TECHNICAL MANUAL

OPERATION, SERVICE AND REPAIR

INSTRUCTIONS

5 TON HYDRAULIC AIRCRAFT HAND JACK

TYPE A-5, PART NO. 53D22020

(REGENT)
(ROCKWEL ENGINEERING)

THIS PUBLICATION REPLACES T.O. 35A2-2-37-1, DATED 1 SEPTEMBER 1957.

TO BE DISTRIBUTED IN ACCORDANCE WITH DD FORM 12-31 (QTY RQR BLOCK NO. 95) IN DIRECT AND GENERAL SUPPORT MAINTENANCE REQUIREMENTS FOR ALL FIXED WING AND ROTOR WING AIRCRAFT.

PUBLISHED UNDER THE AUTHORITY OF THE SECRETARY OF TME AIR FORCE
ANO UNDER THE AUTHORITY OF THE SECRETARY OF THE ARMY.

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES; DISPOSE OF SUPERSEDED PAGES IN ACCORDANCE WITH APPLICABLE REGULATIONS.

NOTE: 1. The portion of text affected by changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

2. Zero in the Change No. column indicates an original page.

3. An asterisk indicates pages changed, added, or deleted by the current change.

DATES OF ISSUE FOR ORIGINAL AND CHANGED PAGES ARE:

Original . . 0 . . 1 Aug 75

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 12 **CONSISTING OF THE FOLLOWING:**

Page No.	Change No.	Page No.	Change No.	Page No.	Change No.
Title	0				
A	0				
1 – 10	0				

Upon receipt of the second and subsequent changes to this technical order, personnel responsible for maintaining this publication in current status will ascertain that all previous changes have been received and incorporated. Action should be taken promptly if the publication is incomplete.

TABLE OF CONTENTS

Section			Page
I	INTRODUCTION		1
	1-1.	General	
	1-2.	Description	1
	1-3.	Purpose	2
	1-4.	Leading Particulars	2
II	OPERATION AND SERVICE INSTRUCTIONS		3
	2-1.	Principle of Operation	3
	2-2.	Operating Preparation	3
	2-3.	LiftingProcedure.	3
	2-4.	LoweringProcedure.	4
	2-5,	Periodic Lubrication.	4
	2-6.	Periodic Inspection.	4
	2-7.	Trouble Shooting	4
III	REPAIR INSTRUCTIONS.		6
	3-1.	Special Tools.	6
	3-2.	Disassembly	6
	3-3.	Removal of Valve Assembly	6
	3-4.	Disassembly of Jack Assembly	6
	3-5.	Cleaning	6
	3 -6.	Inspection	8
	3-7.	Repair	8
	3-8.	Replacement	8
	3 - 9	Lubrication Prior to Reassembly	8
	3-10.	Reassembly	9
	3-11.	By-Pass Valve Adjustment	9
	3-12.	Testing After Reassembly	9
	3-13.	Functional Test	9
	3-14.	Test Stand	10
	3-15.	Leakage Test.	10
	3-16.	Operating Force Test	10
	3-17.	Settling Test	10

SECTION I
INTRODUCTION

1-1. GENERAL. (See figure 1-1.) This publication is issued as the basic Handbook of Operation, Service and Repair Instructions for 5 Ton Hydraulic Aircraft Hand Jack, Type A-5, USAF Part No. 53D22020, manufactured by the Regent Jack Manufacturing Co., Inc., Downey, California and the Rockwell Engineering Co., Blue Island, Illinois.

1-2. DESCRIPTION. (See figures 1-1 and 2-1.) The jack is a portable self-contained unit with a single-speed manually operated pump. The lift Consists of three rams and an extension screw, all encased within an outer cylinder which is integral with the base, A rectangular tank is welded to the base, forming the fluid reservoir.

1-3. PURPOSE. This jack is used for lifting of loads up to 5 tons (10,000) pounds). At the maximum allowable load of 5-1/2 tons (11,000 pounds) the hydraulic operating fluid is by-passed within the jack by an automatic valve,and the jackwill not continue to lift.

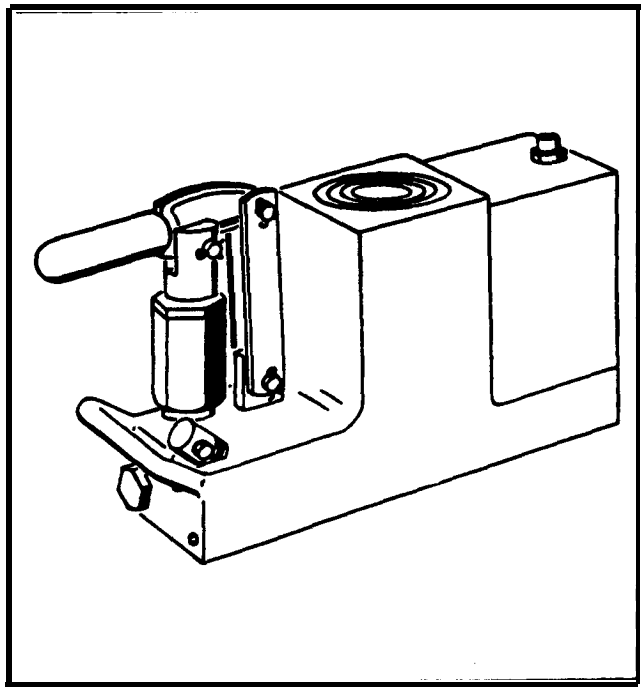

Figure 1-1. Typical View

1-4. LEADING PARTICULARS.

Use . . . . . Vertical Load Lift

Rated Load . . . . . 10,000 lb

Maximum Allowable Load . . . . . l1,000 lb

Operating Force (at rated load) . . . . 75 1b (approx)

Operating Fluid Specifications:

Above-28.89°C (-20°F) MIL-O-5606

Below-28.89°C (-20°F) . . . . . 60% MIL-O-5606, 40% MIL-F- 5616

Hydraulic System Fluid Capacity . . . . . 1.3 pt

Pump Handle Length. . . . . 18 in.

Hydraulic Lift (rams extended) . . . . . 9 in.

Extension Screw lift (fully extended) . . . . . 3 in.

Height of Reins (collapsed) . . . . . 5-1/2 in

Height Over-all:

Collapsed . . . . . 5-l/2 in.

Fully Extended. . . . . .17-l/2 in.

Weight(with fluid) . . . . . .26 lb

SECTION II

OPERATION AND SERVICE INSTRUCTIONS

2-l. PRINCIPLE OF OPERATION. (See figure 2-1. The valve assembly (13, figure 3-1) is located beneath pump body (11 figure 3-l). The valve assembly contains a gravity check valve, a spring-loaded check valve and safety by-pass valve. On the "up'' stroke the pump piston (7, figure 3-1) draws hydralic fluid from the reservoir, and on the "down" stroke force fluid under pressure through the spring-loaded check valve and into the base asseembly (55, figure 3-1) cylunder and rams (32, 38, 43, figure 3-1). This fluid pressure is retained by the spring-loaded check valve Pressure may be released and fluid returned to the reservoir by opening the release valve (24, figure 3-1). The safety by-pass valve is operative when load to the uack rams exceeds the maximum allowable load of 5-1/2 tons (10% grater than 5 ton rated load).

2-2. OPERATION PREPARATION. Proceed as follows to prepare the jack for service:

a. Apply a light film of lubrication oil, Specification MIL-L-7870, to outer bearing surfaces of rams. Wipe away excess oil with a clean, clint-free cloth to prevent diet and grit accumulated on ram surfaces.

b. Open release valve approximately one-half turn and manually collapse rams until flush with base cylinder.

c. Remove vent assembly and inspect reservoir fluid level to ascertain that fluid is within 1/4 inch or reservoir filler hole boss.

d. If fluid level is low, add sufficient operating fluid (refer to Leading Particulars, paragraph 1-4, for proper fluid specification) to fill reservoir to correct fluid level.

NOTE

Reservoir shall be filled with fresh, fluid. Fluid that has been filtered to remove dirt, sand and all other solid matter may be used only in emergency cases. Immediately after emergency operation, flush jack with a clean hydraulic fluid, and fill reservoir to correct level.

e. Replace vent assembly, allowing vent screw to remain open approximately two turns. Open release valve one complete turn. Operate jack handle for ten to twenty pressure stroke to expel all trapped air.

f. Close release valve. Close vent assembly vent screw if jack is to be stored. Vent screw shall remain open when jack is used.

2-3. LIFTING PROCEDURE. Proceed be follows to use jack for lifting vertical loads:

a. Close release valve fully. Unscrew vent assembly vent screw two turns .

b. Ascertatn that jack base rests on a firm, level foundation. If necessary, place a flat metal plate under jack base to provide secure footing for the jack.

WARNING

Do not attemp to lift loads exceeding 10,000 pounds with this jack.

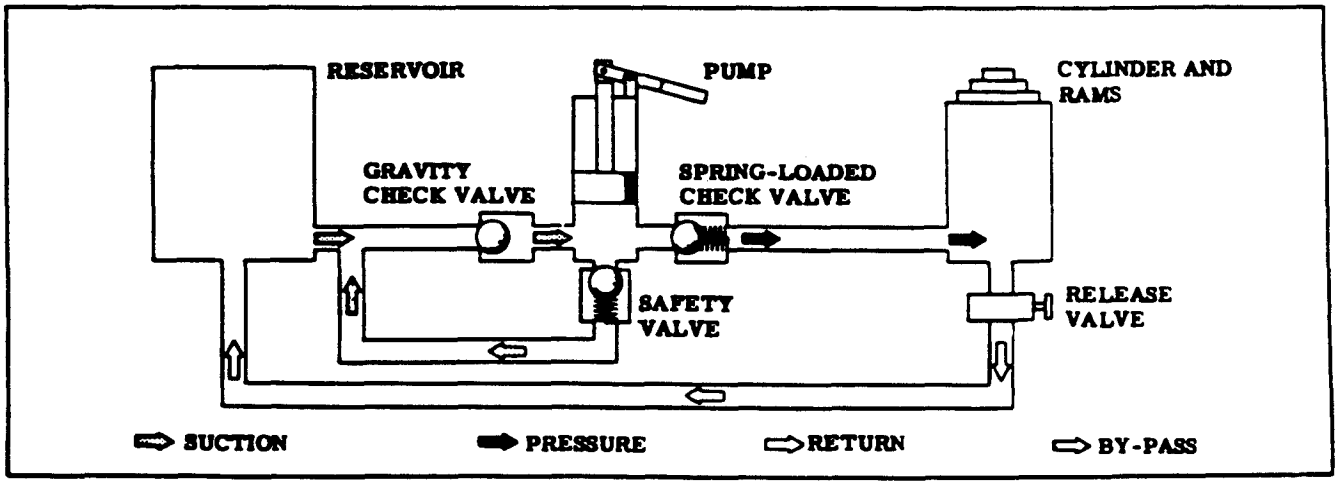

Figure 2-1. Operational Schematic Diagram

c. Operate jack handle to partially lift rams.

d. Position jack under load and, if necessary, partially unscrew extension screw to contact the load and to provide additional lift. Do not attempt to unscrew more than three inches (refer to paragraph 3-4e). Operate handle to lift rams to contact the load if maximum extension screw lift is insufficient.

e. After jack is firmly positioned under load operate jack handle using long, smooth strokes until jack has lifted load.

NOTE

If jack lifting stops before rams are fully extended, an overload is indicated and by-pass valve is relieved fluid pressure (refer to paragraph 2-2). In this event, a jack with greater capacity shall be used to lift the load.

2-4. LOWERING PROCEDURE. Proceed as follows to lower the jack under load:

a. Allow vent assembly vent screw to remain open. Open release valve slowly, using slotted end of handle, until jack begins to lower under load. The rate of load descent is proportionate to the degree of release valve opening.

NOTE

Do not open release valve more than two complete turns.

b. With release valve open, rams will lower under load until load supports itself. Withdraw jack from load. Lower extension screw, and manually press rams flush with base cylinder.

c. Fully close and tighten release valve. If jack is to be stored, close vent assembly vent screw.

2-5. PERIODIC LUBRICATION. No specific schedule of lubrication is required. All internal parts operate in system fluid providing adequate internal lubrication. When extension screw, rams, rocker arm or link pins appear dry or in need of lubricating wipe clean of accumulated dirt and grit, and apply a light film of lubricating oil, Specification MIL-L-7870. Wipe away excess oil with a clean, lint-free cloth.

2-6. PERIODIC INSPECTION. Mechanic will determine equipment is in satisfactory mechanical condition.

2-7. TROULBE SHOOTING. If any operational troubles are encountered, locate the probable cause and remedy, using Table I.

TABLE I. TROUBLE SHOOTING (See figure 3-1.)

Trouble	Probable Cause	Remedy
Rams fail to lift when pump is operated or jack fails to lift rated load	Incomplete closure of release valve (24).	Tighten release valve securely.
	Obstructed fluid suction passage.	Disassemble jack. Blow passages clear with compressed air. Reassemble jack, flush and fill with clean fluid.
	Low fluid level.	Inspect and fill to correct fluid level if necessary (refer to paragraphs 2-2c and 2-2d).
	By-pass valve improperly adjusted.	Remove screw (21). Adjust screw (14) as outlined in paragraphs 3-1la through 3-11c.
	Broken by-pass valve spring (15).	Remove screws (14, 21). Remove, inspect, and replace spring (15) if necessary. install screw (14) and adjust as outlined in paragraphs 3-11a through 3-11c. Install screw (21).
Rams will not fully elevate	Low fluid level.	Inspect and fill to correct fluid level if necessary (refer to paragraphs 2-2c and 2-2d).

TABLE I. TROUBLESHOOTING (Cent)

Trouble	Probable Cause	Remedy
Rams will not fully elevate (cent)	Leaking discharge valve.	Remove valve assembly (13). Inspect ball (19) and ball seating surfaces of valve (20). Replace ball if defective. Reseat if necessary (refer to paragraph 3-7a).
Rams will not support load	Oil leaks at rams.	Remove rams (32, 38, 43). Replace rings (36, 42,47), gaskets (35,41), and packing (46) . Inspect bearings (34, 40, 45) and bushing (30) for damage, grooving and uneven wear. Replace defective parts.
	Leaking discharge valve.	Remove valve assembly (13). Inspect ball (19) and ball seating surfaces of valve (20). Replace ball if defective. Reseat if necessary (refer to paragraph 3-7a).
	Leaking release valve ball (26) or seat.	Remove, inspect and replace ball if necessary. inspect ball seat in base assembly (55) and reseat if necessary (refer to paragraph 3-7a).
Rams raise and fall with each stroke	Incomplete closure of release valve (24).	Tighten release valve securely.
	Leaking discharge valve.	Remove valve assembly (13). Inspect ball (19) and ball seating surfaces of valve (20). Replace ball if defective. Reseat if necessary (refer to paragraph 3-7a).
	Leaking release valve ball (26) or seat.	Remove, inspect and replace ball if necessary. Inspect ball seat in base assembly (55) and reseat if necessary (refer to paragraph 3-7a).
Pump inoperative or difficult to operate	Vacuum created in reservoir due to closed vent assembly (51) vent screw.	Unscrew vent screw 2 turns.
Pump operates, and fluid pressure fails to by-pass at maximum ram extension or with overload applied	By-pass valve improperly adjusted.	Remove screw (21). Adjust screw (14) as outlined in paragraphs 3-11a through
	Defective by-pass spring (15) or ball (16).	Remove screw (21), screw (14), spring and ball. Inspect and replace spring or ball if necessary. Adjust screw (14) as outlined in paragraphs 3-11a through 3-11C.
Rams will not lower	Loose retainer ring (33, 39, or 44) lodged beneath ram (32, 38, or 43).	Remove rams. Inspect and replace retainer rings if necessary.
	Excessively worn rams (32, 38, 43) have jammed.	Relieve load with another jack. Remove, inspect, and replace rams if necessary.

SECTION III

REPAIR INSTRUCTIONS

3-1. SPECIAL TOOLS. None required.

3-2. DISASSEMBLY. (See figure 3-1.) Disassemble the jack as outlined in paragraphs 3-3 and 3-4.

3-3. REMOVAL OF VALVE ASSEMBLY. If removal of valve assembly (13) is necessitated, proceed as follows:

a. Tighten vent assembly (51) vent screw securely.

b. Remove cotter pin (3) and pin (5) securing piston (7) to arm (6).

c. Stand jack on end, resting on reservoir to prevent excessive fluid loss, and unscrew pump body (11) with associated parts (7 through 10).

d. Screw a 1-1/2 inch long, 1/4-20UNC-2B screw into threaded hole atop valve (20) and remove valve assembly (13).

NOTE

For service and repair purposes, do not disassemble valve assembly beyond the point necessary for each service or repair problem. Removal or rotation of screw (14) will necessitate readjustment and testing of jack pressure bypass setting (refer to paragraphs 3-11a through 3-11c).

3-4. DISASSEMBLY OF JACK ASSEMBLY. Disassemble in the same order as the key index numbers assigned to the exploded view illustration, noting the following:

a. Remove handle (1). Remove vent assembly (51). Remove release valve (24), while simultaneously unscrewing lock screw (23). Remove ball (26).

b. Pour hydraulic fluid from jack into a clean container.

c. Do not disassemble valve assembly (13) unless defective valve operation is indicated (refer to Table I and NOTE, paragraph 3-3e).

d. Rap lightly with a soft-head mallet at inner bearing circumference to facilitate removal of bearings (34, (40, 45).

e. Do not remove extension screw (48) from third stage ram (43) unless either part is damaged. Forcible removal of extension screw will damage plunger (49), which with spring (50), internally limits screw extension to a safe height.

NOTE

If damage necessitates removal of extension screw, clamp ram in a vise, using wood blocks to protect outer ram surfaces. Unscrew extension screw forcibly, shearing internal plunger. Install new plunger with spring in extension screw prior to reassembling ram and screw.

3-5. CLEANING. Wash parts with dry cleaning solvent, Federal Specification P-S-661, and dry thoroughly with a clean, lint-free cloth.

WARNING

Use dry cleaning solvent only in a well-ventilated area. Avoid prolonged contact with skin and inhalation of solvent vapors.

KEY TO FIGURE 3-1 ➡

1. Handle
2. Pin
3. Pin
4. Link
5. Pin
6. Arm
7. Piston
8. Nut
9. Ring
10. Packing
11. Body
12. Gasket
13. Valve assembly
14. Screw
15. Spring
16. Ball
17. Ring
18. Spring
19. Ball
20. Valve
21. Screw
22. Gasket
23. Screw
24. Valve
25. Packing
26. Ball
27. Plug
28. Spring
29. Screen
30. Bushing
31. Ring
32. Ram
33. Ring
34. Bearing
35. Gasket
36. Ring
37. Ring
38. Ram
39. Ring
40. Bearing
41. Gasket
42. Ring
43. Ram
44. Ring
45. Bearing
46. Packing
47. Ring
48. Screw
49. Plunger
50. Spring
51. Vent assembly
52. Screw
53. Nameplate
54. Decal
55. Base assembly

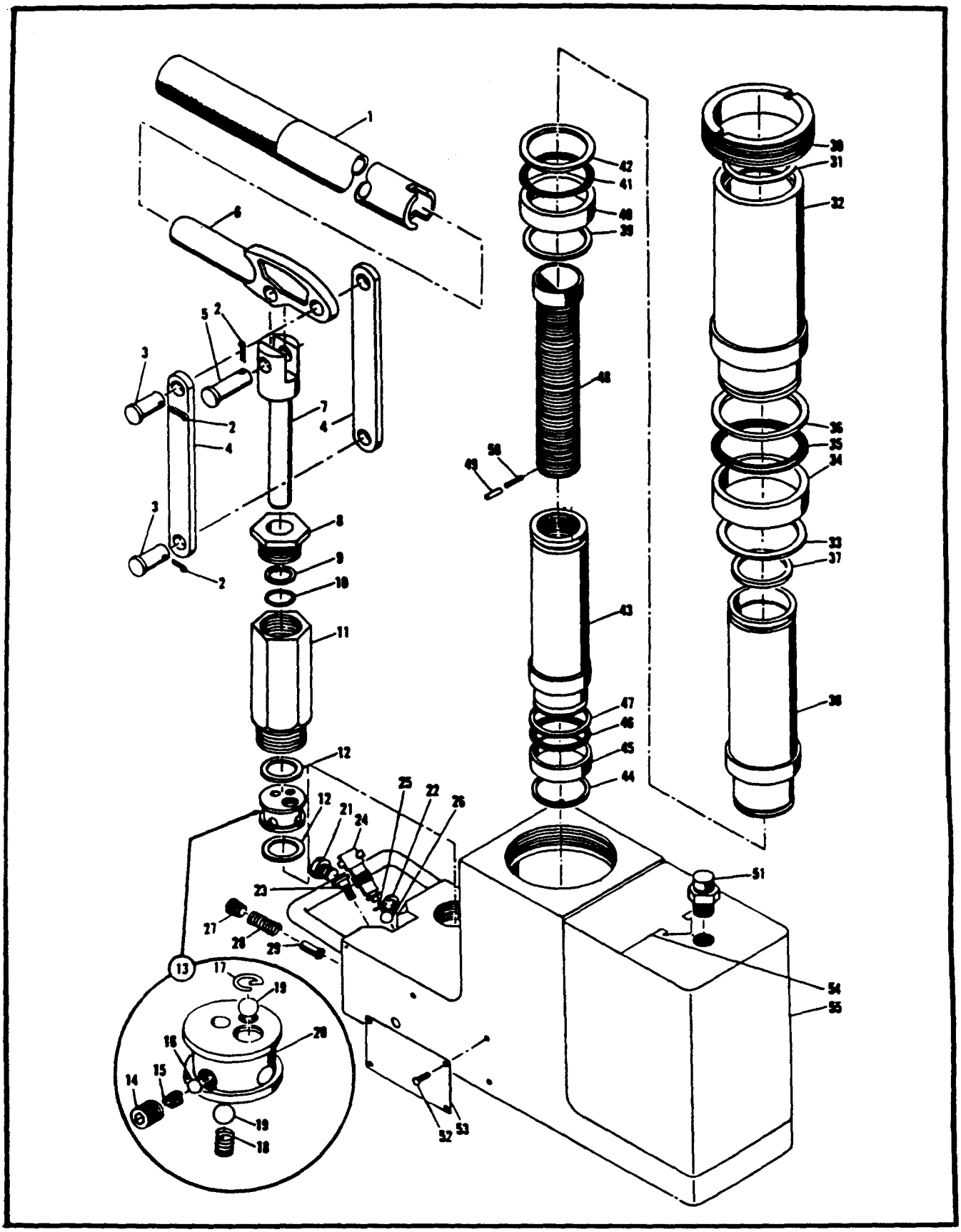

Figure 3-1. 5-Ton Hydraulic Aircraft Hand Jack Assembly, Type A-5, Part No. 53D22020

TABLE II. INSPECTION (See figure 3-1.)

Part	Index No.	Inspect For
Pins	3,5	Grooving
Links	4	Out-of-round holes.
Arm	6	Out-of-round holes.
Piston	7	Grooving and scoring; out-of-round hole.
Nut	8	Grooving and scoring at ID; condition of t breads.
Body	11	Grooving and scoring at ID; condition of threads.
Spring	15	Cracks; free length of 3/8 inch; compressed height of 5‘16 inch at 15-pound load.
Balls	16,19,26	Nicks and grooves; flat sposts.
Spring	18	Cracks; free length of 1/2 inch.
Valve	20	Nicked and scratched ball seats.
Spring	28	Cracks; free length of 1-1,/2 inch.
Screen	29	Breaks in wire mesh; buckling; loosened ends.
Bushing	**30**	Grooving, scoring, and gouging; condition of threads.
Rams	**32, 38, 43**	Cracks, with magnetic particle insertion, Specification MIL- I-6868; grooving and scoring.
Bearings	34,40,45	Grooving and scoring.
Screw	48	Cracks, as outlined for rams (32, 38,43); condition of threads.
Base assembly	55	Cracks. as outlined for rams (32, 38,43 J; grooving and scoring at cylinder ID; condition of threads; nicked and scratched seat for ball (26).

3-6. INSPECTION. Inspect all parts for damage, distortion, corrosion, and as outlined in Tables II and III.

3-7. REPAIR. (See figure 3-1.) Repair defective parts as follows:

a. Defective ball seats in valve (20) and base assem - bly. (55) shall be refaced, using a standard valve seat facing tool. Using a brass dowel, a mallet, and a ball of same size used with seat being repaired, form new seat by rapping lightly at seated ball until a 1/64 inch wide seat is formed. Discard ball used for seating operation. Wash repaired seat with dry cleaning solvent, Federal Specification P-S-661, and dry thoroughly (refer to WARNING, paragraph 3-5), Install a new ball of appropriate size at each refaced seat.

b. Non-critical structural areas of base assembly (55) may be welded ascertaining that machined areas will be unaffected by the weld. Cracks or breaks at cylindrical machined surfaces necessitate replacement of base assembly. Before attempt to weld any portion of base assembly, wash, flush and thoroughly drain fluid passages and reservoir with a non-combustible solvent.

WARNING

All weld repairs shall be performed in a ventilated area.

3-8. REPLACEMENT. (See figure 3-1.) Damaged or defective parts other than repairable valve (20) seats and base assembly (55) shall be replaced (refer to paragraphs 3-7a, 3-7b and to “REMEDY”, Table I).

3-9. LUBRICATION PRIOR TO REASSEMBLY. (See figure 3-1.) Prior to reassembly, dip all parts except handle (l), pins (2, 3, 5), links (4), arm (6), head of piston (7), and external surfaces Of base assembly (55) in hydraulic oil, Specification MIL-O-5606. Lightly coat pins (3, 5) with oil, Specification MIL-L-7870. Protect oil-wet surfaces from dust accumulation pending reassembly.

3-10. REASSEMBLY. (See figure 3-1.) Reassemble in reverse order of disassembly, noting the following:

a. Install ring (47) and packing (46) onto third stage ram (43). Ring shall bear against shoulder of third stage ram. Work ring and packing into place between rams by manually pressing against packing at several points.

b. After ring (47) and packing (46) have been properly seated, install bearing (45), rapping lightly at lower edge of bearing with a soft-head mallet until seated, and install ring (44) on lower end of third stage ram (43). Insert third stage ram into second stage ram until ring (37) groove is accessible. Install ring.

c. Repeat procedure outlined in paragraphs 3-10a and 3-10b for second stage ram (38) and first stage ram (32) and associated parts.

d. Install valve assembly (13) with gaskets (12) in base assembly (55) so that screw (14) hole is aligned with screw (21) hole in base assembly. Maintain hole alignment with a wood dowel, and screw body (11) into base assembly snugly, securing valve assembly.

e. After reassembling the jack, conduct by-pass valve adjustment as outlined in paragraphs 3-11a through 3-11c.

3-11. BY-PASS VALVE ADJUSTMENT. (See figure 3-1.) Using test stand described in paragraph 3-14, adjust by-pass valve in valve assembly (13) as follows:

a. Ascertain that reservoir is filled with fluid, and that jack is in operating condition (refer to paragraph 2-2).

b. Using the test stand, apply a 5-1/2 ton load to the jack. Operate handle (1) to lift load. Third stage ram (43) shall extend partially. If lift ceases, remove screw (21), rotate screw (14) slightly clockwise, replace screw (21) and attempt to lift load. If necessary, repeat clockwise adjustment of screw (14) until partial lift of third stage ram is permitted with the 5-1/2 ton load.

WARNING

If handle fails to "drop" or "go soft" with continued pumping at full ram extension, cease pumping immediately. Serious injury may result because of excessively high by-pass valve pressure and sudden collapse of load.

If excessively high pressure adjustment is evidenced, screw (14) shall be adjusted slightly counterclockwise until by-pass is operative when pumping is continued at 5-1/2 ton load and with the third stage ram partially extended.

c. Allow jack to remain with the third stage ram partially extended and increase load from 5-1/2 tons to 5-3/4 tons. Screw (14) shall be set so that the next pumping stroke of handle (1) will operate by-pass valve, causing handle to "drop" or "go soft".

TABLE III. WEAR TOLERANCES (See figure 3-1.)

Part and Index No.	Description	Tolerance (in.)	
		Max	Min
Piston (7)	Minor diameter	---	0.496
Nut (8)	ID	0.507	---
Body (11)	Minor ID	0.502	---
Bushing (30)	ID	2.518	---
Ram (32)	Outer wear surface diameter	---	2.509
	Major inner wear surface diameter	2.117	---
	Minor inner wear surface diameter	2.017	---
Bearing (34)	OD	---	2.606
Ram (38)	Outer wear surface diameter	---	2.008
	Major inner wear surface diameter	1.617	---
	Minor inner wear surface diameter	1.519	---
Bearing (40)	OD	---	2.106
Ram (43)	Outer wear surface diameter	---	1.510
Base assembly (55)	Cylinder wear surface ID	2.617	---

NOTE

An exact adjustment setting to a maximum lift load (with by-pass functioning) of 5-1/2 tons is often difficult. Therefore a safety tolerance of plus 1/2 ton is allowable (6 ton maximum load). However, whenever possible, the 5-1/2 ton limit setting shall be observed.

3-12. TESTING AFTER REASSEMBLY. (See figure 3-1.) After reassembly and by-pass valve adjustment, test the jack as outlined in paragraphs 3-13 through 3-17.

3-13. FUNCTIONAL TEST. Operate handle (1) with no load applied to jack until rams (32, 38, 43) have extended nine inches. Action of handle shall feel solid at each pressure (downward) stroke. Open release valve (24) and collapse rams with an 80-pound load. Rams shall collapse flush under this load.

3-14. TEST STAND. The test stand shall be used for adjustments and tests outlined in paragraphs 3-11 and 3-15 through 3-17, and shall consist of the following:

a. A hydraulic or pneumatic actuating cylinder with a six ton (maximum) load capacity and a source of hydraulic or air pressure equipped with an adjustable relief valve to operate the cylinder.

b. A platform type weighing scale calibrated to 12,000 pounds for load measurement. Mount cylinder (refer to paragraph 3-14a) in a stationary, vertical position, and place scale directly beneath, so that jack can be positioned between cylinder and scale. These components shall be positioned so that nine-inch compression of cylinder is permitted.

3-15. LEAKAGE TEST. Place jack in test stand (refer to paragraph 3-14). Operate handle (1) to lift rams.(32, 38, 43) to contact cylinder. Adjust cylinder loading to provide 10,000 pound (five-ton) reading on scale. With this load applied to jack, operate handle until the third stage ram is partially extended. Visually inspect jack for fluid leakage at pump packing nut (5), release valve (24), and rams. There shall be no fluid leakage at any point. After test, open release valve to lower jack.

3-16. OPERATING FORCE TEST. Apply five-ton load to jack. Operate handle (1), applying force perpendicular to axis of handle. Operating force required during compression (downward) stroke shall be from 75 to 80 pounds.

3-17. SETTLING TEST. Apply five-ton load to jack, and operate handle (1) to raise jack against load. Settling at this load shall not exceed 0.020 inch per hour. Perform this test twice with a 15-minute interval between each test. Settling shall not exceed 0.005 inch at the end of each 15-minute period, a total maximum of 0.010 inch at the end of the 30-minute period. Open release valve (24) to lower jack after completion of tests.

PIN : 022328-000
* U.S. GOVERMENT PRINTING OFFICE 1995-397-687