead conductor shall be considered to be energized unless and until the person owning or operating such line verifies that the line is not energized, and the line is visibly grounded at the work site

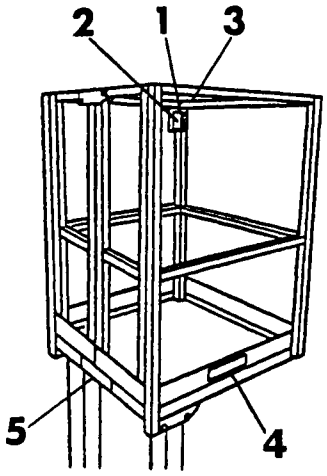
2947. **Warning Signs Required.** The owner, agent, or employer responsible for the operations of equipment shall post and maintain in plain view of the operator and driver on each crane, derrick, power shovel, drilling rig, hay loader, hay stacker, pile driver, or similar apparatus, a durable warning sign legible at 12 feet reading: **"Unlawful To Operate This Equipment Within 10 Feet Of High-Voltage Lines of 50,000 Volts Or Less."**

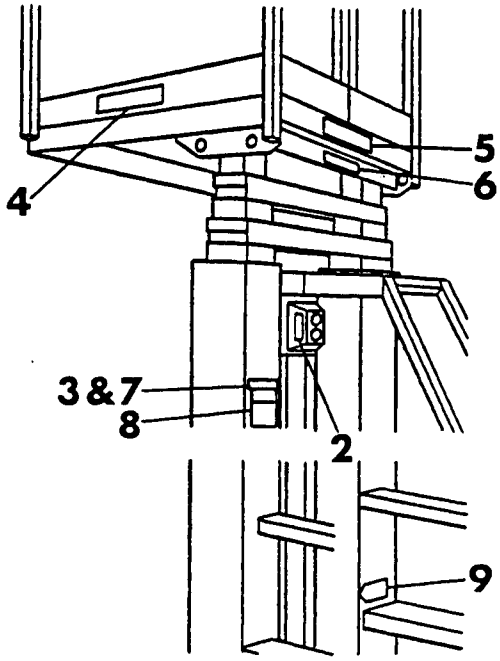
In addition to the above wording, the following statement in small lettering shall be provided on the warning sign: **"For Minimum Clearances of High-Voltage Lines In Excess of 50,000 Volts, See Article 86, Title 8, High-Voltage Electrical Safety Orders."**

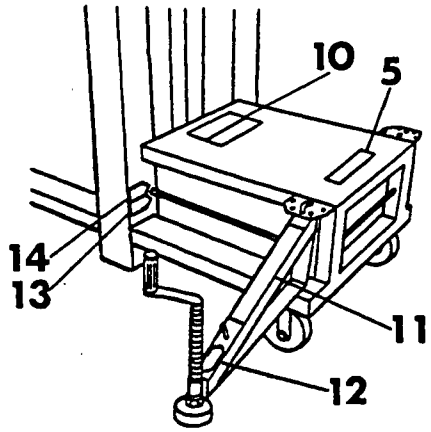
MARKPAL TELESCOPING PUSH-AROUND

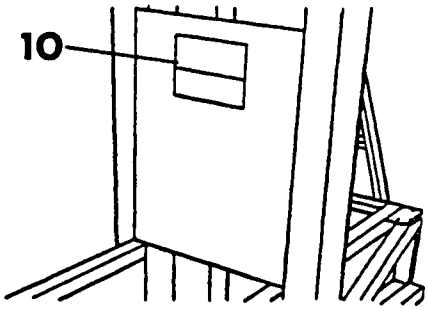
Be completely familiar with all warning and caution decals that are posted on the unit.

Keep in mind to be alert and use common sense and judgement in responding to dangerous situations and conditions that might develop during unit operation.

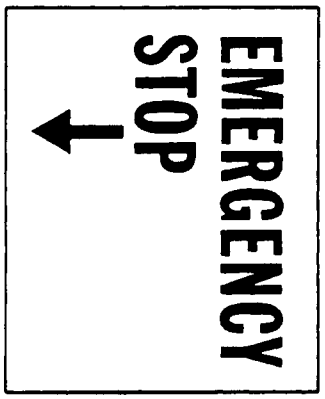








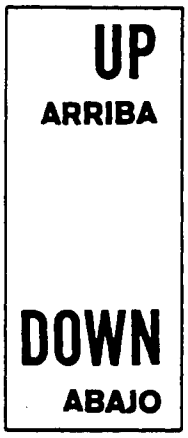
1



11058

LOCATED ON TOP
OF PLATFORM
CONTROL SWITCH BOX

2



11059

LOCATED ON SIDE
OF PLATFORM AND
GROUND CONTROL
SWITCH BOXES.

3

11051

LOCATED BY PLATFORM CONTROL SWITCH BOX
AND TOP OF BASE COLUMNS

4

11056

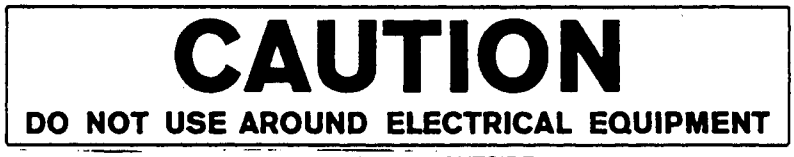
LOCATED OUTSIDE ON PLATFORM SIDE KICK PLATES

5

LOCATED AT PLATFORM ENTRANCE AND TOP REAR
OF POWER COMPARTMENT COVER

11066

6



11053

LOCATED AT PLATFORM ENTRANCE AND OUTSIDE
ON FRONT PLATFORM KICK PLATE

7

LOCATED AT TOP OF RIGHT HAND BASE
COLUMN WHEN MANUAL PUMP MODEL

11061

8

11054

LOCATED AT TOP OF BOTH BASE COLUMNS

9

MANUAL DOWN VALVE

To Lower
Turn Counter Clockwise

11066

10

CAUTION

EXTEND OUTRIGGERS BEFORE USING
USE ON LEVEL GROUND ONLY
PLUG IN CHARGER AT END OF EACH SHIFT
DO NOT USE AROUND LIVE ELECTRICAL EQUIP.
500 POUNDS CAPACITY

11052

LOCATED ON TOP FRONT AND INSIDE OF POWER COMPARTMENT COVER

11

CAUTION BEFORE RAISING PLATFORM EXTEND OUTRIGGERS

11055

LOCATED ON TOP OF OUTRIGGERS (4 PLACES)

12

TO EXTEND REMOVE PIN

11063

LOCATED ON TOP BOTTOM END OF OUTRIGGERS (4 PLACES)

14

CIRCUIT BREAKER

Push in to Reset

11067

13

MASTER SWITCH

TURN OFF AFTER EACH USE

LOCATED ON FRONT OF LEFT HAND BASE COLUMN

11062

15

THE HYDRAULIC SYSTEM
OF THIS MACHINE IS DESIGNED
TO USE G.M. TRANSMISSION FLUID
TYPE "B" WITH DEXRON

2017

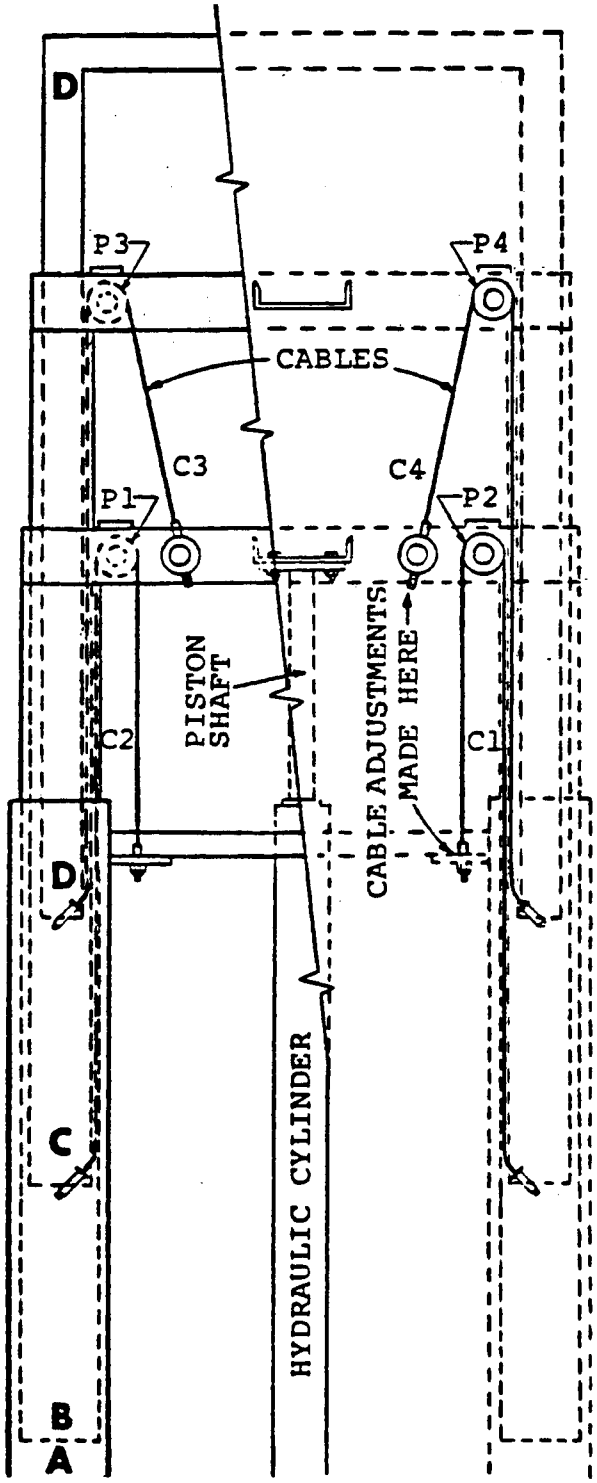
LOCATED ON TOP OF HYDRAULIC RESERVOIR

MARKPAL TELESCOPING PUSH-AROUND

The operational diagram. (Page 13) is a drawing of a Markpal column assembly. In order to understand the working principle involved, assume the platform to be mounted on Section D.

In order for the platform to be raised from its nested height of approximately 78" to its extended height of 240", the platform must move a total distance of 162". To accomplish this, the hydraulic rod must press Section B upwards a total of 54 inches. In other words, the platform moves up or down three inches for every inch of hydraulic cylinder rod travel for the Model 20 units, or two inches for the Model 15's.

To understand how this is accomplished, consider a one inch upward movement of hydraulic cylinder rod and first moveable section (B). Note cables C-1 and C-2 are firmly anchord at one end to base section with adjusting nuts, and the opposite end is attached to lower part of section C. Thus, it can be seen that an upward movement of one inch of Section B and pulleys P-1 and P-2 would cause Section C to move upward two inches. Now, consider the same effect between Sections C and D, with C3 and C4 anchored at one end to top part of Section B, and opposite ends anchored to bottom part of Section D to move up two inches. In other words, the one inch gained by Section D over Section C, and the one inch gained by Section C over Section B, plus the one inch movement of Section B would cause a total platform movement of three inches for each inch of hydraulic rod movement.


D
P3
P4
CABLES
C3
C4
P1
P2
PISTON SHAFT
C2
C1
CABLE ADJUSTMENTS MADE HERE
D
C
B
A
HYDRAULIC CYLINDER

The ratios of platform movement related to hydraulic cylinder rod movement are as follows:

15' units	2 to 1	These heights have been derated approximately 6% to provide greater intersection overlap, increasing safety margin.
20' units	3 to 1	
25' units	4 to 1	
30' units	5 to 1	

MARKPAL TELESCOPING PUSH-AROUND

It shall be the responsibility of all users of the MARKPAL to read and comply with following operating instructions. They are designed to promote safety and a better understanding of the TELESCOPING PUSH-AROUND Aerial Lift.

1. Position unit on level surface only. Not recommended for inclined surfaces.

2. Lock caster brakes.

3. Pull locking pins and rotate outriggers to desired position, replace locking pins.

4. Extend outrigger arms and lock with locking pins. Adjust screws until outrigger base plates are securely firm on surface.

5. Raise basket into position and secure with the two wing nuts, making sure safety latch is locked. TURN ON MASTER SWITCH.

6. Basket load must not exceed 500 lbs. weight, including weight of operator. Make sure swing gates are locked during use.

7. Raise to desired working height, staying a safe distance from electrical apparatus or wiring.

   DO NOT move unit with a person aboard, or while outriggers are extended, or while basket is in raised position.

8. If unit has ladders, they are provided for emergency descent only.

9. Electric units with a 25 AMP charger may be operated during charge cycle without damage to battery charger.

10. TURN OFF MASTER SWITCH when through using the unit for the day. Battery will gradually discharge if switch is left in the "ON" position.

11. EMERGENCY DISCONNECT

If for any reason upon release of the "UP" button, the pump continues to run, the following safety features have been added.

If operating from lower control station, master switch can be switched to "OFF" position to stop travel. Machine may then be lowered by opening the "Manual Down Valve".

If operating from upper control station, an additional safety switch is located on side of push button housing that will disconnect the "UP" electrical circuit only. Lowering of platform may still be accomplished by using the "DOWN" push button switch.

Lift system malfunctions must be corrected before attempting to return unit to service.

MARKPAL TELESCOPING PUSH-AROUND

HYDRAULIC FLUID TABLE

OIL COMPANY	Chevron	Gulf	Shell	Union
BRAND NAME	ATF Dexron 11	ATF Dexron 11	Donax-T6	ATF Dexron
VISCOSITY -				
SUS @ 100°F	187.4	195	200	200
SUS @ 210°F	49.2	50.4	50	52.3
VISCOSITY -				
INDEX TYPICAL	153°	155°	160°	172°
FLASH POINT °F	400°	405°	390°	395°
POUR POINT °F	-40°	-50°	-50°	-45°

SERVICE TOOLS

To properly and efficiently service your MARKPAL, several basic tools are required. The following list of tools should be available.

1. Volt/ohm meter
2. Hydraulic pressure guage (0-3000 PSI)
3. Battery hydrometer
4. Battery load tester
5. Standard mechanics hand tools
6. Electrical test light

MARKPAL TELESCOPING PUSH-AROUND

1. Check side column guides and lubricate with zinc base grease (or equivalent) if needed. Nylon guides do not require lubrication.

2. Check lifting arm cables for proper tension. If any damage or fraying is evident, replace affected cable immediately before use.
3. Charge battery after each period of usage. (see instructions on Battery Care page 28)

4. Check hydraulic lines for any signs of leakage.

5. If used for sandblasting or similar operation, steam clean moving surfaces and relubricate as in #1.

MARKPAL TELESCOPING PUSH-AROUND

1. Check cables for even tension, and make adjustments when necessary, replace cable if any broken strands or other damage is found.

2. Check battery for electrolyte level. If low, add water only.

3. Check hydraulic fluid level. Fill with ATF-Dexron 11 or equivalent, when necessary.

4. Clean corrosion from battery terminals. Remove cables from battery, clean battery posts and cable ends to shiny metal, then replace. Lube outside of connection with non-melting grease if desired.

Keep all moving parts free from sand and other abrasives. If used for sandblasting or similar operations, steam clean and relubricate immediately before re-use.

MARKPAL TELESCOPING PUSH-AROUND

INTRODUCTION

Whenever trouble shooting any problem the initial consideration MUST be to "Check The Basics".

Check the basics, means to insure that the batteries are in good shape, and have at least a three quarter charge, determined by use of a hydrometer, and Battery Care instructions (page 28).

A large percentage of electrical problems can be attributed to insufficiently charged or defective batteries.

(Some Helpful Hints)

ELECTRICAL

1. If problem seems to be electrical, utilize your applicable schematic, and test light to trace power flow (electrical current) starting at battery and continuing through system until the problem is located. The entire Chassis is grounded to negative side of battery making the use of a test light extremely easy.

2. Keep in mind, if you DO NOT have a good ground to a valve coil, relay etc., then even if you have proper electrical current to the coil or relay, the item will not function properly.

3. Diodes can be thought of as "One way electrical check valves" they permit current flow in one direction and stop it in the opposite direction.

Current Flow. ➡

ACTUAL

SCHEMATIC

4. The basic purpose of a relay is to maintain full electrical current. When sending an electrical signal to the relay coil, the electrical current flows through relay contracts and to the desired valve coil.

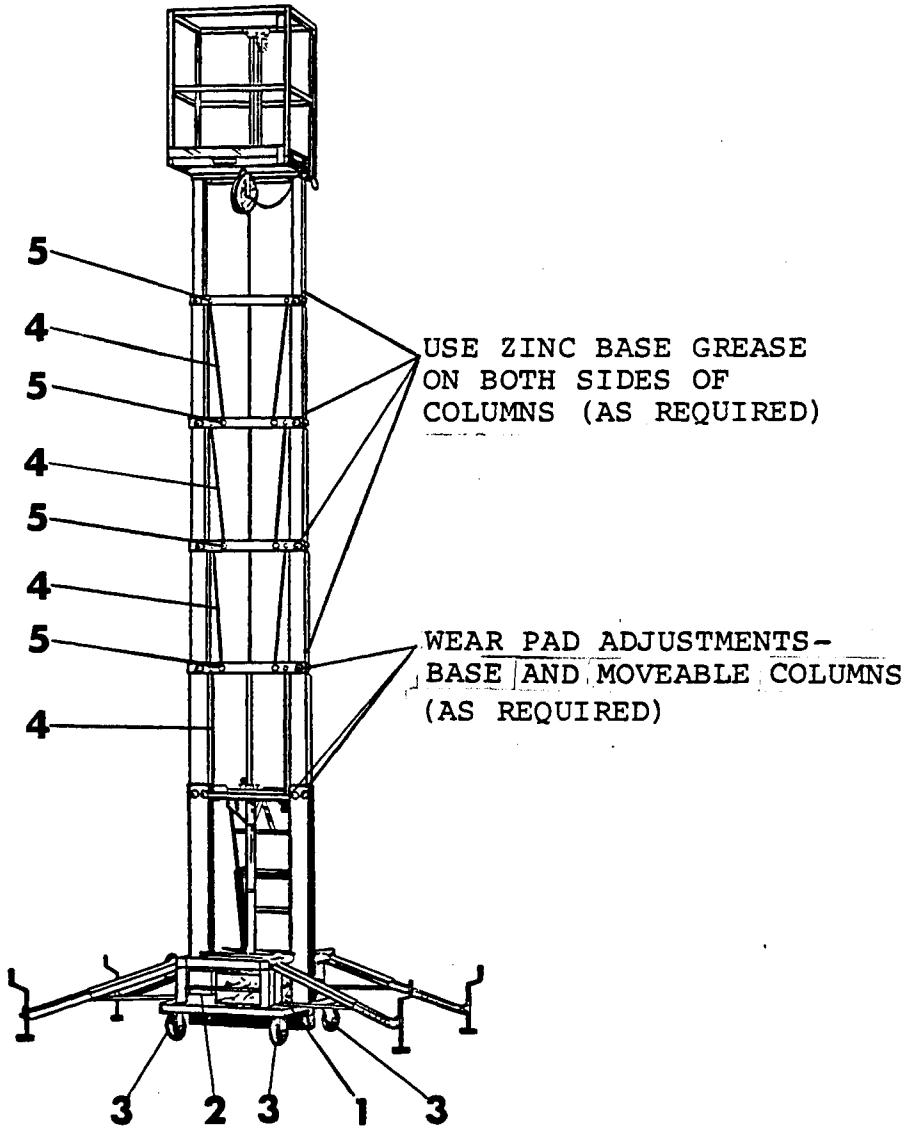
MARKPAL TELESCOPING PUSH-AROUND

PROBLEM	PROBABLE CAUSE	REMEDY
Column assembly creeps down.	1) External hydraulic hose or fitting leakage.	1) Tighten or replace fittings on hose.
	2) Hydraulic cylinder seal leakage.	2) Check by removing top air bleed line from cylinder, raise cylinder to full height. If fluid discharges from top port, fluid is by-passing piston seal (Replace cylinder seals).
	Manual Lowering Valve	
	3.a) Manual lowering valve out of adjustment.	3.a) Loosen jam nut on needle valve, seat needle by turning clockwise and re-tighten jam nut.
	3.b) Needle not seating due to contamination or damage.	3.b) Remove needle, clean, check for damage. If damage to needle is evident, replace valve.
	4) Defective solenoid lowering valve. (If items #1, #2 and #3 check-out, solenoid lowering valve (located on side of pump body) is not closing completely when solenoid is de-energized.	4) To check valve, install a manual operated needle valve between the pressure port of the pump and the hose. Open valve, raise the hydraulic cylinder by operating pump. After extending cylinder, close valve. If columns do not creep down, solenoid lowering valve is defective. Replace solenoid.

PROBLEM	PROBABLE CAUSE	REMEDY
Pump motor runs, column assembly will not lift.	1) Emergency lowering valve open.	1) Loosen jam nut on needle of emergency lowering valve. Turn needle clockwise until firmly seated and tighten jam nut.
	2) Insufficient hydraulic fluid in reservoir.	2) Check level and fill if necessary.
	3) Pump pressure by-pass out of adjustment.	3) Install pressure gage in pressure supply port between pump and hose. Adjust pressure by-pass with 500 lbs. on platform. (adjustment screw located on side of pump body. Remove cover cap, turn clockwise for more pressure).
	4) Broken or loose wires from dump valve. (Located inside of hydraulic reservoir).	4) Check and repair if necessary.
	5) Defective piston seals in hydraulic cylinder.	5) Check cylinder seals as suggested on page 22 item 2.
	6) Defective dump valve.	6) To check valve operation drain oil from reservoir, remove reservoir. Unscrew valve from valve body. Apply 12 volts to valve coil and visually check movement of plunger. If no movement occurs, replace valve or coil as necessary.

PROBLEM	PROBABLE CAUSE	REMEDY
Pump motor will not run when "up" switch is depressed.	1) Broken wire or loose connections.	1) Check.
	2) Master switch not "on".	2) Check.
	3) Circuit breaker tripped or fuse defective.	3) Reset or replace.
	4) Battery output "low".	4) Check and recharge.
	5) Emergency "stop" switch at upper control station turned off.	5) Check.
	6) Defective push-button switch.	6) Switches are of normally open configuration. Check for continuity with push-button pressed. (Replace if defective).
	7) Defective control relay.	7) To check, remove relay from socket, insert jumper wire from socket #1 to socket #6. It pump motor works when "up" button is pressed, relay is defective and should be replaced.
	8) Defective limit switch.	8) To check, by-pass limit switch with jumper wire. If motor runs when push button is pressed, swich is defective. (Replace if necessary).
	9) Defective motor start solenoid.	9) If items "1" thru "8" check out, solenoid may be tested by placing a voltmeter across the motor side of the solenoid and ground. If you do not have a

PROBLEM	PROBABLE CAUSE	REMEDY
		voltage reading when the push-button switch is pressed, replace the motor solenoid.
	10) Defective pump motor.	10) Inspect motor for worn or broken brushes, frozen bearings, defective armature and field windings. Replace if necessary.
Column assembly will not lower when down switch is depressed.	1) Tripped circuit breaker or defective fuse.	1) Reset breaker or replace fuse.
	2) Broken or loose wires in control circuit.	2) Inspect and repair as necessary.
	3) Defective push-button "down" control switch.	3) Switches are of normally open configuration. Check for continuity when button is pressed. Replace if necessary.
	4) Defective solenoid lowering valve.	4) If items #1 thru #3 check OK, check for voltage to solenoid lowering valve. Voltage to the coil indicates that solenoid lowering valve is defective. (Replace).



ITEM	DESCRIPTION	LUBRICANT	INSPECTION	FREQUENCY
1	BATTERY		WATER LEVEL	WEEKLY
2	HYDRAULIC OIL RESERVOIR	ATF DEXRON	HYDRAULIC OIL LEVEL	MONTHLY
3	CASTER ZERKS	MULTI-PURPOSE		MONTHLY
4	CABLES		IF FRAYED, REPLACE	2 MONTHS
5	CABLE ROLLERS		IF WORN, REPLACE	2 MONTHS

MARKPAL TELESCOPING PUSH-AROUND

QTY	PART NO.	DESCRIPTION
1	91310	DC BATTERY CHARGER
1	91333-1	DC CORD REEL
1	CW-34	AC CORD REEL
1	W88CPX-1	DC CONTROL RELAY
1	91334	UP-LIMIT SWITCH (ALL MODELS)
1	4017	EMERGENCY STOP SWITCH (ALL MODELS)
1	91335-3	CONTROL STATION UP-DOWN SWITCH (ALL MODELS)
1	20562	DC 20 AMP CIRCUIT BREAKER
1	91221	MANUAL DOWN VALVE (ALL MODELS)
1	CMMQ20B	CHECK VALVE (ALL MODELS)
1	91230	HIGH PRESSURE HOSE (ALL MODELS)
1	91231	LOW PRESSURE HOSE (ALL MODELS)
1	90900-1WP	CABLE SYSTEM KIT (P15)
1	90900-2WP	CABLE SYSTEM KIT (P20)
1	90900-3WP	CABLE SYSTEM KIT (P25)
1	90900-4WP	CABLE SYSTEM KIT (P30)
1	66180	LIFT CYLINDER SEAL KIT (P15) (P20) (P25)
1	66166	LIFT CYLINDER SEAL KIT (P30)
1	91350	AC MANUAL STARTER
1	5X269	AC MANUAL STARTER SWITCH
1	91351	AC THERMAL UNIT
1	5X828	AC TIME DELAY RELAY
1	5X850A	AC MOTOR START RELAY

MARKPAL TELESCOPING PUSH-AROUND

IMPORTANT FACTS ON BATTERIES AND CHARGERS

Do not discard a good battery as being defective because its specific gravity does not show an increase immediately upon applying a charge. Many good batteries require a charging period as long as three hours before they show any increase in the specific gravity.

Do not charge a battery if the electrolyte temperature could rise above 120° F. This could damage both battery and charger. As a rule of thumb, the electrolyte temperature, during normal charging, is about 20° F. above the local air temperature.

There are only two test methods to determine if a discharged battery is defective without applying charge. These tests are given in steps 5 and 6 of the INSPECTION OF BATTERIES AND ASSOCIATED CIRCUITS. Voltage testing methods without fully charging or made while charging have no relationship to the battery defectiveness.

Failure to keep the battery electrolyte to the proper level will result in a crumbling (abnormal sulfation) of the plates and cause failure of the battery. Distilled water must be added to the battery regularly to make up for the loss due to evaporation, especially during periods of high charging rates. Add water only to fully charged batteries.

Both overcharging and undercharging can cause a premature failure of a battery. Overcharging destroys the positive plates. Consistent undercharging causes a buckling of the plates.

MARKPAL TELESCOPING PUSH-AROUND

INSPECTION OF BATTERIES AND ASSOCIATED CIRCUITS

An inspection of batteries and associated circuits is required often to assure that the batteries are capable of being fully charged. This inspection requires the use of a hydrometer.

1. Verify that all connections within the unit to be charged are clean and tight.

2. Check each battery for loose terminal posts.

3. Test for continuity between all battery terminals and the charging receptacle.

4. Verify that the top of each battery is free of moisture, grease, and acid films which may cause a current leakage.

5. Test each individual cell in each battery with the hydrometer to verify that all specific gravity readings are within 10 points of one another.

6. Using the hydrometer, pull out acid from a cell and then vigorously expel the acid back into the cell to cause a violent stirring action. Immediately draw out another sample of acid and visually inspect it to see if it contains a brownish sediment (indicates positive plates are deteriorated).

MARKPAL TELESCOPING PUSH-AROUND

CHARGING TIME CHART

The following chart provides useful information for determining the minimum charging time needed to restore a battery to a full charge condition. In addition to normal charging, the cells of the batteries should be equalized twice each month. This is done by charging the batteries an additional seven hours after a normal charge cycle. The current indications of the ammeter will be low during cell equalization.

SPECIFIC GRAVITY READING	CONDITION OF BATTERY	HOURS NEEDED TO CHARGE
1100	Fully discharged	12
1125	10% charged	10
1150	20% charged	8
1175	30% charged	7
1200	60% charged	4
1225	75% charged	2
1250	95% charged	½
1260	Fully charged	0

MARKPAL

MARK INDUSTRIES

MAINTENANCE CHECK LIST

Model: _____ Serial No. _____

Date: _____ Equip. No. _____

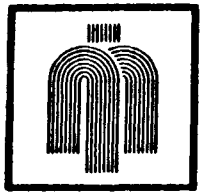
Location: _____ Mechanic: _____

ITEM	CODE	COMMENTS	ITEM	CODE	COMMENTS
1. Batteries			20. Lug Nuts		
2. Battery Terminals			21. Nuts & Bolts		
3. Motor Brushes			22. Guard Rails		
4. Hydraulic Fluid			23. Lubrication		
5. Hydraulic Oil			24. Warning Decals		
Filter			25. Operation		
6. Hydraulic System			Instructions		
7. Hydraulic Pressure			26. General Decals		
8. Hydraulic Hoses			27. Paint		
9. Cylinder			28. All Operations		
10. Emergency Lowering			29. Lift		
Valve			30. Steering		
11. Basket Controls			31. Variable Speed		
12. Lower Controls			Drive		
13. Relays			32. Literature		
14. Wire connections			33. Options		
15. Safety Cut-outs			34. Lifting Arm		
16. Bushings			Cables		
17. Rollers					
18. Tire Pressure					
19. Tire Condition					

CODE

F - Filled
R - Repaired
C - Checked
A - Adjusted
X - Needs Repair

Other Comments:



MARK INDUSTRIES

MARKPAL SERVICE MAINTENANCE RECORD

MODEL: _____

SER. NO.: _____

DATE SOLD _____

DATE IN SERVICE _____

OPTIONS _____

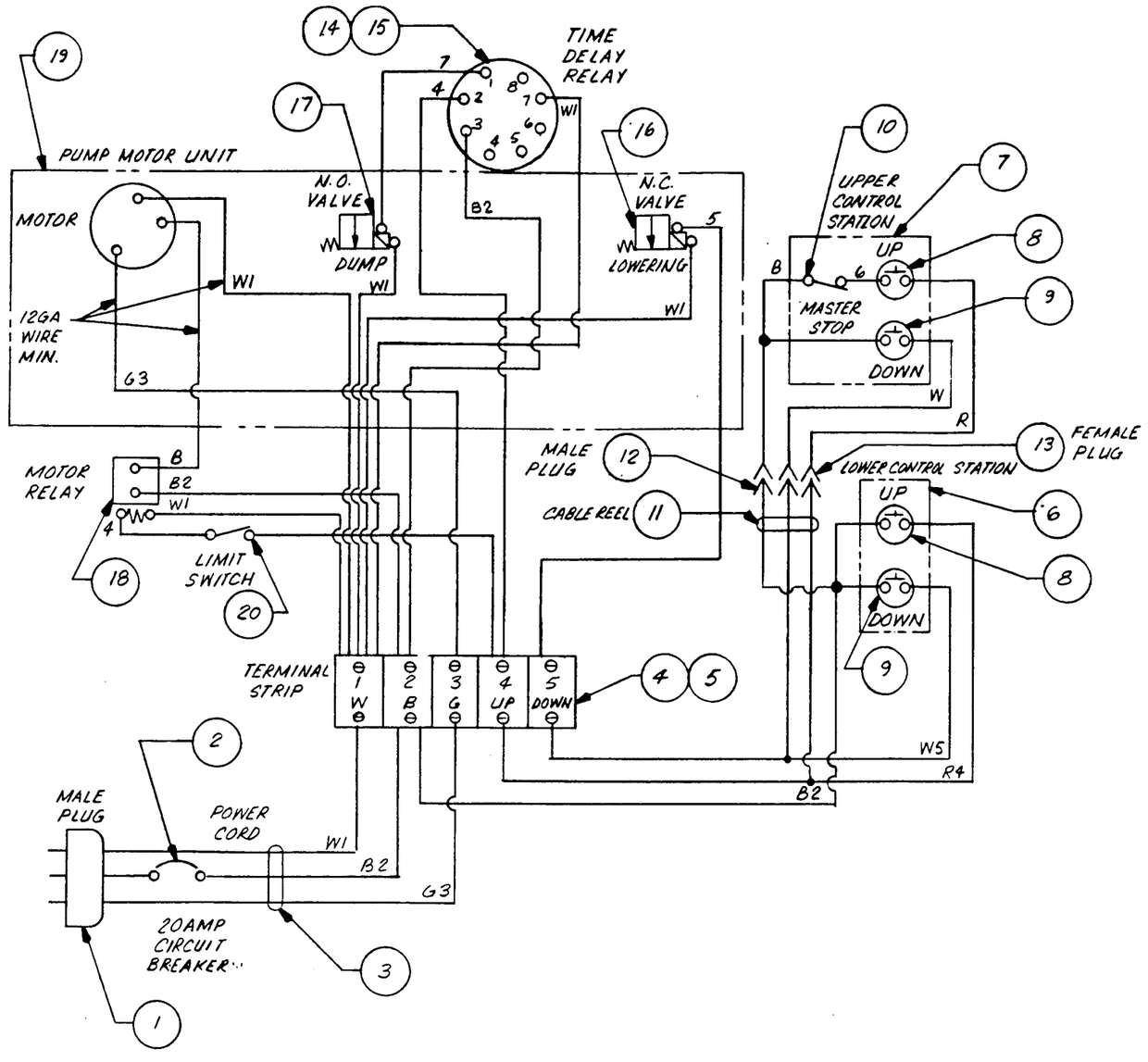
WARRANTY PERIOD _____

CODE:

C—CHECKED
A—ADJUSTED
R—REPAIRED
N—NEW PART
X—NEEDS REPAIR

DATE	W.O.	MECH.	HR METER	PREVENTATIVE MAINT.										ELECTRICAL						HYDRAULIC												STEER			TIRE		MAJ.		MISC.					
				HYDRAULIC OIL CHANGE			DRIVE MOTOR			PUMP MOTOR BRUSHES			ELECTRICAL CONTROLS			BATTERY			HYDRAULIC SYSTEM			LIFT CYL SEALS			HYDRAULIC CONTROL VALVE			HYD PUMP			LIFT ROLLERS			HYD HOSES			STEERING			STEER CYL			DRIVE TIRE								

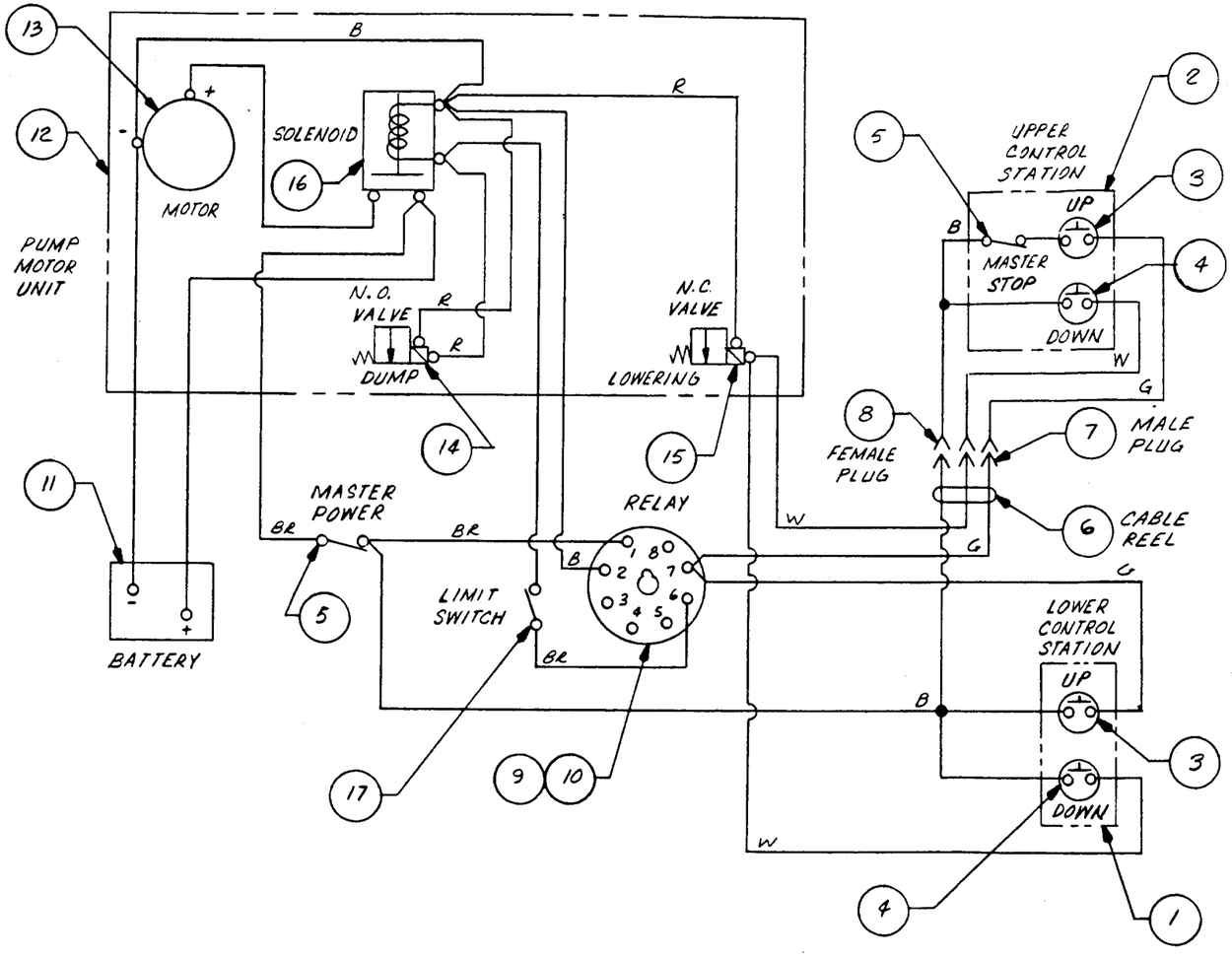
DATE	REMARKS	DATE	REMARKS	AGENCY



QTY. REQ'D	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS.
1	20	91334	LIMIT SWITCH	
1	19	91215	PUMP MOTOR UNIT	
1	18	91353	MOTOR RELAY	
1	17	91217	DUMP VALVE	
1	16	91216	LOWERING VALVE	
1	15	784A	RELAY SOCKET	
1	14	91335	TIME DELAY RELAY	
1	13	91338	FEMALE PLUG	
1	12	91337	MALE PLUG	
1	11	91333-1	CORD REEL	
1	10	4017	TOGGLE SWITCH	EMERGENCY STOP
2	9	91335-5	PUSHBUTTON CAP	BLACK
2	8	91335-4	PUSHBUTTON CAP	RED
1	7	91335	UPPER CONTROL STATION	INCLUDES ITEM 10
1	6	91335	LOWER CONTROL STATION	
1	5	117G	TERMINAL STRIP END	
5	4	4027	TERMINAL BLOCK	
1	3		POWER CORD	
1	2	91356	CIRCUIT BREAKER	20AMPS
1	1	91337	MALE PLUG	

* BILL OF MATERIAL

* SEE FIG.6, IN PARTS SECTION, FOR BALANCE OF CONTROL STATION ITEMS.



QTY. REQ'D	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION	DATA: SPECIFICATIONS SIZES, NOTES, SUPPLIERS.
1	17	91334	LIMIT SWITCH	
1	16	4082	SOLENOID	
1	15	91212	LOWERING VALVE	
1	14	91213	DUMP VALVE	
1	13	91211-2	MOTOR	
1	12	91211	PUMP MOTOR UNIT	
1	11	91320	BATTERY	
1	10	784A	RELAY BASE	
1	9	4032	RELAY	6 V DC
1	8	91338	FEMALE PLUG	
1	7	91337	MALE PLUG	
1	6	91333	CORD REEL	
2	5	4017	TOGGLE SWITCH	EMERGENCY STOP
2	4	91335-5	PUSHBUTTON CAP	BLACK
2	3	91335-4	PUSHBUTTON CAP	RED
1	2	91335	UPPER CONTROL STATION	(INCLUDES ITEM 5)
1	1	91335	LOWER CONTROL STATION	

*** BILL OF MATERIAL**

* SEE FIG.6, IN PARTS SECTION, FOR BALANCE OF CONTROL STATION ITEMS.

MARK PAL TELESCOPING PUSH-AROUND

INDEX

FIGURE 1 - FINAL ASSEMBLY (P15)

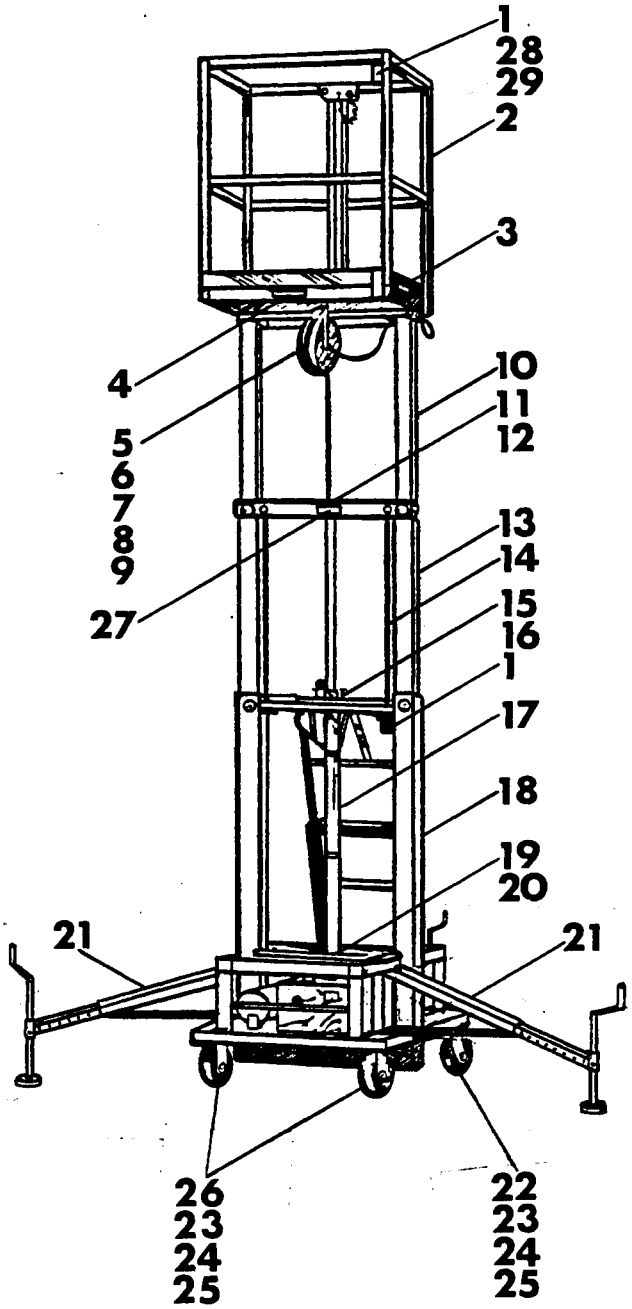
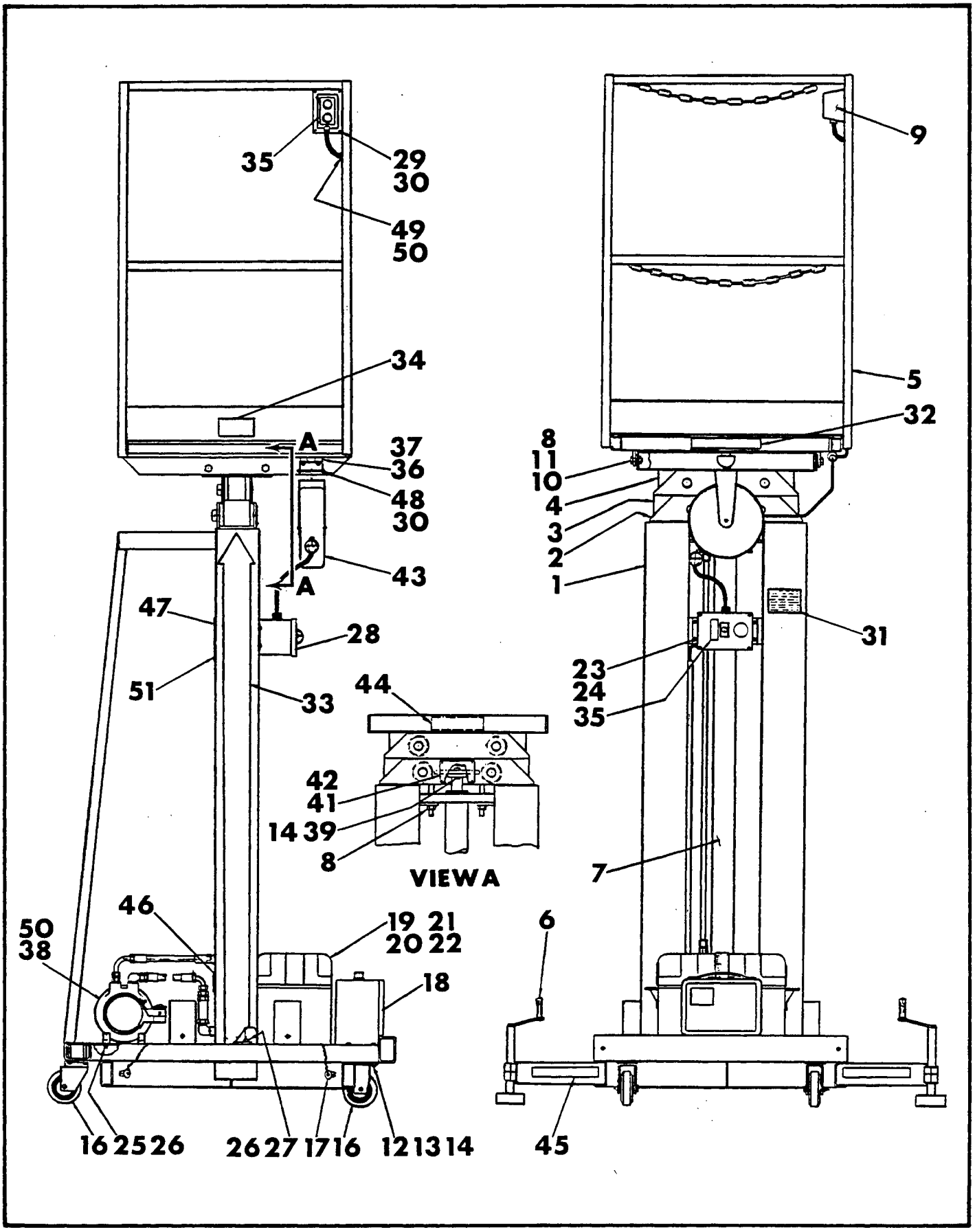


	FIGURE 1 - FINAL ASSEMBLY (P15)	2

ITEM	PART NUMBER	DESCRIPTION	QTY
1-		FINAL ASSEMBLY	1
-1	91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	2
-2	90100-2	PLATFORM ASSEMBLY (SEE FIG.2)	1
-3	* 11056	DECAL - "500 LBS. CAPACITY"	2
-4	* 11053	DECAL - "CAUTION - DO NOT USE AROUND ELECTRICAL EQUIPMENT"	2
-5		AC CORD REEL - CW-34	1
	91333-1	DC CORD REEL	1
-6	**	REEL MOUNT	1
-7	**	HEX NUT - 5/16-18	2
-8	**	LOCK WASHER - 5/16	2
-9	**	TEE NUT - 5/16-18	2
-10	90200WP	VERTICAL SECTION (2) (SLAVE)	1
-11	** 91514	CYLINDER ROD MOUNTING CAPSCREW - ½ X 2	2
-12	** 91515	CYLINDER ROD MOUNTING LOCKNUT - ½	2
-13	90300-2WP	VERTICAL SECTION (3) (DRIVEN)	1
-14	90900-1WP	CABLE SYSTEM KIT	1
-15	** 91512	UPPER CYLINDER MOUNTING CAPSCREW - 5/16 X 3½	4
-16	** 91513	UPPER CYLINDER MOUNTING LOCKNUT 5/16	4
-17	91100-1	LIFT CYLINDER (SEE FIG.5)	
-18	90700-1WP	BASE ASSEMBLY (AC-SEE FIG.3) (DC-SEE FIG.3B) (MANUAL PUMP-SEE FIG.3D)	1
-19	** 91510	LOWER CYLINDER MOUNTING CAPSCREW - 5/16 X 3/4	2
-20	** 91511	LOWER CYLINDER MOUNTING LOCKWASHER - 5/16	2
-21	90800	OUTRIGGER ASSEMBLY (SEE FIG.4)	2
-22	*** 91011	SWIVEL CASTER WITH BRAKE	2
-23	*** 91012	CASTER MOUNTING CAPSCREW - 3/8 X 2 3/4	16
-24	*** 91013	CASTER MOUNTING LOCKWASHER - 3/8	16
-25	*** 91014	CASTER MOUNTING STOP NUT 3/8-16 (NYLOC)	16
-26	*** 91010	RIGID CASTER	2

ITEM	PART NUMBER	DESCRIPTION	QTY
-27	20415	PLATE - MODEL/SERIAL NUMBER	1
-28	91336	PLATFORM CONTROL CABLE	1
-29		PLATFORM CONTROL CABLE LOOM 68"-3/8" - 1205E	1
		* FOR ADDITIONAL DECAL INFORMATION SEE PAGE 9 IN OPERATION SECTION.	
		** PART OF MISC. HARDWARE KIT 91500	
		*** PART OF CASTER SET KIT 91000	

FIGURE 1.1 - FINAL ASSEMBLY (P19DC)



REV.1 4-83	FIGURE 1.1 - FINAL ASSEMBLY (P19DC)	3.2

ITEM	PART NUMBER	DESCRIPTION	QTY
1.1-	93465	FINAL ASSEMBLY	1
-1	93470	SUPPORT BASE WELDMENT	1
-2	93511	1ST STAGE COLUMN ASSEMBLY (SEE FIG. 1D)	1
-3	93510	2ND STAGE COLUMN ASSEMBLY (SEE FIG. 1E)	1
-4	98506	3RD STAGE COLUMN ASSEMBLY (SEE FIG. 1F)	1
-5	93512	PLATFORM ASSEMBLY (SEE FIG. 2C)	1
-6	93505	OUTRIGGER ASSEMBLY (SEE FIG. 4.1)	4
-7	93475	LIFT CYLINDER (SEE FIG. 5A)	1
-8	61305	SELF LOCKING NUT - 1/2-13 UNC	8
-9	93464	UPPER CONTROL ASSEMBLY (SEE FIG. 6A)	1
-10	60308	HEX HEAD CAP SCREW - 1/2-13 UNC X 1 1/4	4
-11	63405	FLAT WASHER - 1/2	4
-12	60317	HEX HEAD CAP SCREW - 3/8-16 UNC X 2 1/2	16
-13	63405	FLAT WASHER - 3/8	16
-14	61318	SELF LOCKING NUT - 3/8-16 UNC	18
-15	65394	RIGID CASTER	2
-16	65395	SWIVEL CASTER	2
-17	65404	LOCK PIN	4
-18	70154	BATTERY CHARGER	1
-19	782	BATTERY BOX	1
-20	16934	BATTERY BOX COVER	1
-21	16935	STRAP	1
-22	70157	BATTERY	1
-23	60309	HEX HEAD CAP SCREW - 1/4-20 UNC X 3/4	4
-24	61227	SELF LOCKING NUT - 1/2-20 UNC	4
-25	60331	HEX HEAD CAPSCREW - 3/8-16 UNC X 1 1/4	2
-26	63303	LOCK WASHER - 3/8	4
-27	60102	HEX HEAD CAP SCREW - 3/8-16 UNC X 1	2
-28	93514	LOWER CONTROL ASSEMBLY (SEE FIG. 6B)	1
-29	62611	MACHINE SCREW - NO. 10-32 UNF X 1/2	4
-30	61241	SELF LOCKING NUT - NO. 10-32 UNF	5
-31	93411	DECAL - "CAUTION - UNIT MUST BE BLOCKED SO THAT CASTERS DO NOT CONTACT TRANSPORTING VEHICLE"	1

ITEM	PART NUMBER	DESCRIPTION	QTY
-32	11053	DECAL - "CAUTION - DO NOT USE AROUND ELECTRICAL EQUIPMENT"	2
-33	93287	DECAL - "ARROW STRIPE"	2
-34	2021	DECAL - "LOAD CAPACITY 350 LBS."	2
-35	11059	DECAL - "UP - DOWN"	2
-36	882	SHOCK MOUNT	2
-37	61322	SELF LOCKING NUT - 5/16-18 UNC	2
-38	93513	HYDRAULIC SYSTEM INSTALLATION (SEE FIG. 8)	1
-39	60102	HEX HEAD CAP SCREW - 3/8-16 UNC X 1	2
-40	93517	ELECTRICAL SYSTEM INSTALLATION (SEE FIG. 7)	1
-41	20415	PLATE - MODEL/SERIAL NUMBER	1
-42	63656	POP RIVET - 1/8 DIA. X 1/2	4
-43	70181	CORD REEL	1
-44	11066	DECAL - "USE ON LEVEL GROUND ONLY"	2
-45	11055	DECAL - "USE ON LEVEL GROUND ONLY"	4
-46	93412	DECAL - "MANUAL DOWN VALVE"	1
-47	11051	DECAL - "CAUTION-CAGE SAFETY WING NUTS MUST BE SECURED BEFORE RAISING PLATFORM"	4
-48	62626	MACHINE SCREW - NO. 10-32 UNF X 3 1/2	1
-49	70192	GROMMET	1
-50	70132	LOOM-CABLE	1
-51	11054	DECAL - "CAUTION-EXTEND OUTRIGGERS BEFORE USING. USE ON LEVEL GROUND ONLY. DO NOT USE AROUND LIVE ELECTRICAL EQUIP."	2

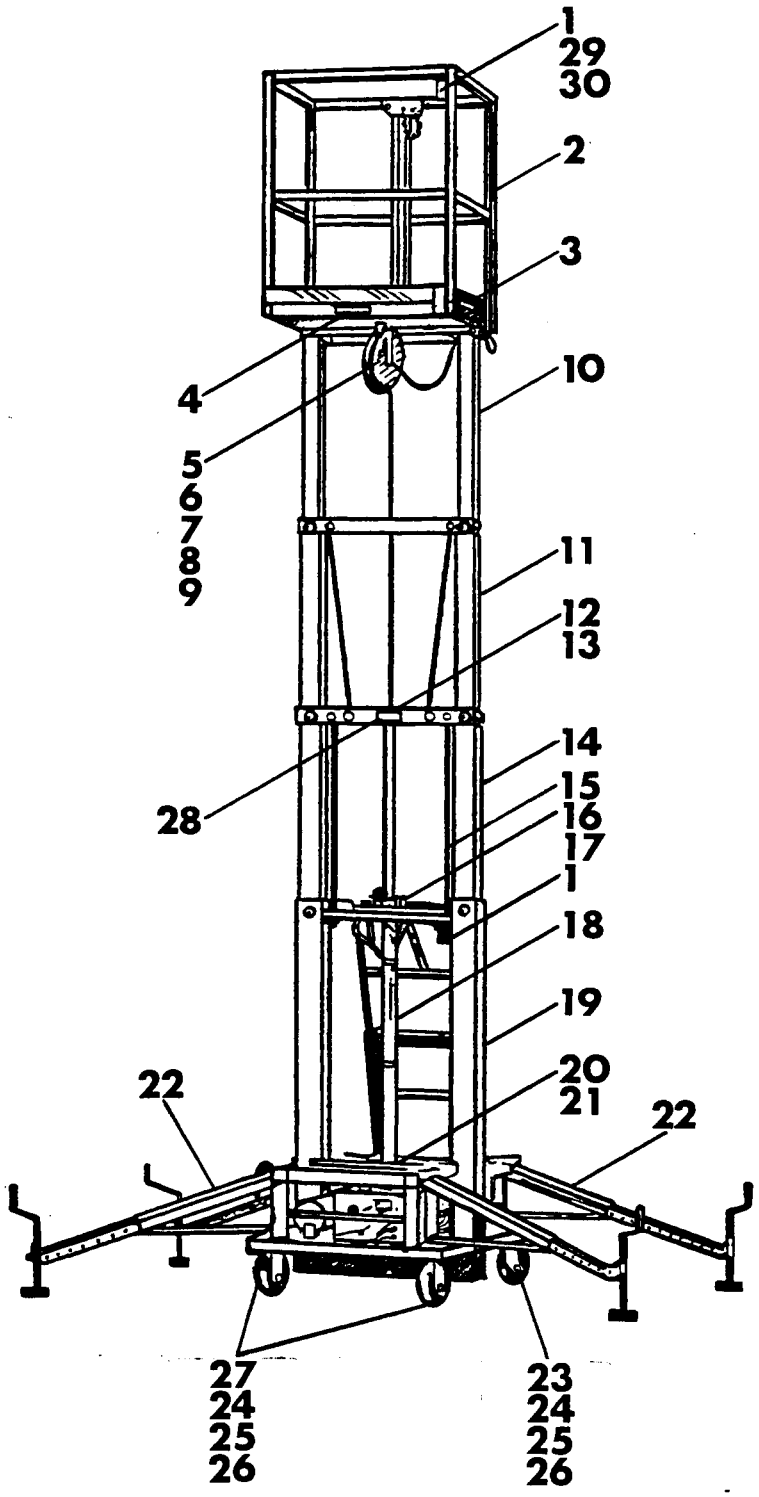

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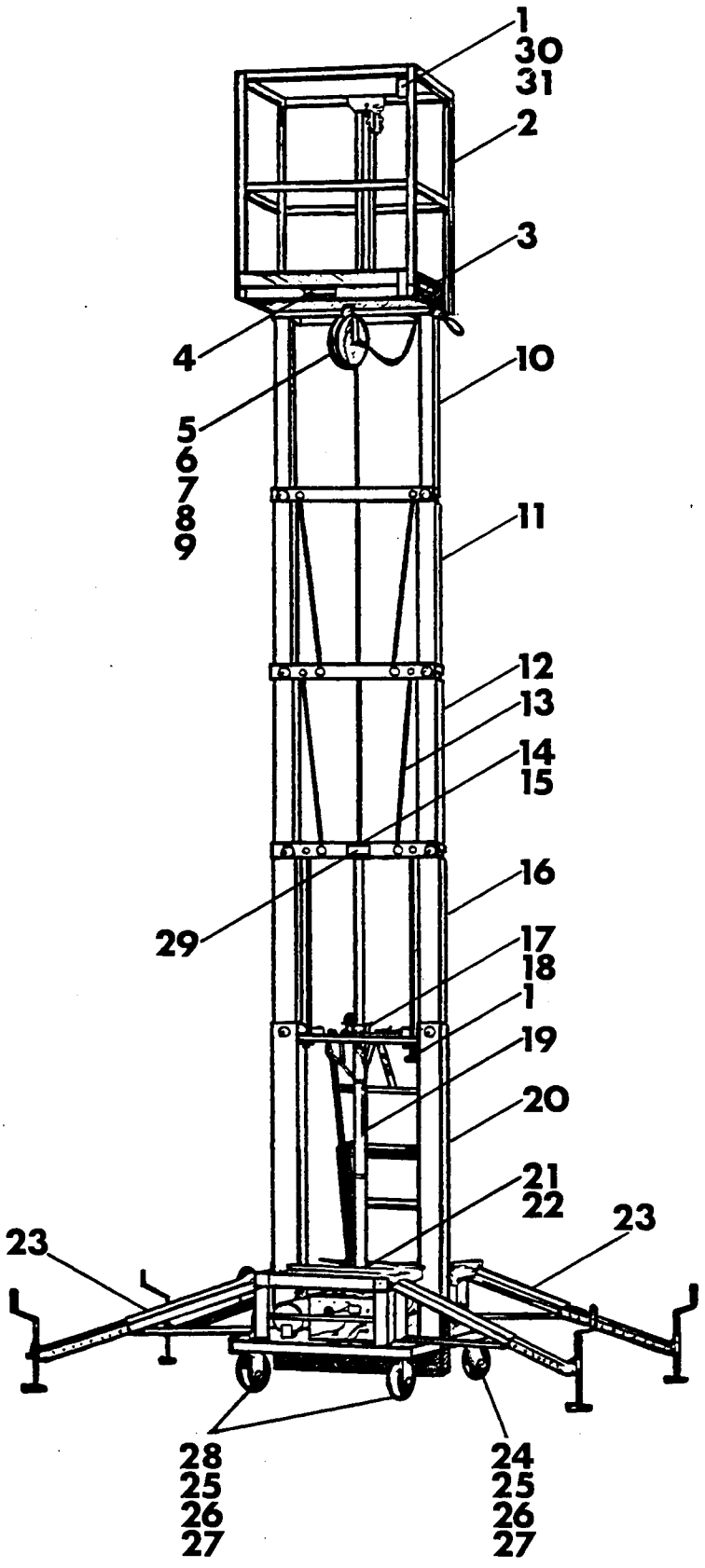
FIGURE 1A - FINAL ASSEMBLY (P20)

ITEM		PART NUMBER	DESCRIPTION	QTY
1A-			FINAL ASSEMBLY	1
-1		91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	2
-2		90100-2	PLATFORM ASSEMBLY (SEE FIG.2)	1
-3	*	11056	DECAL - "500 LBS. CAPACITY"	2
-4	*	11053	DECAL - "CAUTION - DO NOT USE AROUND ELECTRICAL EQUIPMENT"	2
-5			AC CORD REEL - CW-34	1
		91333-1	DC CORD REEL	1
-6	**		REEL MOUNT	1
-7	**		HEX NUT - 5/16-18	2
-8	**		LOCKWASHER - 5/16	2
-9	**		TEE NUT - 5/16-18	2
-10		90200WP	VERTICAL SECTION (2) (SLAVE)	1
-11		90300-1WP	VERTICAL SECTION (3) (SLAVE)	1
-12	**	91514	CYLINDER ROD MOUNTING CAPSCREW - ½ X 2	2
-13	**	91515	CYLINDER ROD MOUNTING LOCKNUT - ½	2
-14		90400-2WP	VERTICAL SECTION (4)(DRIVEN)	1
-15		90900-2WP	CABLE SYSTEM KIT	1
-16	**	91512	UPPER CYLINDER MOUNTING CAPSCREW - 5/16 X 3½	4
-17	**	91513	UPPER CYLINDER MOUNTING LOCKNUT - 5/16	4
-18		91100-1	LIFT CYLINDER (SEE FIG.5)	1
-19		90900-2WP	BASE ASSEMBLY (AC-SEE FIG.3A) (DC-SEE FIG.3C) (MANUAL PUMP-SEE FIG.3E)	1
-20	**	91510	LOWER CYLINDER MOUNTING CAPSCREW - 5/16 X 3/4	2
-21	**	91511	LOWER CYLINDER MOUNTING LOCKWASHER - 5/16	2
-22		90800-1	OUTRIGGER ASSEMBLY (SEE FIG.4)	4
-23	***	91011	SWIVEL CASTER WITH BRAKE	2
-24	***	91012	CASTER MOUNTING CAPSCREW - 3/8 X 2 3/4	16
-25	***	91013	CASTER MOUNTING LOCKWASHER 3/4	16
-26	***	91014	CASTER MOUNTING STOP NUT - 3/8-16 (NYLOC)	16

ITEM	PART NUMBER	DESCRIPTION	QTY
-27	*** 91010	RIGID CASTER	2
-28	20415	PLATE - MODEL/SERIAL NUMBER	1
-29	91336	PLATFORM CONTROL CABLE	1
-30		PLATFORM CONTROL CABLE LOOM 68"-3/8" - 1205E	1
		* FOR ADDITIONAL DECAL INFORMATION SEE PAGE 9 IN OPERATION SECTION	
		** PART OF MISC. HARDWARE KIT 91500	
		*** PART OF CASTER SET KIT 9100	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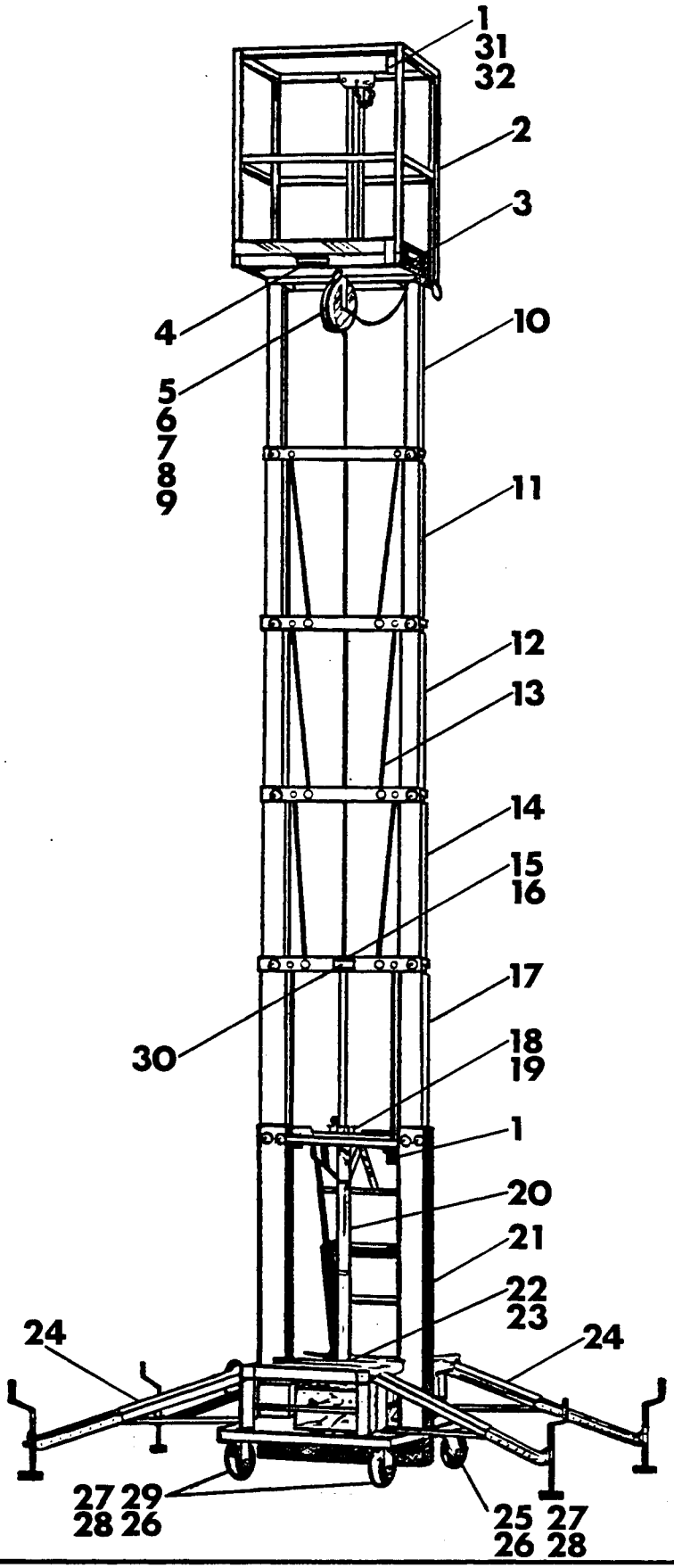
ITEM		PART NUMBER	DESCRIPTION	QTY
1B-			FINAL ASSEMBLY	1
-1		91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	2
-2		90100-2	PLATFORM ASSEMBLY (SEE FIG.2)	1
-3	*	11056	DECAL - "500 LBS. CAPACITY"	2
-4	*	11053	DECAL - "CAUTION - DO NOT USE AROUND ELECTRICAL EQUIPMENT"	
-5			AC CORD REEL - CW-34	1
		91333-1	DC CORD REEL	1
-6	**		REEL MOUNT	1
-7	**		HEX NUT - 5/16-18	2
-8	**		LOCKWASHER - 5/16	2
-9	**		TEE NUT - 5/16-18	2
-10		90200WP	VERTICAL SECTION (2) (SLAVE)	1
-11		90300-1WP	VERTICAL SECTION (3) (SLAVE)	1
-12		90400-1WP	VERTICAL SECTION (4) (SLAVE)	1
-13		90900-3WP	CABLE SYSTEM KIT	1
-14	**	91514	CYLINDER ROD MOUNTING CAPSCREW - ½ X 2	2
-15	**	91515	CYLINDER ROD MOUNTING LOCKNUT - ½	2
-16		90500-2WP	VERTICAL SECTION (5) (DRIVEN)	1
-17	**	91512	UPPER CYLINDER MOUNTING CAPSCREW - 5/16 X 3½	4
-18	**	91513	UPPER CYLINDER MOUNTING LOCKNUT - 5/16	4
-19		91100-1	LIFT CYLINDER (SEE FIG.5)	1
-20		90700-3WP	BASE ASSEMBLY (AC-SEE FIG.3A) (DC-SEE FIG.3C) (MANUAL PUMP-SEE FIG.3E)	1
-21	**	91510	LOWER CYLINDER MOUNTING CAPSCREW - 5/16 X 3/4	2
-22	**	91511	LOWER CYLINDER MOUNTING LOCKWASHER - 5/16	2
-23		90800-1	OUTRIGGER ASSEMBLY (SEE FIG.4)	4
-24	***	91011	SWIVEL CASTER WITH BRAKE	2
-25	***	91012	CASTER MOUNTING CAPSCREW - 3/8 X 2 3/4	16
-26	***	91013	CASTER MOUNTING LOCKWASHER - 3/8	16
-27	***	91014	CASTER MOUNTING STOP NUT - 3/8-16 (NYLOC)	16

ITEM	PART NUMBER	DESCRIPTION	QTY
-28	*** 91010	RIGID CASTER	2
-29	20415	PLATE - MODEL/SERIAL NUMBER	1
-30	91336	PLATFORM CONTROL CABLE	1
-31		PLATFORM CONTROL CABLE LOOM 68" - 3/8" - 1205E	1
		* FOR ADDITIONAL DECAL INFORMATION SEE PAGE 9 IN OPERATION SECTION	
		** PART OF MISC. HARDWARE KIT 91500	
		*** PART OF CASTER SET KIT 91000	

FIGURE 1C - FINAL ASSEMBLY (P30)



ITEM		PART NUMBER	DESCRIPTION	QTY
1C-			FINAL ASSEMBLY	1
-1		91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	2
-2		90100-2	PLATFORM ASSEMBLY (SEE FIG.2)	1
-3	*	11056	DECAL - "500 LBS. CAPACITY"	2
-4	*	11053	DECAL - "CAUTION - DO NOT USE AROUND ELECTRICAL EQUIPMENT"	2
-5			AC CORD REEL - CW-34	1
		91333-1	DC CORD REEL	1
-6	**		REEL MOUNT	1
-7	**		HEX NUT - 5/16-18	2
-8	**		LOCKWASHER - 5/16	2
-9	**		TEE NUT - 5/16-18	2
-10		90200WP	VERTICAL SECTION (2) (SLAVE)	1
-11		90300-1WP	VERTICAL SECTION (3) (SLAVE)	1
-12		90400-3WP	VERTICAL SECTION (4) (SLAVE)	1
-13		90900-4WP	CABLE SYSTEM KIT	1
-14		90500-1WP	VERTICAL SECTION (5) (SLAVE)	1
-15	**	91514	CYLINDER ROD MOUNTING CAPSCREW - ½ X 2	2
-16	**	91515	CYLINDER ROD MOUNTING LOCKNUT - ½	2
-17		90600-2	VERTICAL SECTION (6) (DRIVEN)	1
-18	**	91512	UPPER CYLINDER MOUNTING CAPSCREW - 5/16 X 3½	4
-19	**	91513	UPPER CYLINDER MOUNTING LOCKNUT - 5/16	4
-20		91100-2	LIFT CYLINDER (SEE FIG.5)	1
-21		90700-4WP	BASE ASSEMBLY (AC-SEE FIG.3A) (DC-SEE FIG.3C)(MANUAL PUMP-SEE FIG.3E)	1
-22	**	91510	LOWER CYLINDER MOUNTING CAPSCREW - 5/16 X 3/4	2
-23	**	91511	LOWER CYLINDER MOUNTING LOCKWASHER - 5/16	2
-24		90800-2	OUTRIGGER ASSEMBLY (SEE FIG.4A)	4
-25	***	91011	SWIVEL CASTER WITH BRAKE	2
-26	***	91012	CASTER MOUNTING CAPSCREW - 3/8 X 2 3/4	16

ITEM	PART NUMBER	DESCRIPTION	QTY
-27	*** 91013	CASTER MOUNTING LOCKWASHER	16
-28	*** 91014	CASTER MOUNTING STOP NUT - 3/8-16 (NYLOC)	16
-29	*** 91010	RIGID CASTER	2
-30	20415	PLATE-MODEL/SERIAL NUMBER	1
-31	91336	PLATFORM CONTROL CABLE	1
-32		PLATFORM CONTROL CABLE LOOM 68"-3/8" - 1205E	1
		* FOR ADDITIONAL DECAL INFORMATION SEE PAGE 9 IN OPERATION SECTION	
		** PART OF MISC. HARDWARE KIT 91500	
		*** PART OF CASTER SET KIT 91000	

FIGURE 1C.1 - FINAL ASSEMBLY (P30DC)
(APRIL 1983)

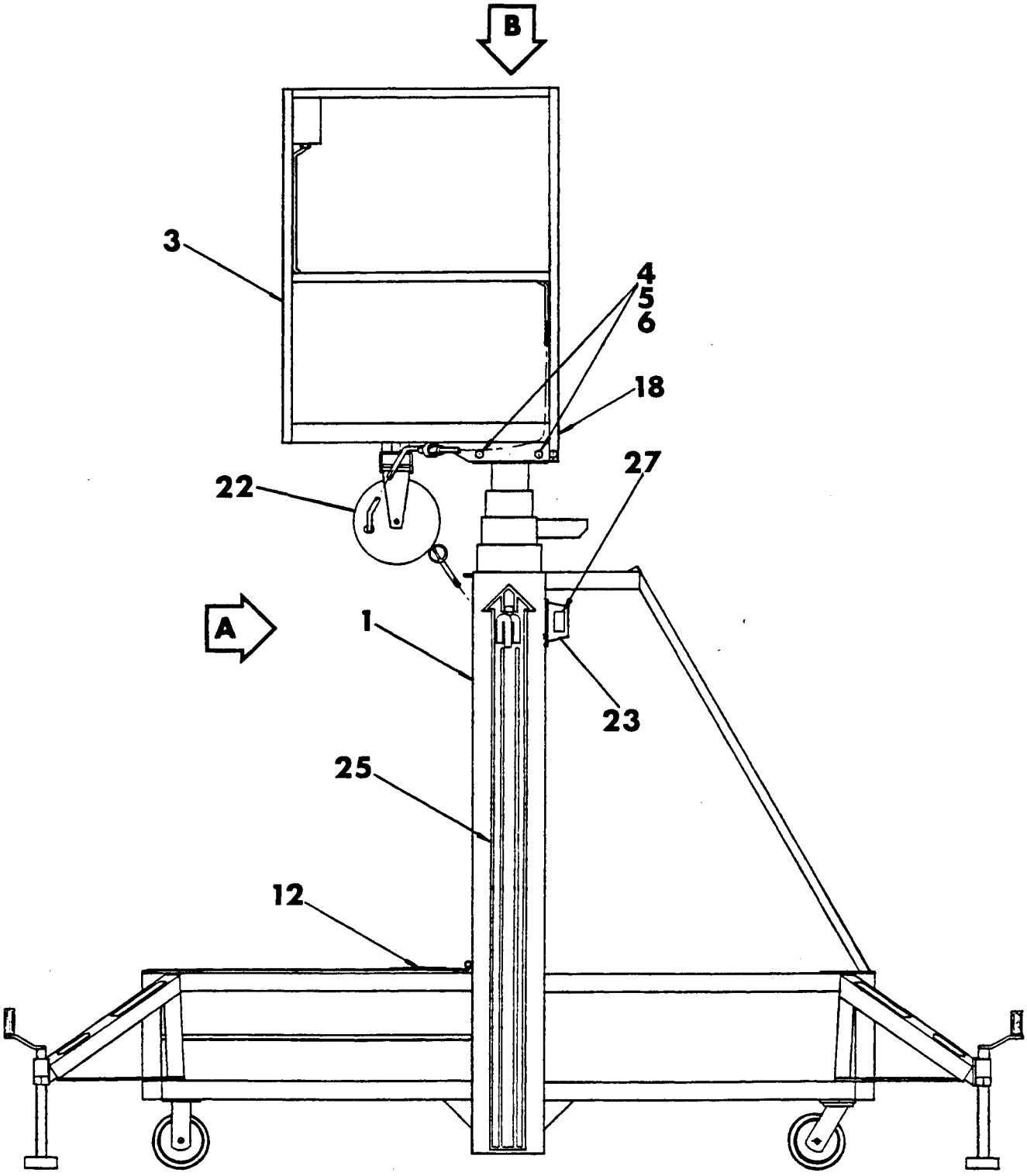
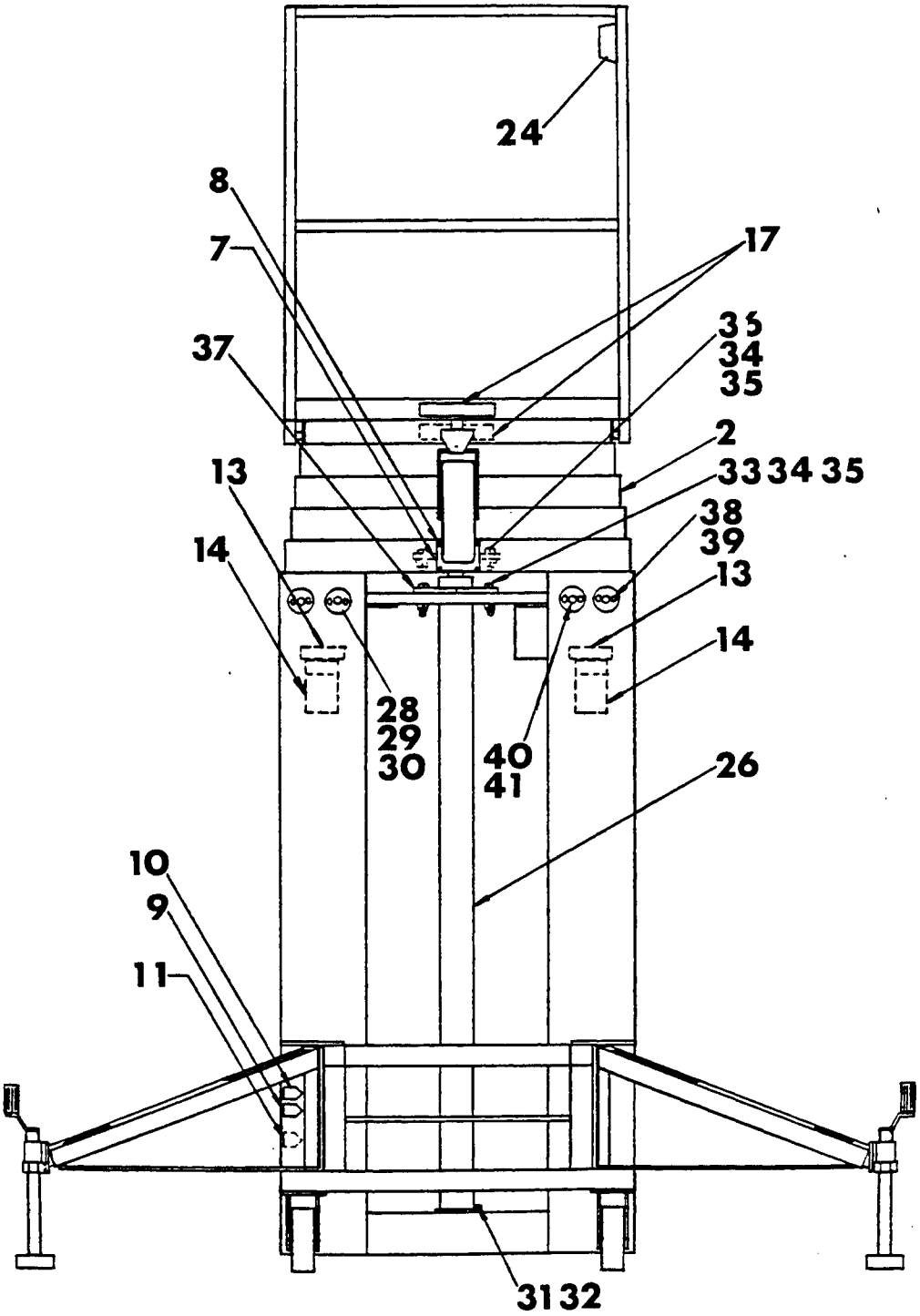


FIGURE 1C.1 - FINAL ASSEMBLY (P30DC)
(APRIL 1983)



VIEW A

FIGURE 1C.1 - FINAL ASSEMBLY (P30DC)
(APRIL 1983)

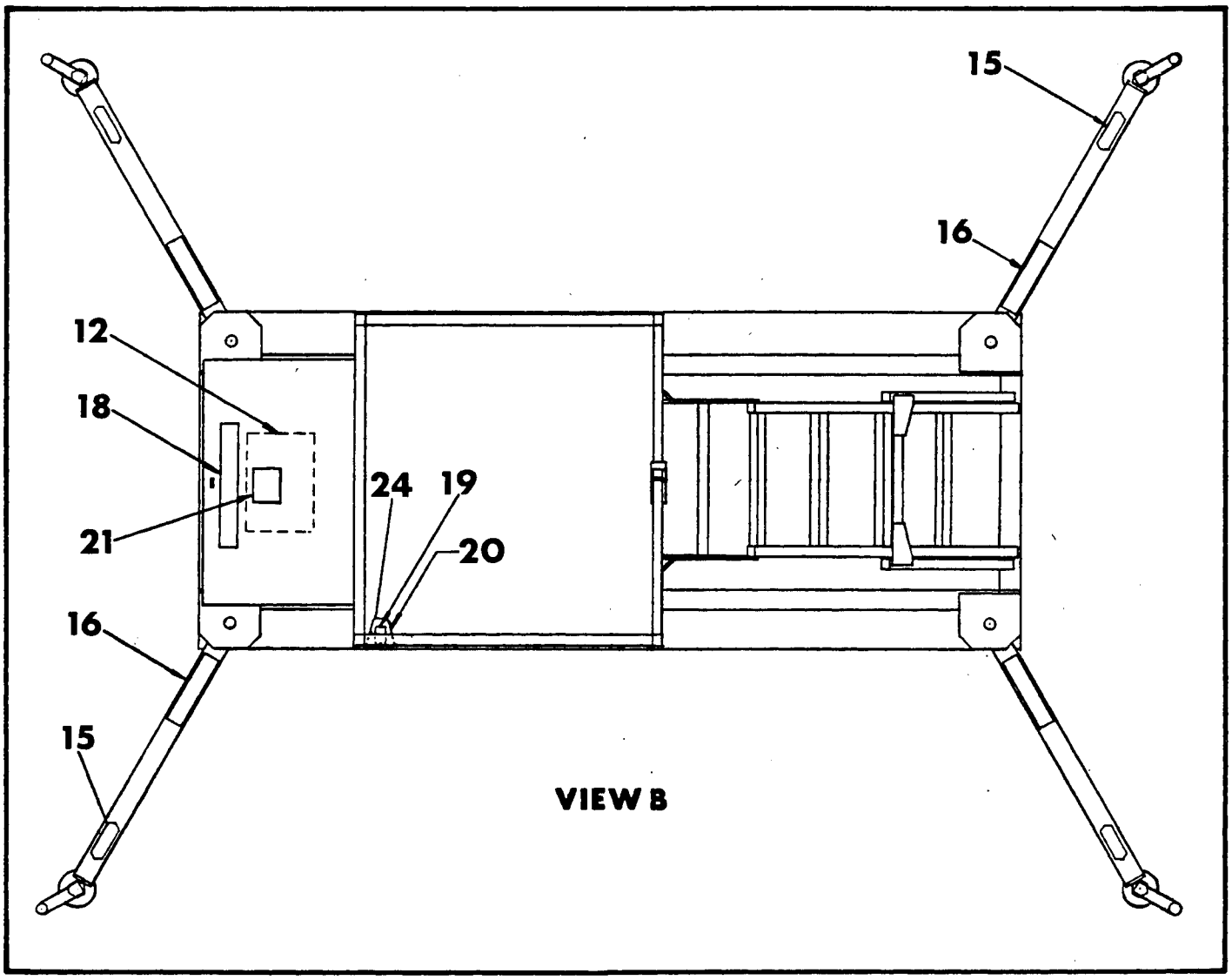


FIGURE 1C.1 - FINAL ASSEMBLY (P30DC)
(APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
1C.1-	93425	FINAL ASSEMBLY	1
-1	93427	BASE ASSEMBLY (SEE FIG. 3C.1)	1
-2	93429	COLUMN ASSEMBLY (SEE FIG. 1G)	1
-3	93458	PLATFORM ASSEMBLY (SEE FIG. 2D)	1
-4	60311	HEX HEAD CAPSCREW - 1/2-13 UNC X 1 1/4	4
-5	63405	FLAT WASHER - 1/2	4
-6	61305	SELF LOCKING NUT - 1/2-13 UNC	4
-7	20964	PLATE - MODEL/SERIAL NUMBER	1
-8	63653	POP RIVET - 1/8 DIA. X 1/4	4
-9	11062	DECAL - "MASTER SWITCH"	1
-10	11067	DECAL - "CIRCUIT BREAKER"	1
-11	93412	DECAL - "MANUAL DOWN VALVE"	1
-12	11052	DECAL - "CAUTION"	2
-13	11051	DECAL - "CAUTION-CAGE SAFETY"	2
-14	11054	DECAL - "CAUTION"	2
-15	11063	DECAL - "REMOVE PIN"	4
-16	11055	DECAL - "CAUTION-RAISE OUTRIGGER"	4
-17	11053	DECAL - "CAUTION-ELECTRICAL EQUIPMENT"	2
-18	11066	DECAL - "USE ON LEVEL GROUND"	2
-19	11058	DECAL - "EMERGENCY STOP"	1
-20	11059	DECAL - "UP-DOWN"	1
-21	93411	DECAL - "CAUTION"	1
-22	93268	CORD REEL ASSEMBLY (SEE FIG. 2B.1)	1
-23	93463	LOWER CONTROL STATION ASSEMBLY (SEE FIG. 6D)	1
-24	93464	UPPER CONTROL STATION ASSEMBLY (SEE FIG. 6C)	1
-25	93287	DECAL - MARK PAL ARROW	2
-26	93450	LIFT CYLINDER (SEE FIG. 5B)	1
-27	11057	DECAL - "EMERGENCY STOP-UP/DOWN"	1
-28	92122	BEARING PLATE	8
-29	92164	WEAR PAD	8
-30	92109	ADJUSTER PLATE	8
-31	60329	CAP SCREW	2

ITEM	PART NUMBER	DESCRIPTION	QTY
-32	63302	LOCK WASHER	2
-33	60338	CAP SCREW	2
-34	63402	FLAT WASHER	6
-35	61322	LOCK NUT	6
-36	60343	CAP SCREW	2
-37	93533	CYLINDER SUPPORT	2
-38	60501	CAP SCREW	16
-39	63301	LOCK WASHER	16
-40	62210	SET SCREW	8
-41	60801	HEX NUT	8

FIGURE 1C.2 - FINAL ASSEMBLY (P30AC)
(APRIL 1983)

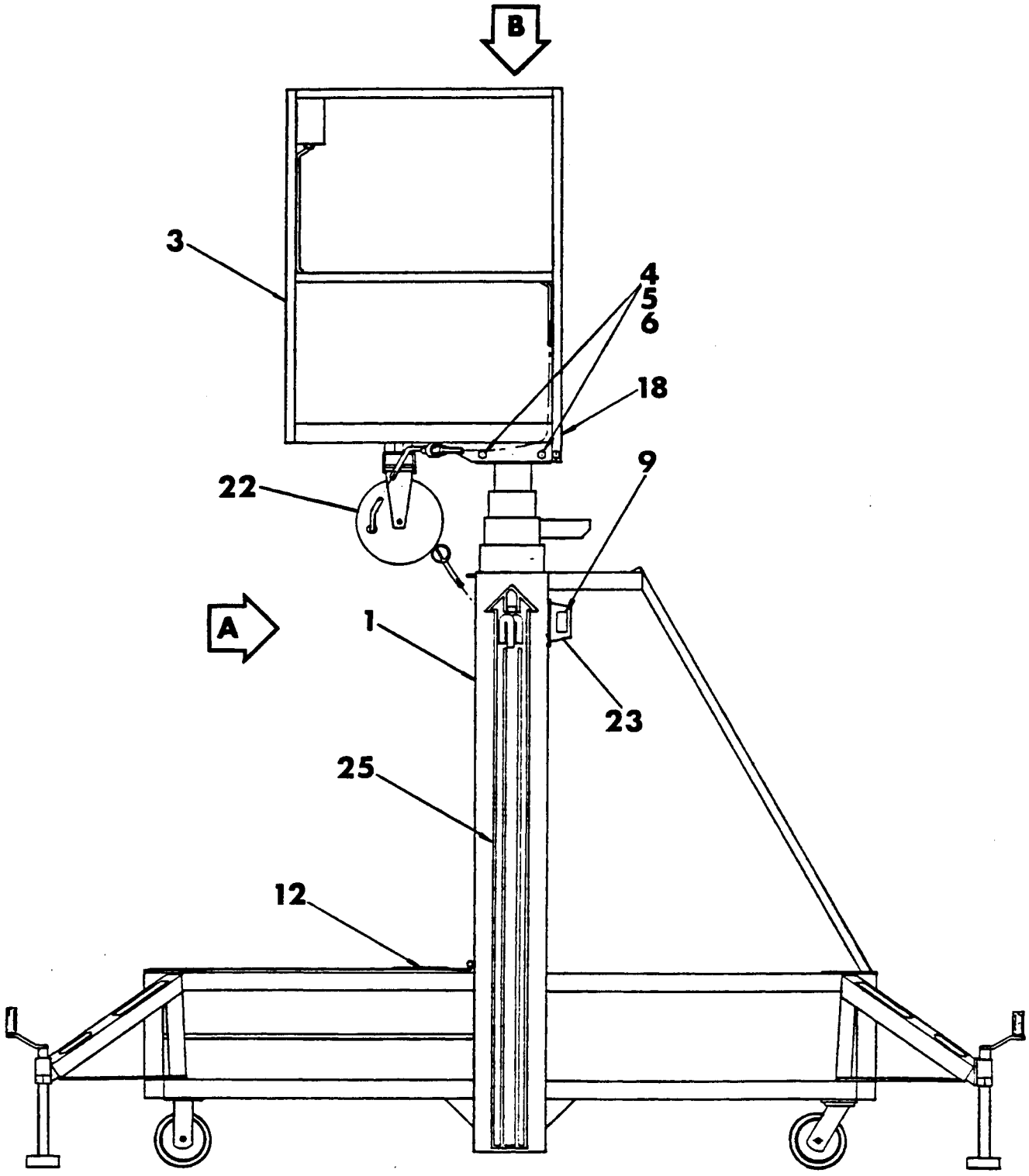
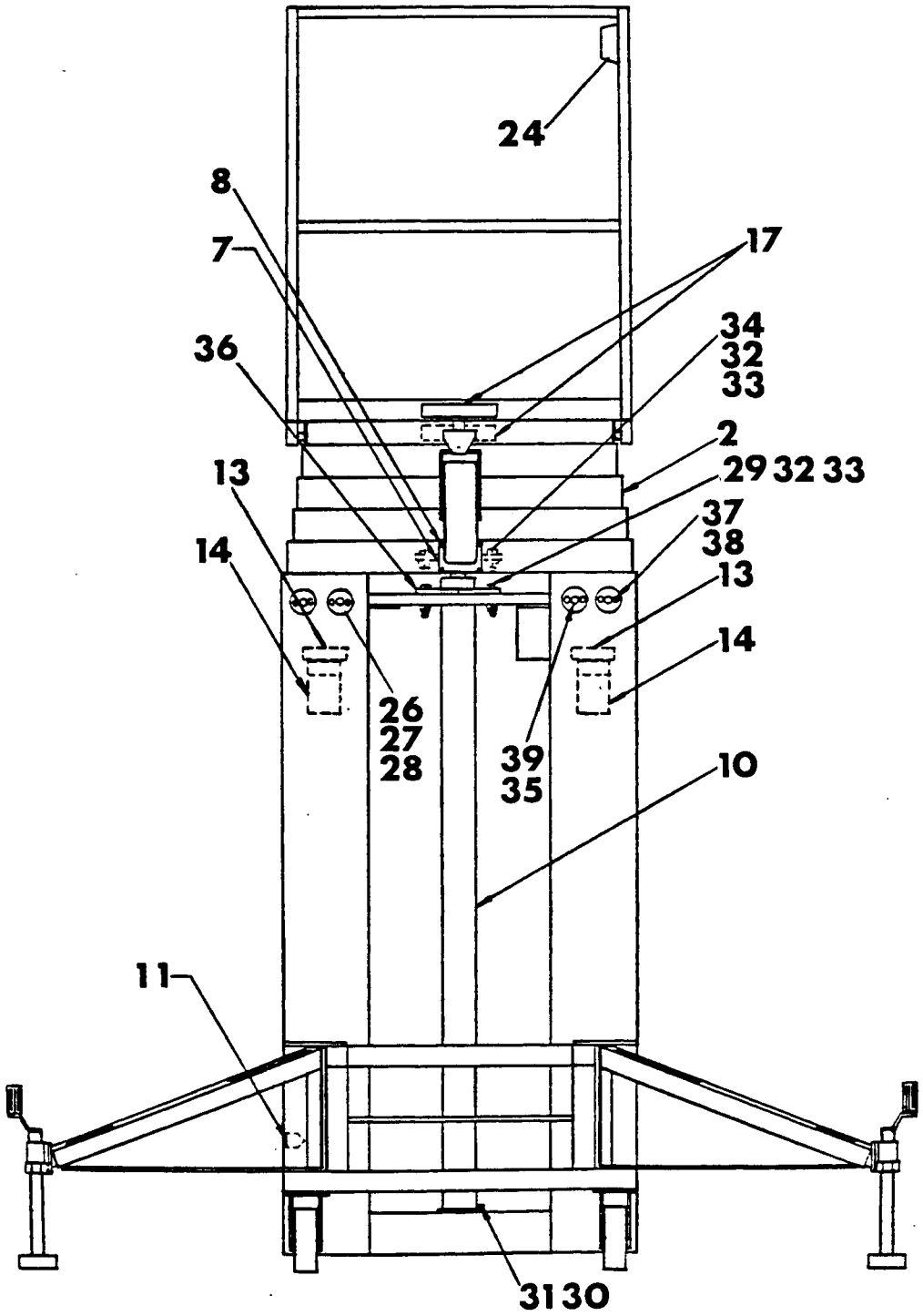
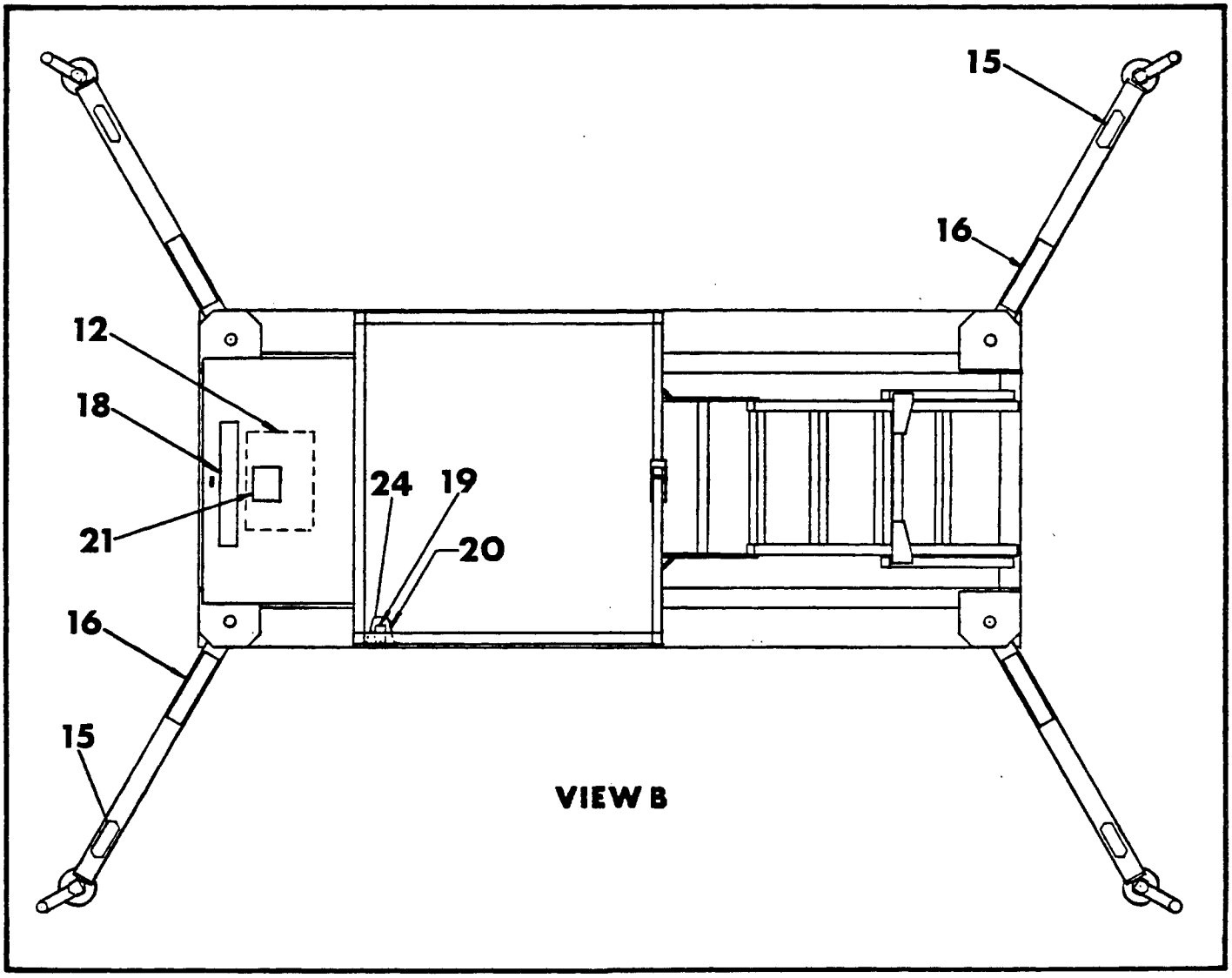


FIGURE 1C.2 - FINAL ASSEMBLY (P30AC)
(APRIL 1983)



VIEW A

FIGURE 1C.2 - FINAL ASSEMBLY (P30AC)
(APRIL 1983)



ITEM	PART NUMBER	DESCRIPTION	QTY
1C.1-	93426	FINAL ASSEMBLY	1
-1	93428	BASE ASSEMBLY (SEE FIG. 3C.3)	1
-2	93429	COLUMN ASSEMBLY (SEE FIG. 1G)	1
-3	93458	PLATFORM ASSEMBLY (SEE FIG. 2D)	1
-4	60311	HEX HEAD CAP SCREW - 1/2-13 UNC X 1 1/4	4
-5	63405	FLAT WASHER - 1/2	4
-6	61305	SELF LOCKING NUT - 1/2-13 UNC	4
-7	20964	PLATE - MODEL/SERIAL NUMBER	1
-8	63653	POP RIVET - 1/8 DIA. X 1/4	4
-9	11057	DECAL - "EMERGENCY STOP-UP/DOWN"	1
-10	93450	LIFT CYLINDER (SEE FIG. 5B)	1
-11	93412	DECAL - "MANUAL DOWN VALVE"	1
-12	11052	DECAL - "CAUTION"	2
-13	11051	DECAL - "CAUTION-CAGE SAFETY"	2
-14	11054	DECAL - "CAUTION"	2
-15	11063	DECAL - "REMOVE PIN"	4
-16	11055	DECAL - "CAUTION-RAISE OUTRIGGER"	4
-17	11053	DECAL - "CAUTION-ELECTRICAL EQUIPMENT"	2
-18	11066	DECAL - "USE ON LEVEL GROUND"	2
-19	11058	DECAL - "EMERGENCY STOP"	1
-20	11059	DECAL - "UP-DOWN"	1
-21	93411	DECAL - "CAUTION"	1
-22	93268	CORD REEL ASSEMBLY (SEE FIG. 2B.1)	1
-23	93463	LOWER CONTROL STATION ASSEMBLY (SEE FIG. 6D)	1
-24	93464	UPPER CONTROL STATION ASSEMBLY (SEE FIG. 6C)	1
-25	93287	DECAL "MARK PAL ARROW"	2
-26	92122	BEARING PLATE	8
-27	92164	WEAR PAD	8
-28	92109	ADJUSTER PLATE	8
-29	60329	CAP SCREW	2
-30	63302	LOCK WASHER	2
-31	60338	CAP SCREW	2

FIGURE 1C.2 - FINAL ASSEMBLY (P30AC)
(APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
-32	63402	FLAT WASHER	6
-33	61322	LOCK NUT	6
-34	60343	CAP SCREW	2
-35	60801	HEX NUT	8
-36	93533	CYLINDER SUPPORT	2
-37	60501	CAP SCREW	16
-38	63301	LOCK WASHER	16
-39	62210	SET SCREW	8

FIGURE 1D - 1ST STAGE COLUMN ASSEMBLY (P19DC)

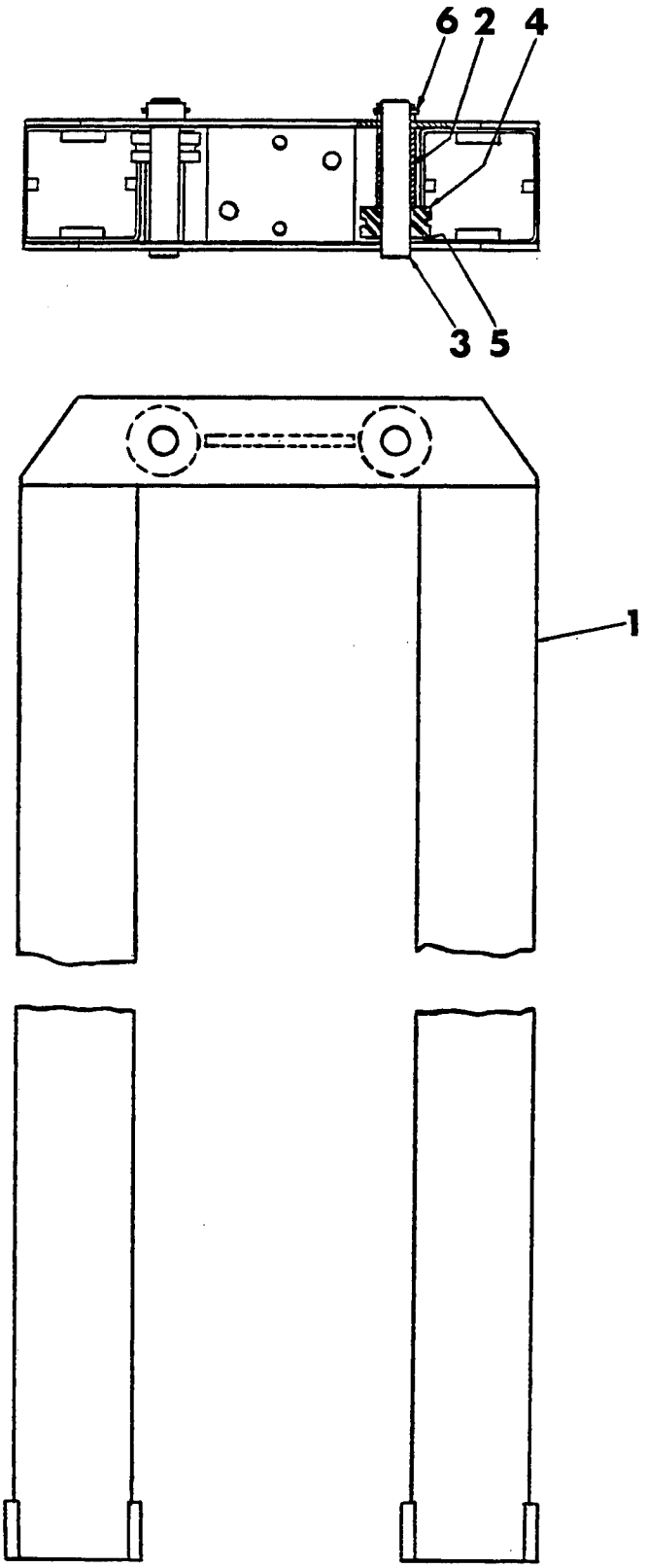


FIGURE 1D - 1ST STAGE COLUMN ASSEMBLY (P19DC)

ITEM	PART NUMBER	DESCRIPTION	QTY
1D-	93511	1ST STAGE COLUMN ASSEMBLY	1
-1	93467	1ST STAGE WELDMENT	1
-2	95121	PIPE	2
-3	93218	PULLEY SHAFT	2
-4	92116	PULLEY	2
-5	63427	FLAT WASHER - 1"	2
-6	64207	ROLL PIN - 1/4 DIA. X 1 1/2	2

FIGURE 1E - 2ND STAGE COLUMN ASSEMBLY (P19DC)

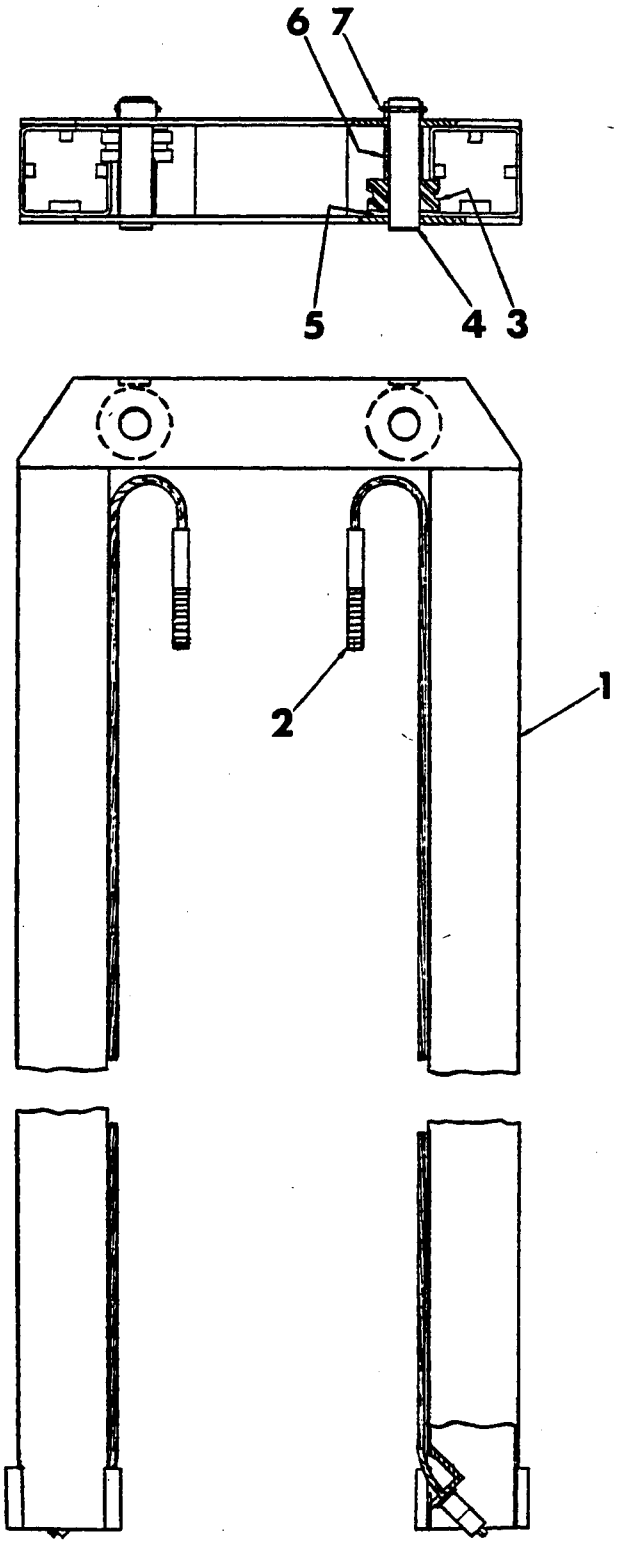


FIGURE 1E - 2ND STAGE COLUMN ASSEMBLY (P19DC)

ITEM	PART NUMBER	DESCRIPTION	QTY
1E-	93510	2ND STAGE COLUMN ASSEMBLY	1
-1	93468	2ND STAGE WELDMENT	1
-2	93509	CABLE ASSEMBLY	2
-3	92116	PULLEY	2
-4	93482	PULLEY SHAFT	2
-5	63427	FLAT WASHER - 1"	2
-6	95129	PIPE	2
-7	64207	ROLL PIN - 1/4 DIA. X 1 1/2	2

FIGURE 1F - 3RD STAGE COLUMN ASSEMBLY (P19DC)

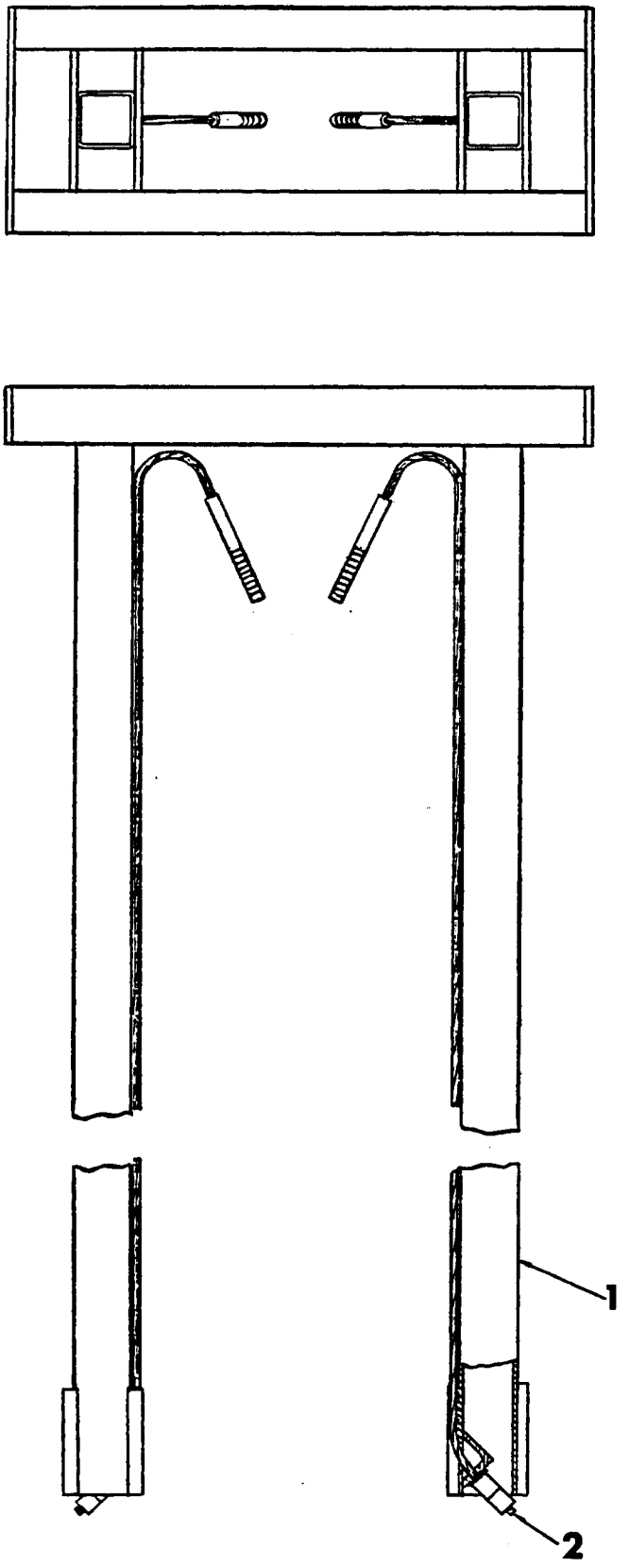
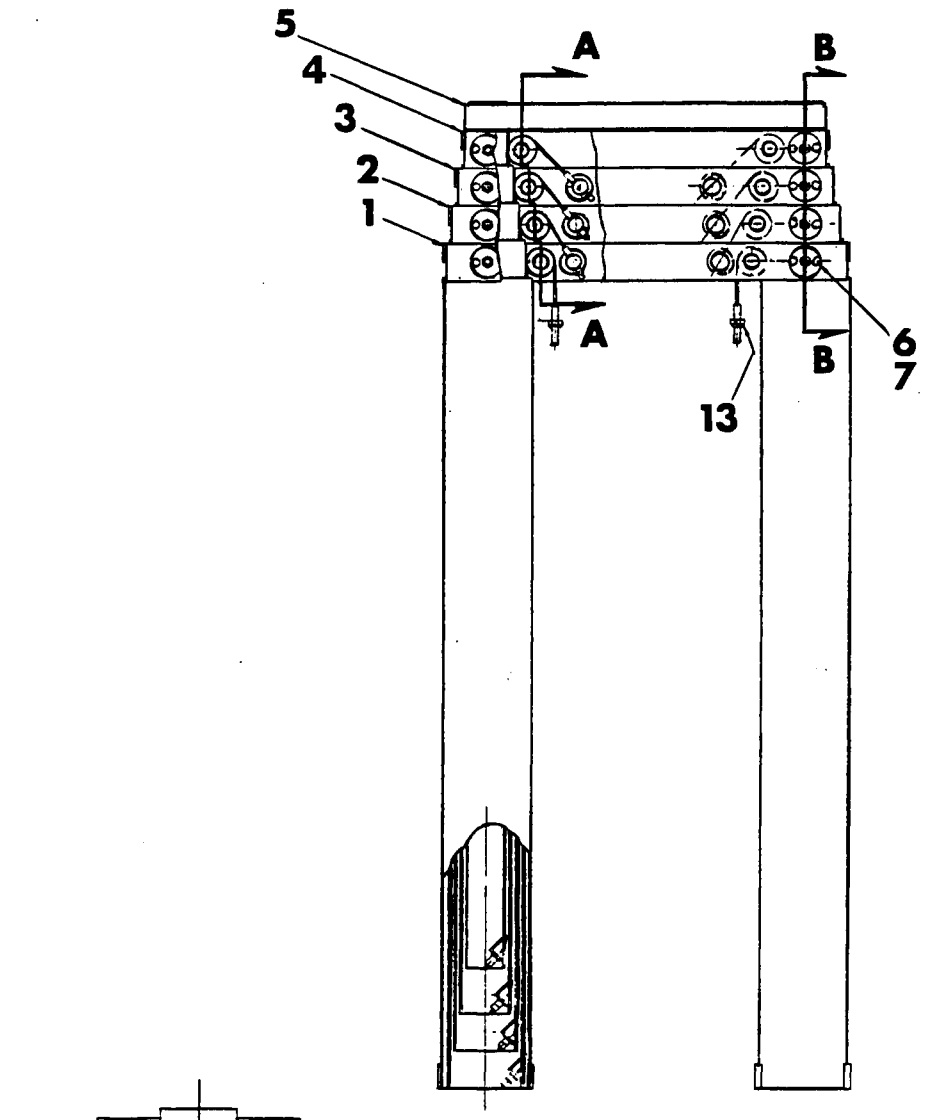
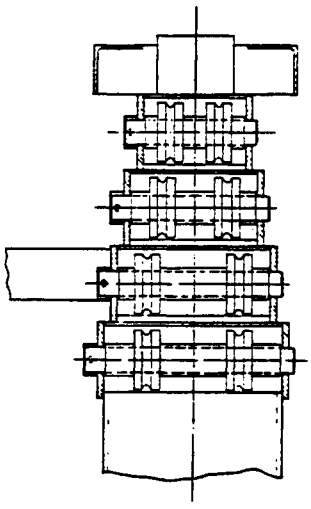


FIGURE 1F - 3RD STAGE COLUMN ASSEMBLY (P19DC)

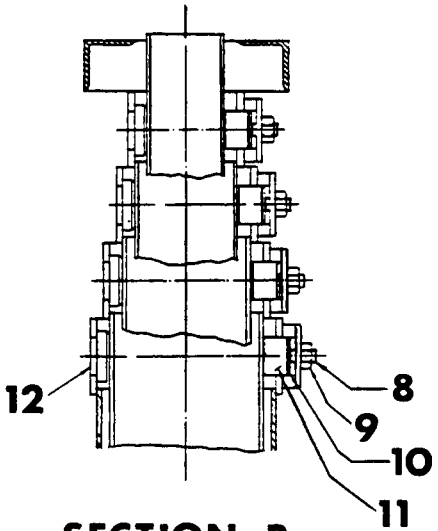
ITEM	PART NUMBER	DESCRIPTION	QTY
1F-	93506	3RD STAGE COLUMN ASSEMBLY	1
-1	93469	3RD STAGE WELDMENT	1
-2	93509	CABLE ASSEMBLY	2

FIGURE 1G - COLUMN ASSEMBLY (P30) (APRIL 1983)





SECTION A



SECTION B

FIGURE 1G - COLUMN ASSEMBLY (P30) (APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
1G-	93429	COLUMN ASSEMBLY	1
-1	93430	1ST STAGE COLUMN ASSEMBLY (SEE FIG. 1G.1)	1
-2	93431	2ND STAGE COLUMN ASSEMBLY (SEE FIG. 1G.2)	1
-3	93432	3RD STAGE COLUMN ASSEMBLY (SEE FIG. 1G.3)	1
-4	93433	4TH STAGE COLUMN ASSEMBLY (SEE FIG. 1G.4)	1
-5	93434	5TH STAGE COLUMN ASSEMBLY (SEE FIG. 1G.5)	1
-6	60501	HEX HEAD CAP SCREW - 1/4-20 UNC X 3/4 (GR. 8)	16
-7	63301	SPLIT LOCK WASHER - 1/4	16
-8	62210	HEX SOCKET SET SCREW - 1/2-20 UNF X 1	8
-9	60801	HEX NUT - 1/2-20 UNF	8
-10	92122	BEARING PLATE	8
-11	92121	WEAR PAD	8
-12	92124	BACK-UP PAD	8
-13	61305	SELF LOCKING HEX NUT - 1/2-13 UNC	16

FIGURE 1G.1 - 1ST STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

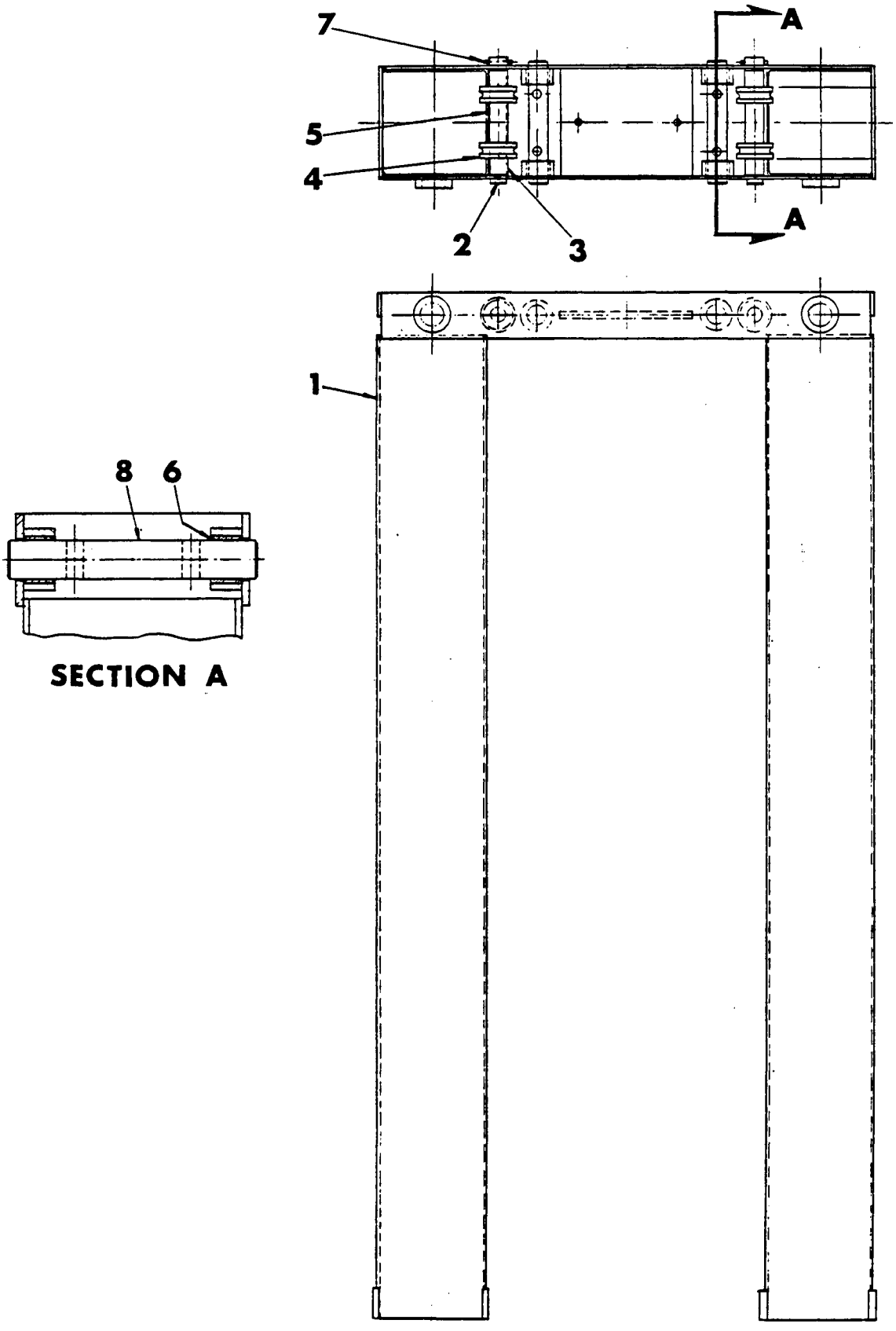


FIGURE 1G.1 - 1ST STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
1G.1-	93430	1ST STAGE COLUMN ASSEMBLY	1
-1	93435	COLUMN WELDMENT	1
-2	92024	PULLEY SHAFT	2
-3	95060	PULLEY SPACER	4
-4	92138	PULLEY	4
-5	95062	PULLEY SPACER	2
-6	64906	BUSHING	4
-7	64209	ROLL PIN - 1/4 DIA. X 1 3/4	2
-8	92069	CABLE SHAFT ANCHOR	2

FIGURE 1G.2 - 2ND STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

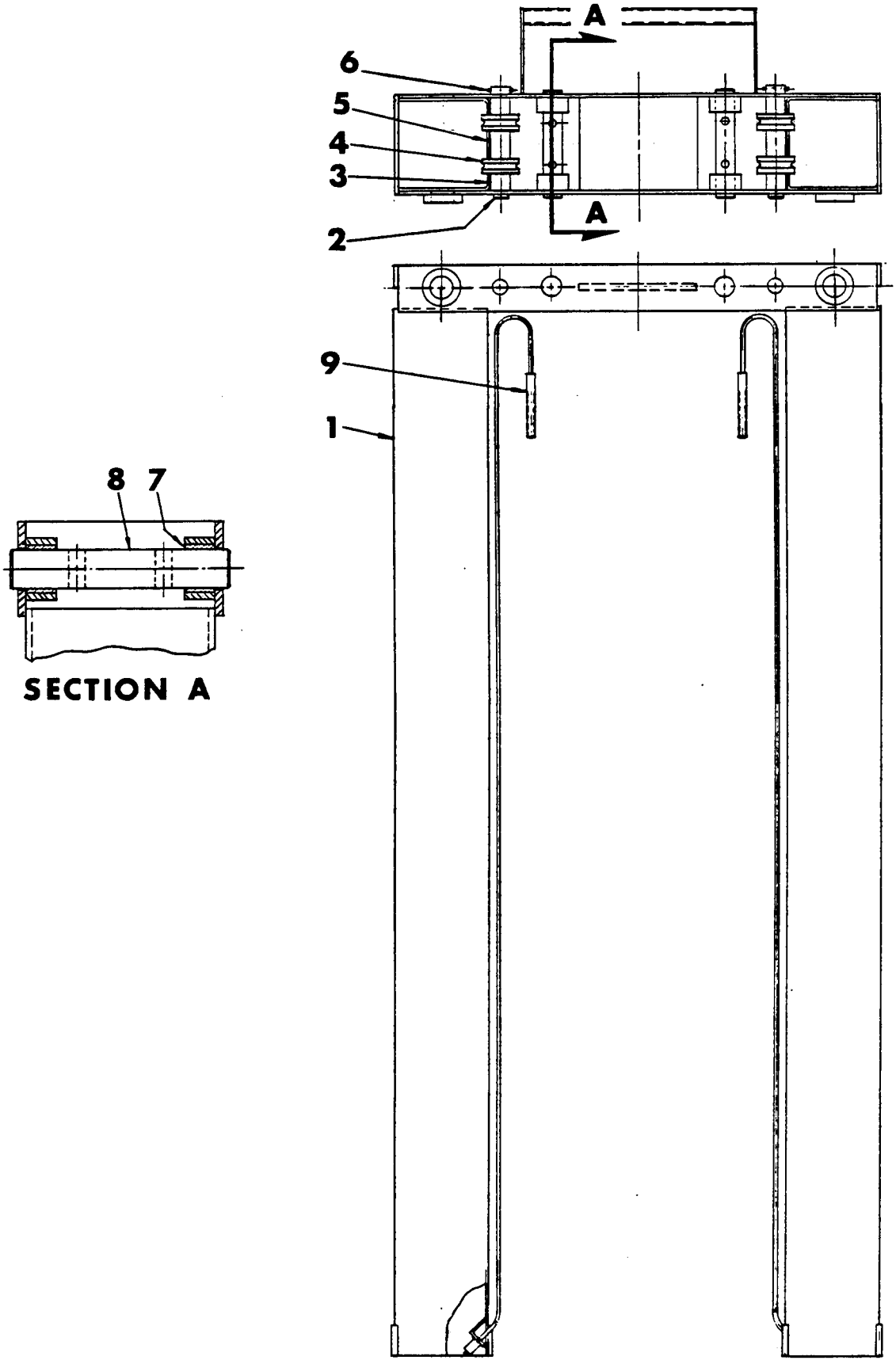
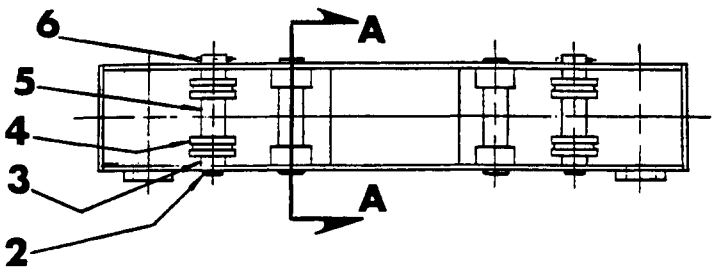
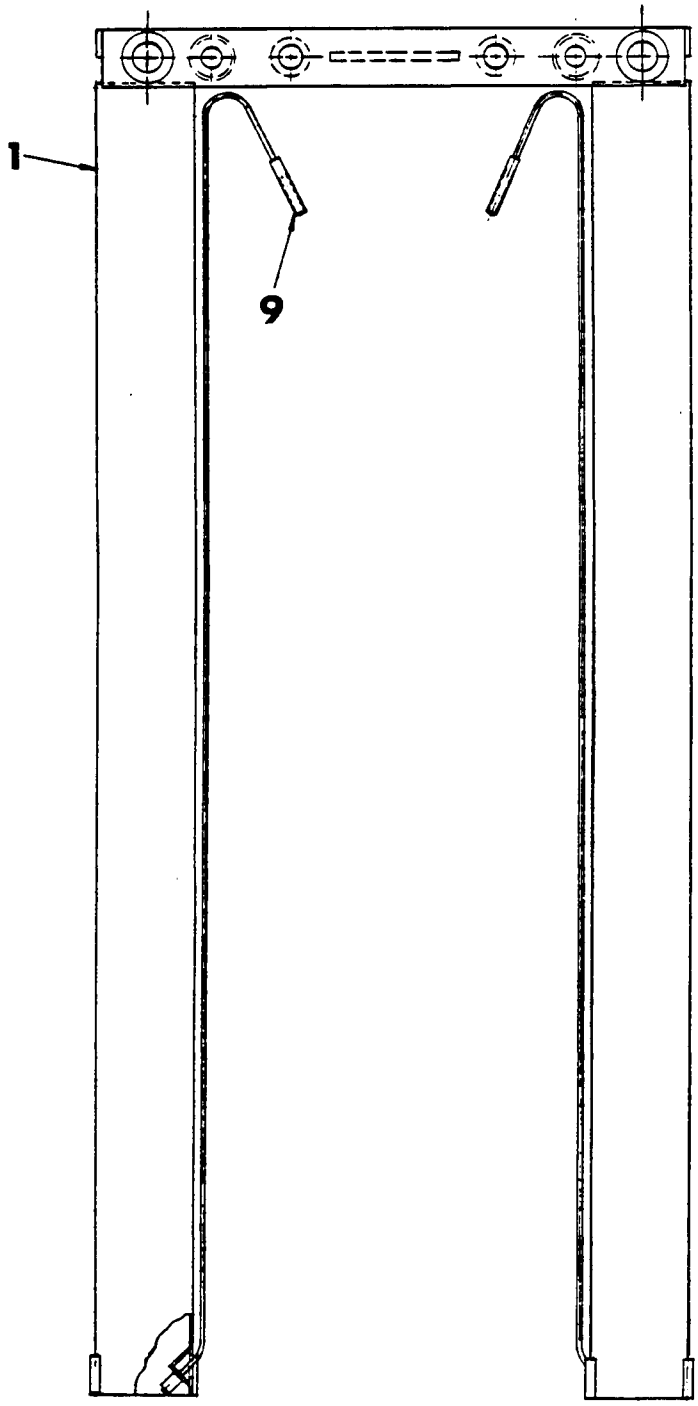


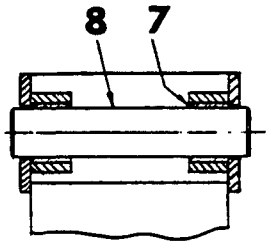
FIGURE 1G.2 - 2ND STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
1G.2-	93431	2ND STAGE COLUMN ASSEMBLY	1
-1	93436	COLUMN WELDMENT	1
-2	92033	PULLEY SHAFT	2
-3	95064	PULLEY SPACER	4
-4	92116	PULLEY	4
-5	95062	PULLEY SPACER	2
-6	64209	ROLL PIN - 1/4 DIA. X 1 3/4	2
-7	64906	BUSHING	4
-8	92070	CABLE SHAFT ANCHOR	2
-9	93448	CABLE ASSEMBLY	4

FIGURE 1G.3 - 3RD STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)







SECTION A

FIGURE 1G.3 - 3RD STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
1G.3-	93432	COLUMN ASSEMBLY	1
-1	93437	COLUMN WELDMENT	1
-2	92042	PULLEY SHAFT	2
-3	95064	PULLEY SPACER	4
-4	92116	PULLEY	4
-5	95068	PULLEY SPACER	2
-6	64209	ROLL PIN - 1/4 DIA. X 1	2
-7	64906	BUSHING	4
-8	93200	CABLE SHAFT ANCHOR	2
-9	93448	CABLE ASSEMBLY	4

FIGURE 1G.4 - 4TH STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

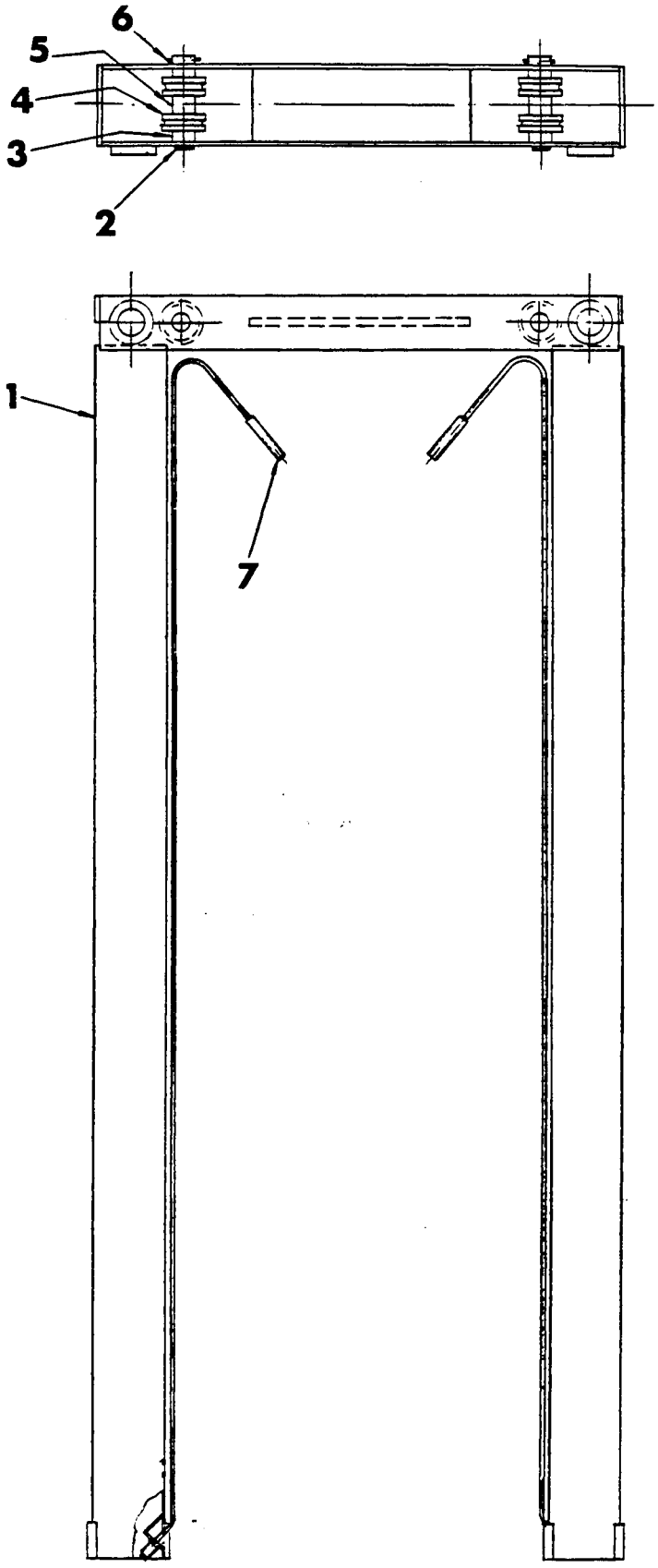


FIGURE 1G.4 - 4TH STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
1G.4-	93433	COLUMN ASSEMBLY	1
-1	93438	COLUMN WELDMENT	1
-2	93218	PULLEY SHAFT	2
-3	93216	PULLEY SPACER	4
-4	92116	PULLEY	4
-5	93217	PULLEY SPACER	2
-6	64209	ROLL PIN - 1/4 DIA. X 1 3/4	2
-7	93448	CABLE ASSEMBLY	4

FIGURE 1G.5 - 5TH STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

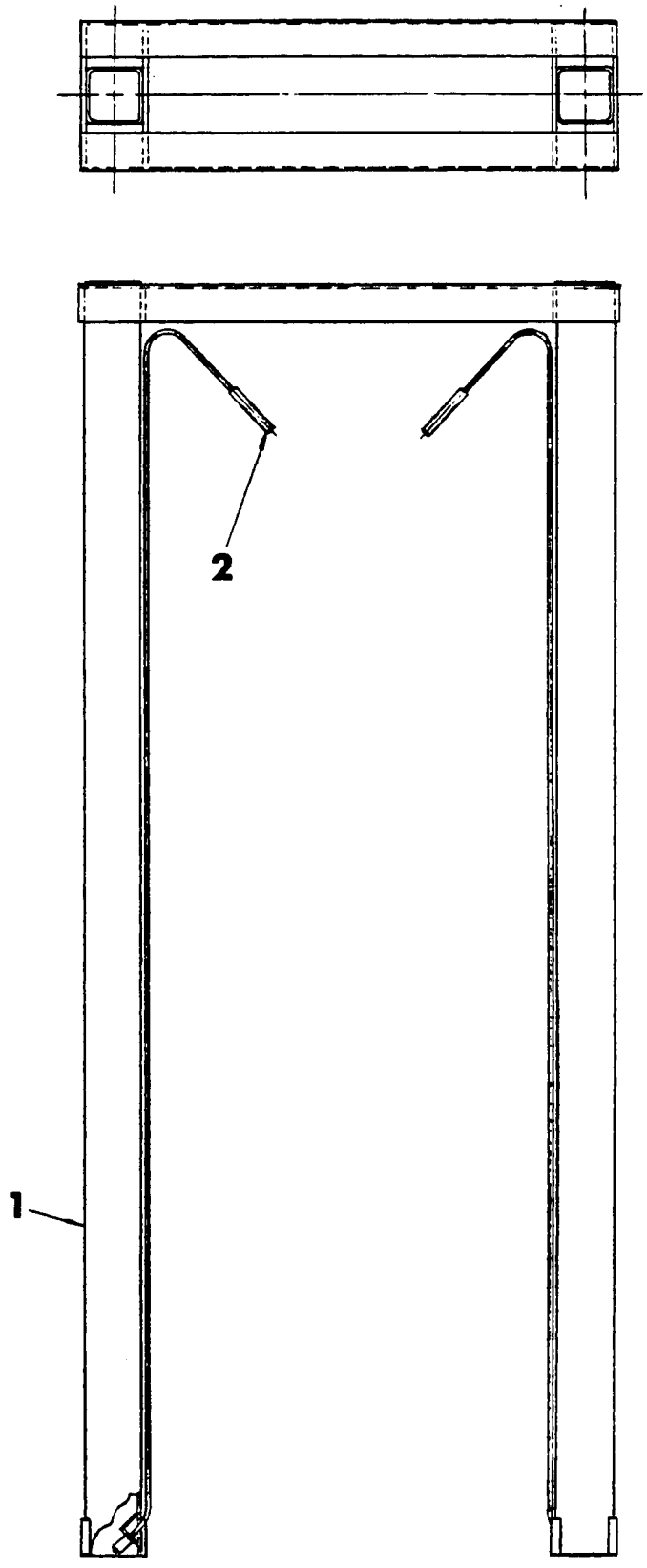
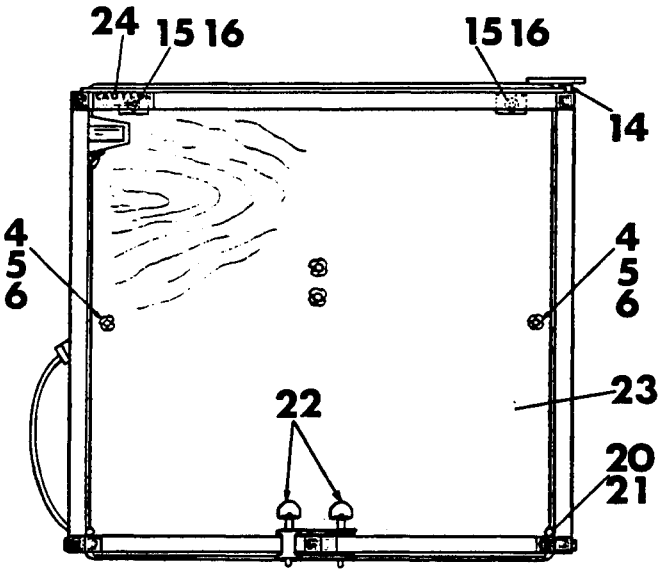
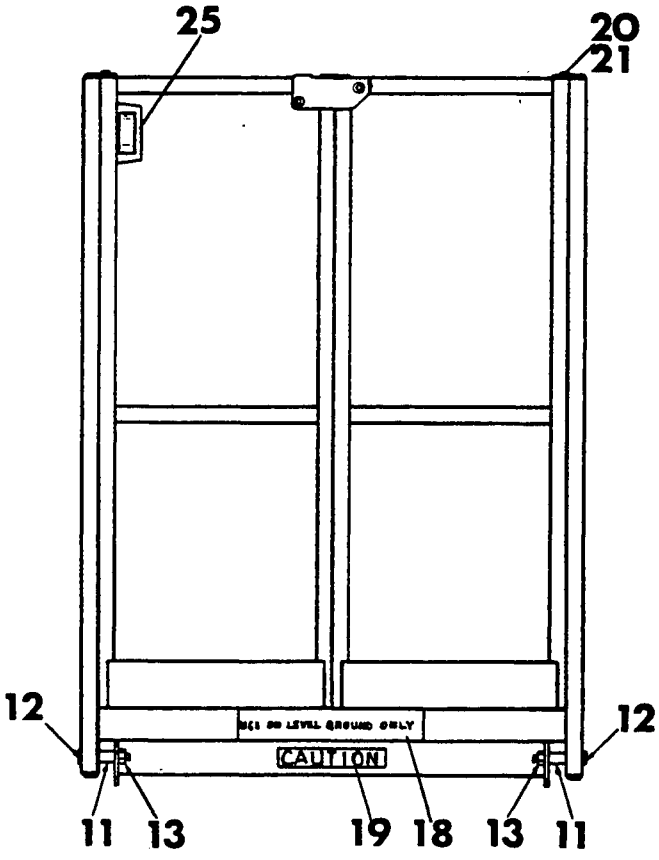


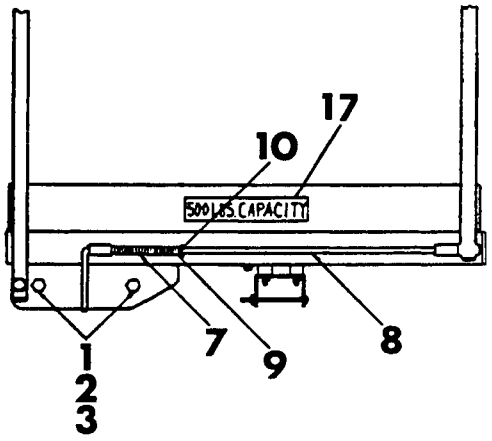
FIGURE 1G.5 - 5TH STAGE COLUMN ASSEMBLY
(P30) (APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
1G.5-	93434	COLUMN ASSEMBLY	1
-1	93440	COLUMN WELDMENT	1
-2	93530	CABLE ASSEMBLY	4

FIGURE 2 - PLATFORM ASSEMBLY (30X30)
(ALL MODELS)





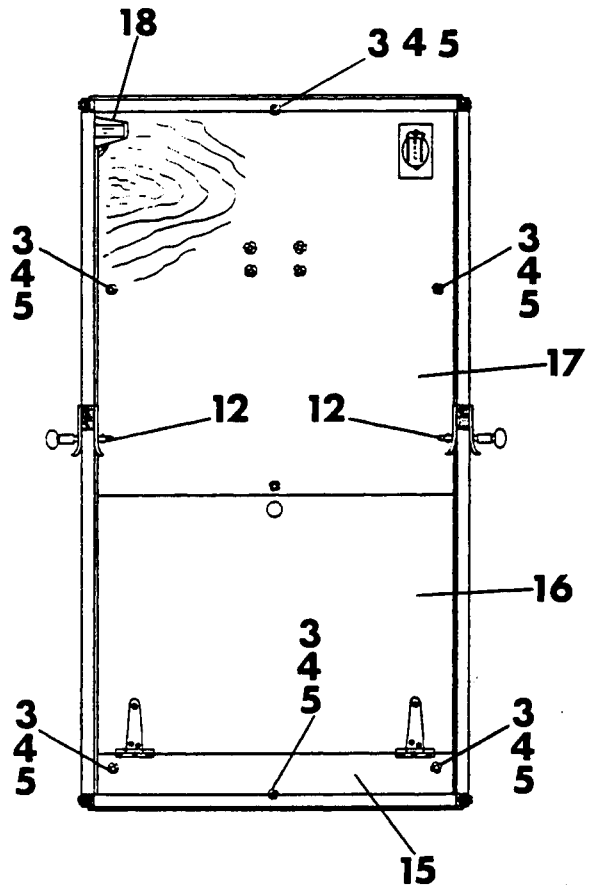


VIEW A

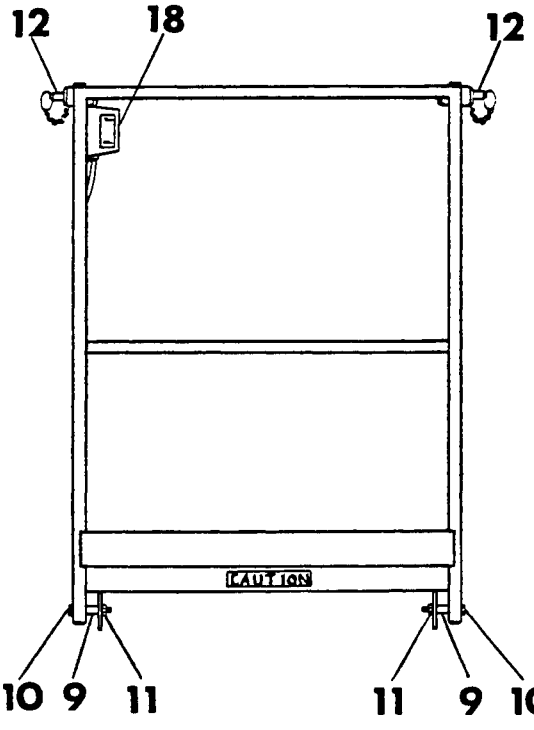
FIGURE 2 - PLATFORM ASSEMBLY (30X30)
(ALL MODELS)

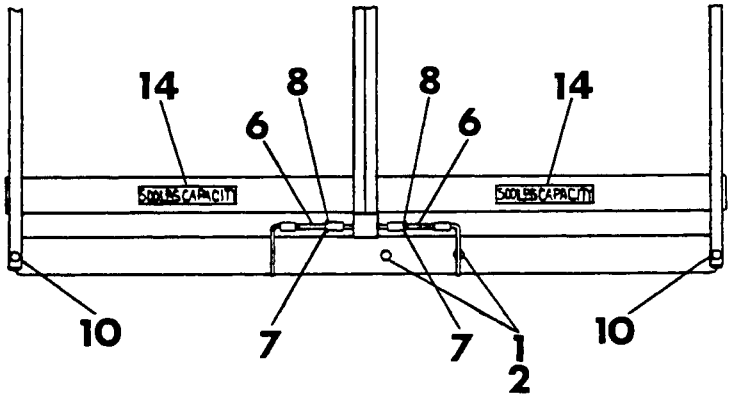
ITEM	PART NUMBER	DESCRIPTION	QTY
2-	90100-2	PLATFORM ASSEMBLY (30X30)	1
-1	90113	HEX HEAD CAPSCREW - ½ X 1¼	4
-2	90114	LOCKNUT - ½	4
-3		FLAT WASHER - ½	4
-4	90115	HEX BOLT - ¼ X 1	2
-5	90116	LOCKWASHER - ¼	2
-6	90117	TEE NUT - ¼	2
-7	90119	LOCK PIN RETURN SPRING 7/16	1
-8	90120	LOCK PIN - 3/8 X 35½	1
-9		LOCK PIN SPRING WASHER - 3/8	2
-10	90121	COTTER PIN - 1/8 X 1	1
-11	90122	SPACER - ½	2
-12	90123	SWIVEL BOLT - ½ X 3	2
-13	90124	SWIVEL NUT - ½	2
-14	90140	LATCH TUBE - 5/8	1
-15	90137	HOLD DOWN BOLT - ½-13 X 1¼	2
-16	90138	HOLD DOWN NUT - ½-13	2
-17	11056	DECAL - "500 LBS. CAPACITY"	2
-18	11066	DECAL - "USE ON LEVEL GROUND ONLY"	1
-19	11053	DECAL - "CAUTION - DO NOT USE AROUND ELECTRICAL EQUIPMENT"	2
-20		GATE HINGE TUBE - 5/8 X 1 1/8	8
-21		GATE HINGE BOLT - 3/8-16 X 2 3/4	4
-22		GATE LATCH PIN - 3/8 X 2	2
-23	90110-1	PLYWOOD FLOOR - 3/4 X 29 3/4 X 29 3/4	1
-24	11051	DECAL - "CAUTION - CAGE SAFETY WING NUTS MUST BE SECURED BEFORE RAISING PLATFORM"	1
-25	91335	PUSH BUTTON CONTROL STATION (SEE FIG. 6)	1

FIGURE 2A - PLATFORM ASSEMBLY (30X60)
(ALL MODELS) (OPTION)



A



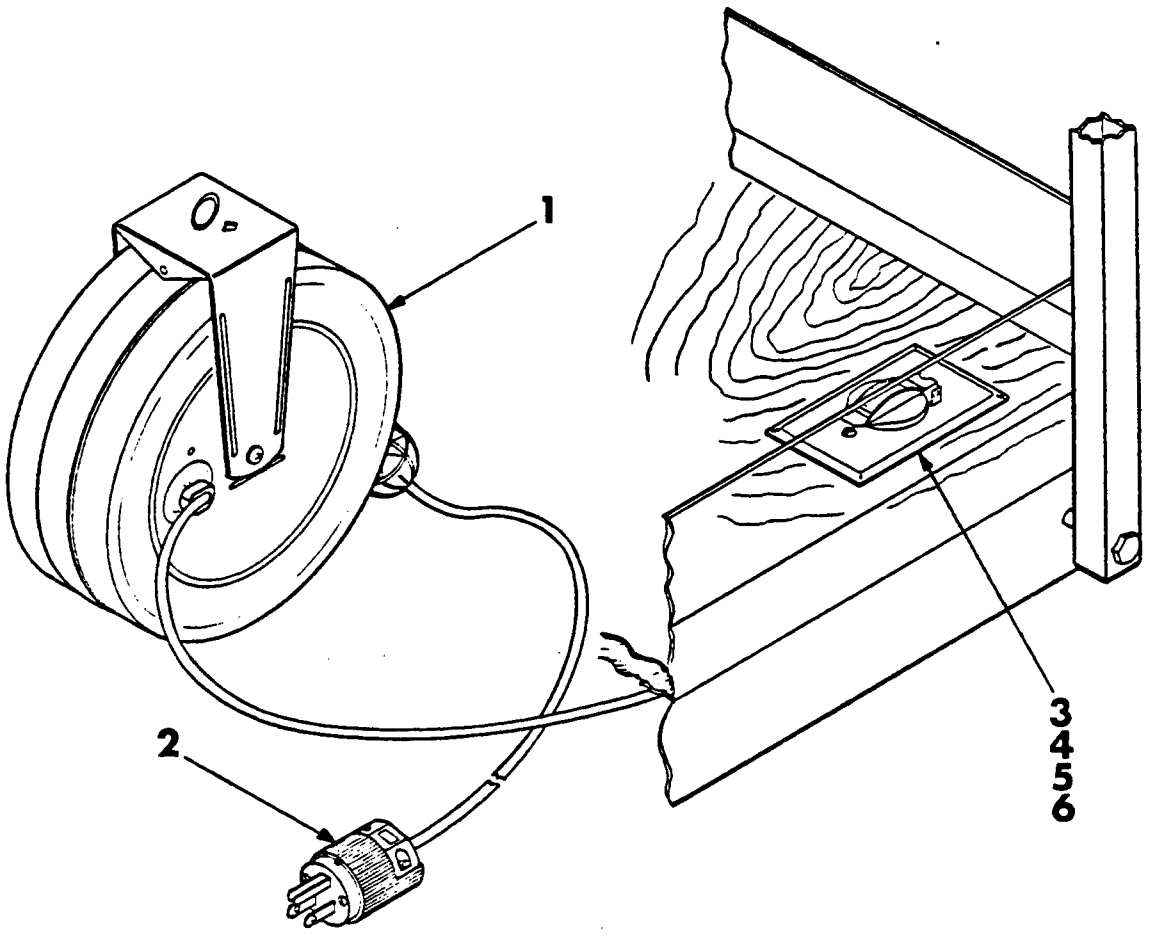


VIEW A

FIGURE 2A - PLATFORM ASSEMBLY (30X60)
(ALL MODELS) (OPTION)

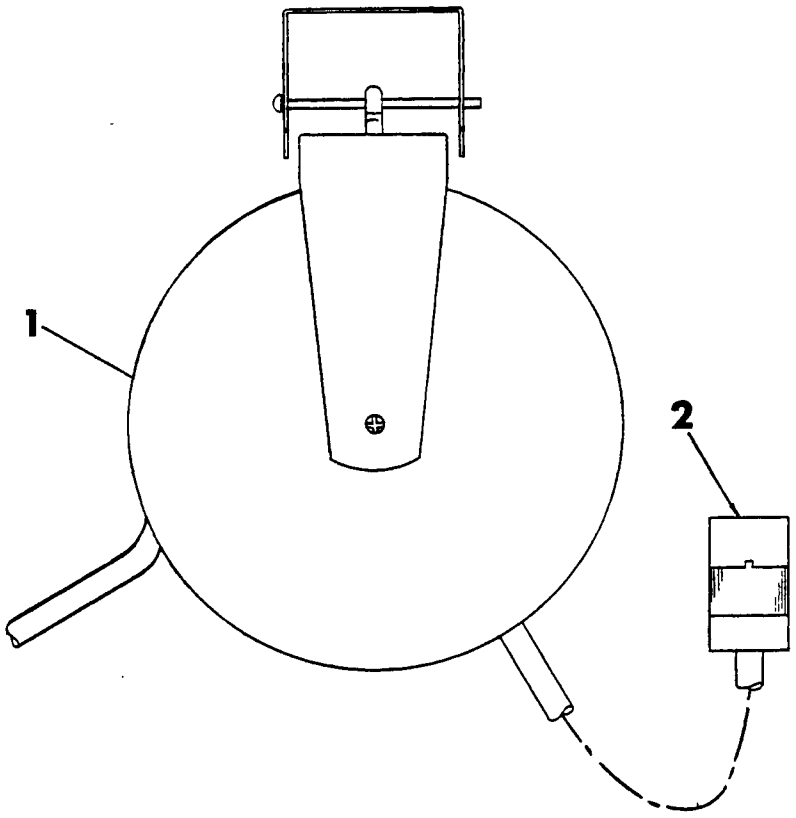
ITEM	PART NUMBER	DESCRIPTION	QTY
2A-	90100-3	PLATFORM ASSEMBLY (30X60)	1
-1	90113	HEX HEAD CAPSCREW - ½ X 1¼	4
-2	90014	LOCKNUT - ½	4
-3	90015	BOLT - ¼ X 1	6
-4	90116	LOCKWASHER - ¼	6
-5	90117	TEE NUT - ¼	6
-6	90119	LOCK PIN RETURN SPRING - 7/16	2
-7		FLAT WASHER - 3/8	4
-8	90121	COTTER PIN - 1/8 X 1	2
-9	90122	SPACER - ½	4
-10	90123	SWIVEL BOLT - ½ X 3	4
-11	90124	LOCK NUT - ½	4
-12	90145	BALL LOCK PIN - 3/8 X 2	2
-13	11053	DECAL - "CAUTION - DO NOT USE AROUND ELECTRICAL EQUIPMENT"	2
-14	11056	DECAL - "500 LBS. CAPACITY"	4
-15	90130	PLYWOOD FLOOR SECTION - 3/4 X 4¼ X 29½	1
-16	90128	PLYWOOD TRAP DOOR - 3/4 X 23 3/4 X 29½	1
-17	90110-2	PLYWOOD FLOOR - 3/4 X 32½ X 29½	1
-18	91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	1

FIGURE 2B - POWER TO PLATFORM
(ALL MODELS) (OPTION)



ITEM	PART NUMBER	DESCRIPTION	QTY
-1	91333-1	CORD REEL	1
-2		PLUG - 5266-C	1
-3	355	BOX	1
-4	356	BOX COVER	1
-5	4060	RECEPTACLE	1
-6	91335-6	CONNECTOR	1

FIGURE 2B.1 - CORD REEL ASSEMBLY (P30)
(APRIL 1983)



ITEM	PART NUMBER	DESCRIPTION	QTY
2B.1-	93268	CORD REEL ASSEMBLY	1
-1	70181	CORD REEL	1
-2	70182	FEMALE PLUG	1

FIGURE 2C - PLATFORM ASSEMBLY (P19DC)

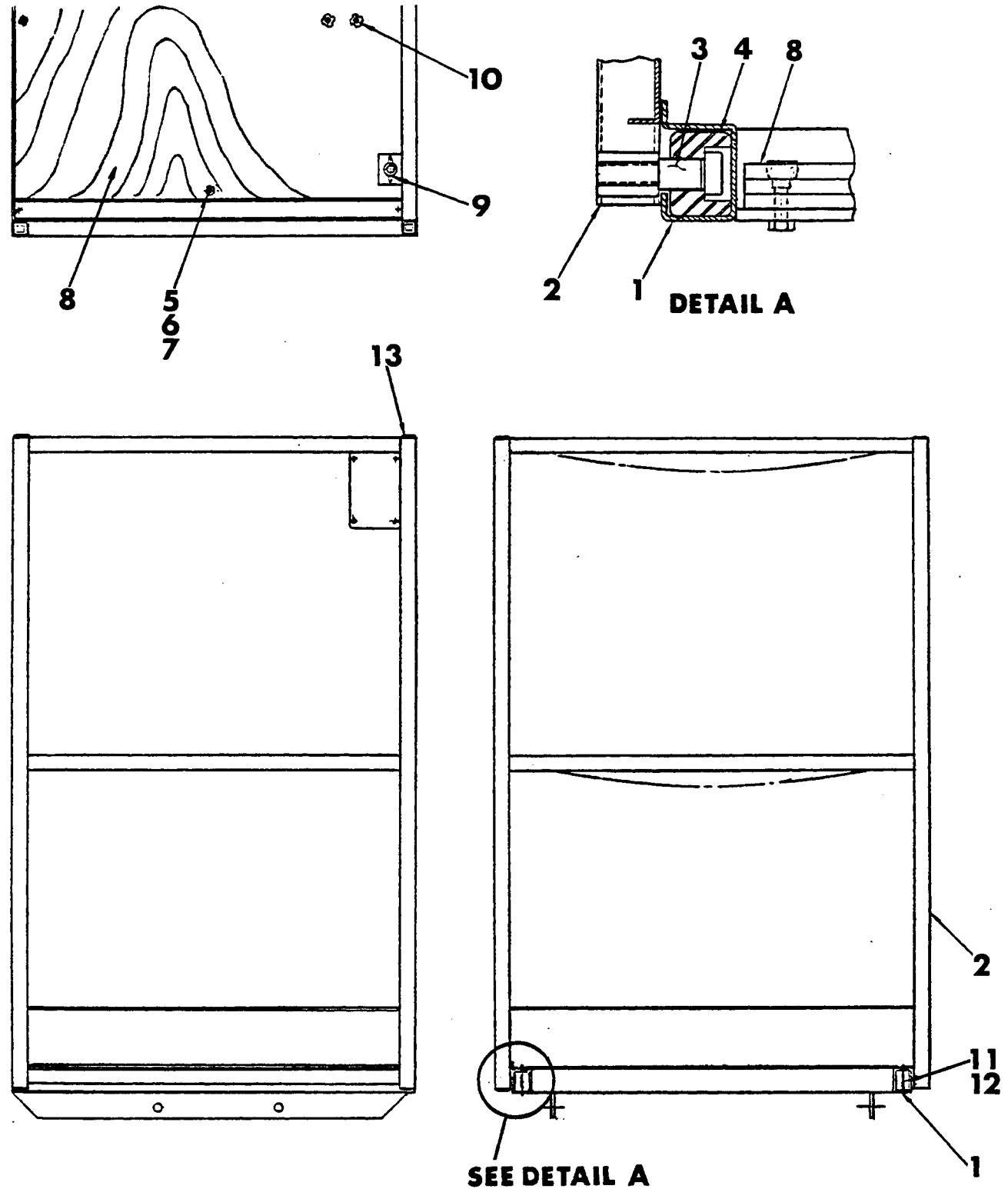


FIGURE 2C - PLATFORM ASSEMBLY (P19DC)

ITEM	PART NUMBER	DESCRIPTION	QTY
2C-	93512	PLATFORM ASSEMBLY	1
-1	93471	PLATFORM WELDMENT	1
-2	93466	GUARD RAIL WELDMENT	1
-3	62113	SHOULDER SCREW - 1/2 DIA. X 3/4	2
-4	7073	ROLLER	2
-5	60916	TEE NUT - 1/4-20 UNC	3
-6	60359	HEX HEAD CAP SCREW - 1/4-20 UNC X 3/4	3
-7	63301	LOCK WASHER - 1/4	3
-8	93489	PLYWOOD FLOOR	1
-9	61617	WING NUT - 1/2-13 UNC	2
-10	60915	TEE NUT - 5/16-18 UNC	2
-11	65382	CLEVIS PIN - 3/16 DIA. X 2	4
-12	64301	COTTER PIN - 1/16 DIA. X 1	4
-13	65390	CAP PLUG	8

FIGURE 2D - PLATFORM ASSEMBLY (P30)
(APRIL 1983)

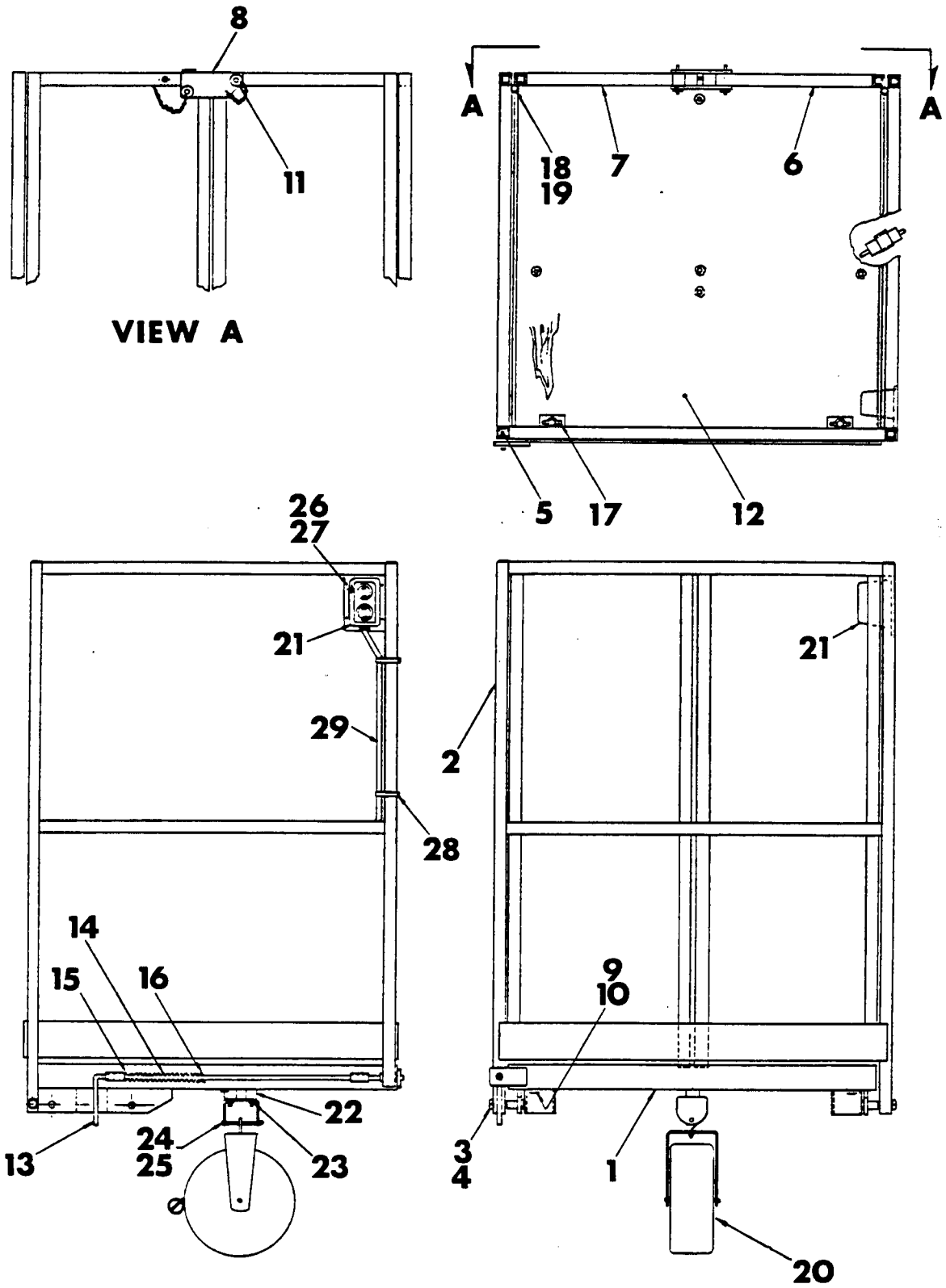
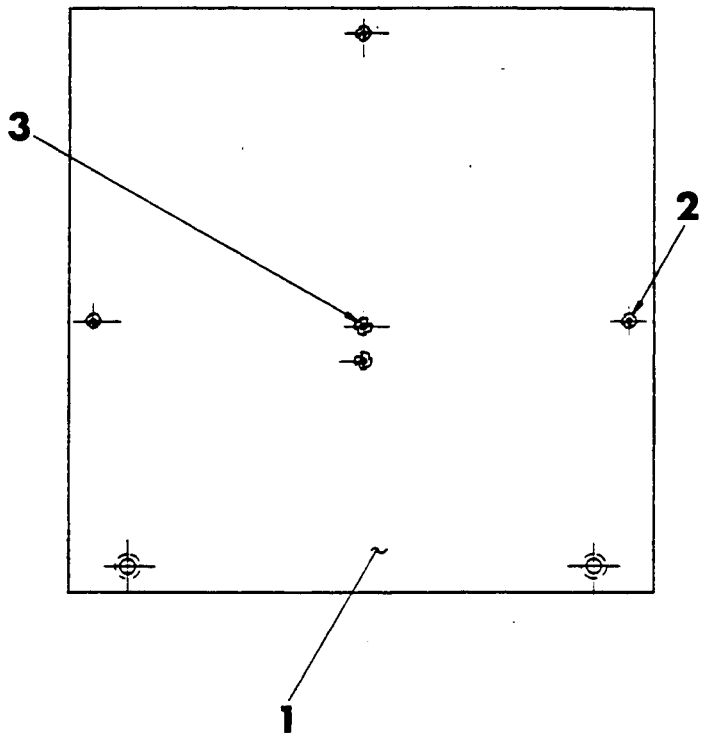


FIGURE 2D - PLATFORM ASSEMBLY (P30)
(APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
2D-	93458	PLATFORM ASSEMBLY	1
-1	93257	PLATFORM WELDMENT	1
-2	93256	BASKET WELDMENT	1
-3	60375	HEX HEAD CAP SCREW - 1/2-13 UNC X 3	2
-4	61305	SELF LOCKING HEX NUT - 1/2-13 UNC	2
-5	65390	PLUG	6
-6	93279	LEFT DOOR	1
-7	93280	RIGHT DOOR	1
-8	93264	GATE LATCH WELDMENT	1
-9	60312	HEX HEAD CAP SCREW - 1/4-20 UNC X 1	3
-10	63301	LOCK WASHER - 1/4	3
-11	65252	LATCH PIN	1
-12	93267	FLOOR ASSEMBLY (SEE FIG. 2D.1)	1
-13	93269	LOCK PIN	1
-14	65251	SPRING	2
-15	63428	FLAT WASHER - 3/8	2
-16	64301	COTTER PIN - 1/8 DIA. X 1	1
-17	61617	WING NUT	2
-18	60345	HEX HEAD CAP SCREW - 3/8-16 UNC X 2 3/4	4
-19	61302	SELF LOCKING HEX NUT - 3/8-16 UNC	4
-20	93268	CORD REEL ASSEMBLY (SEE FIG. 2B.1)	1
-21	93464	UPPER CONTROL STATION ASSEMBLY (SEE FIG. 6C)	1
-22	65253	CONNECTOR CUSHION	2
-23	60702	HEX NUT - 5/16-18 UNC	2
-24	62723	ROUND HEAD MACHINE SCREW - 1/4-20 UNC X 3 1/2	1
-25	61313	SELF LOCKING HEX NUT - 1/4-20 UNC	1
-26	62722	ROUND HEAD MACHINE SCREW - NO. 12-24 UNC X 1/2	4
-27	62140	SELF LOCKING HEX NUT - NO. 12-24 UNC	4
-28	255	CABLE TIE	4
-29	10132	CABLE LOOM	1

FIGURE 2D.1 - FLOOR ASSEMBLY (P30)
(APRIL 1983)



ITEM	PART NUMBER	DESCRIPTION	QTY
2D.1-	93267	FLOOR ASSEMBLY	1
-1	93266	DECK FLOOR	1
-2	60916	TEE NUT - 1/4-20 UNC	3
-3	60915	TEE NUT - 5/16-18 UNC	2

FIGURE 3 - BASE ASSEMBLY (AC) (PI5)

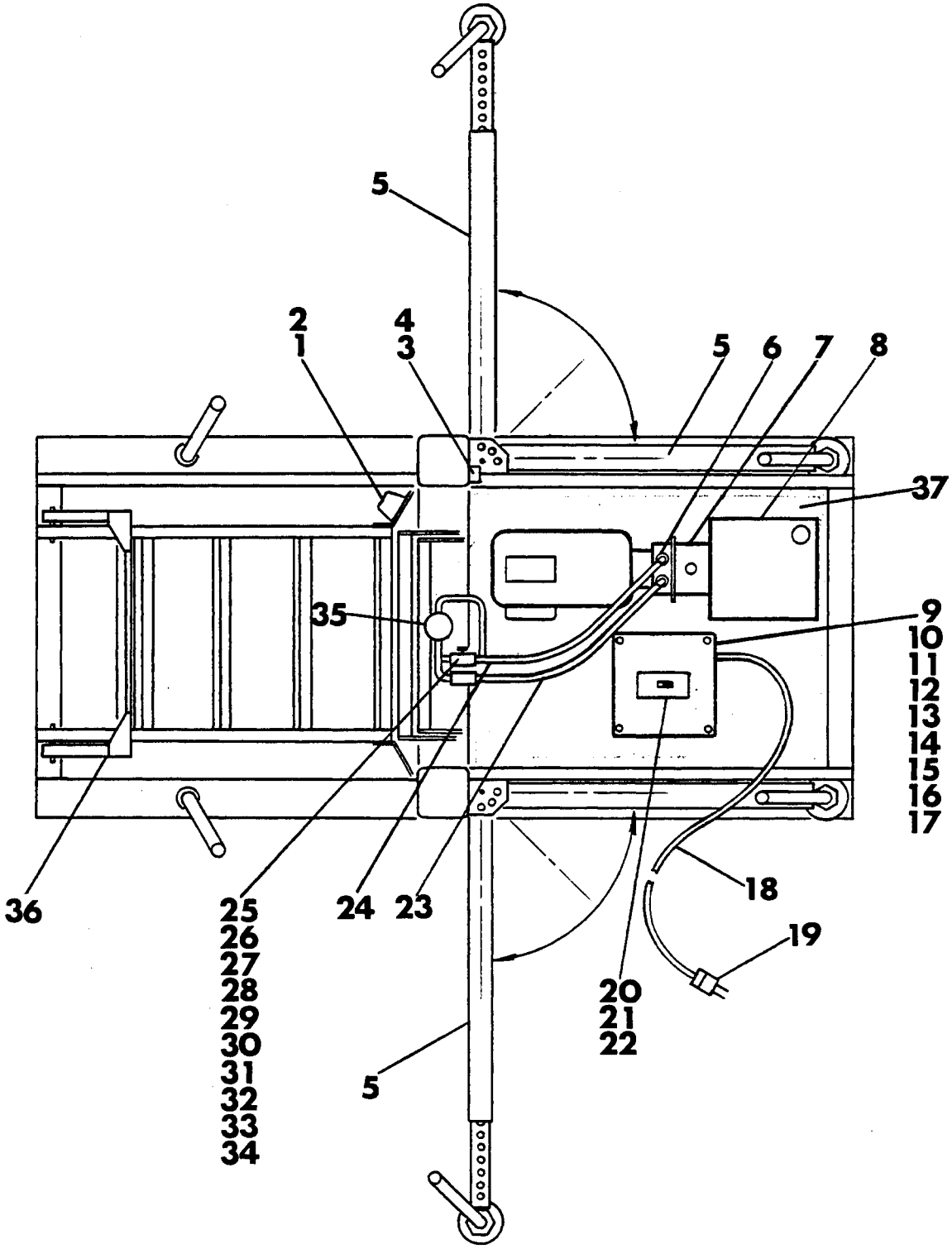


FIGURE 3 - BASE ASSEMBLY (AC) (P15)

ITEM	PART NUMBER	DESCRIPTION	QTY
3-	90700-1WP	BASE ASSEMBLY	1
-1	91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	1
-2		LOWER CONTROL STATION CABLE - 76" 18-3	1
-3	91334	UP-LIMIT SWITCH	1
-4	91332	UP LIMIT SWITCH CONTROL CABLE - 84" 18-2	1
-5	90800	OUTRIGGER ASSEMBLY (SEE FIG.4)	1
-6	91226	SWIVEL ELBOW	3
-7		PUMP ASSEMBLY - MPT AC-100A-A151103B	1
-8		HYDRAULIC RESERVOIR - 2½ GAL.	1
-9	91339-3	JUNCTION BOX	1
-10	91350	MANUAL STARTER	1
-11	91351	THERMAL UNIT	1
-12		TERMINAL STRIP CONTACT SECTION - 524	5
-13		TERMINAL STRIP END SECTION - 530	1
-14		TIME DELAY RELAY - 5 X 828	1
-15		TERMINAL SOCKET - 5 X 852	1
-16		30 AMP RELAY - 5 X 850A	1
-17		ROMEX CONNECTOR - 6623	7
-18		ELECTRICAL CABLE - 14GA 4 CONDUCTOR - 5 FT.	1
-19		ELECTRICAL PLUG - 5266-C	1
-20		MANUAL STARTER ENCLOSURE - 5 X 271	1
-21		MANUAL STARTER SWITCH 5 X 269	1
-22	91351	FUZE	1
-23	91230	HIGH PRESSURE HOSE-16"	1
-24	91231	LOW PRESSURE HOSE-52"	1
-25	91221	MANUAL DOWN VALVE	1
-26	91214	CHECK VALVE	1
-27		CHECK VALVE - CMMQ20B	1
-28	91225	REDUCER BUSHING	2
-29	91227	HEX NIPPLE	1
-30	91112	PIPE COUPLING	1
-31	91224	STREET ELBOW	1
-32	91236	STREET TEE	2

ITEM	PART NUMBER	DESCRIPTION	QTY
-33		STRAIGHT SWIVEL FITTING - 1404-4-4	1
-34		90° ELBOW - ¼ CR-S	1
-35	91100-1	LIFT CYLINDER (SEE FIG.5)	1
			1
-36		PULL BAR	1
-37	90410	PLYWOOD FLOOR - 22½ X 27½ X ½	1

FIGURE 3A - BASE ASSEMBLY
(AC) (P20) (P25) (P30)

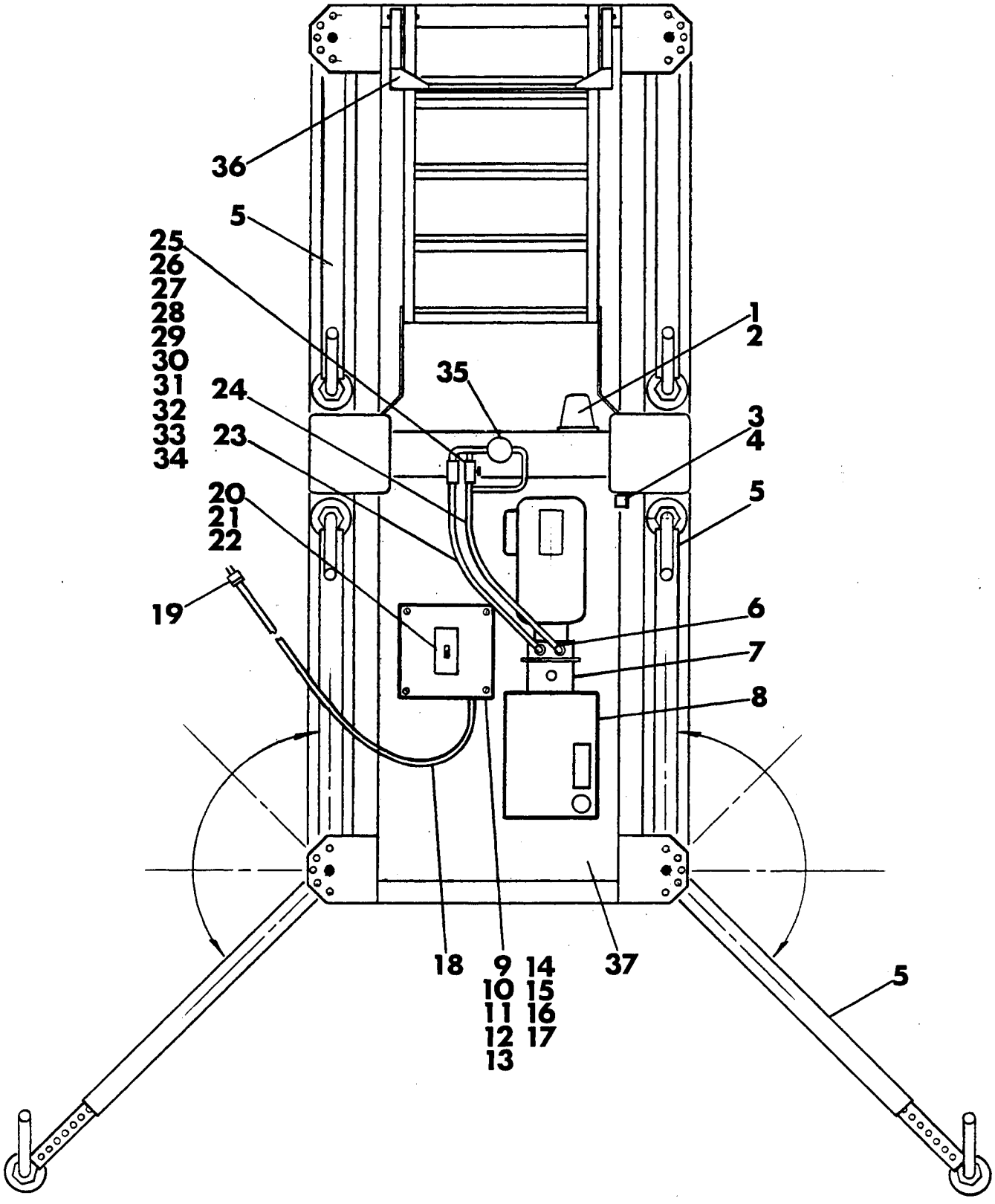


FIGURE 3A - BASE ASSEMBLY
(AC) (P20) (P25) (P30)

ITEM	PART NUMBER	DESCRIPTION	QTY
3A-	90700-2WP	BASE ASSEMBLY (P20)	1
	90700-3WP	BASE ASSEMBLY (P25)	1
	90700-4WP	BASE ASSEMBLY (P30)	1
-1	91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	1
-2		LOWER CONTROL STATION CABLE - 76" 18-3	1
-3	91334	UP-LIMIT SWITCH	1
-4	91332	UP-LIMIT SWITCH CONTROL CABLE - 84" 18-2	1
-5	90800-1	OUTRIGGER ASSEMBLY (P20) (P25) (SEE FIG.4)	1
	90800-2	OUTRIGGER ASSEMBLY (P30) (SEE FIG.4A)	1
-6	91226	SWIVEL ELBOW	3
-7		PUMP ASSEMBLY - MPT-AC-100A-A15/103B	1
-8		HYDRAULIC RESERVOIR - 2½ GAL.	1
-9	91229-3	JUNCTION BOX	1
-10	91350	MANUAL STARTER	1
-11	91351	THERMAL UNIT	1
-12		TERMINAL STRIP CONTACT SECTION - 524	5
-13		TERMINAL STRIP END SECTION - 530	1
-14		TIME DELAY RELAY - 5 X 828	1
-15		TERMINAL SOCKET - 5 X 852	1
-16		30 AMP RELAY - 5 X 850A	1
-17		ROMEX CONNECTOR - 6623	7
-18		ELECTRICAL CABLE - 14GA - 4 CONDUCTOR - 5 FT.	1
-19		ELECTRICAL PLUG - 5266-C	1
-20		MANUAL STARTER ENCLOSURE - 5 X 271	1
-21		MANUAL STARTER SWITCH 5 X 269	1
-22	91351	FUZE	1
-23	91230	HIGH PRESSURE HOSE-16"	1
-24	91231	LOW PRESSURE HOSE-52"	1
-25	91221	MANUAL DOWN VALVE	1
-26	91214	CHECK VALVE	1
-27		CHECK VALVE - CMMQ20B	1
-28	91225	REDUCER BUSHING	2

FIGURE 3A - BASE ASSEMBLY
(AC) (P20) (P25) (P30)

ITEM	PART NUMBER	DESCRIPTION	QTY
-29	91227	HEX NIPPLE	1
-30	91112	PIPE COUPLING	1
-31	91224	STREET ELBOW	1
-32	91236	STREET TEE	2
-33		STRAIGHT SWIVEL FITTING - 1404-4-4	1
-34		90° ELBOW - ¼ CR-S	1
-35	91100-1	LIFT CYLINDER (P20) (P25) (SEE FIG.5)	1
	91100-2	LIFT CYLINDER (P30) (SEE FIG.5)	1
-36		PULL BAR	1
-37	90410	PLYWOOD FLOOR (P20) (P25) 22½ X 27½ X ½ (P30) 22½ X 33½ X ½	1

FIGURE 3B - BASE ASSEMBLY (DC) (P15)

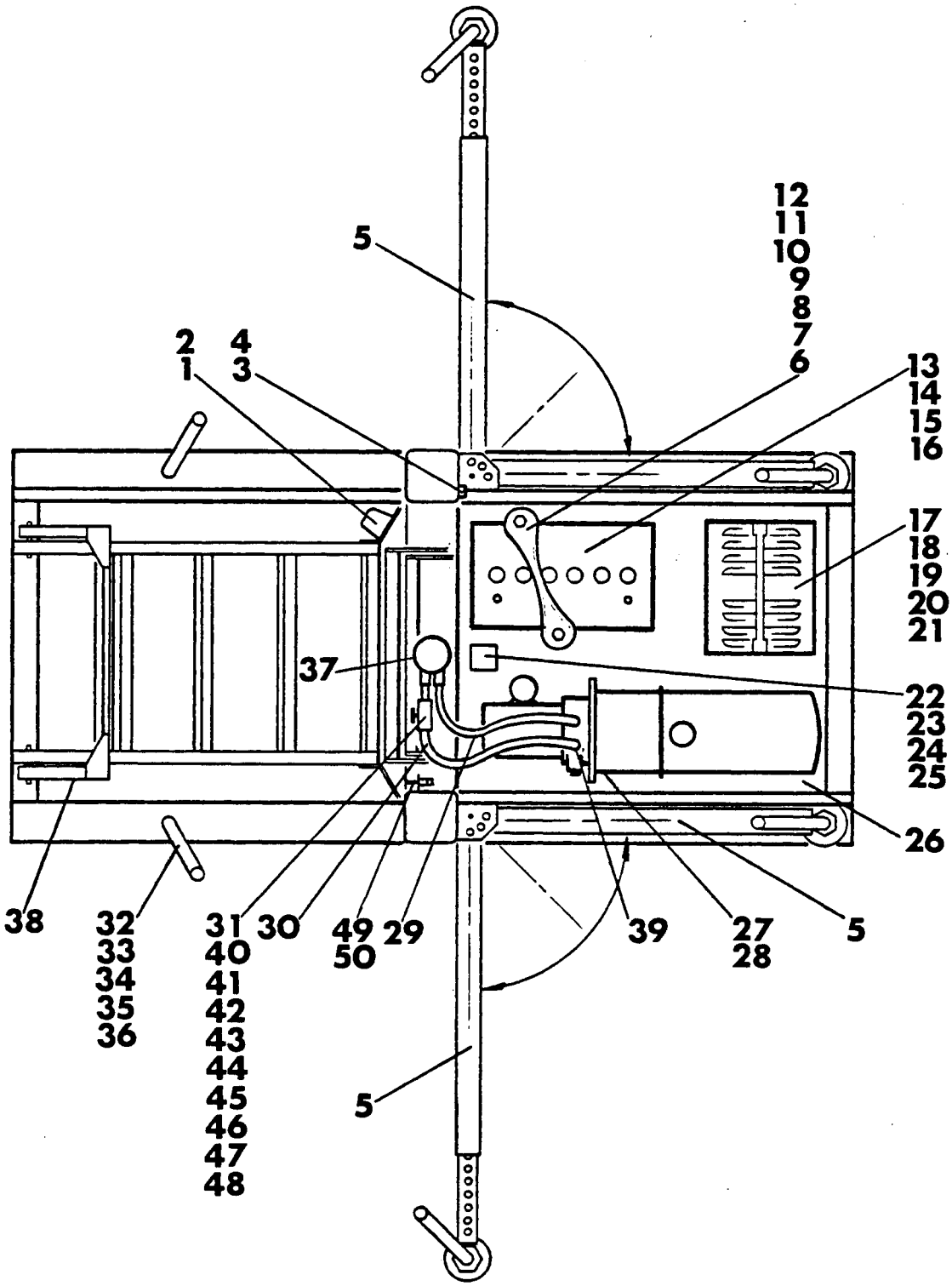


FIGURE 3B - BASE ASSEMBLY (DC) (P15)

ITEM		PART NUMBER	DESCRIPTION	QTY
3B-		90700-1WP	BASE ASSEMBLY	1
-1		91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	1
-2			LOWER CONTROL STATION CABLE - 76" 18-3	1
-3		91334	UP-LIMIT SWITCH	1
-4		91332	UP-LIMIT SWITCH CONTROL CABLE - 84" 18-2	1
-5		90800	OUTRIGGER ASSEMBLY (SEE FIG.4)	2
-6	*	91415	BATTERY HOLD DOWN	1
-7	*	91411	THREADED HOLD DOWN ROD - 5/16	2
-8	*	91412	NUT - 5/16	4
-9	*	91413	WASHER - 5/16	2
-10	*	91414	LOCKWASHER - 5/16	2
-11	*	91416	FLAT WASHER - 5/16	2
-12	*	91417	STOP NUT - 5/16 (NYLOC)	2
-13		91320	BATTERY	1
-14			BATTERY CABLE - 20" #6AWG	1
-15			BATTERY CABLE - 9" #6AWG	1
-16			RING TERMINAL - 5/16 EYE F01405T	4
-17		91310	BATTERY CHARGER	1
-18	*		CABLE CLIP - 8942-¼	5
-19	*		CABLE CLIP SCREW - 10 X 3/4	5
-20	*	91418	MOUNTING BOLT - ¼-20 X 1	2
-21	*	91419	MOUNTING WASHER - ¼	2
-22			CONTROL RELAY - 6 VDC-SPDT-W88CPX-1	1
-23			RELAY SOCKET 5 X 852	1
-24	*		RELAY SOCKET SCREW - 10-32 X 1	2
-25	*		RELAY SOCKET NUT - 10-32 (NYLOC)	2
-26	*	90410	PLYWOOD FLOOR - 22½ X 27½ X ½	1
-27		91211	PUMP ASSEMBLY	1
-28	*		PUMP MOUNTING BOLT - 3/8-16 X 1¼	2
-29		91231	LOW PRESSURE HOSE - 52"	1
-30		91230	HIGH PRESSURE HOSE - 16"	1
-31		91221	MANUAL DOWN VALVE	1
-32		90874	ADJUSTMENT HANDLE	2

ITEM	PART NUMBER	DESCRIPTION	QTY
-33	90873	OUTRIGGER SCREW	2
-34	90877	RUBBER PAD	2
-35	90878	PAD MOUNTING SCREW 3/8 X 1	2
-36		LOCKWASHER - 3/8	2
-37	91100-1	LIFT CYLINDER (SEE FIG.5)	1
-38		PULL BAR	1
-39	91225	REDUCER BUSHING	2
-40	91214	CHECK VALVE	1
-41		CHECK VALVE - CMMQ20B	1
-42	91227	HEX NIPPLE	1
-43	91112	PIPE COUPLING	1
-44	91224	STREET ELBOW	2
-45	91226	SWIVEL ELBOW	3
-46	91236	STREET TEE	2
-47		STRAIGHT SWIVEL FITTING 1404-4-4	1
-48		90° ELBOW - ¼ CR-S	1
-49		TOGGLE SWITCH - 8510K9	1
-50	20562	20 AMP CIRCUIT BREAKER	1

* PART OF PUMP COMPARTMENT FLOOR KIT 91400

FIGURE 3C - BASE ASSEMBLY
(DC) (P20) (P25) (P30)

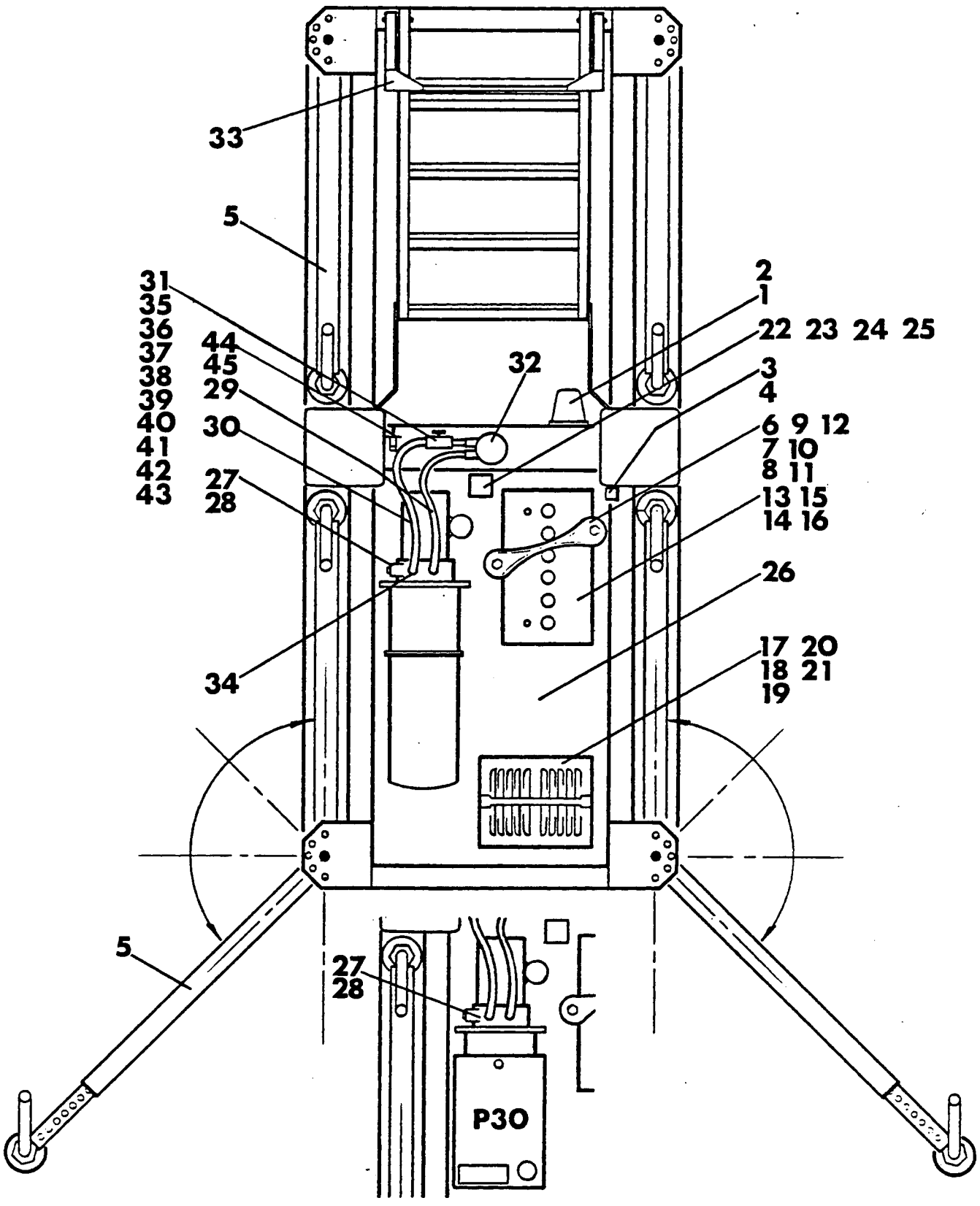


FIGURE 3C - BASE ASSEMBLY
(DC) (P20) (P25) (P30)

ITEM		PART NUMBER	DESCRIPTION	QTY
3C-		90700-2WP	BASE ASSEMBLY (P20)	1
		90700-3WP	BASE ASSEMBLY (P25)	1
		90700-4WP	BASE ASSEMBLY (P30)	1
-1		91335	PUSH BUTTON CONTROL STATION (SEE FIG.6)	1
-2			LOWER CONTROL STATION CABLE - 76" 18-3	1
-3		91334	UP-LIMIT SWITCH	1
-4		91332	UP-LIMIT SWITCH CONTROL CABLE - 84" 18-2	1
-5		90800-1	OUTRIGGER ASSEMBLY (P20) (P25) (SEE FIG.4)	4
		90800-2	OUTRIGGER ASSEMBLY (P30) (SEE FIG.4A)	4
-6	*	91415	BATTERY HOLD DOWN	1
-7	*	91411	THREADED HOLD DOWN ROD - 5/16	2
-8	*	91412	NUT - 5/16	4
-9	*	91413	WASHER - 5/16	2
-10	*	91414	LOCKWASHER - 5/16	2
-11	*	91416	FLAT WASHER - 5/16	2
-12	*	91417	STOP NUT - 5/16 (NYLOC)	2
-13		91320	BATTERY	1
-14			BATTERY CABLE - 20" #6AWG	1
-15			BATTERY CABLE - 9" X6AWG	1
-16			RING TERMINAL - 5/16 EYE F01405T	4
-17		91310	BATTERY CHARGER	1
-18	*		CABLE CLIP - 8942-¼	5
-19	*		CABLE CLIP SCREW - 10 X 3/4	5
-20	*	91418	MOUNTING BOLT - ¼-20 X 1	2
-21	*	91419	MOUNTING WASHER - ¼	2
-22			CONTROL RELAY - 6 VDC-SPDT-W88CPX-1	1
-23			RELAY SOCKET - 5 X 852	1
-24	*		RELAY SOCKET SCREW - 10-32 X 1	2
-25	*		RELAY SOCKET NUT - 10-32 (NYLOC)	2
-26	*	90410	PLYWOOD FLOOR (P20) (P25) 22½ X 27½ X ½ (P30) 22½ X 33½ X ½	1
-27		91211	PUMP ASSEMBLY (P30 HAS 2½ GAL. HYD. RESERVOIR)	1
-28	*		PUMP MOUNTING BOLT - 3/8-16 X 1¼	2

FIGURE 3C - BASE ASSEMBLY
(DC) (P20) (P25) (P30)

ITEM	PART NUMBER	DESCRIPTION	QTY
-29	91231	LOW PRESSURE HOSE - 52"	1
-30	91230	HIGH PRESSURE HOSE - 16"	1
-31	91221	MANUAL DOWN VALVE	1
-32	91100-1	LIFT CYLINDER (P20) (P25) (SEE FIG.5)	1
	91100-2	LIFT CYLINDER (P30) (SEE FIG.5)	1
-33		PULL BAR	1
-34	91225	REDUCER BUSHING	2
-35	91214	CHECK VALVE	1
-36		CHECK VALVE - CMMQ20B	1
-37	91227	HEX NIPPLE	1
-38	91112	PIPE COUPLING	1
-39	91224	STREET ELBOW	2
-40	91226	SWIVEL ELBOW	3
-41	91236	STREET TEE	2
-42		STRIGHT SWIVEL FITTING 1404-4-4	1
-43		90° ELBOW - ¼ CR-S	1
-44		TOGGLE SWITCH - 8510K9	1
-45	20562	20 AMP CIRCUIT BREAKER	1

* PART OF PUMP COMPARTMENT FLOOR KIT 91400

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FIGURE 3C.1 - BASE ASSEMBLY (P30DC)
(APRIL 1983)

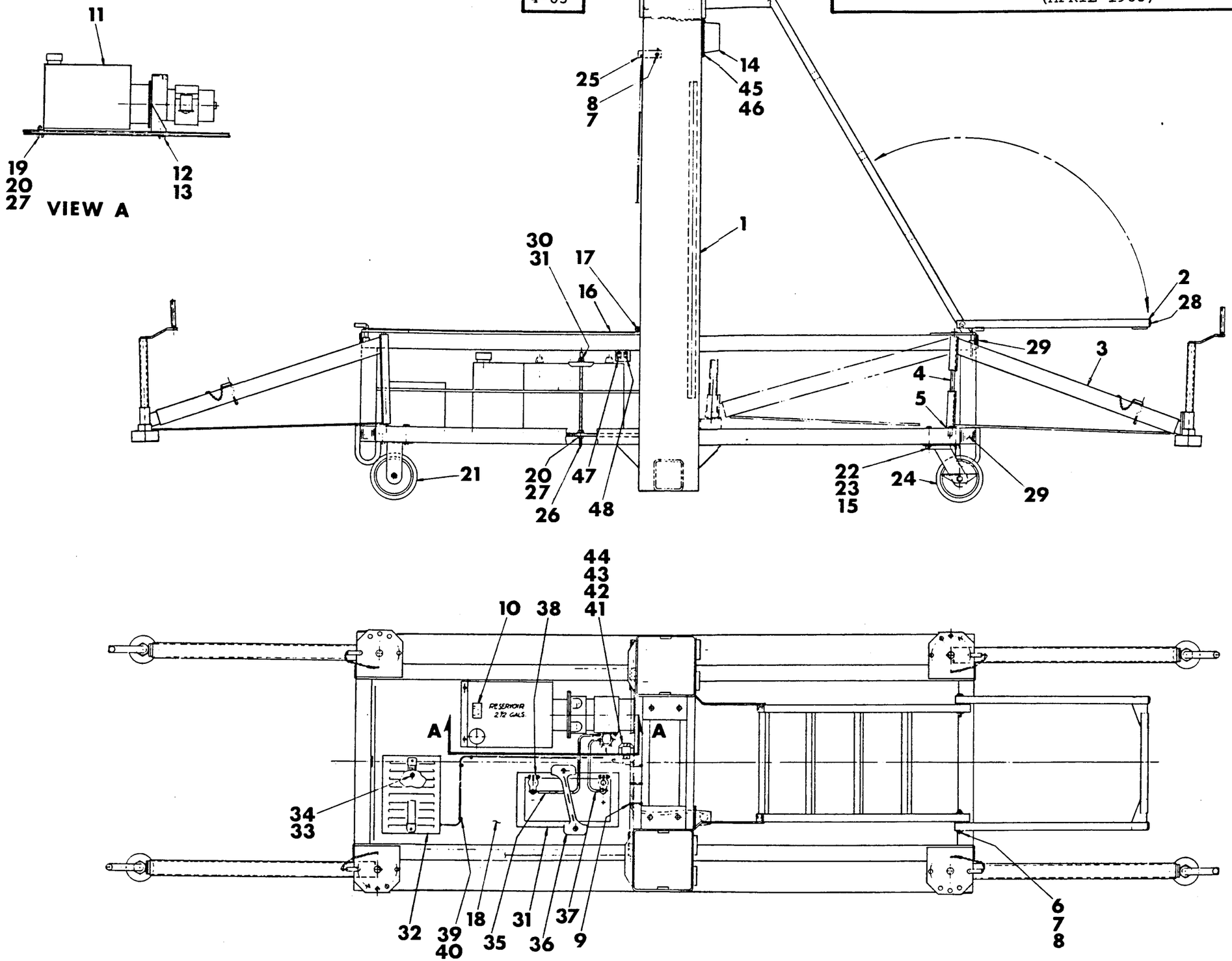


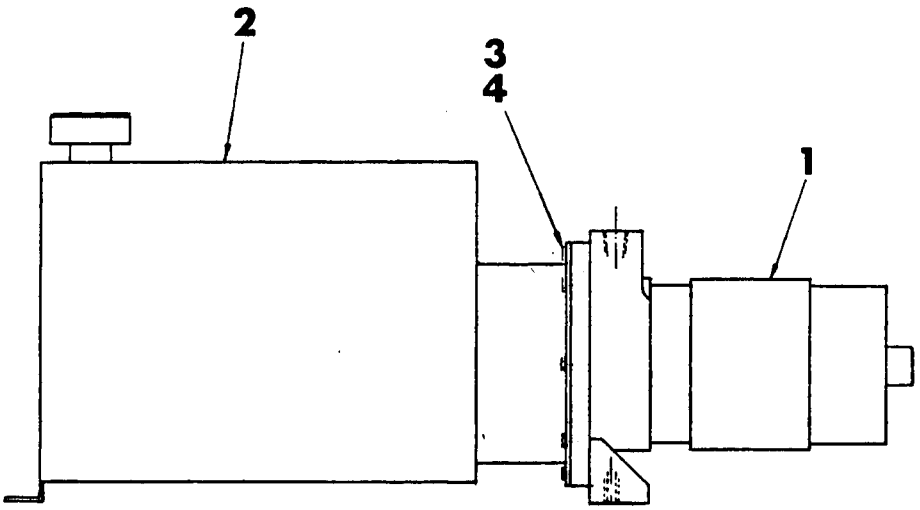
FIGURE 3C.1 - BASE ASSEMBLY (P30DC)
(APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
3C.1-	93427	BASE ASSEMBLY	1
-1	93449	BASE WELDMENT	1
-2	93205	PULL BAR WELDMENT	1
-3	93459	OUTRIGGER ASSEMBLY (SEE FIG. 4B)	4
-4	93201	OUTRIGGER HINGE PIN	4
-5	63407	FLAT WASHER - 5/8	4
-6	60337	HEX HEAD CAP SCREW - 1/4-20 UNC X 3 (GR. 5)	4
-7	63401	FLAT WASHER - 1/4	16
-8	61313	SELF LOCKING HEX NUT - 1/4-20 UNC	4
-9	65236	CABLE TIE	4
-10	2017	DECAL - HYDRAULIC FLUID SPEC.	1
-11	93253	MOTOR - PUMP & TANK ASSEMBLY (SEE FIG. 3C.2)	1
-12	60343	HEX HEAD CAP SCREW - 3/8-16 UNC X 1	2
-13	63403	FLAT WASHER - 3/8	2
-14	93463	LOWER CONTROL STATION ASSEMBLY (SEE FIG. 6D)	1
-15	63303	LOCK WASHER - 3/8	36
-16	93248	COVER WELDMENT	1
-17	95242	ROUND BAR	1
-18	93255	PLYWOOD BASE	1
-19	60338	HEX HEAD CAP SCREW - 5/16-18 UNC X 1"	2
-20	63402	FLAT WASHER - 5/16	4
-21	92163	RIGID CASTER	2
-22	60507	HEX HEAD CAP SCREW - 3/8-16 X 2 3/4	16
-23	61302	SELF LOCKING HEX NUT - 3/8-16 UNC	16
-24	92162	SWIVEL CASTER	2
-25	93516	COVER LOCKING STRAP	1
-26	63640	THREADED ROD - 5/16-18 UNC X 11	2
-27	60702	HEX NUT - 5/16-18 UNC	6
-28	65390	TUBE CAP	4
-29	65418	TUBE CAP	8
-30	61322	SELF LOCKING HEX NUT - 5/16-18 UNC	2

FIGURE 3C.1 - BASE ASSEMBLY (P30DC)
(APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
-31	70184	BATTERY	1
-32	70183	BATTERY CHARGER	1
-33	60312	HEX HEAD CAP SCREW - 1/4-20 UNC X 1	2
-34	63433	FLAT WASHER - 1/4	2
-35	93283	NEGATIVE CABLE ASSEMBLY	1
-36	70185	BATTERY HOLD DOWN BRACKET	1
-37	93284	POSITIVE CABLE ASSEMBLY	1
-38	70129	BATTERY POST TERMINAL	2
-39	70128	CABLE CLIP - 1/4 DIA.	8
-40	64503	ROUND HEAD WOOD SCREW - NO. 10 X 3/4	8
-41	784-A	SOCKET	1
-42	4032	CONTROL RELAY	1
-43	62702	ROUND SLOTTED HEAD MACHINE SCREW - NO. 10-32 UNF X 1	2 2
-44	61241	SELF LOCKING HEX NUT - NO. 10-32 UNF	2
-45	62722	ROUND SLOTTED HEAD MACHINE SCREW - NO. 12-24 UNC X 1/2	4
-46	61240	SELF LOCKING HEX NUT - NO. 12-24 UNC	4
-47	4017	TOGGLE SWITCH	1
-48	20562	CIRCUIT BREAKER SWITCH	1

FIGURE 3C.2 - MOTOR - PUMP & TANK ASSEMBLY (P30DC) (APRIL 1983)



ITEM	PART NUMBER	DESCRIPTION	QTY
3C.2-	93253	MOTOR-PUMP & TANK ASSEMBLY	1
-1	81002	PUMP & MOTOR ASSEMBLY	1
-2	92205	HYDRAULIC RESERVOIR	1
-3	60374	HEX HEAD CAP SCREW - NO. 10-24 UNC X 1/2	8
-4	63313	LOCK WASHER - NO. 10	8

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FIGURE 3C.3 - BASE ASSEMBLY (P30AC)
(APRIL 1983)

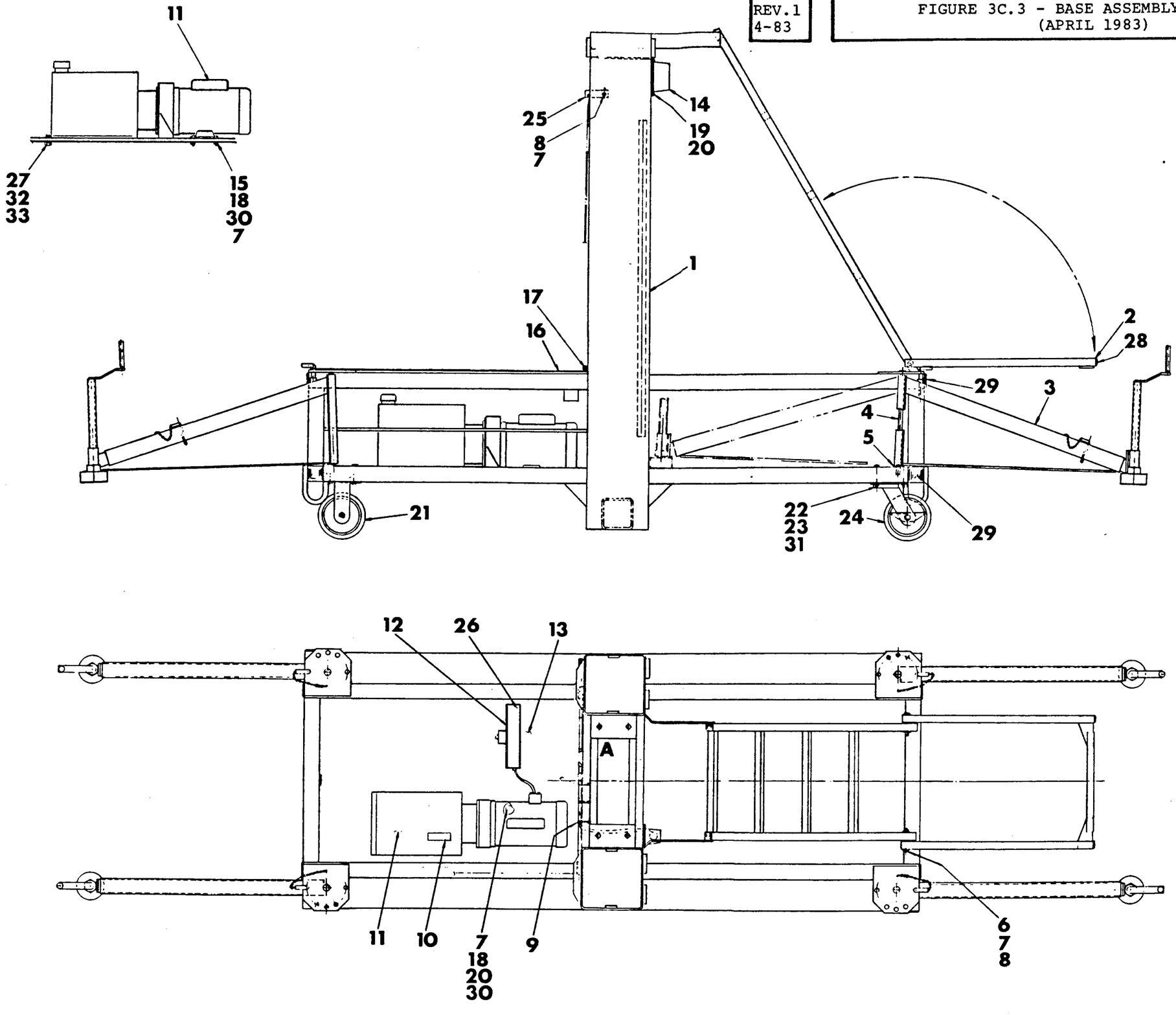


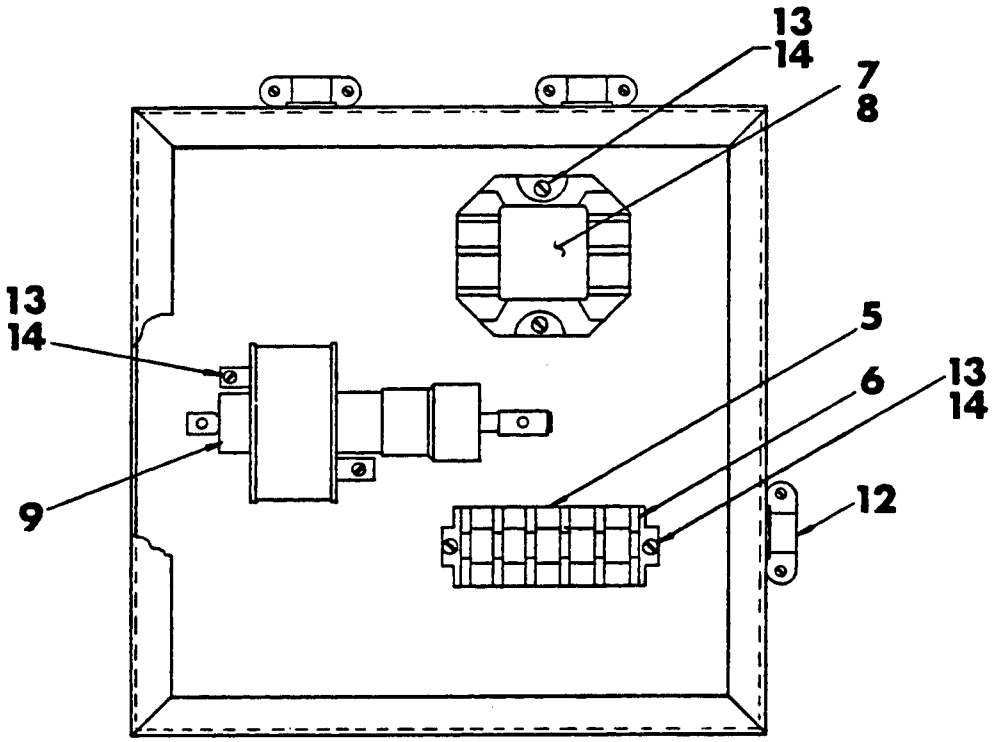
FIGURE 3C.3 - BASE ASSEMBLY (P30AC)
(APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
3C.3-	93428	BASE ASSEMBLY	1
-1	93449	BASE WELDMENT	1
-2	93205	PULL BAR WELDMENT	1
-3	93459	OUTRIGGER ASSEMBLY (SEE FIG. 4B)	4
-4	93201	OUTRIGGER HINGE PIN	4
-5	63407	FLAT WASHER - 5/8	8
-6	60337	HEX HEAD CAP SCREW - 1/4-20 UNC X 3 (GR. 5)	2
-7	63401	FLAT WASHER - 1/4	17
-8	61313	SELF LOCKING HEX NUT - 1/4-20 UNC	3
-9	65236	CABLE TIE	4
-10	2017	DECAL - HYDRAULIC FLUID SPEC.	1
-11	93306	MOTOR - PUMP & TANK ASSEMBLY (SEE FIG. 3C.5)	1
-12	93305	JUNCTION BOX ASSEMBLY (SEE FIG. 3C.4)	1
-13	93307	PLYWOOD BASE	1
-14	93463	LOWER CONTROL STATION ASSEMBLY (SEE FIG. 6D)	1
-15	65255	STEP BOLT	4
-16	93248	COVER WELDMENT	1
-17	95242	ROUND BAR	1
-18	60701	HEX NUT - 1/4-20 UNC	4
-19	62702	ROUND SLOTTED HEAD MACHINE SCREW - NO. 10-32 UNF X 1	4
-20	61240	SELF LOCKING HEX NUT - NO. 12-24 UNC	4
-21	92163	RIGID CASTER	2
-22	60507	HEX HEAD CAP SCREW - 3/8-16 UNC X 2 3/4 (GR. 8)	16
-23	61302	HEX NUT - 3/8-16 UNC	16
-24	92162	SWIVEL CASTER (WITH FOOT BRAKE)	2
-25	93516	COVER LOCKING STRAP	1
-26	61719	SELF TAPPING SLOTTED PAN HEAD SCREW - NO. 10-24 X 1/2	4
-27	60702	HEX NUT - 5/16-18 UNC	2
-28	65390	PLUG	4

FIGURE 3C.3 - BASE ASSEMBLY (P30AC)
(APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
-29	65418	PLUG	8
-30	63301	LOCK WASHER - 1/4	4
-31	6303	LOCK WASHER	16
-32	60338	HEX HEAD CAP SCREW - 5/16-18 UNC X 1	2
-33	63402	FLAT WASHER - 5/16	4

FIGURE 3C.4 - JUNCTION BOX ASSEMBLY
(P30AC) (APRIL 1983)



VIEW A

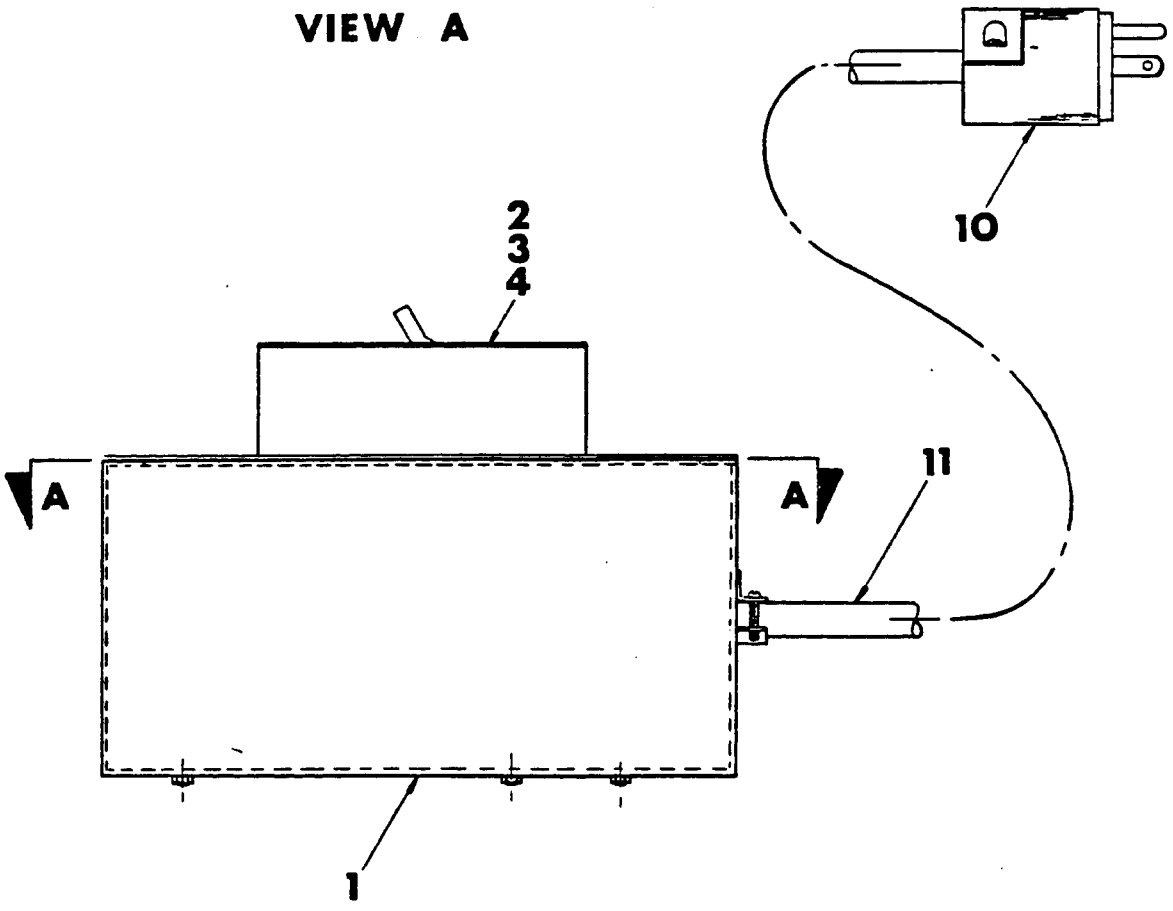
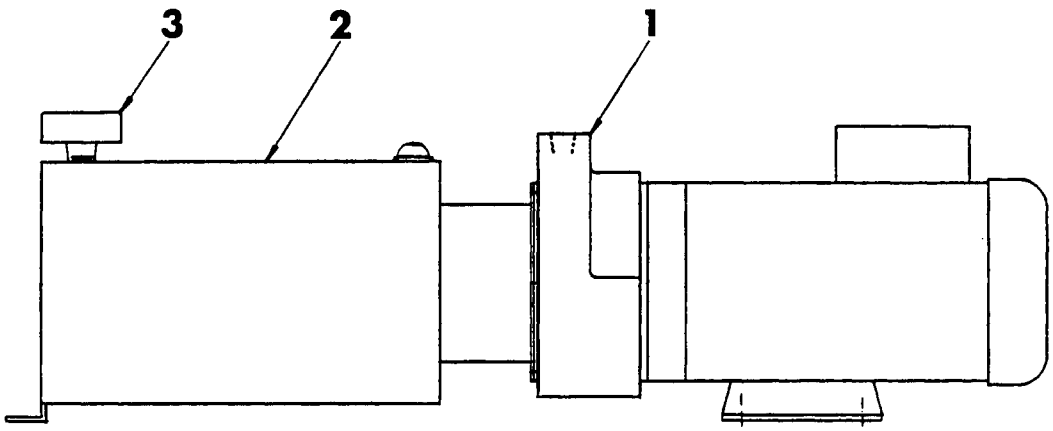


FIGURE 3C.4 - JUNCTION BOX ASSEMBLY
(P30AC) (APRIL 1983)

ITEM	PART NUMBER	DESCRIPTION	QTY
3C.4-	93305	JUNCTION BOX ASSEMBLY	1
-1	93308	JUNCTION BOX	1
-2	70133	MANUAL STARTER	1
-3	70134	THERMAL UNIT	1
-4	70135	MANUAL STARTER ENCLOSURE	1
-5	4027	TERMINAL CONTACT	5
-6	117-A	TERMINAL CONTACT END	1
-7	70139	TIME DELAY RELAY	1
-8	784-A	TERMINAL SOCKET	1
-9	70188	35 AMP RELAY	1
-10	2624	MALE PLUG	1
-11	70137	ELECTRICAL CABLE - 5 FT.	1
-12	70136	CONNECTOR	3
-13	62724	PAN HEAD SLOTTED MACHINE SCREW - NO. 10 24 UNC X 1/2	6
-14	61243	SELF LOCKING NUT - NO. 10-24 UNC	6

FIGURE 3C.5 - MOTOR - PUMP & TANK ASSEMBLY (P30AC) (APRIL 1983)



ITEM	PART NUMBER	DESCRIPTION	QTY
3C.5-	93306	MOTOR - PUMP & TANK ASSEMBLY	1
-1	70198	MOTOR & PUMP ASSEMBLY	1
-2	92205	RESERVOIR - 2 1/2 GAL.	1
-3	92213	FILLER - BREATHER	1

FIGURE 3D - BASE ASSEMBLY (MANUAL PUMP) (P15)

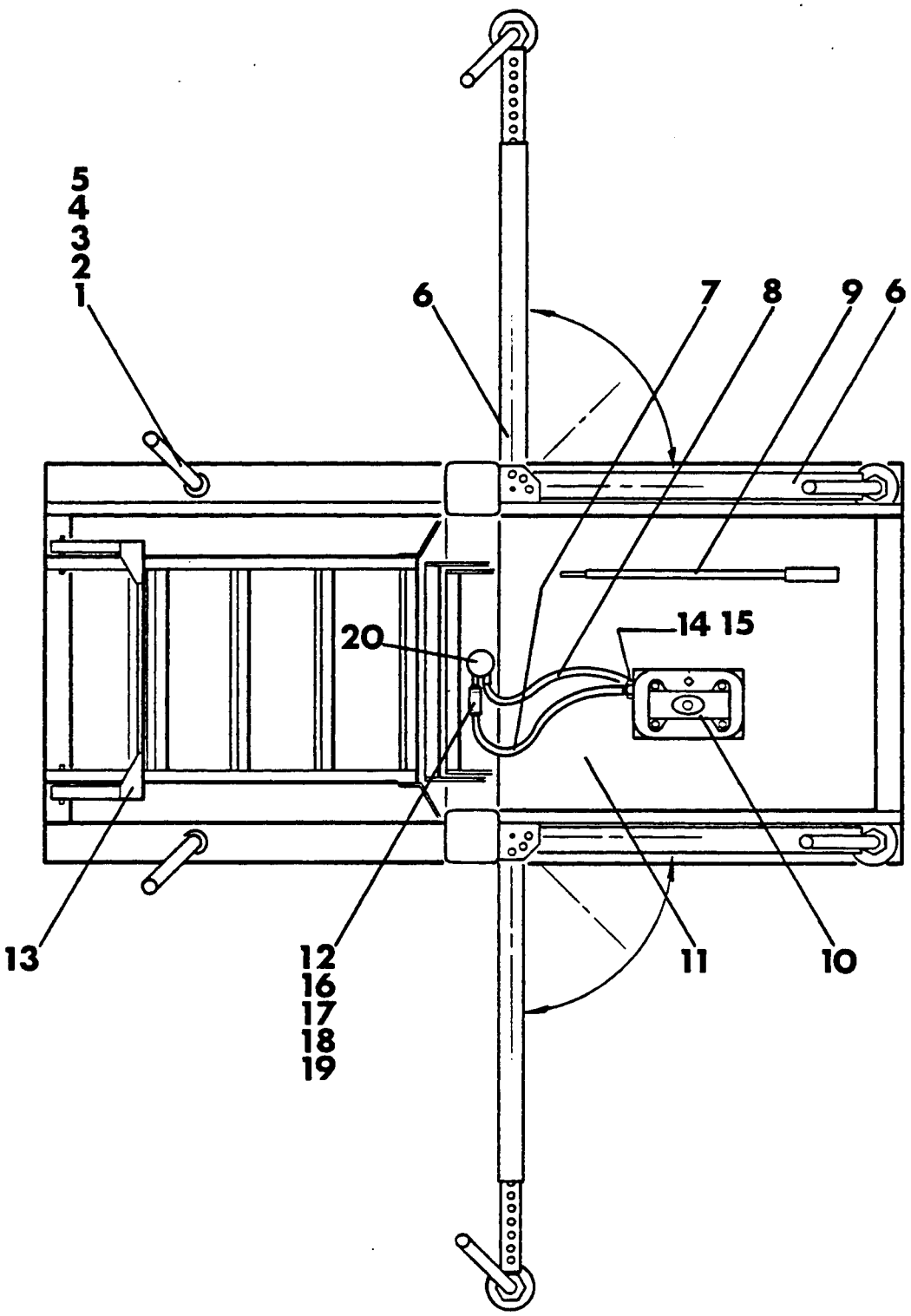


FIGURE 3D - BASE ASSEMBLY (MANUAL PUMP) (P15)

ITEM	PART NUMBER	DESCRIPTION	QTY
3D-	90700-1WP	BASE ASSEMBLY	1
-1	90874	ADJUSTMENT HANDLE	2
-2	90873	OUTRIGGER SCREW	2
-3	90877	RUBBER PAD	2
-4	90878	PAD MOUNTING SCREW 3/8 X 1	2
-5		LOCKWASHER - 3/8	2
-6	90800	OUTRIGGER ASSEMBLY (SEE FIG.4)	2
-7	91230	HIGH PRESSURE HOSE - 16"	1
-8	91231	LOW PRESSURE HOSE - 52"	1
-9		PUMP HANDLE	1
-10		MANUAL HYDRAULIC PUMP AND RESERVOIR - C-307	1
-11	90410	PLYWOOD FLOOR - 22½ X 27½ X ½	1
-12	91214	CHECK VALVE	1
-13		PULL BAR	1
-14	91227	HEX NIPPLE	1
-15	91226	SWIVEL ELBOW	2
-16		STRAIGHT SWIVEL FITTING	3
-17	91224	STREET ELBOW	1
-18		CHECK VALVE - CMMQ20B	1
-19	91112	PIPE COUPLING	1
-20	91100-1	LIFT CYLINDER (SEE FIG.5)	1

FIGURE 3E - BASE ASSEMBLY
(MANUAL PUMP) (P20) (P25)

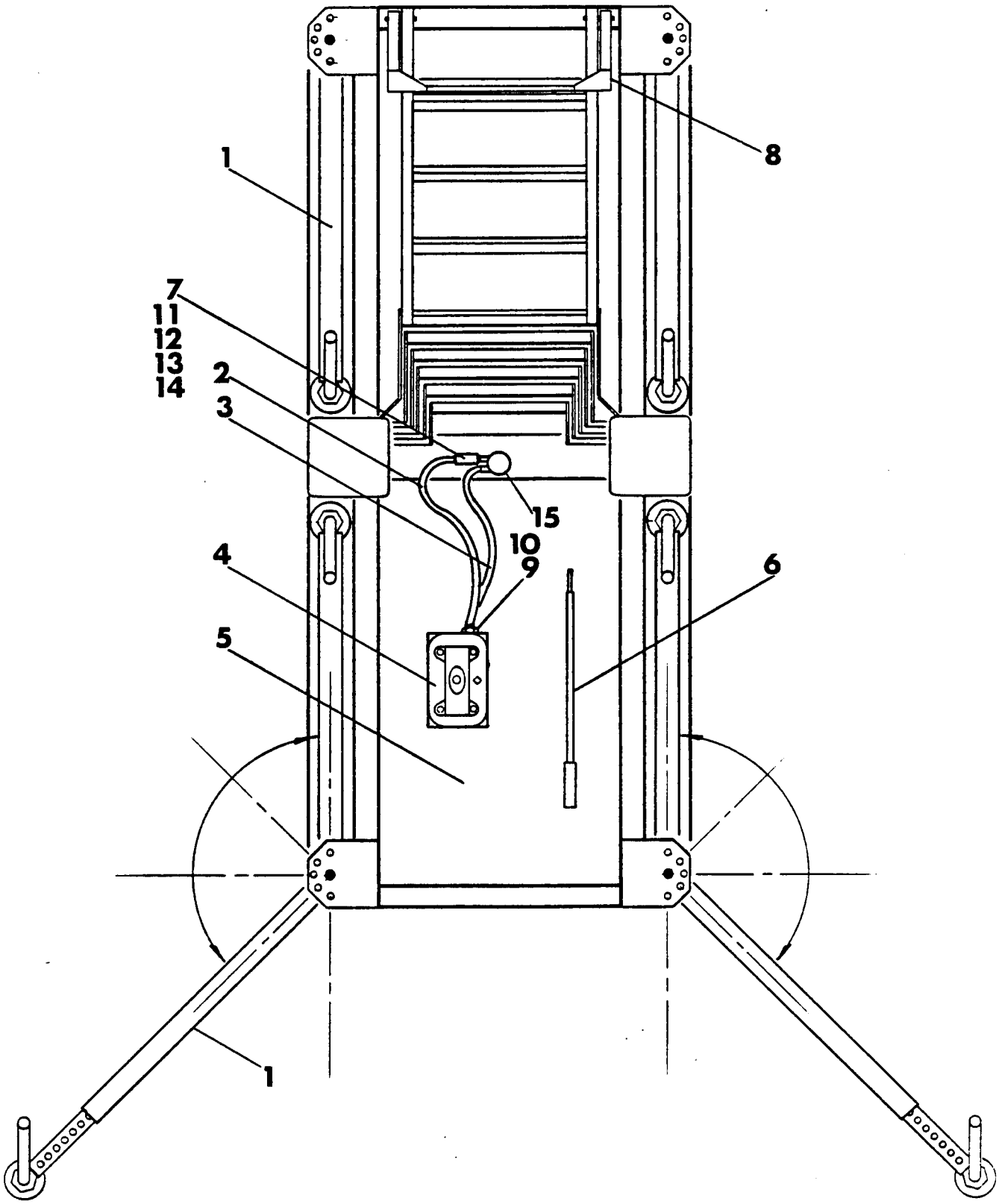
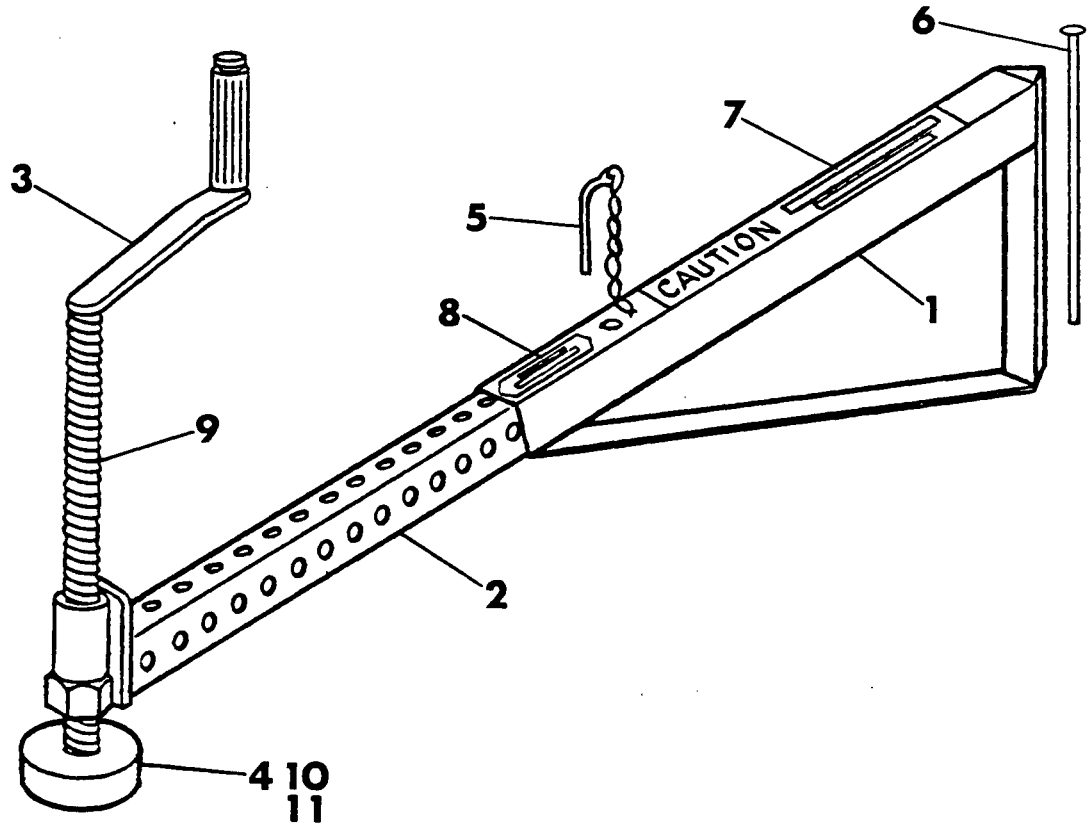


FIGURE 3E - BASE ASSEMBLY (MANUAL PUMP) (P20) (P25)

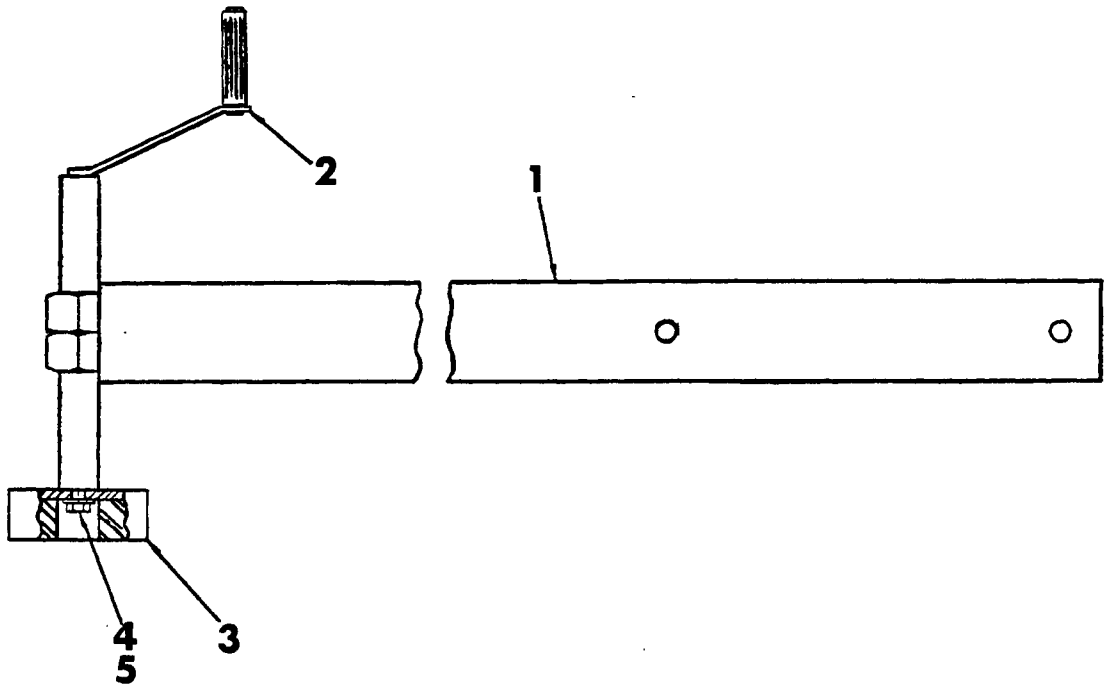
ITEM	PART NUMBER	DESCRIPTION	QTY
3E-	90700-2WP	BASE ASSEMBLY (P20)	1
	90700-3WP	BASE ASSEMBLY (P25)	1
-1	90800-1	OUTRIGGER ASSEMBLY (P20) (P25) (SEE FIG.4)	4
-2	91230	HIGH PRESSURE HOSE - 16"	1
-3	91231	LOW PRESSURE HOSE - 52"	1
-4		MANUAL HYDRAULIC PUMP & RESERVOIR - C-307	1
-5	90410	PLYWOOD FLOOR (P20) (P25) 22½ X 27½ X ½	
-6		PUMP HANDLE	1
-7	91214	CHECK VALVE	1
-8		PULL BAR	1
-9	91227	HEX NIPPLE	1
-10	91226	SWIVEL ELBOW	2
-11		STRAIGHT SWIVEL FITTING	3
-12	91224	STREET ELBOW	1
-13		CHECK VALVE - CMMQ20B	1
-14	91112	PIPE COUPLING	1
-15	91100-1	LIFT CYLINDER (SEE FIG.5)	1

FIGURE 4 - OUTRIGGER ASSEMBLY (P15) (P20) (P25)



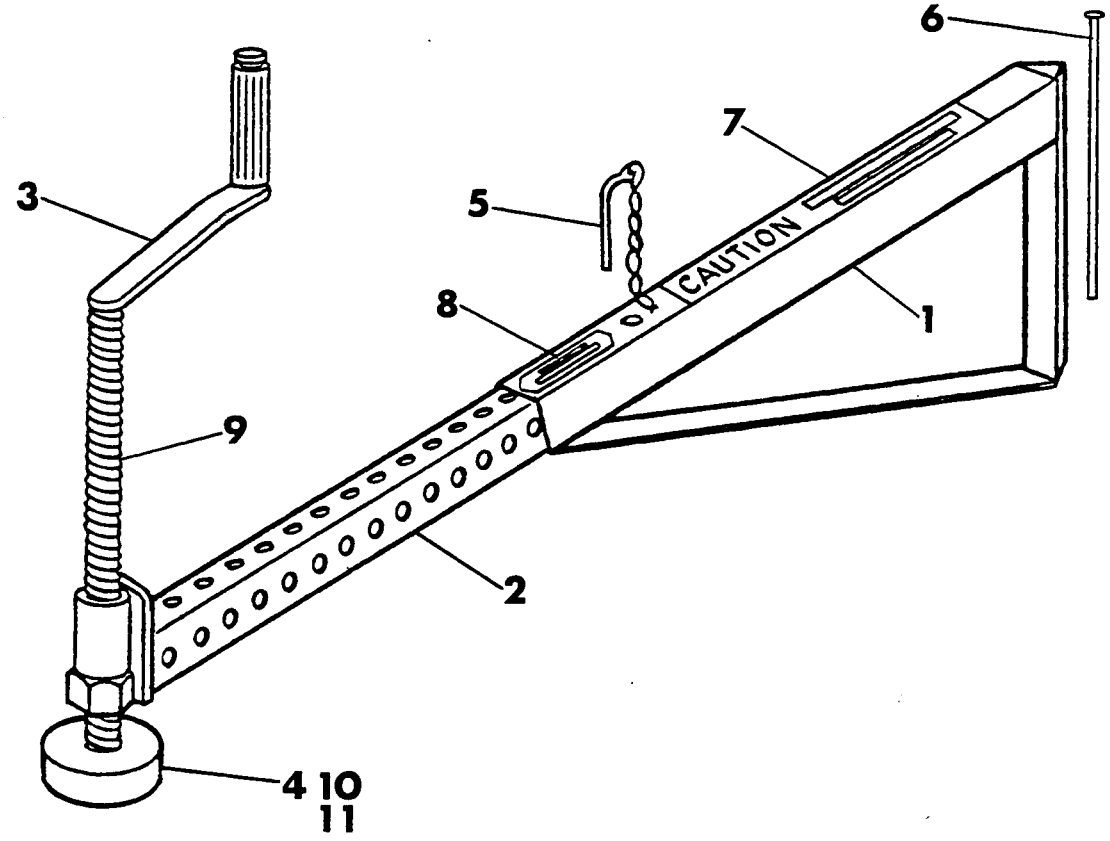
ITEM	PART NUMBER	DESCRIPTION	QTY
4-	90800	OUTRIGGER ASSEMBLY (P15)	1
	90800-1	OUTRIGGER ASSEMBLY (P20) (P25)	
-1	90861	OUTRIGGER (P20) (P25)	1
		OUTRIGGER (P15)	
-2	90871	ARM	1
-3	90874	ADJUSTMENT HANDLE	1
-4	90877	RUBBER PAD	1
-5	90866	EXTENSION PIN	1
-6	90882	HINGE PIN	1
-7	11055	DECAL - "CAUTION - BEFORE RAISING	1
		PLATFORM EXTEND OUTRIGGERS"	
-8	11063	DECAL - "TO EXTEND REMOVE PIN"	1
-9	90873	OUTRIGGER SCREW	1
-10	90878	PAD MOUNTING SCREW - 3/8 X 1	1
-11		LOCKWASHER - 3/8	1

FIGURE 4.1 - OUTRIGGER ASSEMBLY (P19DC)



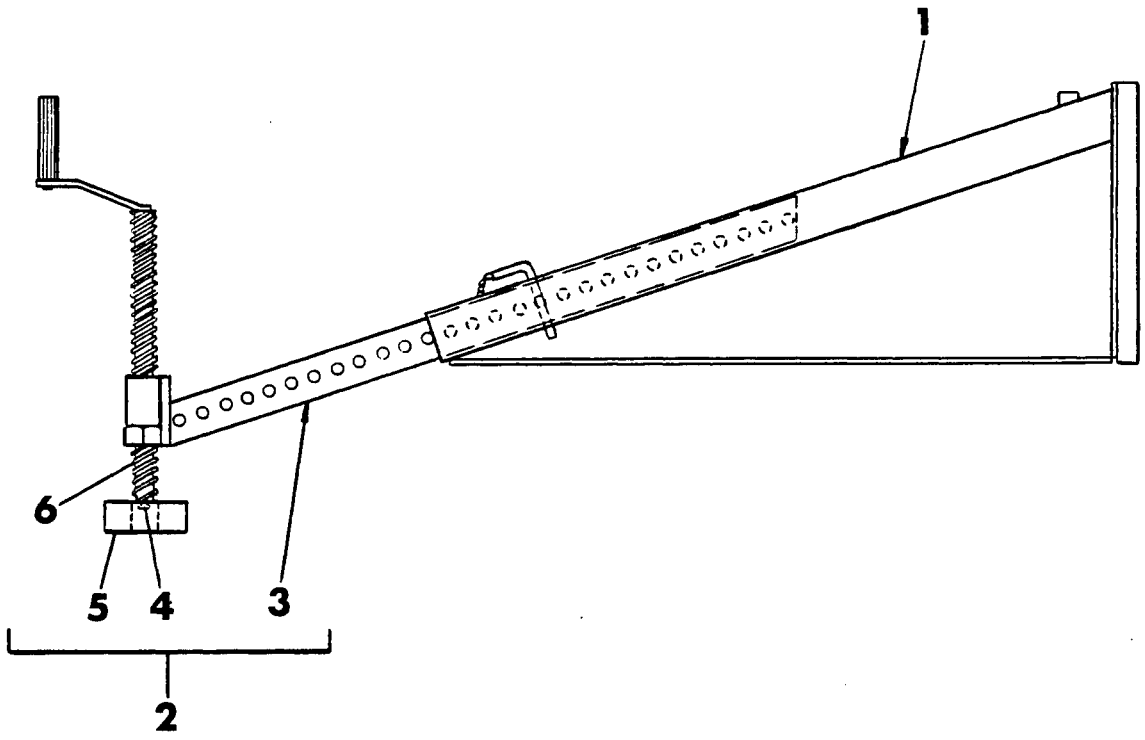
ITEM	PART NUMBER	DESCRIPTION	QTY
4.1-	93505	OUTRIGGER ASSEMBLY	1
-1	93494	OUTRIGGER WELDMENT	1
-2	93495	CRANK WELDMENT	1
-3	93460	FOOT PAD	1
-4	60307	HEX HEAD CAP SCREW - 3/8-16 UNC X 1 1/2	1
-5	63403	FLAT WASHER - 3/8	1

FIGURE 4A - OUTRIGGER ASSEMBLY (P30)

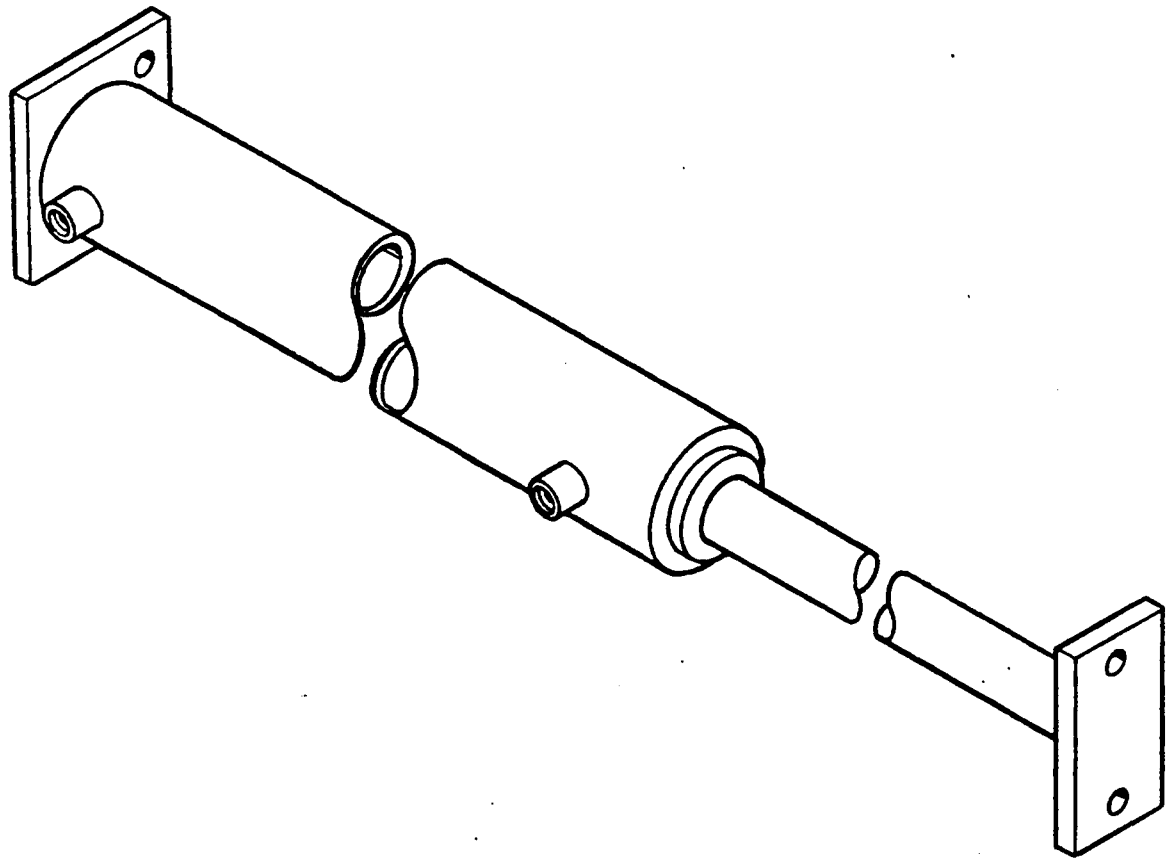


ITEM	PART NUMBER	DESCRIPTION	QTY
4A-	90800-2	OUTRIGGER ASSEMBLY	1
-1	90861-2	OUTRIGGER	1
-2	90871-2	ARM	1
-3	90874	ADJUSTMENT HANDLE	1
-4	90877	RUBBER PAD	1
-5	90866	EXTENSION PIN	1
-6	90882	HINGE PIN	1
-7	11055	DECAL - "CAUTION - BEFORE RAISING PLATFORM EXTEND OUTRIGGERS"	1
-8	11063	DECAL - "TO EXTEND REMOVE PIN"	1
-9	90873	OUTRIGGER SCREW	1
-10	90878	PAD MOUNTING SCREW - 3/8 X 1	1
-11		LOCKWASHER - 3/8	1

FIGURE 4B - OUTRIGGER ASSEMBLY (P30)
(APRIL 1983)

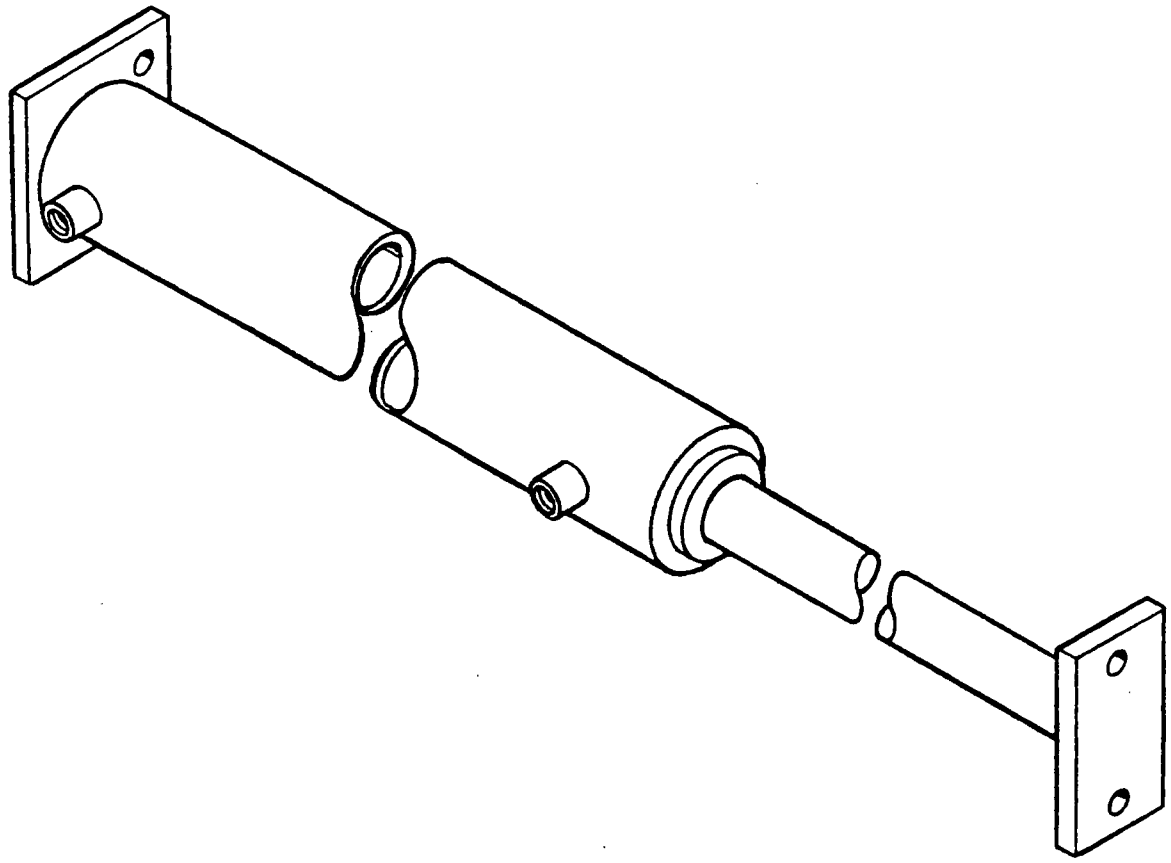


ITEM	PART NUMBER	DESCRIPTION	QTY
4B-	93459	OUTRIGGER ASSEMBLY	1
-1	93202	OUTRIGGER OUTSIDE WELDMENT	1
-2	93204	EXTENSION ASSEMBLY	1
-3	93203	UNISTRUT WELDMENT	1
-4	60343	HEX HEAD CAP SCREW - 3/8-16 UNC X 1	1
-5	93460	FOOT PAD	1
-6	93206	OUTRIGGER SCREW WELDMENT	1



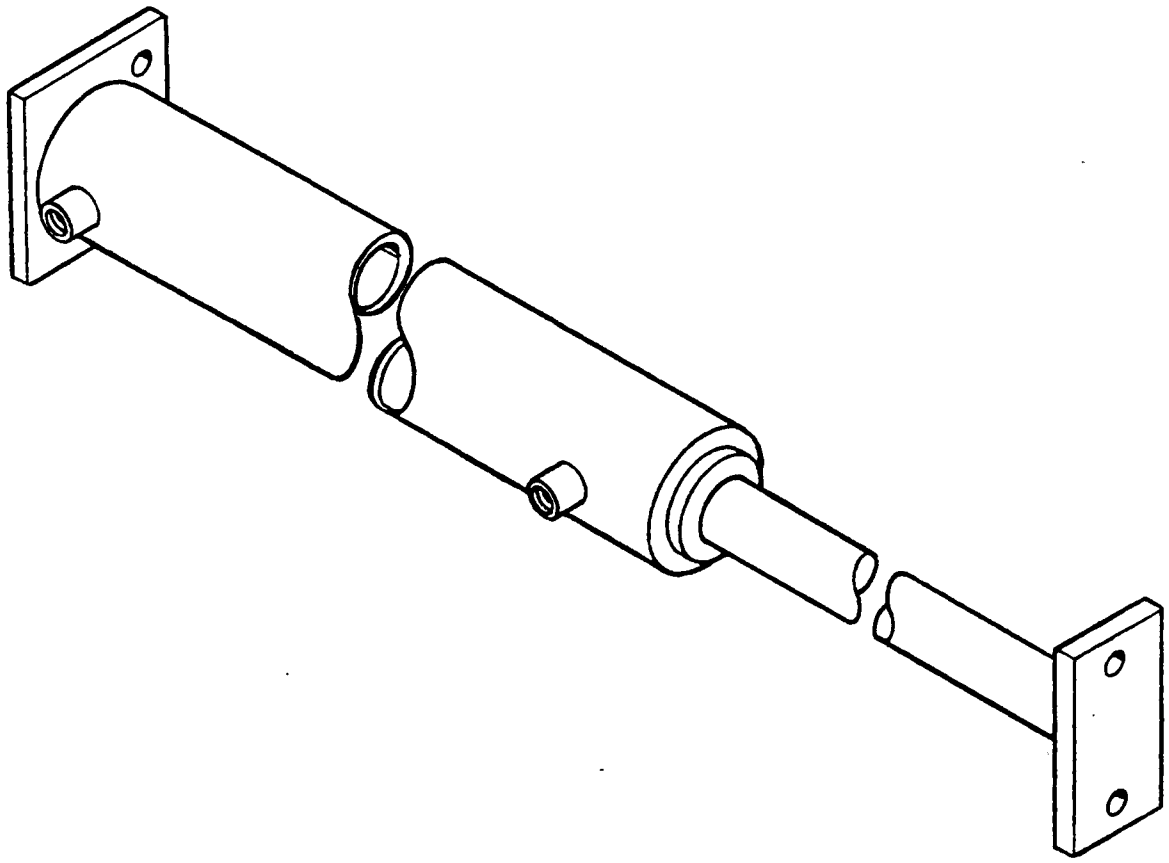
ITEM	PART NUMBER	DESCRIPTION	QTY
5-	91100-1	LIFT CYLINDER (P15) (P20) (P25) (SIERRA)	1
	91100-2	LIFT CYLINDER (P30) (SIERRA)	1
-1	66180	SEAL KIT (P15) (P20) (P25)	1
	66166	SEAL KIT (P30)	1

FIGURE 5A - LIFT CYLINDER (P19DC)



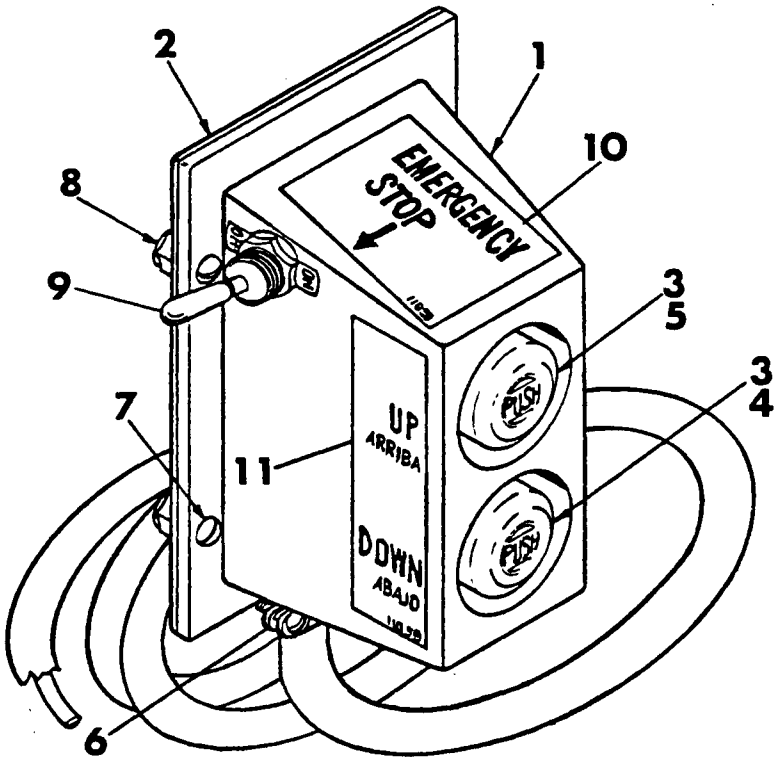
ITEM	PART NUMBER	DESCRIPTION	QTY
5A-	93475	LIFT CYLINDER (SIERRA)	1
-1	66180	SEAL KIT	1

FIGURE 5B - LIFT CYLINDER (P30) (APRIL 1983)



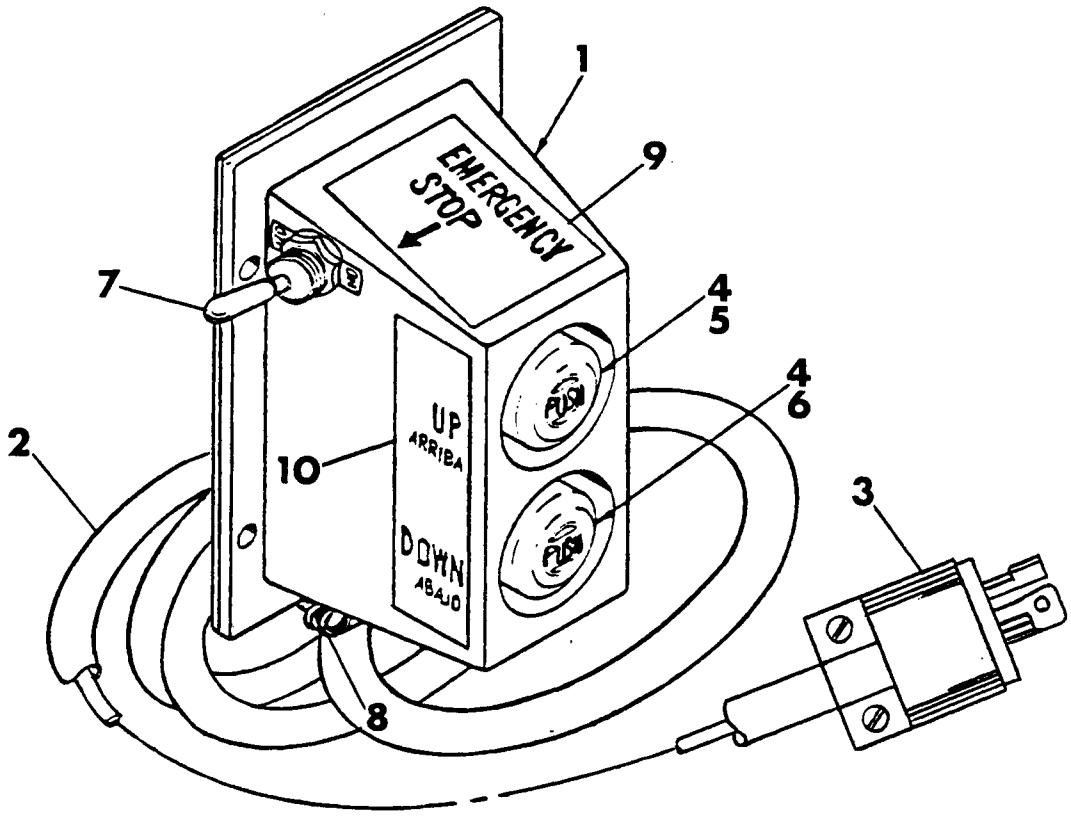
ITEM	PART NUMBER	DESCRIPTION	QTY
5B-	93450	LIFT CYLINDER (SIERRA)	1
-1	66166	SEAL KIT	1

FIGURE 6 - PUSH BUTTON CONTROL STATION ASSEMBLY
(ALL MODELS)



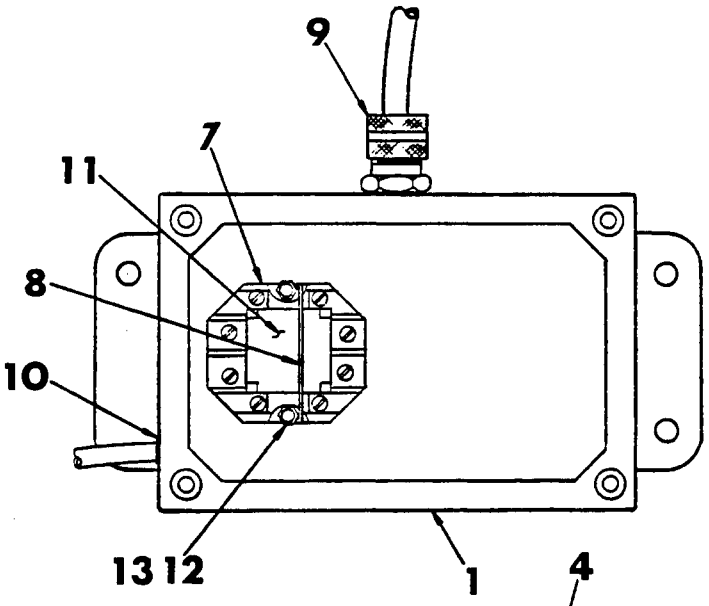
ITEM	PART NUMBER	DESCRIPTION	QTY
6-	91335	PUSH BUTTON CONTROL STATION ASSEMBLY	1
-1	91335-1	CONTROL HOUSING	1
-2	91335-2	CONTROL HOUSING GASKET	1
-3	91335-3	UP-DOWN SWITCH	2
-4	91335-4	DOWN SWITCH CAP-RED	1
-5	91335-5	UP SWITCH CAP-BLACK	1
-6	91335-6	CORD ANCHOR	1
-7		CONTROL HOUSING MOUNTING BOLT - 8-32 X ½	4
-8		CONTROL HOUSING MOUNTING NUT - 8-32 (NYLOC)	4
-9	4017	EMERGENCY STOP SWITCH (UPPER CONTROL STATION)	1
-10	11058	DECAL - "EMERGENCY STOP" (UPPER CONTROL STATION)	1
-11	11059	DECAL - "UP-DOWN"	1

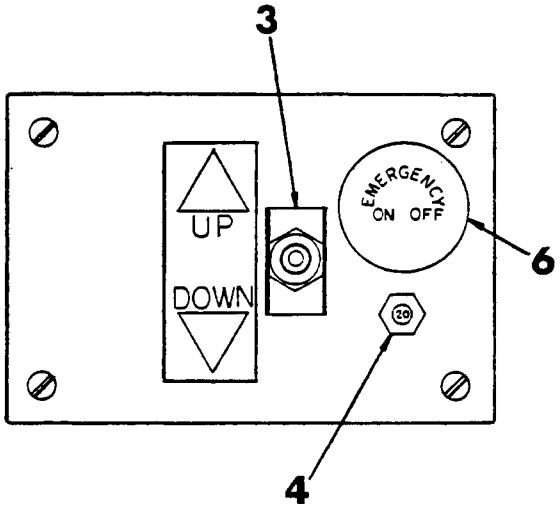
FIGURE 6A - UPPER CONTROL STATION ASSEMBLY (P19DC)



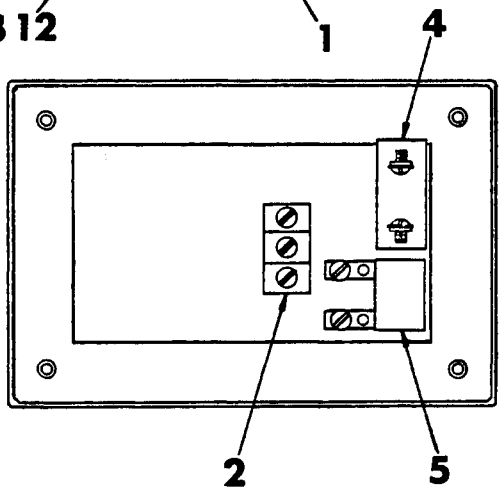
ITEM	PART NUMBER	DESCRIPTION	QTY
6A-	93464	UPPER CONTROL STATION ASSEMBLY	1
-1	70174	ELECTRICAL HOUSING	1
-2	70175	CORD	1
-3	70176	MALE PLUG	1
-4	70177	SWITCH	2
-5	70178	RUBBER CAP - BLACK	1
-6	70179	RUBBER CAP - RED	1
-7	4017	TOGGLE SWITCH	1
-8	70180	CONNECTOR	1
-9	11058	DECAL - "EMERGENCY STOP"	1
-10	11059	DECAL - "UP-DOWN"	1

FIGURE 6B - LOWER CONTROL STATION ASSEMBLY (P19DC)





COVER FRONT VIEW



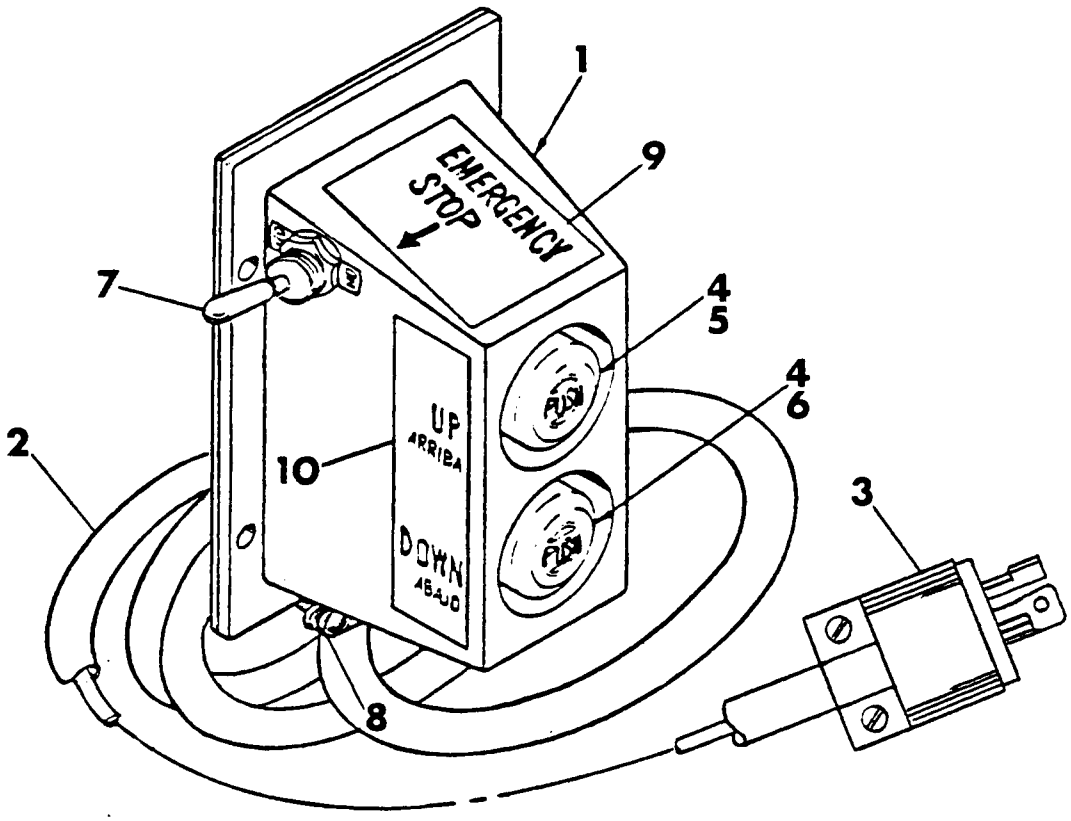
COVER BACK VIEW

ITEM	PART NUMBER	DESCRIPTION	QTY
6B-	93514	LOWER CONTROL STATION ASSEMBLY	1
-1	93515	CONTROL BOX	1
-2	4021	TOGGLE SWITCH	1
-3	20884	SWITCH GUARD	1
-4	20562	CIRCUIT BREAKER	1
-5	4018	SWITCH	1
-6	5300	ON-OFF KNOB	1
-7	4032	RELAY SOCKET	1
-8	30215	HOLD DOWN CLIP	1
-9	66354	STRAIN RELIEF	1

FIGURE 6B - LOWER CONTROL STATION ASSEMBLY (P19DC)

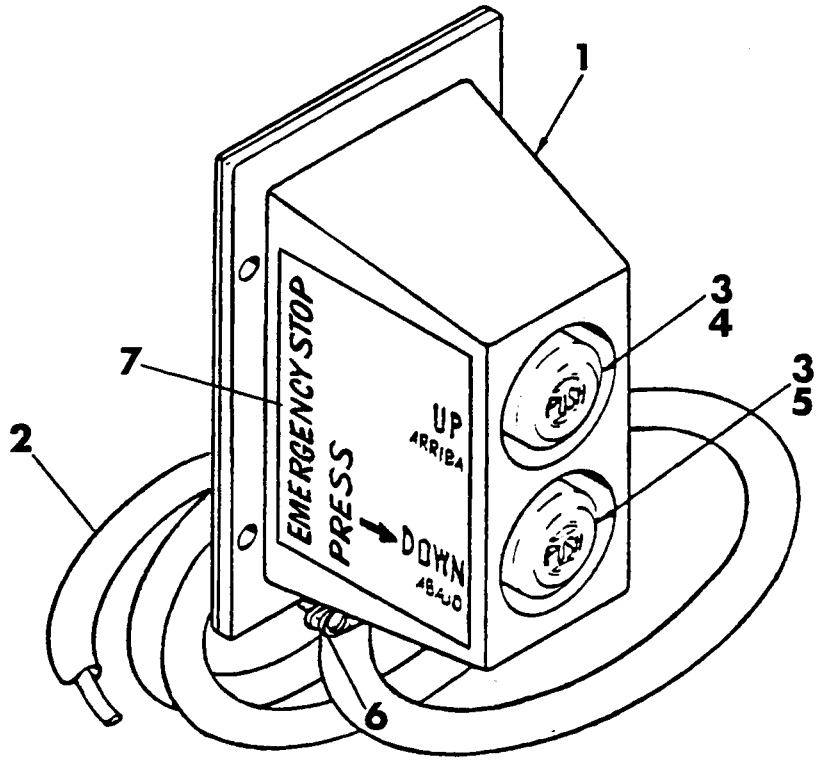
ITEM	PART NUMBER	DESCRIPTION	QTY
-10	70190	GROMMET	1
-11	70139	CONTROL RELAY	1
-12	62604	ROUND HEAD SLOTTED MACHINE SCREW - NO. 10 - 32 UNF X 1/2	2
-13	61241	SELF LOCKING NUT - NO. 10 - 32 UNF	2

FIGURE 6C - UPPER CONTROL STATION ASSEMBLY (P30) (APRIL 1983)



ITEM	PART NUMBER	DESCRIPTION	QTY
6C-	93464	UPPER CONTROL STATION ASSEMBLY	1
-1	70174	ELECTRICAL HOUSING	1
-2	70175	CORD	1
-3	70176	MALE PLUG	1
-4	70177	SWITCH	2
-5	70178	RUBBER CAP - BLACK	1
-6	70179	RUBBER CAP - RED	1
-7	4017	TOGGLE SWITCH	1
-8	70180	CONNECTOR	1
-9	11058	DECAL - "EMERGENCY STOP"	1
-10	11059	DECAL - "UP-DOWN"	1

FIGURE 6D - LOWER CONTROL STATION ASSEMBLY
(P30) (APRIL 1983)



ITEM	PART NUMBER	DESCRIPTION	QTY
6D-	93463	LOWER CONTROL STATION ASSEMBLY	1
-1	70174	ELECTRICAL HOUSING	1
-2	70175	CORD	1
-3	70177	SWITCH	2
-4	70178	RUBBER CAP - BLACK	1
-5	70179	RUBBER CAP - RED	1
-6	70190	CONNECTOR	1
-7	11057	DECAL - "EMERGENCY STOP PRESS UP-DOWN"	1

FIGURE 7 - ELECTRICAL SYSTEM INSTALLATION (P19DC)

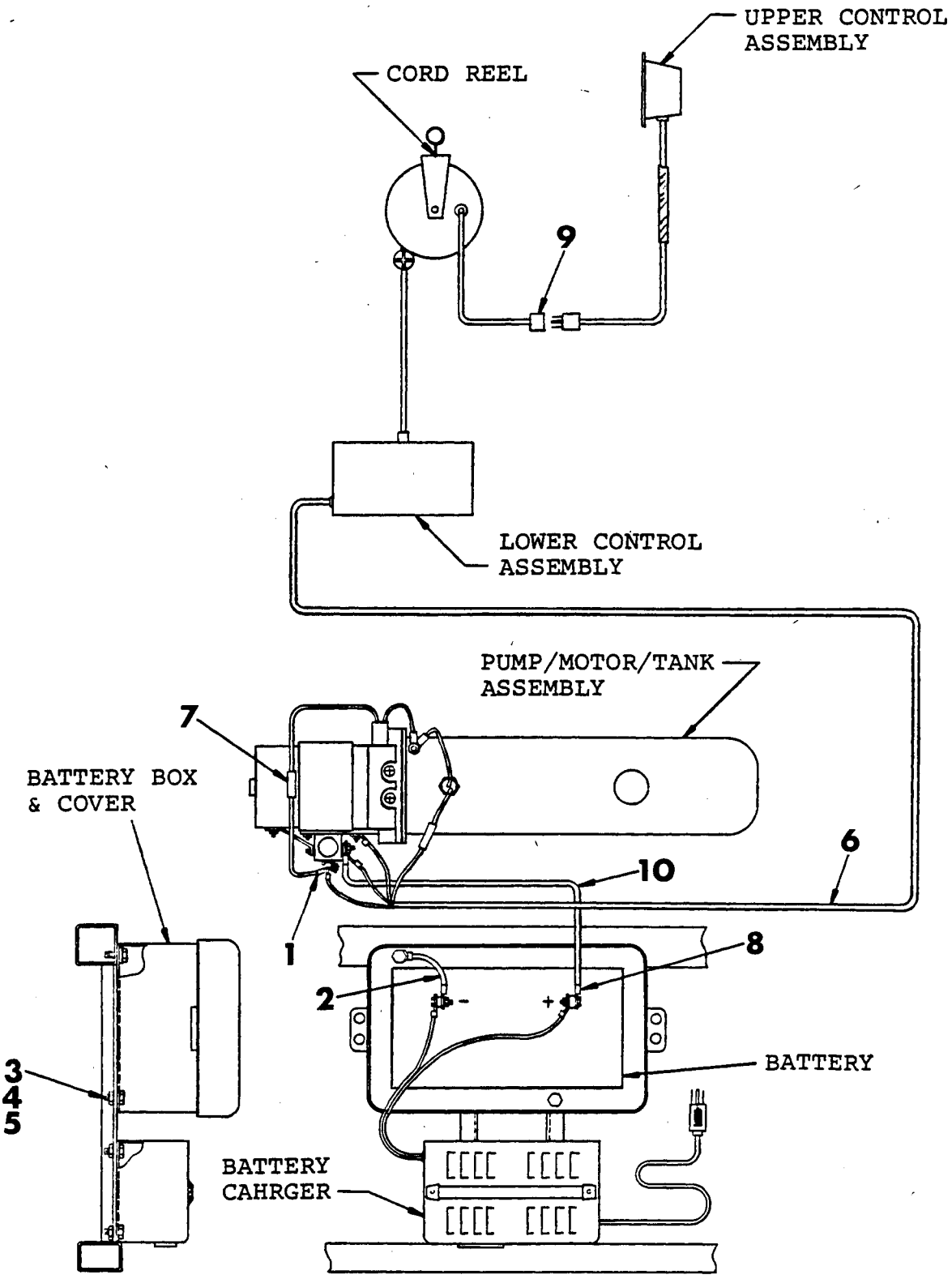


FIGURE 7 - ELECTRICAL SYSTEM INSTALLATION (P19DC)

ITEM	PART NUMBER	DESCRIPTION	QTY
7-	93517	ELECTRICAL SYSTEM INSTALLATION	1
-1	70191	TERMINAL RING TONGUE	5
-2	93519	BATTERY CABLE ASSEMBLY	1
-3	60309	HEX HEAD CAP SCREW - 1/4-20 UNC X 3/4 (GR. 5)	4
-4	63401	FLAT WASHER - 1/4	2
-5	61313	SELF LOCKING NUT - 1/4-20 UNC	3
-6	70187	CORD	1
-7	70069	WIRE SPLICER	2
-8	70056	TERMINAL RING TONGUE	3
-9	70182	CONNECTOR	1
-10	93518	BATTERY CABLE ASSEMBLY	1

FIGURE 8 - HYDRAULIC INSTALLATION (P19DC)

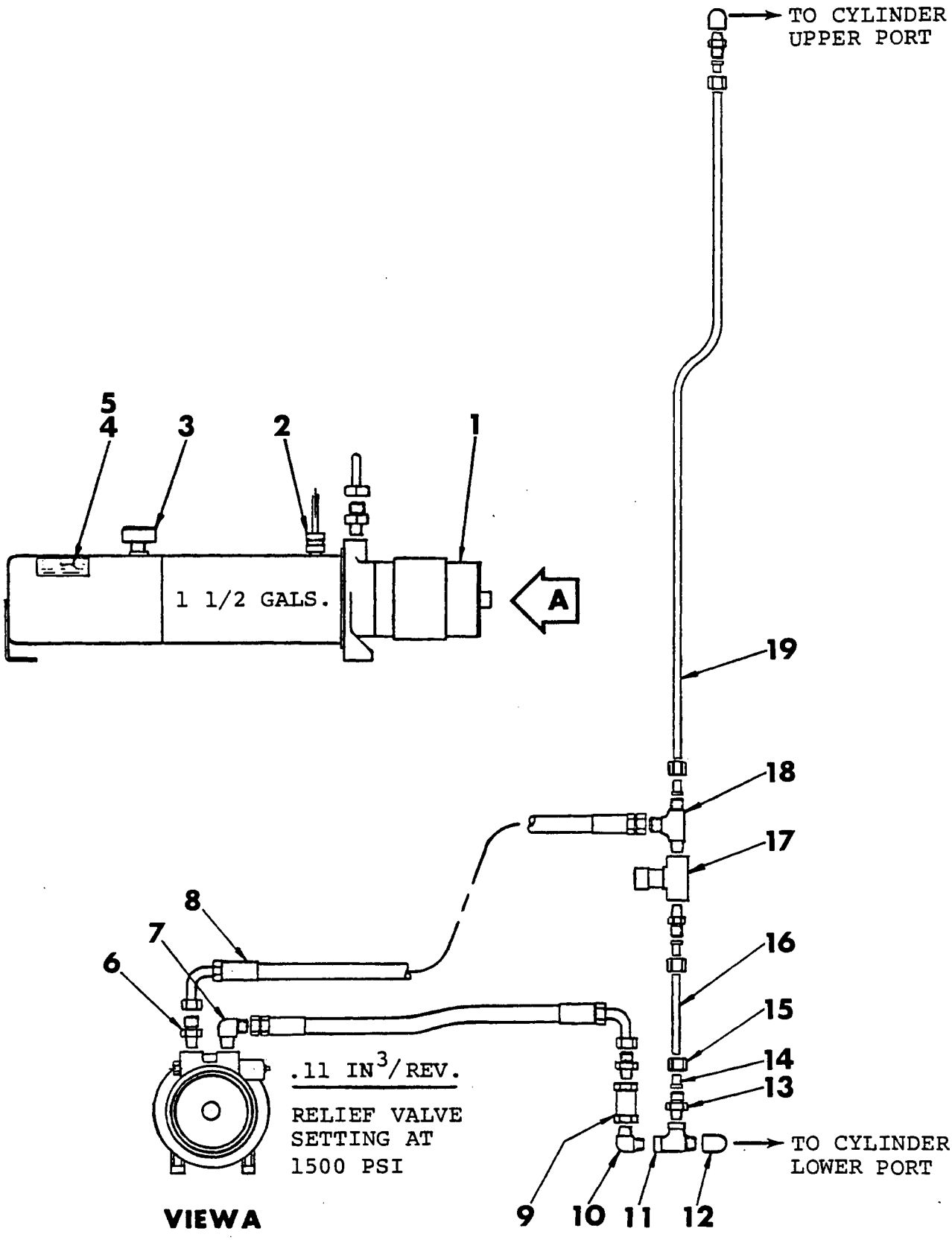


FIGURE 8 - HYDRAULIC INSTALLATION (P19DC)

ITEM	PART NUMBER	DESCRIPTION	QTY
8-	93513	HYDRAULIC INSTALLATION	1
-1	91211	MOTOR/PUMP & TANK UNIT	1
-2	66354	STRAIN RELIEF	1
-3	92213	BREATHER CAP	1
-4	2017	DECAL - HYDRAULIC FLUID SPEC.	1
-5	222	HYDRAULIC FLUID	1 1/2 GALS
-6	2478	MALE CONNECTOR	1
-7	2449	MALE ELBOW	1
-8	93528	HOSE ASSEMBLY	2
-9	92210	CHECK VALVE	1
-10	52500	MALE PIPE ELBOW	1
-11	2420	STREET TEE	1
-12	2450	STREET ELBOW	2
-13	2476	MALE CONNECTOR	4
-14	2540	SLEEVE	4
-15	2539	NUT	4
-16		TUBING - 3/8 X .042 WALL X 3 SAE J-525	1
-17	92223	NEEDLE VALVE	1
-18	2425	MALE RUN TEE	1
-19		TUBING - 3/8 X .042 WALL X 48 SAE J-525	1

C20T BATTERY CHARGER

INSTRUCTIONS

SPECIFICATIONS

MODEL	A-C VOLTS	A-C AMP	BATTERY AMP HRS.	D-C VOLTS	D-C AMP
C20T	117	38	150	6/12	20

CHARGING CHARACTERISTICS

The charging rate of the charger will be indicated on the meter and will depend upon the state of charge of the battery. On a completely discharged battery, the charger will start charging at near the full rating of the unit (20 amp) and as the battery recharges, the rate will reduce reaching about 1/2 the output rating when the battery is fully charged.

Charger output will vary some if the A-C voltage at the outlet where the charger is connected varies from the nominal 117 volts. If the A-C voltage is higher, the output will be higher. If the A-C voltage is lower, the output will be lower.

Charging time is controlled by a 12 hour timer which terminates the charge at the end of a pre-set time. This charger is also equipped with a "trickle-charge" switch. The trickle-charge position should not be used to re-charge dead batteries. Use the trickle-charge position to maintain a battery at full charge if the equipment is not used for several months. A 12 hour trickle-charge once a month should be suffficient to maintain the battery at full charge.

OPERATING INSTRUCTIONS

1. Do not expose the charger to rain or other adverse weather conditions.
2. There must be a three wire, single phase, 117 volt, 15 ampere power outlet within reach of the A-C power cord of the charger.
3. Be sure the timer is in the "OFF" position, the trickle switch is in the 20A position, and the 6/12 switch is set for 12 volts.
4. Connect the A-C plug to the 117 volt, grounded power outlet.
5. Turn the timer "ON" to the desired setting (see table below.)

BATTERY SPECIFIC GRAVITY READING	CONDITION OF BATTERY	HOURS NEEDED TO RE-CHARGE
1100	Fully discharged	12
1150	80% discharged	10
1200	40% discharged	6
1250 up	0-10% discharged	0*

(* 12 hour trickle charge may be beneficial)

OPERATING INSTRUCTIONS (CONT.)

6. The timer will turn the charger off after the preset time has elapsed.
7. After charge is completed and the timer has shut off, remove the A-C cord from the power outlet.
8. Using a hydrometer, verify that the battery is properly charged.

IMPORTANT FACTS ON BATTERIES AND CHARGERS

To determine whether or not a battery is properly charged, a measuring device known as a hydrometer is used. A hydrometer measures the specific gravity of a liquid and a battery hydrometer is graduated to measure the specific gravity of battery electrolyte. The electrolyte in your battery becomes heavier as it is charged, therefore, a higher specific gravity reading indicates a higher charge condition of your battery. The specific gravity reading will range from 1100 for a completely discharged battery to 1260 for a fully charged battery. No amount of overcharging will raise the specific gravity above 1260 on the electric vehicle type of battery. Overcharging destroys the positive plates. Consistent undercharging causes a buckling of the plates.

Do not discard a good battery as being defective because its specific gravity does not show an increase immediately upon applying a charge. Many good batteries require a charging period as long as three hours before they show any increase in the specific gravity. Do not charge a battery if the electrolyte temperature could rise about 120 degrees F. This could damage both battery and charger. As a rule of thumb, the electrolyte temperature during normal charging will rise about 25 degrees above the temperature in the charging area.

Failure to keep the battery electrolyte to the proper level will result in crumbling (abnormal sulfation) of the plates and cause failure of the battery. Distilled water must be added to the battery regularly to make up for the loss due to evaporation. Prior to charging, the electrolyte level should cover the battery plates. Fill the battery to the proper level only after it has been fully charged.

WARNING - HAZARD OF EXPLOSIVE GAS MIXTURE

Batteries being charged or discharged will give off hydrogen gas. If this gas is concentrated it can cause an explosion. Concentrations of gas may remain for several hours if ventilation is not provided. Do not have any fire in the vicinity and do not tamper with circuits that might cause sparking while charging or discharging batteries.

INSPECTION OF BATTERIES AND ASSOCIATED CIRCUITS

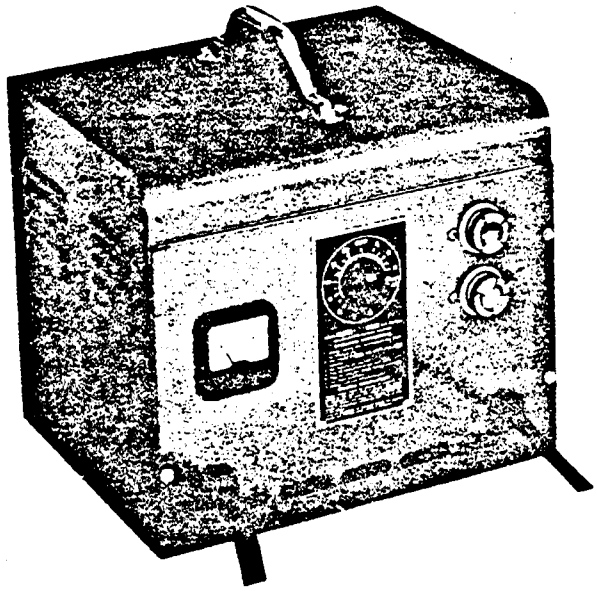
An inspection of batteries and associated circuits is required to assure that the batteries are being properly charged. For this inspection we recommend the use of a hydrometer and a continuity tester.

INSPECTION OF BATTERIES AND ASSOCIATED CIRCUITS (CONT.)

1. Verify that all connections within the unit to be charged are clean and tight.
2. Check each battery for loose terminals.
3. Test for continuity between all battery terminals and the charging receptacle.
4. Verify that the top of each battery is free of moisture, grease and acid film, which may cause terminal corrosion and current leakage.
5. After the battery has been recharged, test each individual cell in each battery with the hydrometer to verify that all specific gravity readings are within 10 points of each other.
6. Using the hydrometer, pull out acid from a cell and then vigorously expel the acid back into the cell to cause a violent stirring action. Immediately draw out another sample of acid and visually inspect it to see if it contains a brownish sediment (indicates positive plates are deteriorated).
7. When testing battery condition with hydrometer, always return electrolyte solution to the same cell from which it was removed. DO NOT MIX electrolyte from one cell to another.

OPERATING & SERVICING

1220A-2(OVERSEAS)



SINCE 1929

CHRISTIE

ELECTRIC CORP.

SERIES "A" BATTERY CHARGERS

INTRODUCTION

This handbook describes the installation, operation, trouble shooting, and repair of the CHRISTIE Series A portable and built-in battery chargers. These units are self-contained, fully automated, ruggedized, commercial battery chargers, designed for operation on the normal electrical service. The built-in model is permanently mounted on the battery powered vehicle.

SPECIFICATIONS

INPUT POWER	115 Volts; 60 Hz
INPUT ADJUSTMENT	Transformer taps factory set
OUTPUT VOLTAGE	24, 36 or 48 volts, DC
OUTPUT CURRENT	20 Amp, Max.
OUTPUT MONITOR	0 to 30 amp meter, $\pm$5%
OUTPUT CONNECTION	Polarized plug on 9 ft. cable (portable type only)
OUTPUT CONTROL	24-hour Automatic Timer
TRANSFORMER PROTECTION	30 Amp output fuses
PERSONNEL PROTECTION	Grounded cabinet (3rd wire)
SHIPPING WEIGHT	35 pounds

INSPECTION AND INSTALLATION

Inspect the exterior of the shipping container for visual signs of rough handling during shipment

Remove the charger from the shipping container and inspect the exterior of the unit for damage (broken glass, cracked knobs, etc.). CLAIMS FOR SHIPPING DAMAGE SHOULD BE FILED WITH THE CARRIER.

Install the charger on any suitable working surface so that there is free access to the front (control) panel and at least six (6) inches of free clearance on each side. There should be at least two (2) inches of clearance on the top of the charger. (The charger may be suspended overhead by the handle.) The clearance is required to allow proper flow of air through the side and top louvers for cooling.

There must be a separately fused, three-wire, single phase, 115 volt, 15 ampere power receptacle within reach of the AC input cord of the charger.

OPERATING INSTRUCTIONS

1. Verify that the output fuses are fully tightened.
2. Connect the AC plug to a suitable power receptacle.
3. Connect the DC plug to the battery receptacle. (On the built-in model chargers, the DC lead is permanently connected to the batteries).

NOTE

Check the output plug for the correct polarity.*
The WHITE lead must be connected to the POSITIVE terminal
The BLACK lead must be connected to the NEGATIVE terminal

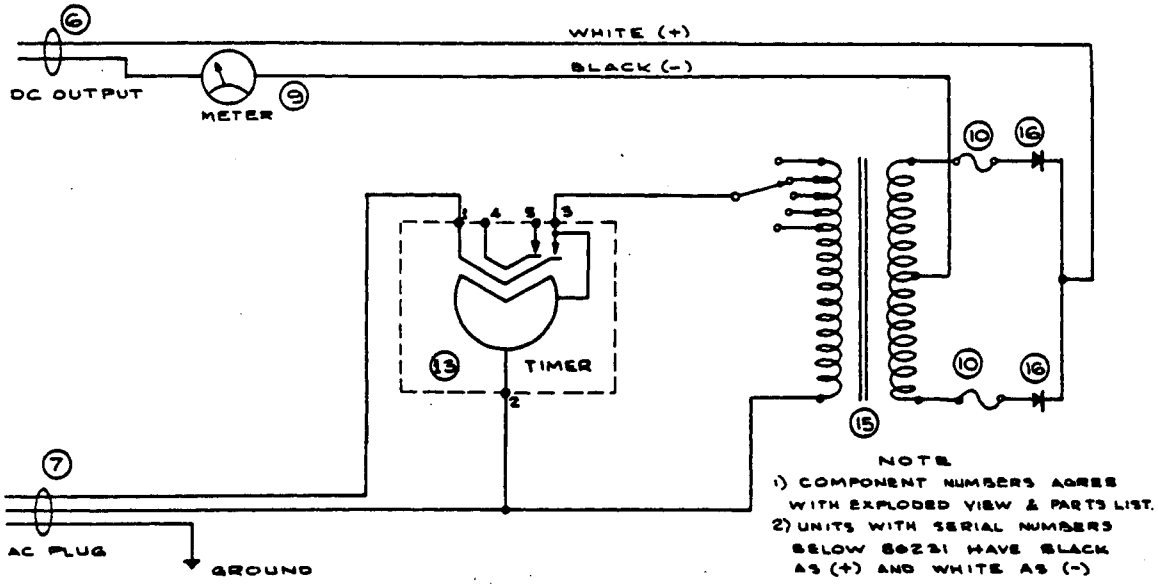
*Units with serial numbers below 86231 are wired with black as positive and white as negative.

4. Determine the charging time. See CHARGING TIME CHART.
5. Turn on the charger by setting the TIMER CONTROL knob to the desired charging time.
6. Verify that the OUTPUT METER indicates a charging current. (If it does not, see TROUBLE SHOOTING SECTION).
7. The TIMER CONTROL will turn off the charger (positive turn-off feature) at the completion of the charge cycle.
8. Disconnect the battery from the charger (on built-in model disconnect the AC cord).
9. Using a hydrometer, verify that the battery has been properly charged.

TROUBLE SHOOTING & REPAIR INSTRUCTIONS

LOW OR NO CHARGING CURRENT

1. Using a voltmeter, verify that the battery being charged has no open or dead cells. Check jumper cables between batteries for tight and clean connections and also verify that the battery is not already fully charged.
2. Check the output fuses of the charger.
3. Verify that the AC receptacle has power by plugging in an electrical appliance.
4. Turn the charger ON and verify that the transformer hums. If no hum is heard, proceed with step 4.1. If a hum exists, go to step 5.
   - 4.1 Remove cabinet cover (1) to gain access to the interior of the charger.
   - 4.2 Disconnect the transformer primary leads from the timer assembly (13). Check for continuity between the two primary input leads of the transformer on the terminal board (20). If no continuity is found, replace the transformer. If continuity is found, proceed as follows:
   - 4.3 With the timer switch ON, check for continuity across the switch. If the switch is open with the timer on, replace the timer assembly.



CHRISTIE SERIES "A" BATTERY CHARGERS

4.4 If all of the foregoing checks indicate continuity, but the transformer does not hum, check for loose or broken leads between the AC plug, timer assembly (13), and terminal board (20).

5. If the transformer hums, proceed as follows:
   - 5.1 Check the two output fuses (10) to insure they are good. Inspect the fuse holders for damage or a blackened appearance. (If the fuse holder is blackened it indicates oxidation and should be replaced).
   - 5.2 Remove one of the output fuses. With the timer switch OFF, check for continuity across the DC output plug, connecting the continuity indicator first in one direction and then in the other. The indicator should show an open in one direction and continuity in the other.
   - 5.3 Repeat step 5.2, interchanging the condition of the two output fuses.
   - 5.4 If a short is measured in <u>both</u> directions in either step 5.2 or 5.3, the diode associated with the installed fuse is defective and should be replaced. If the indications in <u>both</u> directions in either step 5.2 or 5.3 are open, then the diode or transformer secondary may be open.
   - 5.5 To isolate the defective part with one of the output fuses installed, check for continuity between its fuse holder and <u>both</u> terminals of the output ammeter (9). If continuity exists between the fuse holder and one of the meter terminals but not the other, the meter and shunt are defective and must be replaced.
   - 5.6 If continuity exists, repeat step 5.5 by interchanging fuses and connecting the continuity meter to the other fuse holder.
   - 5.7 If continuity does not exist in either step 5.5 or 5.6, the transformer secondary may be open. Check for continuity directly across the transformer secondary with both output fuses removed.
   - 5.8 If all indications to this point are normal, test the entire DC output circuitry for continuity by progressing from the +DC output prong to the -DC prong in incremental test sections, checking for open circuits and poor connections.

AC LINE FUSES BLOW

6. With unit unplugged and timer turned ON, check for continuity between each input prong of the AC plug and the ground plug. If all indications are open, the transformer or timer is shorted. Operate the timer with the transformer disconnected to isolate the faulty item. If continuity is found, a short circuit exists and must be found and removed.

OUTPUT FUSES BLOW

7. Verify that the circuit under charge is not shorted by disconnecting the charger and operating it disconnected.
8. If output fuses continue to blow, test the charger as per steps 5.1 through 5.8.

TIMER DOES NOT TURN UNIT OFF

9. Indicates that timer motor or switch is faulty. Replace timer assembly.

CHARGING TIME CHART

The following chart provides useful information for determining the minimum charging time needed to restore a battery to a full charge condition. In addition to normal charging, the cells of the batteries should be equalized twice each month. This is done by charging the batteries an additional seven (7) hours after a normal charge cycle. The current indications of the ammeter will be low during cell equalization.

Specific Gravity Reading	Condition of Battery	Hours Needed to Charge
1100	fully discharged	12
1125	10% charged	10
1150	20% charged	8
1175	30% charged	7
1200	60% charged	4
1225	75% charged	2
1250	95% charged	½
1260	fully charged	0

INSPECTION OF BATTERIES AND ASSOCIATED CIRCUITS

An inspection of batteries and associated circuits is required often to assure that the batteries are capable of being fully charged. This inspection requires the use of a single-cell voltmeter, a hydrometer, and a continuity tester.

1. Verify that all connections within the unit to be charged are clean and tight.
2. Check each battery for loose terminal posts.
3. Test for continuity between all battery terminals and the charging receptacle.
4. Verify that the top of each battery is free of moisture, grease, and acid films which may cause a current leakage.
5. Test each individual cell in each battery with the hydrometer to verify that all specific gravity readings are within 10 points of one another.
6. Using the hydrometer, pull out acid from a cell and then vigorously expel the acid back into the cell to cause a violent stirring action. Immediately draw out another sample of acid and visually inspect it to see if it contains a brownish sediment (indicates positive plates are deteriorated).

IMPORTANT FACTS ON BATTERIES AND CHARGERS

Do not discard a good battery as being defective because its specific gravity does not show an increase immediately upon applying a charge. Many good batteries require a charging period as long as three (3) hours before they show any increase in the specific gravity.

Do not charge a battery if the electrolyte temperature could rise above 120°F. This could damage both battery and charger. As a fule of thumb, the electrolyte temperature during normal charging is about 20°F above the local air temperature.

There are only two test methods to determine if a discharged battery is defective without applying a charge. These tests are given in steps 5 and 6 of the INSPECTION OF BATTERIES AND ASSOCIATED CIRCUITS. Voltage testing methods without fully charging or made while charging have no relationship to battery defectiveness.

Failure to keep the battery electrolyte to the proper level will result in a crumbling (abnormal sulfation) of the plates and cause failure of the battery. Distilled water must be added to the battery regularly to make up for the loss due to evaporation, especially during periods of high charging rates. Add water only to fully charged batteries.

Both overcharging and undercharging can cause a premature failure of a battery. Overcharging destroys the positive plates. Consistent undercharging cause a buckling of the plates.

The most reliable, safe, and efficient battery chargers are of the automatic, two-step design, or the taper design. Other types of chargers can cause a charging rate in violation of the "Ampere-Hour Law? and damage the battery. All CHRISTIE chargers are either the taper or automatic two-step design.

Service Instructions

MANUAL PUMP

The complete hand pump unit consists of a pump mounted on a tank.

Simplicity is the keynote of construction. Should trouble occur, however, these service instructions will enable the trouble to be located and corrected.

DETAILED DESCRIPTION

The pump is double-acting. A full or partial stroke is effective in either direction. Outlets tapped for ¼" NPT male fittings are provided at both ends of the pump. If only a single outlet is used, the other remains plugged.

The tank serves as the hydraulic oil reservoir. During shipment the filler opening is closed with a solid plug. It should be replaced with a vented plug when in operation.

Most normally, hand pumps are mounted in a vertical position. There should be adequate oil to operate all rams connected to the tank at one time, plus a reserve. It is important that the end of the suction pipe be submerged at all times. The suction pipe must be tight to prevent air from entering the pump.

If the hand pump is installed in any position other than vertical, again be certain that the suction pipe is always submerged.

OIL SPECIFICATIONS

The hydraulic oil we supply in these units is of the best quality, suitable for all-year operation, including winter temperatures as low as 20 to 30 degrees below zero. Whenever replacing oil, use equal quality. An SAE 10W oil with a minus 30 degree cold-pour test is satisfactory for climates wherein temperatures do not fall below this mark. Never use hydraulic brake fluid.

Care should be taken when filling the tank to exclude all foreign particles and water. Dirt will eventually damage check valves; water causes foaming, and castings can burst if freezing occurs.

LINES AND HOSES

High pressure flexible hose or tubing with a minimum bursting pressure between 8,000 & 10,000 psi is recommended. Since the pump outlets are ¼", lines should be the same size.

A union or swivel connection should be used at one end of the line. When assembling attach the non-swiveling end of the line to the pump unit. With the ram in its operating position and retracted, run the connecting line from the pump to the ram and work the pump handle until oil flows from the end of the line. Then make the connection, venting as much air as possible from the line. Be sure, also, to avoid twists in the hose when tightening the union or swivel. Twists cause early hose failures. And air in the lines creates uncertain and jerky action. So keep all lines tight.

OPERATION

To extend a ram connected to the pump, first close the control valve. Then operate the pump handle back and forth until the ram has been extended to the desired length, or until the end of its stroke. The ram will stay in this position until lowered by the operator. Do not pump after the end of the stroke has been reached, which is signalled by sharply increased resistance on the pump handle. Never use a longer handle than provided as original equipment. To do so may damage vital parts.

To lower or retract the ram, open the control valve and the load on the ram will force it down, at the same time returning the oil to the supply tank. Speed of lowering can be controlled by varying the valve opening.

CARE AND SERVICE

Should the pump fail to operate at one or both ends of the stroke, it is usually due to improper seating of check balls. Dirt and other foreign particles are the chief troublemakers. Remove plug No. 21 and check balls and springs. Examine the seats to see that they are smooth and clean. Clean all parts thoroughly and reassemble. Apply sealing compound to the thread of the plug and tighten into place. Take care not to use an excess of compound which will work into the oil passages.

If both ends fail to pump, dirt may be in both check valves or an insufficiency of oil may have exposed the suction line. Make sure the suction pipe is clean, free of obstructions, and airtight. Replenish the oil supply if insufficient. Also, check to see that the seat and needle valve seal perfectly.

Use sealing compound on the threads of caps No. 5 when reassembling if they have been removed to inspect the piston or bore of the pump. These caps must be tight to prevent any oil leak and to keep air out of the pump.

If necessary to remove the plunger, be sure to refill the operating lever chamber with oil.

ORIGINAL SERVICE PARTS

In order to avoid delays in receiving service parts, please include the model and serial numbers of the pump in your order.

Operator's Notebook

TROUBLE SHOOTING & SERVICING
D. C. Powered Hydraulic Controls

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It is the intent of this article to specifically cover D.C. Powered Hydraulic Control Systems.

Before we can confront maintenance problems, however, we must have test equipment with which we can isolate specific problems. The following is a list of the essential equipment required and is readily available through local sources. First, a small 5000 PSI pressuregage, preferably glycerine filled; second, a high pressure needle type shut off valve; third, a volt meter; fourth, a piece of high pressure hose, low pressure hose and some assorted fittings such as tees, nipples, couplings, etc., to adapt the test equipment to the system; fifth, a jumper wire or two with alligator clips.

With the above mentioned test equipment at hand we are now able to define, isolate, and correct some of the more common problems found in D.C. Power Hydraulic Controls.

The system can be broken down into 5 basic problem areas. First, the motor and its control; second, the reservoir and sump filter; third, the pump and relief valve; fourth, the valving and its filtration; and fifth, the cylinders, hoses and related fittings.

First then, lets look at the D.C. motor and its control circuit. Problems common in this area are: 1) faulty control switches or contacts, 2) motor start solenoid failure; 3) corroded battery cable connections or insufficient ground capability and finally, 4) failure of the motor itself. To trouble shoot, energize the motor through regular control circuitry, if motor does not start check for a misaligned or broken contact finger or a faulty switch; the jumper wire can be used to bypass suspected components. Replace or repair parts as required. If the switches and wiring check out, however the motor still does not start when required, look next at the motor start solenoid. Place voltmeter across motor side of solenoid start switch and ground. (Fig. 1). If you do not have a voltage reading with control system energized replace the motor start solenoid. NOTE: there are many different types of motor start solenoids used by the manufacturers, be sure the new solenoid is of the same type as the original. With the system in operation and the pump running over relief the voltage at the motor (Fig. 1). should not drop below 9.5 volts with a good fully charged battery; if it does, clean battery cable connections and check for a good ground connection and proper battery voltage. The installation of heavier gauge cable might be

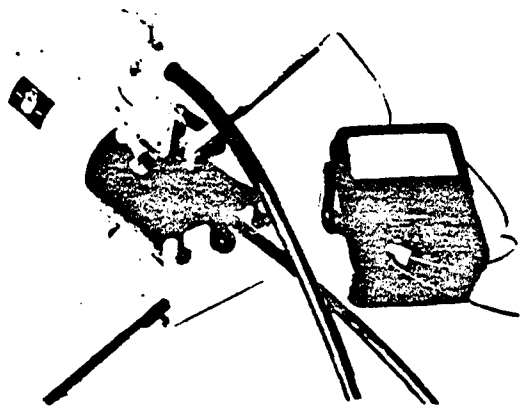

Figure 1

in order if a check with the meter shows a voltage drop in the cables themselves.

If the motor is still drawing too heavy voltage clean or replace brushes, inspect motor bearings, armature, and field windings, and repair as required. If motor does not turn or works slow in freezing weather or if the inside of the motor case is rusty the motor is probably filling up with water. Clean drain hole or drill a small hole in lowest part of motor case to let water and condensation out. This problem is especially prevalent on units mounted on the outside of vehicle or on those which are washed with high pressure cleaning equipment.

The second area to consider is the reservoir and sump filter. Problems found in this area are: 1) dirty suction filter; 2) oil in tank is dirty or has water suspended in it; 3) suction pickup tube is loose or broken, or 4) oil is too heavy for use in cold temperature. All of the above problems starve the pump for oil and cause cavitation, the cylinders will act slow and jerky and the pump makes a muffled grinding sound. The motor does not slow down to normal speed as oil is not reaching the pump to be displaced to the cylinders. To isolate this problem, remove valves from unit, place hose in high pressure output, energize pump and observe the flow. The flow should meet manufacturers specifications and be steady and clear with no air bubbles suspended in the oil. (Fig. 2). To correct problem remove tank, clean or replace dirty screen, check pickup tube for fractures or looseness. Clean reservoir with solvent. (Do not wipe with rags.) Water suspended in oil makes it look milky, replace oil every year and use oil no thicker than 200 SSU

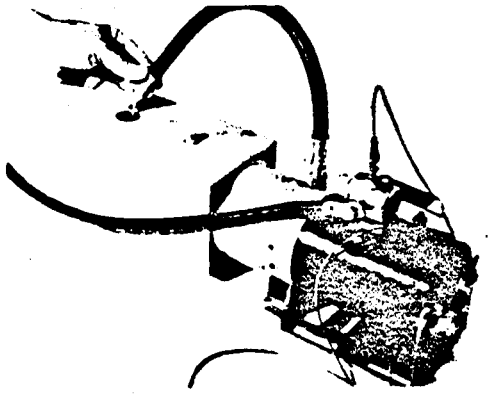

Figure 2

@ 100 F and a pour point low enough for your climate (consult manufacturers specifications).

The third basic area is the pump and its relief valve. Problems found in this area are relief valves with weak springs or dirt contamination and a worn pump. The symptoms found here are slow speed with lack of sufficient pressure to lift the load. Again, to troubleshoot these problems; isolate the pump, place a high pressure hose in pump outlet, run it to a high pressure tee and attach a gage and shut off valve to the other connections. Run a low pressure hose from valve back to tank. (See Fig. 3). Energize pump and slowly shut off the valve, pressure should climb to relief valve setting.

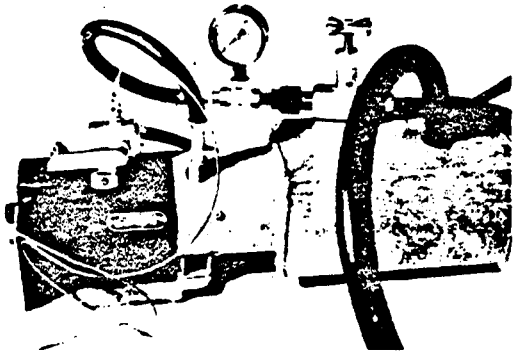

Figure 3

(See manufacturers specifications). If pressure does not rise, remove relief valve cone or ball and flush seat area with oil (Energize pump) replace faulty parts and "Seat" ball or cone with a drift punch (light hit) and small hammer; adjust screw to set proper pressure using the gage as shown in Fig. 3. If proper pressure still cannot be achieved the pump is worn and oil is slipping past the gears. Replace the pump. NOTE: the above symptoms can be caused by a dirty suction filter and this area should be inspected and corrected before disturbing the pump. (See above).

The next area to consider is the valving. The only purpose of valves is to control the path the oil must take in order to get to and from the cylinders. Therefore, a valve failure would constitute a loss of the required control. Specific problems commonly found in valves are: 1) faulty load checks, 2) binding or freezing of control rods or cables, 3) loose handles, 4) faulty switches, 5) broken or shorted wires, 6) solenoid failures, 7) contamination causing sticking of internal parts, 8) damaged internal parts due to high pressure shocks, and 9) dirty filters which protect the valves from cylinder contamination. Lets first consider the valve controlling the lift cylinder, the three-way valve. If the symptom is cylinder drift, the problem probably lies in faulty load checks. There are three types used: 1) mechanical, 2) pilot or hydraulic operated and 3) solenoid operated. To repair, remove check from valve, clean and or replace worn parts and reinstall. If the plow fails to drop when the valve is shifted to the "lower position" check and repair, binding controls or loose handles in manual valves, or; faulty switches, wiring, solenoids or stuck spools in electric valves. Some valves are equipped with filters and they should be inspected for dirt when system reacts slow on decent. If the problem lies in the fact that plow will not raise when valve is shifted to the "up position" again check and repair binding controls or loose handles on the manual valves or in the case of a solenoid operated valve, check the switch, wiring, solenoid or the spool. NOTE: when raising the plow there should be no oil circulating to tank, remove breather and check for this condition, this will allow you to determine if the tank port on the valve is being shut completely off. Note a weak relief valve spring will cause the same problem to exist, (See above). Plows that have "power reverse" are equipped with a 4-way valve in addition to the 3-way. The basic components are the same, however, and should be inspected and repaired in the same manner as the lift valve. In some instances "Power Reverse" systems are equipped with cross over relief valves, these valves are designed to protect the plow in the event an immovable object is struck. These valves are simply made up of 2 relief valves mounted back to back in the cylinder lines. On occasion these reliefs do not find their seat after hitting an object at high speed. If this is true the plow will not hold a load in the neutral position and the plow will move slowly when the valve is shifted. If this is the case remove the cone (or ball) and inspect the spring and other connected parts for damage, replace any faulty parts and reset relief valves to proper setting. (NOTE: Consult the manufacturer for proper specifications).

The final area for inspection is made up of cylinders, hoses, and their related fittings. The most prevalent problems found here are worn or leaking cylinder packings and broken or loose fittings. Check all fittings and hoses for leaks, keep all threads tight and leak free. This is of utmost importance since D.C. powered hydraulic systems have quite small reservoir tanks and any leak can soon drain the tank which causes entire systems to become filled with air. Cylinder packings can also leak and should be checked for seepage. If the cylinder is equipped with vee-ring packings they can be tightened slightly to correct problem (Do not tighten more than ¼ to ½ turn at any one time. If this does not cure the problem or if cylinder is made with O-ring seals replace the worn seals. It should be noted that seals that have become worn break down, find their way back into the valves and reservoir. When replacing these seals check the filters in the system as they will trap these particles and clog, causing a failure in the not too distant future.

The above mentioned list is made up of the more common problems found in D.C. powered hydraulics, it is by no means complete in every detail or aimed at any one pump unit. If you have specific problems which are related to a particular unit the manufacturer should be contacted. Parts sheets, wire diagrams, hydraulics schematics and service manuals can be supplied for your careful study and should be consulted when diagnosing the particular units you are using. ●

SERVICE BULLETINS

As we make improvements to the **MARKLIFTS**, we like to supply you, the customer, with updated information which applies to your machine.

This section is provided as a place to store Service Bulletins as you receive them from MARK INDUSTRIES.

No: 3387
Date: April, 1983

To: Mark Industries Distributors and Representatives

From: Service Department

Subject: Revision 1 - Telescoping Push-Around Operation Maintenance and Parts Manual.

This revision has been prepared to incorporate New Model P19DC and P30 AC & DC coverage. The P19DC has been in production since June 1983. The P30 AC & DC Models are going into production April 1983.

For ease of updating this Manual, a complete parts section has been provided. The Revision 1 section replaces the existing section in your book.

Refer to the "Record of Revisions" (Page iv) in the fore-matter section, as a guide to perform the rest of this update.

This cover letter goes in the "Service Bulletins" section.

John Laurin
Service Manager