

Chapter 8

BOGIE ROTATION JACK

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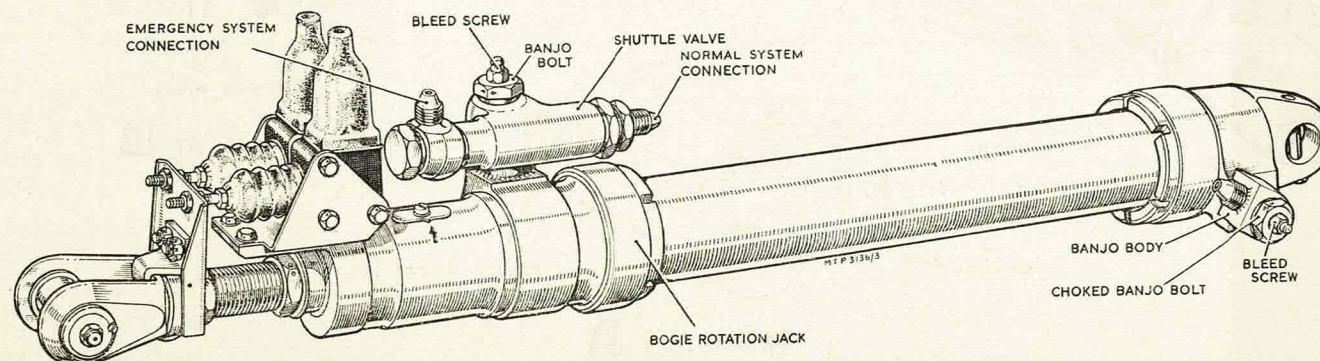


Fig. 1. Bogie rotation jack assembly

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Introduction

1. The jack assembly described and illustrated in this chapter is a basic type and its variants are given in appendices. It is employed to rotate a main undercarriage bogie from the housed to the operational position and vice versa. A lock mechanism is incorporated which secures the jack in the extended position and from which it can be released only by hydraulic pressure. Two micro-switches are fitted to give a remote indication of the position of the jack.

Description

Assembly (fig. 1)

2. The assembly consists of a double acting jack, a shuttle valve, and a banjo body secured by a choked banjo bolt. The shuttle valve, to which the Emergency hydraulic system and the undercarriage "DOWN" system are connected, is secured to the lock housing at the "closure" side of the jack by a banjo bolt. The banjo body is secured to the end fitting at the "extension" side of the jack and is connected to the undercarriage "UP" system.

The jack is described in this chapter and a description of the shuttle valve will be found in Book 4 of this Volume.

Jack cylinder and end fitting (fig. 2)

3. The cylinder is closed at one end by an externally screwed eye-end fitting which is located by a peg and secured by a ring nut that bears on a split ring fitted in a groove in the cylinder. The eye-end fitting, which is sealed on the cylinder by a rubber ring, secures an abutment ring against the cylinder end face and carries a securing bolt in the eye. On the

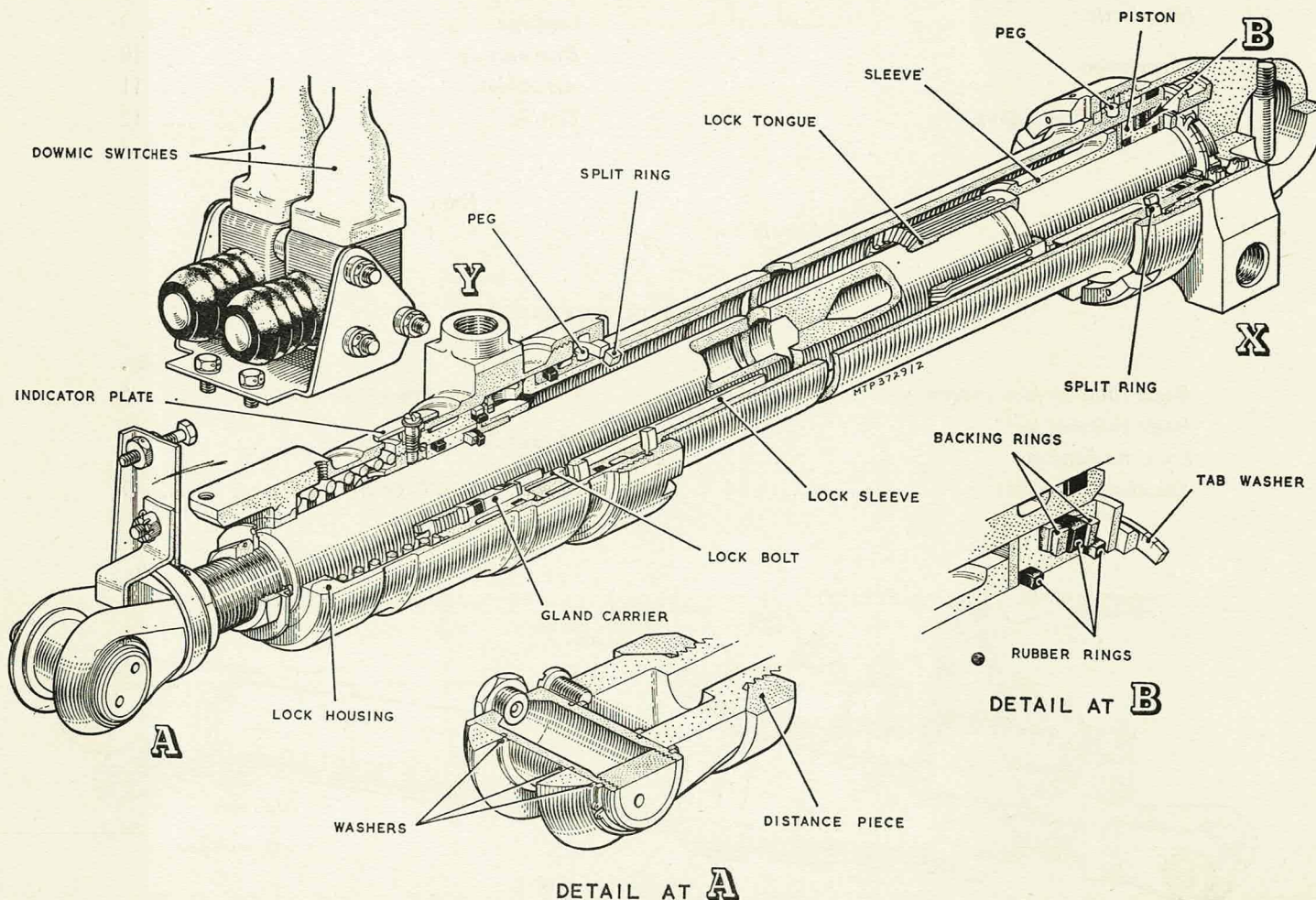


Fig. 2. Bogie rotation jack

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other end of the cylinder a lock housing, through which the piston rod passes, is located, sealed and secured in the same manner as the eye-end fitting. Bleed screws are fitted in the banjo bolts that secure the shuttle valve and the banjo body to the fluid connections in the lock housing and eye-end fitting respectively.

Lock housing and bolt (fig. 2 and 3)

4. The lock housing is bushed at its outer end for the passage of the piston rod and, with an abutment ring interposed, secures a lock sleeve in the cylinder. The housing contains a spring-loaded, bushed lock bolt within which a gland carrier is retained by a nut. The gland carrier is fitted with a rubber ring and backing ring for the piston rod and is sealed by a rubber ring in the lock bolt, which is itself sealed in the housing by a rubber ring and P.T.F.E. ring arranged concentrically. A slot in the housing accommodates a collar which, together with an indicator plate, is secured by a screw to the lock bolt and nut. Two micro-switches are bolted to a bracket which is secured to a platform that is integral with the lock housing.

Piston, rod and lock tongue (fig. 2 and 3)

5. A bolt, screwed into one end of the piston rod and locked by a washer and tab-washer, secures the piston, a sleeve and a lock tongue against a shoulder on the rod. The piston is sealed in the cylinder by a rubber ring between two backing rings and on the rod by two rubber rings retained by washers. A fork-end fitting is screwed into the other end of the piston rod and carries a connecting pin, with washers, that is secured by a circlip and locked by a cheese-head screw. A bracket that carries a locking plate and two adjustable switch-operating screws is mounted on the fork-end fitting shank and is secured against the fork-end, with a distance-piece interposed, by a lock-nut. A second nut locks the fitting in the piston rod.

Principal of operation

Extension

6. Pressure admitted at X (fig. 4) moves the piston outwards until the lock tongue enters the lock sleeve which presses the tongue tips inwards to abut the end of the lock bolt and force the bolt back against its spring. This movement continues until the tongue tips clear the end of the lock sleeve and are free to spring outwards. This action allows the lock spring to force the bolt into the tongue and secure the tips against the end of the sleeve and thus lock the jack in the extended position.

Closure

7. The admission of pressure at Y (fig. 4) first moves the lock bolt back against its spring until the bolt clears the tongue sufficiently to permit the tongue tips to be pressed inwards by the lock sleeve chamfer as the pressure commences to move the piston. With the tongue tips within the bore of the lock sleeve the piston continues to move inwards until the jack is closed.

Switches

8. As the piston moves from or to the fully closed position, the switch-operating screws release or depress the switch plungers at a predetermined point in the stroke and so change the switch settings.

TABLE 1

Special tools

Part No.	Description
MT.1025	Bench clamp for holding blocks
MT.1026/20	Holding blocks for cylinder
MT.1026/21	Holding blocks for piston rod
MT.1026/33	Holding blocks for lock bolt
MT.1189	Spring compressor for lock spring
RS/181/14	Spanner for lock-bolt nut
RS.181/15	Spanner for piston securing bolt
RS.181/27	Spanner for lock-housing and eye-end fitting ring nuts

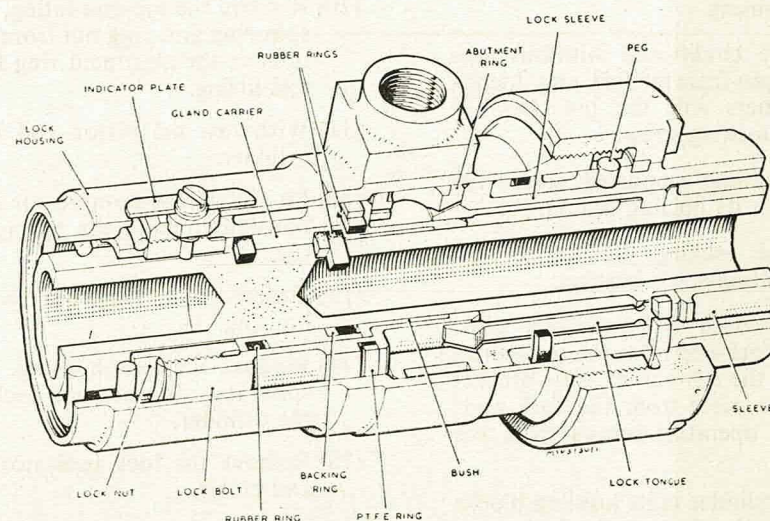


Fig. 3. Lock mechanism

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SERVICING

Leakage

9. Leakage from joints sealed by bonded seals may be rectified by checking that the adapter or banjo bolt is tightened normally. If this is ineffective the joint faces must be examined and the seal renewed. Defective cylinder sealing rings are indicated by leakage around the ring nuts. Leakage at the indicator slot or along the piston rod indicates defective sealing rings in the lock bolt or gland carrier. In all cases the surfaces must be examined and the rings renewed.

Dismantling

10. (1) Extend the piston rod to half-stroke and drain all fluid from the cylinder.
- (2) Remove the banjo bolt and connection from the eye-end fitting; remove the bleeder screw from the bolt.
- (3) Remove the banjo bolt and shuttle valve from the lock housing; remove the bleeder screw from the bolt.
- (4) Remove the micro-switches from the bracket, identifying the washers with their bolts, and remove the bracket from the lock housing.
- (5) Remove the circlip and withdraw the connecting-pin from the fork end. Identify the washers with the pin. Do not remove the locking screw.
- (6) With the cylinder supported, secure the piston rod in its holding blocks.
- (7) Remove the locking plate from the switch operating-screw bracket.
- (8) Slacken off both fork-end lock nuts, remove the fork-end from the piston rod and remove the tab-washer, nuts bracket and distance piece from the fork end; remove the operating screws from the bracket.
- (9) Secure the cylinder in its holding blocks and unscrew the ring nut from the eye-end fitting.

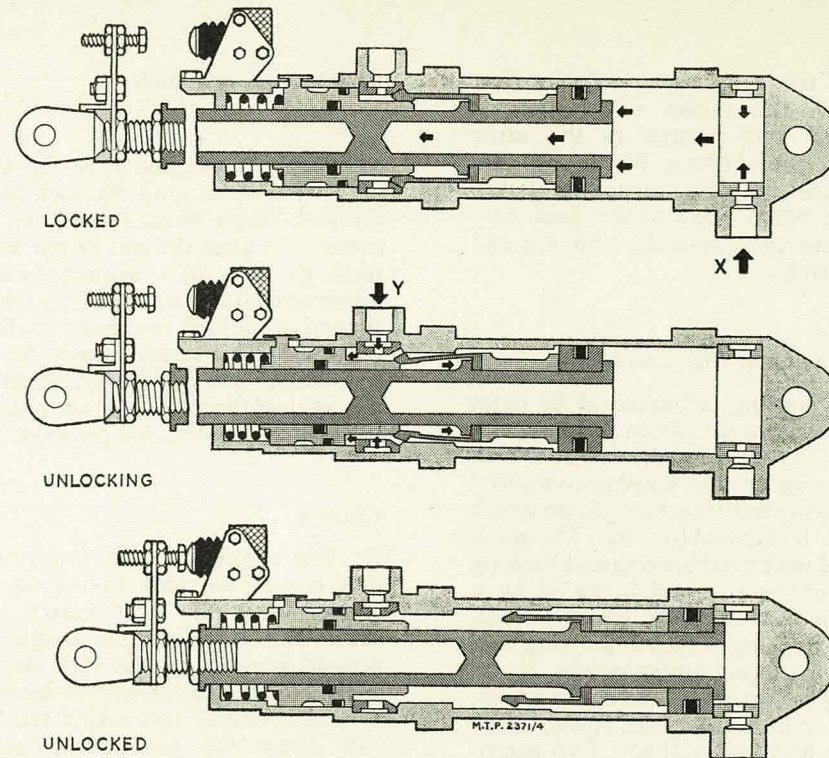


Fig. 4. Functional diagram

- (10) Remove the eye-end fitting, locating peg, split ring and ring nut from the cylinder; remove the abutment ring from the eye-end fitting.
- (11) Withdraw the piston and rod from the cylinder.
- (12) Fit the spring compressor into the lock housing to hold the spring compressed (fig. 5).
- (13) Unscrew the ring nut from the lock housing.
- (14) Remove the lock housing, locating peg, split ring, ring nut and lock sleeve from the cylinder.
- (15) Remove the lock indicator screw, plate and collar.
- (16) Slacken and remove the spring compressor, and withdraw the abutment ring,

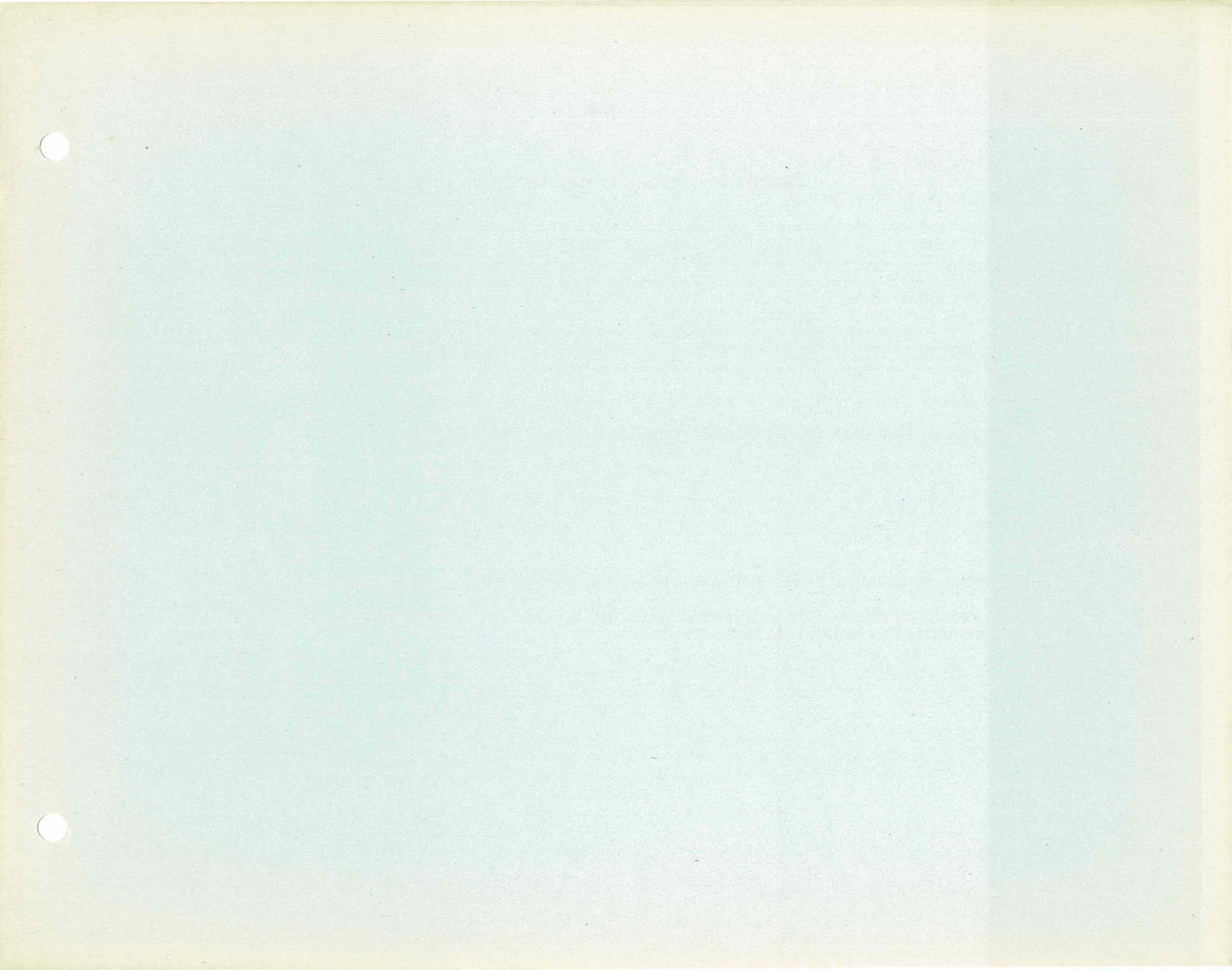
lock bolt and spring from the lock housing.

- (17) Secure the lock bolt in its holding blocks and remove the nut, gland carrier and bush.
- (18) Secure the piston rod in its holding blocks and remove the piston securing bolt, washers, piston, sleeve and lock tongue.
- (19) Remove all sealing rings from the cylinder, piston, lock bolt and gland carrier.

Assembling

11. New sealing rings are to be fitted throughout and are to be lubricated with grease XG-315. Backing rings are to be split at 45 degrees; the gap is not to exceed 0.005 in. when the ring is fitted in the appropriate

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March, 1970

AIRCRAFT HYDRAULIC EQUIPMENT

DOWTY ROTOL

ADVANCE INFORMATION LEAFLET NO. 1/70

Insert this leaflet in A.P.1803U, Vol. 1, Book 5, Sect. 11, Chap. 8 to face Para. 11, sub-para. (18)

Para. 11, sub-para. (18)

Set the piston rod at 0.040/0.060 in. not 0.390/0.410 in. as quoted in this sub-para.

Notes

- (1) The information contained in this leaflet will be incorporated by normal amendment action in due course.
- (2) If, after receipt of this leaflet, an amendment list with a prior date and conflicting information is received, the information in this leaflet is to take precedence.

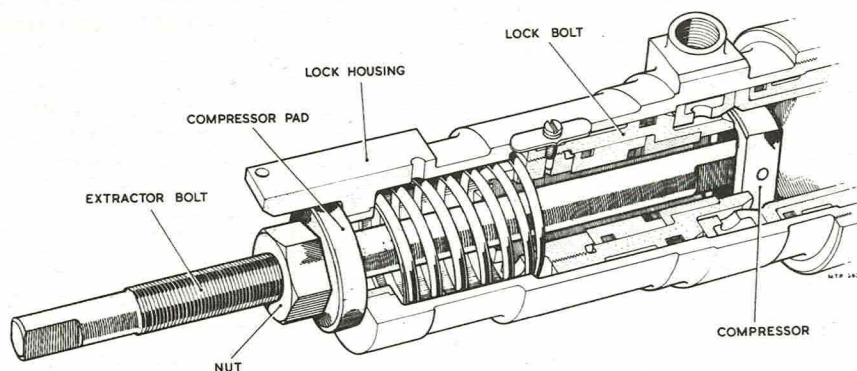


Fig. 5 Use of spring compressor

bore and the gap edges are to be trimmed clean. Backing rings are to be fitted as shown in fig. 2 and 3. Lubricate bearing surfaces with clean oil OM-15 unless otherwise instructed.

(1) Secure the piston rod in its holding block and, in the order given, pass on to it the lock tongue with tips leading, the sleeve with chamfered face leading, a plain washer, the piston, a plain washer and the chamfered washer with plain face leading.

(2) Place the tab-washer in position with tab locked into the piston rod, screw in and tighten the securing bolt and lock it with the tab-washer.

(3) Secure the lock bolt in its holding block, insert the bush followed by the gland carrier, double seal leading, and secure it with the nut.

(4) Fill the annular groove in the lock bolt with grease XG-315, then insert the spring, lock bolt and abutment ring in the lock housing in that order. The indicator screw hole in the bolt must be in line with the slot in the housing and the internal chamfer in the abutment ring is to face outwards.

(5) Fit the spring compressor in the lock housing (fig. 5) and tighten it to permit

the indicator collar, plate and screw to be fitted to the lock bolt.

(6) Secure the cylinder in its holding blocks, pass the ring nuts on to the cylinder at each end and fit the locating pegs and split rings.

(7) Fit the lock sleeve into one end of the cylinder and on that end fit the lock housing; locate the housing on its peg and secure it with the ring nut.

(8) Remove the spring compressor.

(9) Pass the piston rod into the cylinder to about half-stroke, taking care to avoid damage to the cylinder bore or gland carrier and piston seals.

(10) Place the abutment ring in the eye-end fitting and the fitting on the cylinder, locating it on its peg and securing it with the ring nut.

(11) Fit the distance piece, switch operating-screw bracket and a lock nut on the fork-end.

(12) Secure the locking plate to the bracket with its tongue extended in the fork, then tighten the lock nut on to the bracket. Fit split pins in the locking plate securing nuts.

(13) Fit the second lock nut and the tab-washer on the fork-end and screw the fork-end into the piston rod.

◀ (14) Smear the contact faces of the connecting pin where it locates in the fork-end, with anti-fretting compound ZX-28, then fit the pin, with washers in the fork-end and secure it with the circlip. ▶

(15) Press the piston rod in to the fully closed position, adjust the fork-end in the rod to obtain a distance between centres of 23.92 in., locate the tab-washer on the end of the rod and lightly tighten the lock nut against it. With the nut tightened, the radial hole in the fork-end must not be visible.

(16) Secure the switch bracket on its platform and wire-lock the three bolts.

(17) Secure the micro-switches to the bracket with the spacing washers fitted between them.

(18) Set the piston rod at 0.390/0.410 in. from the fully closed position, and fit and adjust the switch operating screws to change over the switch contacts at that point. Tighten the lock nuts on the screws.

(19) Carry out the tests on the jack as detailed in para. 12 before completing the assembly.

(20) Secure the shuttle valve to the lock housing connection with the banjo bolt and two new bonded seals; fit the bleeder screw in the bolt. The major axis of the shuttle valve is to be parallel to that of the jack and the emergency connection is to face towards the switches.

(21) Secure the banjo connection to the eye-end fitting connection with the choked banjo bolt and two new bonded

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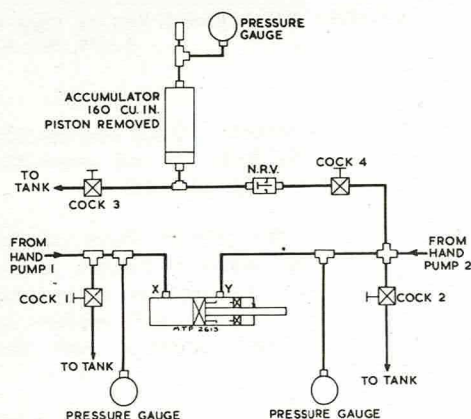


Fig. 6 Hydraulic test diagram

seals; fit the bleeder screw in this bolt. The banjo connection is to face towards the shuttle valve and inwards at 30 degrees to the jack centre line.

(22) Carry out the jack assembly tests detailed in para. 13.

Testing

Jack (fig. 2)

12. Oil OM-15 is to be used for all tests.

(1) With the jack extended and locked, apply a pressure of 5400 lb/in² at X (fig. 2) and hold it for two minutes. Leakage is not permissible.

(2) Apply pressure at Y to close the jack, raise the pressure to 5400 lb/in² and hold it for two minutes. Leakage is not permissible.

(3) Connect the jack to a hydraulic test circuit (fig. 6) in which the accumulator, containing approximately 5 cu. in. of oil, is mounted vertically and inflated initially to 25 lb/in². If the accumulator pressure exceeds 30 lb/in² during the tests, excess pressure is to be relieved by opening cock 3, but at all other times cock 3 is to remain closed. The connecting pipes are to be as short as possible.

(4) With cock 1 open and cocks 2 and 4 closed, operate hand pump 2 to close the jack and increase the pressure to 4000 lb/in² when fully closed. Leakage is not permissible.

(5) With cock 2 open and cocks 1 and 4 closed, operate hand pump 1 to extend the jack until it is 1.0/1.5 in. from full extension; then close cock 2, open cock 4 and continue pumping until the jack is fully extended and locked, and increase the pressure to 4000 lb/in². Leakage is not permissible. The lock bolt must go home within 2 seconds of the jack reaching the fully extended position.

(6) Carry out tests (4) and (5) five times.

◀ (7) Connect the micro-switches to the electrical test circuit (fig. 7) and, while carrying out tests (8) and (9), check that lamps A go out and lamps B light when the jack is 0.04 to 0.06 in. from the fully closed position. ▶

(8) With cock 1 open and cocks 2 and 4 closed, operate hand pump 2 to close the jack against no load.

(9) With cock 2 open and cocks 1 and 4 closed, operate hand pump 1 to extend the jack against no load.

(10) Carry out tests (8) and (9) five times, during which the operating pressures must not exceed the following values:—

- At X during free travel (extending)—75 lb/in².
- At X during locking (extending)—150 lb/in².
- At Y during unlocking (closing)—300 lb/in².
- At Y during free travel (closing)—100 lb/in².

(11) Mount the jack in a suitable press and, with the jack extended and locked, apply a compressive load of 6750 lb and maintain this load for one minute.

Jack assembly (fig. 1)

13. (1) Apply a pressure of 4000 lb/in² at the banjo connection in the end fitting. Leakage is not permissible.

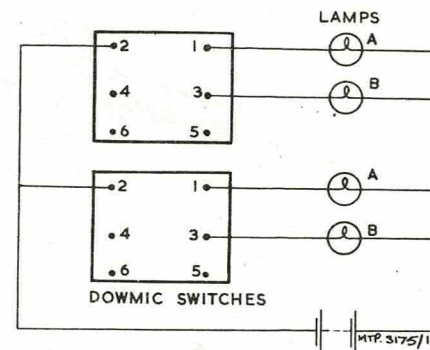


Fig. 7 Electrical test diagram

(2) Apply a pressure of 4000 lb/in² at the shuttle valve Emergency connection. Leakage is not permissible.

(3) Apply a pressure of 4000 lb/in² at the shuttle valve Normal connection. Leakage is not permissible.

(4) Carry out the tests in the above order.

◀ Installation

14. On fitment of the assembly to the main undercarriage, remove all trace of the temporary rust preventative from the attachment pin, using an approved solvent, and smear the pin with anti-fretting Compound ZX-28, including the contact faces in the fork-end. ▶

Appendix 1

BOGIE ROTATION JACK

Type No. 1.00649.001

incorporating:—

Jack Type No. 5396 Mk. 2

Shuttle valve Type No. 1.00648.001

1. This assembly is identical to that described and illustrated in the chapter.

Appendix 2

BOGIE ROTATION JACK

Type No. 1.00649.012

incorporating:—

Jack Type No. 1.02275.012

Shuttle valve Type No. 1.00648.001

1. This assembly is similar to that described and illustrated in the chapter but differs by the fitment of 'Honeywell' switches.



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