

Chapter 9

NOSE UNDERCARRIAGE JACK ASSEMBLY

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Introduction

1. The assembly described and illustrated in this chapter is a basic type and its variants are given in appendices. It is employed to raise and lower the nose undercarriage, and the jack incorporates damping devices which function at each end of the stroke and ensure that the undercarriage is brought to rest in the 'up' or 'down' position without shock to the aircraft structure.

DESCRIPTION

Assembly

2. The assembly (fig. 1) comprises a double acting jack, a shuttle valve and a two-way restrictor and connecting pipe. The shuttle valve, to which the Normal and Emergency

hydraulic systems are connected, is mounted on the anchored end fitting of the jack. One port of the shuttle valve, conveying either normal or emergency pressure, leads directly into the jack end fitting; a second port is connected by a rigid pipe to a two-way restrictor mounted on and leading into the end fitting at the free end of the jack. The connecting pipe is secured to the jack cylinder by a clip with clamp block and bush. The jack is described in this chapter, and descriptions of the shuttle valve and restrictor, and instructions for servicing them, will be found in A.P.1803T.

Jack cylinder and end fittings

3. The cylinder is closed at one end by an internally screwed eye-end fitting that houses

a spherical bush in the eye and incorporates a three-stud flanged connection for the passage of fluid to and from a tubular static piston rod. The shuttle valve is secured on the flange by the three studs and is sealed in the connection bore by a rubber ring. The eye-end fitting, which is locked on the cylinder by a circlip, accommodates a spring-loaded breather valve assembly, a bleed screw and a bolt which, with a cap nut and bonded seals, secures one end of the static piston rod. A stepped washer is fitted in the rod, which is sealed in the eye-end fitting by a rubber ring and backing ring.

4. At its other end the cylinder carries an end fitting that is secured against an external shoulder on the cylinder by a ring nut, and is sealed by a rubber ring. A fluid con-

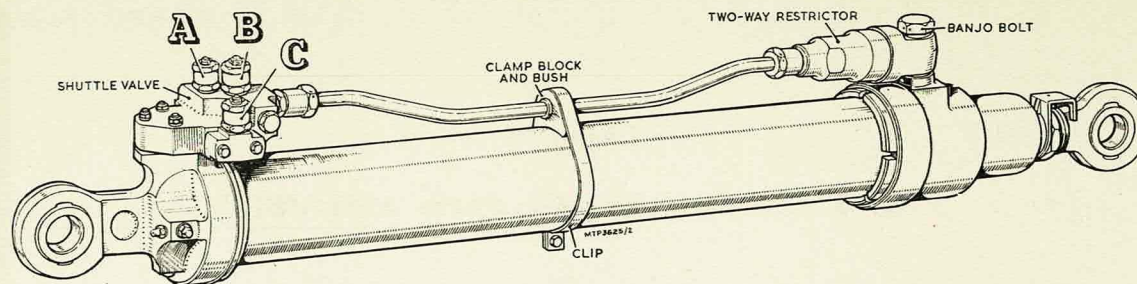


Fig. 1. Nose undercarriage jack assembly

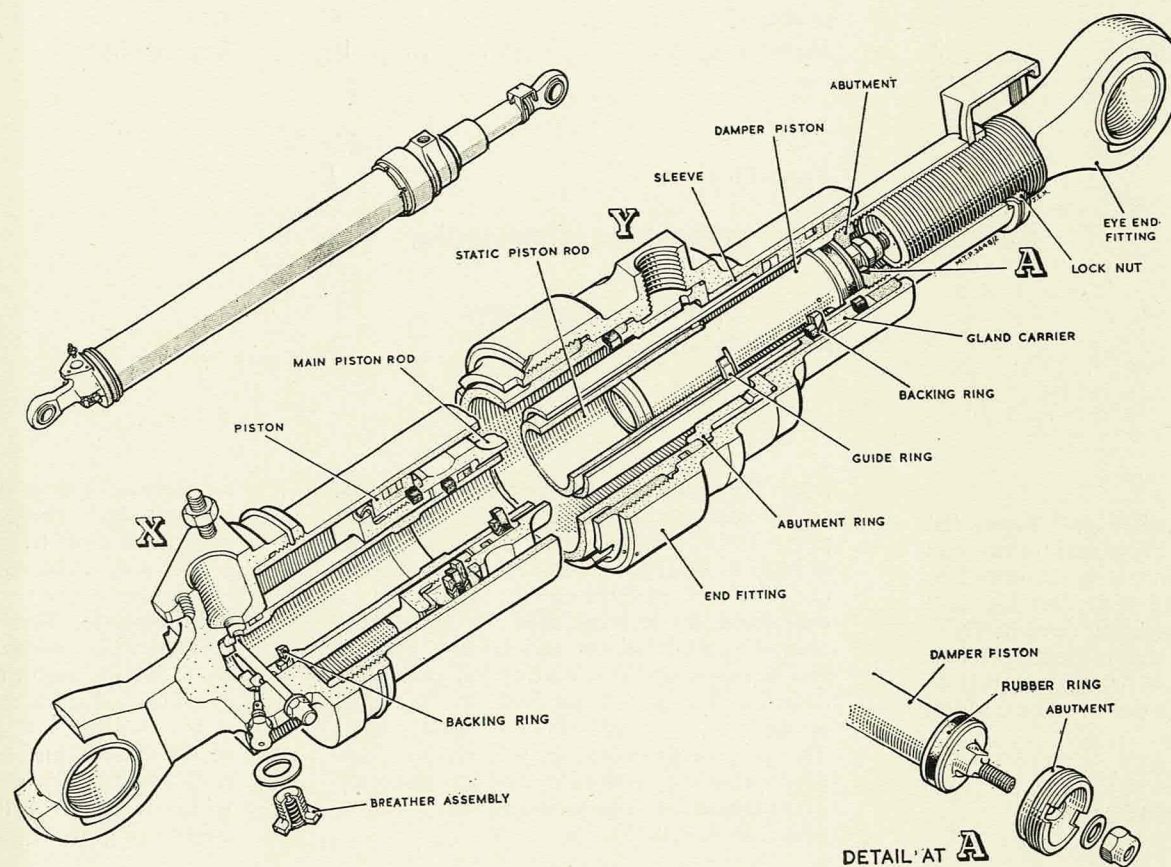


Fig. 2. Nose undercarriage jack

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nection in the end fitting receives a banjo bolt by which the two-way restrictor is secured. The end fitting houses an abutment ring forming the female portion of the extension damper, a sleeve, a gland carrier and a bush. The gland carrier is sealed in the end fitting by a rubber ring and carries a rubber ring and backing ring for the piston rod.

Main and static piston rods

5. The static piston rod, over which the piston and main piston rod operate and in which a damper piston functions, extends throughout the length of the cylinder, and its open end is supported within the main piston rod by an external guide ring secured by a circlip. A retaining nut, with lock washer, secures the piston against a shoulder on the main piston rod with a washer interposed (fig. 3). The piston nut also secures a gland carrier against a shoulder in the main

piston rod bore. A laminated shim is fitted between the piston nut and gland carrier and a washer between the gland carrier and the shoulder. The piston is sealed in the cylinder by a rubber ring between two backing rings and on the rod by a rubber ring. The gland carrier is sealed in the main piston rod by a rubber ring and carries a rubber ring and backing ring for the static piston rod.

6. Over a short length adjacent to the main piston, the diameter of the main piston rod is increased to form the male portion of the extension damper. The outer end of the main piston rod is screwed internally to receive an abutment to which the damper piston is secured by a stiffnut with washer. A rubber ring seals the damper piston in the main piston rod. An eye-end fitting, which houses a spherical bush, is also screwed into the main piston rod and is locked by a locking bracket and nut.

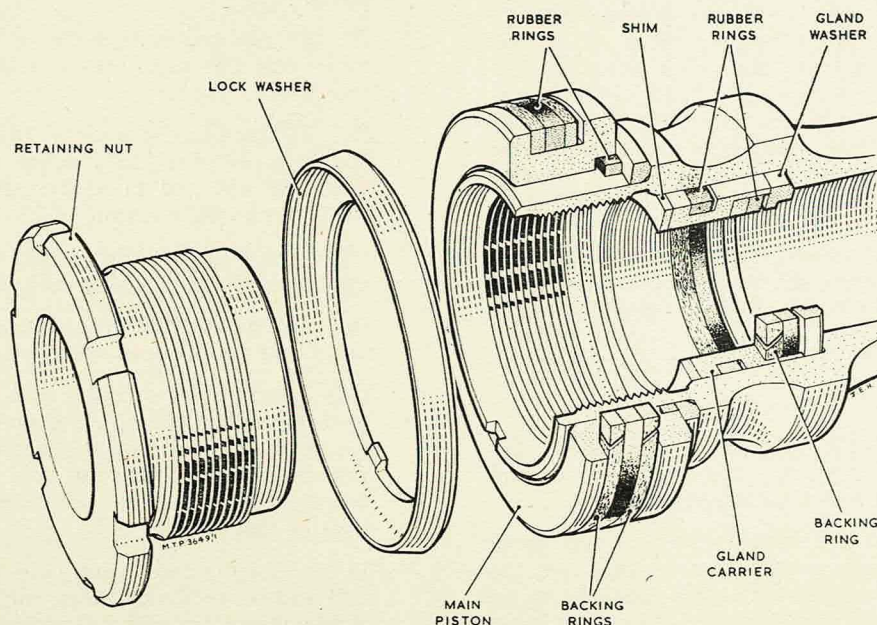


Fig. 3. Detail of piston

Principal of Operation

Extension

7. Hydraulic pressure admitted to the jack through either the Normal or the Emergency connection of the shuttle valve passes to the static piston rod bore and acts upon the damper piston to extend the jack. As the main piston rod approaches the end of the outward stroke, its larger diameter enters the abutment ring and the consequent restriction upon the release of fluid from the outward face of the main piston provides the required damping effect.

Closure

8. Hydraulic pressure admitted through the independent connection in the shuttle valve body passes through the connecting pipe to the two-way restrictor, then into the cylinder and acts upon the outward face of the main piston to close the jack. As the main piston rod approaches the end of the inward stroke the damper piston enters the static piston rod. This damps the movement by restricting the passage for the release of fluid from the bore of the main piston rod to a small hole in the wall of the damper piston and to the damper piston clearance in the static piston rod.

TABLE
Special tools

Part No.	Description
MT.1025	Bench clamp for use with holding blocks
MT.1026/6	Holding block for cylinder
MT.1026/14	Holding block for main piston rod
MT.1044	Tommy bar for end fitting
MT.1389	Test adapter
MT.1390	Spanner for main piston nut
RS.181/33	Spanner for ring nut

SERVICING

Leakage

9. If there is leakage from joints sealed by bonded seals or olives check that the adapter,

banjo bolt or nut is tightened normally. If this is ineffective, the joint faces must be examined and the seal or olive renewed. Defective sealing rings in the main piston, static piston rod gland will be indicated by fluid issuing from the breather or seepage around the cylinder eye-end fitting. Defective sealing rings in the main piston rod gland carrier or on the cylinder will be indicated by leakage along the rod or at the ring nut respectively. Seepage around the locking bracket and nut will indicate a defective sealing ring in the damper piston. In all cases, the surfaces must be examined and the rings renewed.

Dismantling

10. (1) Remove the spherical bushes from the eye-ends by rotating the bushes through 90 degrees on edge.
- (2) Disconnect the pipe from the shuttle valve and restrictor and remove the bolt from the pipe clip.
- (3) Remove the clip, clamp block and pipe from the cylinder.
- (4) Remove the banjo bolt and restrictor.
- (5) Remove the shuttle valve securing nuts and remove the shuttle valve.
- (6) Slacken the piston rod eye-end fitting lock nut, remove the eye-end fitting and locking bracket from the rod and remove the nut and bracket from the fitting.
- (7) Hold the cylinder in its holding block, unscrew the ring nut and remove the end fitting.
- (8) Withdraw the abutment ring, sleeve, gland carrier and bush from the end fitting.
- (9) Remove the circlip, breather valve, bleed screw, and static piston rod securing bolt from the cylinder eye-end fitting and remove the fitting and ring nut from the cylinder.
- (10) Withdraw the main and static piston rods from the cylinder.

(11) Hold the main piston rod in its holding block, unlock the lock-washer, unscrew the piston nut and remove the tab-washer, piston and washer.

(12) Withdraw the static piston rod together with the laminated shim, gland carrier and washer from the main piston rod. Do not snatch the static rod, but maintain a steady pull to prevent damage to the guide ring and circlip.

(13) Remove the circlip, guide ring, end washer, laminated shim, gland carrier and recessed washer from the static rod. Identify the shim and recessed washer with the rod.

(14) Remove the damper piston stiffnut and washer and withdraw the damper piston. The abutment is not to be removed.

(15) Remove all sealing rings.

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 bore and the gap edges are to be trimmed clean. Backing rings are to be located as shown in Fig. 2 and 3. If new parts, other than seals, have to be fitted to the main piston or static piston rod gland assemblies, these should include a new laminated shim, and the end float of the gland carrier is to be checked as detailed in subpara. (6) below. Lubricate bearing surfaces with clean oil OM-15, unless otherwise instructed.

(1) Fit the damper piston into the abutment in the main piston rod and secure it with the stiffnut and washer.

(2) Pass the laminated shim, the gland carrier with external seal leading and the recessed washer with plain face leading on to the static piston rod in that order at the guide ring end.

(3) Fit the guide ring on the static piston rod and secure it with a circlip.

(4) Hold the main piston rod in its holding block and insert the static piston rod, guiding the gland assembly into position.

(5) Fit the piston washer (chamfer leading), the piston (internal seal leading) and the lock-washer on to the main piston rod, secure them with the piston nut and lock the nut. The existing lock-washer may be used provided that it is not cracked and the locking points are at least 15 degrees apart.

(6) If new parts, including a new laminated shim, have been fitted, tighten the piston nut and measure the gap between the piston and the lock-washer. This dimension plus 0.002/0.004 in. equals the thickness of laminations to be removed from the shim to give the gland carrier the required end float of 0.002/0.004 in. Each lamination is 0.002 in. thick. Clean the face of the shim before refitting.

(7) Pass the ring nut on to the cylinder, then secure the cylinder in its holding block.

(8) Fit the end washer on to the static piston rod and insert the assembled piston rods in the cylinder.

(9) Fit the cylinder eye-end fitting on to the static piston rod and secure it with the bolt, cap nut and bonded seals; tighten the cap nut with a torque of 25 lb/in.

(10) Screw the eye-end fitting on to the cylinder and lock it with the circlip.

(11) Screw the bleed screw and breather valve and washer into the eye-end fitting.

(12) Fit into the cylinder end fitting the bush (chamfer leading), the gland carrier (external seal leading), the sleeve (smaller internal diameter leading) and the abutment ring (smaller internal diameter leading) in that order.

(13) Pass the end fitting over the piston rod and on to the cylinder, align the two fluid connections and secure the end fitting with the ring nut.

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(14) Carry out the test detailed in *para.* 12.

(15) Fit the lock nut and locking bracket on the piston rod eye-end fitting, screw the fitting into the rod until the inspection hole is no longer visible, locate the locking bracket on the end of the rod and lightly tighten the lock nut. The lock nut is to be finally tightened after adjustment upon installation.

(16) Fit the shuttle valve on the cylinder eye-end fitting and secure it with the three nuts; fit the cone and union adapters with new bonded seals.

(17) Fit the two-way restrictor, with new bonded seals, on the end fitting and secure it, lined up on the shuttle valve cone union, with the banjo bolt.

(18) Fit the connecting pipe, with bush, clamp block and clip on to the cylinder, couple the pipe to the shuttle valve and restrictor and secure the clip with the bolt and nut.

◀(19) Fit the spherical bushes in both eye-ends having first coated their inside and outside diameters with anti-fretting compound ZX-28. ▶

(20) Carry out tests detailed in *para.* 13.

TESTING

Jack (Fig. 2)

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

(1) With the jack closed and full of oil apply a pressure of 5400 lb/in² at Y and hold it for two minutes. Leakage is not permissible.

(2) Fit the test adapter, apply pressure at X to extend the jack, raise the pressure to 5400 lb/in² and hold it for two minutes. Leakage is not permissible. (With the piston rod eye-end fitting removed, it is possible to observe any leakage past the abutment in the piston rod).

(3) Apply pressure alternately at X and Y to extend and close the jack completely 25 times, and at each end of each stroke raise the pressure to 4000 lb/in². The movement of the piston must be smooth and regular throughout the test.

(4) Apply pressure to the fully closed jack at X, the pressure required to extend the jack should not exceed 500 lb/in².

(5) Apply pressure to the fully extended jack at Y; the pressure required to close the jack should not exceed 75 lb/in².

Jack assembly (Fig. 1)

13. (1) Apply a pressure of 4000 lb/in² at shuttle valve connection B. Leakage is not permissible.

(2) With connection C blanked, apply a pressure of 4000 lb/in² at connection A. Leakage is not permissible.

(3) With connection A blanked, apply a pressure of 4000 lb/in² at connection C. Leakage is not permissible.

(4) Extend the jack, remove the breather valve, pour a quantity of oil OM-15 into the cylinder, replace the breather valve and close the jack, blowing out the excess fluid.

(5) The tests must be carried out in the above order.

Appendix 1

NOSE UNDERCARRIAGE JACK ASSEMBLY

Type No. 1.00634.004

incorporating— JACK, J.5062 Mk. 2
SHUTTLE VALVE, 8542 Mk. 2
TWO-WAY RESTRICTOR 8516/70

Introduction

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

Appendix 2

NOSE UNDERCARRIAGE JACK ASSEMBLY

Type No. 1.00634.005

incorporating— JACK 1.01015.006
SHUTTLE VALVE 8542, Mk. 2
TWO-WAY RESTRICTOR 8516/70

Introduction

1. The jack in this assembly differs from that described and illustrated in the chapter by the means in which the static piston rod is retained in the cylinder eye-end fitting.

Description

2. The retaining bolt and cap nut are replaced by a screwed pin and plug, as shown in fig. 1. The pin, which is screwed into the eye-end fitting from the same side as the bleeder screw, has a plain body that extends

beyond the threaded length and, when in position, passes through the static piston rod and enters the hole in the other side of the fitting. The outer end of this hole is closed by the screwed plug. Bonded seals are fitted on the pin and plug both of which are to be tightened to a torque of 25 lb. in.

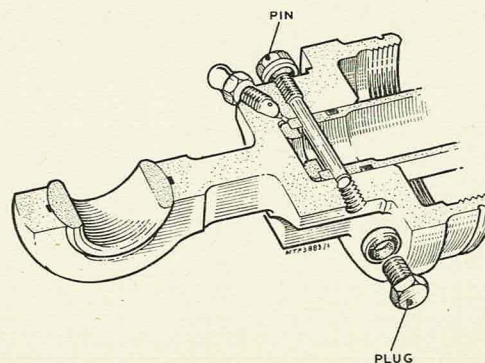


Fig. 1. Retaining pin and plug

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