

Chapter 22

HOIST JACK

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Introduction

1. This jack is incorporated in a specific hydraulic system and functions to raise and lower a store. The unit consists of a piston operating in a cylinder and carries a movable wedge assembly controlled by a handwheel. The wedge provides a safety device for locking the piston rod in the closed position when the jack is underload. A micro-switch, fitted to the wedge mechanism, gives visual indication when the jack is in the locked position. A basic type is described in the chapter and appendices cover the variants. ►

DESCRIPTION

Cylinder assembly

2. The cylinder, which is wire-wound, is closed at one end by an end fitting and grooved for sealing rings supported by backing rings. A spherical end fitting screwed over the opposite end of the cylinder houses a gland assembly to seal and support the piston rod. This assembly consists of a gland housing fitted with a sealing ring and backing ring and grooved

for a wiper ring. A gland nut screwed into the gland housing retains a gland ring and spacer against a backing ring located against the end of the housing bore. The gland ring is fitted with a chamfer ring and the gland nut is wire-locked to a set-bolt screwed into the housing. Shims, fitted under the gland housing, provide for adjustment on assembly, and the end face of the housing is recessed for a shim-washer against which the cylinder butts when screwed into the end fitting.

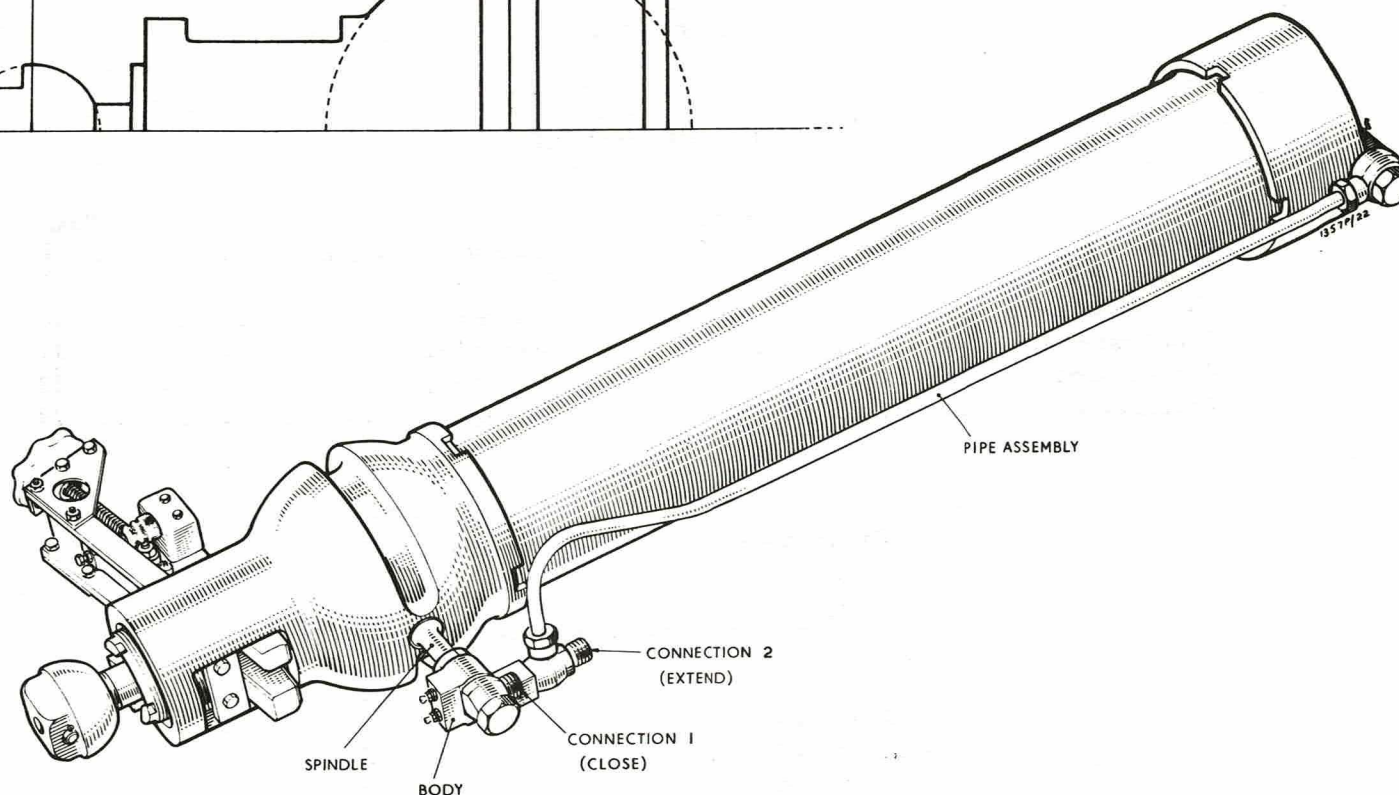
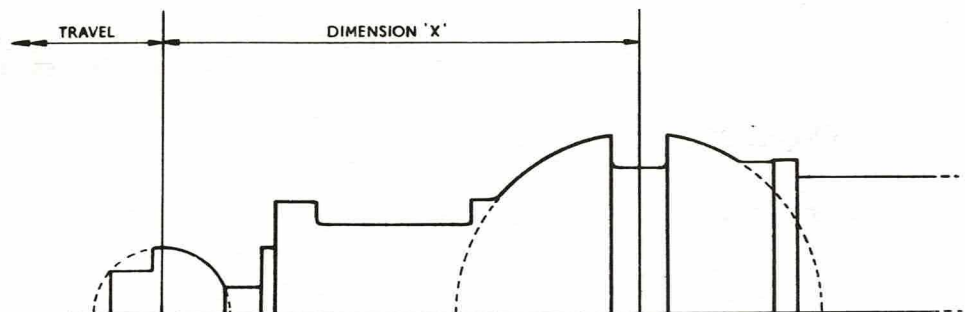


Fig. 1. Hoist jack

Piston assembly

3. The flanged-piston rod is threaded at each end to receive a piston head and a ball-end respectively. The rod is grooved at one end for a sealing ring supported by backing rings, and the piston head, screwed over this end against a shim, is fitted with a sealing ring and supporting split rings. The piston is retained on the rod by a pin locked with a split pin. The ball-end, which screws over the opposite end of the piston rod, engages

with the aircraft linkage and is secured by a pin locked with a split pin. Shims are fitted between the ball-end and the rod for adjustment purposes.

Wedge assembly

4. This assembly is positioned at the outer end of the piston rod and locates in the slotted stem of the spherical end fitting. The assembly consists of a wedge, forked to pass over the piston rod, which bears

against a flange on the rod to lock the jack in the closed position.

5. The wedge is operated by a wedge screw and slides against a bracket and a wedge support. The screw is rotated by a handwheel secured by a washer and self-locking nut; and a spacer is located under the handwheel to provide adequate clearance between the wheel and a bushed bearing plate. The screw has a left-hand two-start thread and

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rotates in the bearing plate, which is bolted to side plates secured to the bracket. The bearing plate houses a ratchet arrangement, consisting of a spring-loaded plunger engaging in a notched flange integral with the wedge screw. The bracket is dowelled and bolted to the wedge support, and the wedge is held against the piston rod flange by an adjusting sleeve, screwed into the end fitting and retained against the wedge support and bracket by a ring inserted into a groove in the wedge support. The adjusting sleeve provides for wedge adjustment, and houses an inner sleeve which makes contact with the aircraft linkage on installation. A guide plate, bolted to the wedge support, prevents rotation of the assembly in the end fitting.

6. The wedge carries a micro-switch and an actuating lever assembly. Two adjustable striker screws are screwed into the lever and locked by nuts. The outer screw opposes the micro-switch plunger, and the inner screw provides an adjustable abutment stop to stabilise the lever when the wedge is withdrawn from the locked position. The lever, which operates in slots in the bracket and wedge support, is bushed to pivot on a pin secured to the wedge and lever by washers and nuts. A laminated spacer is fitted under the lever to eliminate slackness and ensure free movement. A tension spring, anchored to a pin secured to the wedge by a washer and nut, loads the lever arm against a flange on the piston rod when the wedge is in the locked position.

Connections

7. A spindle (fig. 1) is screwed into a tapping in the spherical end fitting against a sealing ring and carries a body sealed by an 'O' section ring. The body is fitted with bleeder plugs and receives a banjo adapter post screwed in to retain the banjo union of a transfer pipe assembly. The banjo union is fitted with sealing rings and the banjo post provides the connection for extending the jack. A restrictor stem which serves as a filter is inserted in the outer end of the spindle, and a banjo union, fitted with sealing rings, is retained on the spindle by a cap nut.

The banjo union provides the connection for closing the jack. The transfer pipe, fitted with collars and sleeves, is connected to a banjo union at the opposite end of the cylinder; the banjo union is fitted with sealing rings and secured by a banjo bolt to a tapping in the end fitting.

Principle of operation

8. When fluid pressure from the hydraulic system is directed to connection 1 to close the jack and raise the store, ensure that the wedge is wound clear of the piston rod. On completion of the closing stroke with the store crutched in the aircraft, wind in the wedge until the arm of the micro-switch actuating lever contacts the flange on the rod. This action will cause the striker screw to depress the switch plunger and give visual indication that the wedge has effectively locked the rod.

9. To lower the store, select fluid to connection 1 to pressurise the cylinder on the rod side of the piston and wind out the wedge as far as possible. The exposure of a spigot on the actuating lever through an indicator plate at the top of the bracket denotes that the wedge is fully withdrawn. Reverse the selection and apply pressure at connection 2 to fully extend the jack.

TABLE 1
Special tools

Ref. No.	Part No.	Description
27Q/12311	S.T.1406	Drift for bush of actuating lever.
27Q/12317	S.T.1652	Drift for bush of bearing plate
27Q/16255	S.T.2113	'C' key spanner for piston head
◀27Q/21475▶	03077TA01	Tubular key spanner for gland nut
27Q/22525	4.60001.030	'C' key spanner for end fitting
27Q/22526	4.60001.045	Assembly post for gland ring
◀27Q/	4.60001.810	Hook spanner for inner adjusting sleeve
27Q/	4.60001.811	Pin spanner for outer adjusting sleeve.

Note . . .

It is most important to ensure that the wedge is always clear of the piston rod before operating the jack.

Leakage

10. External leakage will indicate a faulty sealing ring or gland ring which must be renewed. Internal leakage past the sealing rings of the piston head or piston rod will be shown by sluggish action of the jack in service or loss of pressure during test. Renew the appropriate seal.

Dismantling

11. (1) Remove the transfer pipe and the body from the spindle, and unscrew the spindle from the end fitting. Withdraw the restrictor stem from the spindle. Unscrew the banjo bolt from the opposite end fitting to free the banjo union. Remove all sealing rings.
- (2) Remove the pin and unscrew the ball-end from the piston rod. Remove the shims from the ball-end.
- (3) Unscrew the bolts and remove the guide plate.
- (4) Wind out the wedge and unscrew the bolts adjacent to the locating dowel. Unscrew the self-locking nut, remove the washer and withdraw the hand-wheel and the spacer from the wedge screw. Allow the wedge to slide downwards to free the wedge screw from the bearing plate. Remove the wedge screw from the wedge.
- (5) Withdraw the wedge, complete with micro-switch and actuating lever assemblies, from the bracket; carefully extricating the lever from the slots in the wedge support and bracket.
- (6) Remove the micro-switch from the wedge. Slacken the locknuts and remove the striker screws from the actuating lever.
- (7) Remove the nut and washer securing the actuating lever, and detach the spring from the spring pin. Remove the lever from the lever pin and detach the spring from the lever. Remove the nut and washer securing the lever pin to the wedge and withdraw the pin. Remove the

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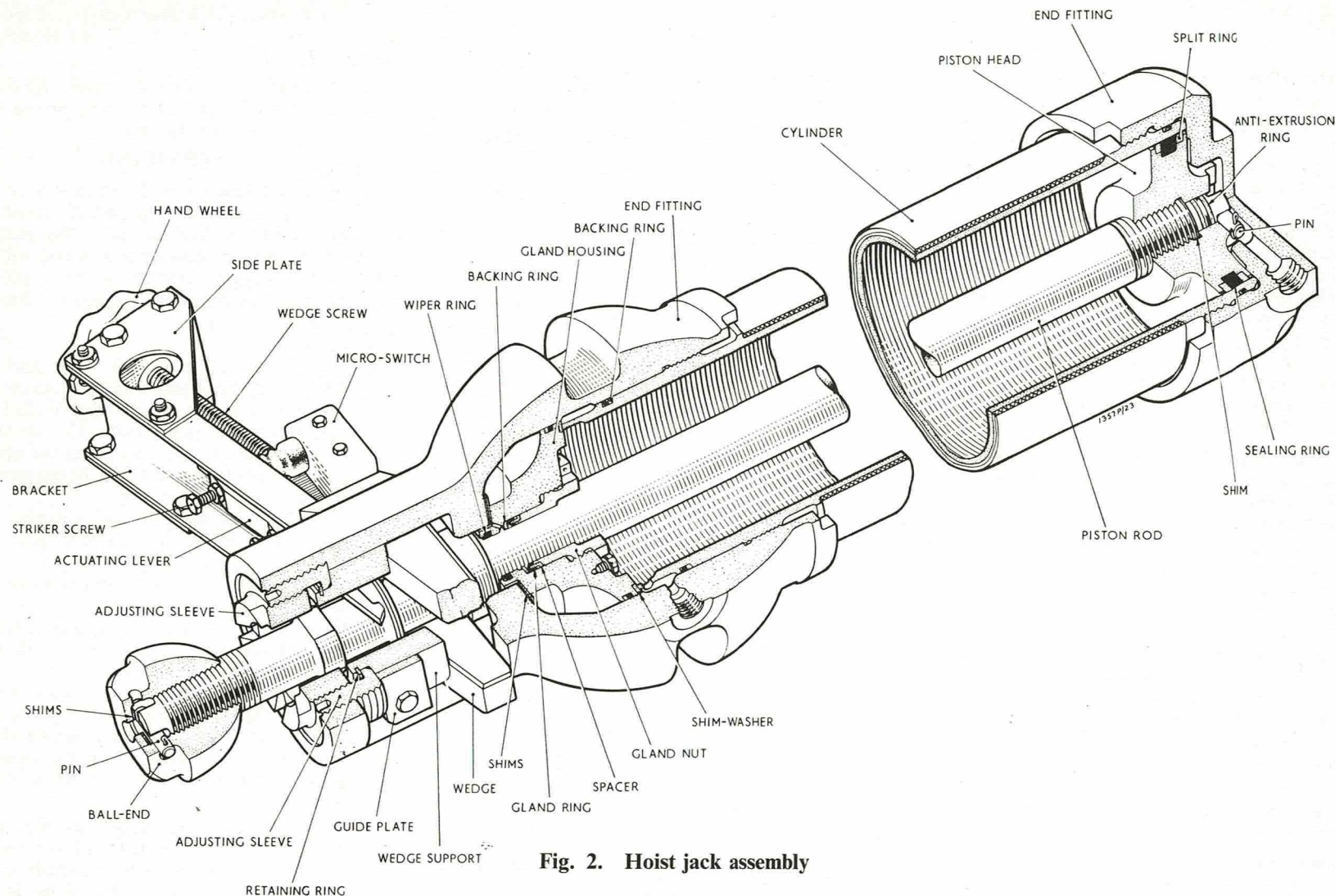


Fig. 2. Hoist jack assembly

spacer from the lever pin. Remove the nut and washer securing the spring pin and withdraw the pin from the wedge.

Note . . .

The small spring pin which is secured in the lever by peening, must not be disturbed.

(8) Unscrew the remaining bolts securing the bracket to the wedge support and withdraw the bracket.

(9) Remove the nuts, bolts and washers securing the bearing plate assembly to the side plates of the bracket, and withdraw the assembly from the side plates.

(10) Withdraw the spring and plunger from the bearing plate. The indicator plate is secured to the bearing plate with a screw locked by peening and should not be removed except for renewal purposes.

(11) Remove the nuts, bolts and washers securing the side plates to the bracket and remove the plates.

(12) Unscrew the inner adjusting sleeve and detach the retaining ring from the wedge support. Unscrew the outer sleeve to free the wedge support from the end fitting.

(13) Unscrew the spherical end fitting from

the cylinder and withdraw the piston and gland assemblies complete. Unscrew the opposite end fitting and remove the sealing rings and backing rings from the cylinder.

- (14) Remove the spherical end fitting from the piston rod and remove the shims from the end fitting.
- (15) Withdraw the pin retaining the piston head and unscrew the head from the piston rod. Remove the shim from the head. Remove the sealing ring and split rings from the piston head, and the sealing ring and anti-extrusion rings from the end of the piston rod.
- (16) Slide the gland housing off the piston rod and remove the shim-washer from the cylinder abutment face. Remove the sealing ring and backing ring from the housing.
- (17) Unscrew the gland nut from the gland housing and withdraw the spacer, the gland ring, the chamfer ring and the backing ring from the bore of the housing. Remove the wiper ring and the set-bolt from the housing.

Assembling

12. All sealing rings are to be lightly coated with Grease XG-315 (34B/9100519) before being assembled in the unit.
- (1) Fit the sealing rings and the backing rings to the cylinder, with the rough faces of the backing rings adjacent to the sealing rings. The sealing rings are to be located at the outer ends of the cylinder.
- (2) Assemble the details of the gland assembly. Fit the sealing ring and the backing ring to the gland housing, with the rough face of the backing ring adjacent to the sealing ring. Insert the backing ring, chamfered face leading, into the bore of the gland housing. Fit the chamfer ring to the gland ring and insert the gland ring, chamfer ring leading, into the bore followed by the spacer. Ensure that these

items are correctly bedded together and screw the gland nut tightly into the housing.

- (3) Screw the set-bolt into the gland housing and wire-lock the gland nut to the bolt. Fit the wiper ring to the housing and position the shim-washer in the recess of the housing abutment face.
- (4) Locate the shims over the spigot of the gland housing. A maximum of three shims, each 0.018 in. thickness and one laminated shim should be fitted initially.
- (5) Slide the gland housing assembly over the piston rod.
- (6) Fit the sealing ring and the anti-extrusion rings to the groove in the piston rod, with the sealing ring located between the lips of the anti-extrusion rings. If a new anti-extrusion ring is fitted; the 'feeder' on the side of the ring must be cut off flush with the surface and the ring diagonally cut through to facilitate assembly to the rod.
- (7) Fit the sealing ring and the split rings to the piston head. If new split rings are fitted, they are to be gapped 0.009 to 0.012 in. on assembly and the sharp edges at the gap, on the flat faces only, removed by a radius of 0.005 to 0.015 in.
- (8) Fit the shims against the shoulder of the piston rod and screw the piston head on to the rod, aligning a hole in the head with a slot in the end of the rod to allow for insertion of the retaining pin. If necessary, vary the thickness of the shim pack to achieve this alignment. For reference, the thickness of the shim laminations is 0.002 in. Insert the retaining pin and secure it with a split pin.

Note . . .

Before assembling further, ensure that the gland housing abutment face of the cylinder is free from burrs and rough edges.

- (9) Screw the end fitting tightly on to the piston head-end of the cylinder. Insert the piston assembly into the cylinder, allowing the piston head to bottom and locate the gland housing assembly to the cylinder. It is most important to ensure that the abutment shim-washer is correctly seated in the housing recess and that it bears firmly against the end of the cylinder.
- (10) Pass the spherical end fitting over the piston rod and screw it tightly on to the cylinder, ensuring that the gland housing assembly is fully bottomed against the end fitting. The tapping in the end fitting is to be aligned with the tapping in the opposite end fitting. If necessary, vary the thickness of the shims under the gland housing to obtain this alignment.
- (11) Smear the threads of the outer adjusting sleeve and the bearing surface of the wedge support with Grease ZX-28 (34B/9428473). Insert the spigoted-end of the wedge support in the sleeve and secure the two items together with the retaining ring. Screw the inner adjusting sleeve into the outer sleeve. Then screw the assembly fully home in the end fitting, ensuring that the projecting portion of the wedge support is uppermost. Position the guide plate to the wedge support, with the chamfered edges adjacent to the adjusting sleeve and secure the plate with the two bolts. Wire-lock the heads of the bolts together.
- (12) Insert the stem of the lever pin through the appropriate drilling in the wedge and secure it with the washer and nut. Position the laminated spacer against the flange of the pin. Connect the tension spring to the spring pin in the drilling of the micro-switch actuating lever and secure the lever to the lever pin with the washer and nut. Check that there is no slack in the lever and that it moves freely on the pin. If necessary, vary the thickness of the spacer to obtain these conditions.

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- (13) Insert the stem of the spring pin through the wedge and secure it with the washer and nut. Locate the free end of the tension spring over the spindle of the spring pin. Wire-lock the flanges of the lever and spring pins together.
- (14) Position the micro-switch and the lock plate on either side of the wedge and secure the assembly with the two bolts screwed into the plate. Wire-lock the heads of the bolts together.
- (15) Smear the bearing surfaces of the wedge and bracket, and the threaded portion of the wedge screw with Grease ZX-28. Assemble the side plates to the bracket and secure them with the bolts, washers and nuts. The heads of the bolts must be on the inside of the bracket.
- (16) If the indicator plate has been removed from the bearing plate, insert it in the slot of the bearing plate and secure the plates together with the countersunk screw. Lock the screw by punching the adjacent metal into both ends of the screwdriver slot.
- (17) Insert the plunger, spherical end leading into the bore of the bearing plate and follow with the spring. Position the bearing plate sub-assembly between the side plates of the bracket, locating the projecting end of the indicator plate in the slot of the bracket. Secure the bearing plate to the side plates with the bolts, washers and nuts. Wire-lock the heads of the bolts together.
- (18) Position the bracket to the wedge support, locating it with the dowel. Secure the bracket to the wedge support with the bolts and washers screwed into the tappings adjacent to the dowel. The remaining bolts securing the bracket to the wedge support will be inserted later.
- (19) Screw the wedge screw fully into the wedge. Lower the wedge assembly over the bracket and wedge support, at the same time carefully easing the switch actuating lever into the slots of the bracket and wedge support.
- (20) Slide the wedge up the bearing faces of the wedge support and bracket, until the flanged end of the wedge screw is fully home in the bearing plate, ensuring that the plunger has engaged with a notch in the flange. ◀Support the wedge and locate the spacer followed by the hand wheel over the end of the wedge screw. Secure the wheel to the screw with the washer and self-locking nut.▶ Screw in the remaining bolts to secure the bracket firmly to the wedge support.
- (21) Screw the striker screws into the actuating lever, with the longer screw opposing the micro-switch plunger. Do not lock the screws with the nuts at this stage.
- (22) With the piston fully bottomed and the jack closed, wind in the wedge as far as possible. Pull the piston rod outwards until the rod flange abuts the wedge and check that the arm of the micro-switch actuating lever contacts the relevant flange on the piston rod. If the actuating lever is not in contact with the flange, wind out the wedge and pull the rod out further. Wind in the wedge again and check that the lever is now in contact with the flange. If necessary, repeat the above procedure until the requirements are fulfilled. An adjustment of 0.20 in. is permissible on the wedge with the piston fully bottomed in the closed position, and this will determine the point of lever contact on the flange. A further adjustment of 0.50 in. is obtainable on the outer adjusting sleeve, making a total adjustment of 0.70 in.
- (23) With the piston rod bottomed and locked, and the switch actuating lever in contact with the rod flange, screw in the striker screw until it contacts the switch plunger and operates the switch. Then screw in the other striker screw to just make contact with the wedge abutment face. Wind the wedge in and out several times and check for satisfactory operation of the micro-switch plunger by the striker screw. The screw should depress the switch plunger when the actuating lever makes contact with the piston rod flange and should release the plunger when the contact is broken. Tighten the lock-nuts against the lever and wire-lock the heads of the screws to the nuts.
- (24) Position the six shims and the one laminated shim against the inner face of the ball-end. Screw the ball-end on to the piston rod, using a ½ in. diameter bar inserted in the bore of the ball-end to centralise the shims.
- (25) With the jack closed and locked, screw the ball-end in or out and vary the thickness of the shim pack to obtain dimension X shown in *fig. 1*. This dimension must be within the limits of 10.43 to 10.45 in. When the dimension has been obtained ensure that the piston rod travel, with the jack bottoming at both ends, is within the limits of 30.20 to 30.33 in. (*fig. 1*). Screw the ball-end hard home and, if necessary, turn it back to align the holes in the ball-end with the slots in the piston rod to allow for insertion of the retaining pin. The laminated shim may be varied in thickness to achieve this condition; at the same time ensure that dimension X is maintained. For reference, the laminated shim consists of 0.002 in. laminations. Insert the retaining pin and secure it with the split pin.
- (26) Fit the sealing rings to the spindle and screw the spindle into the tapping in the spherical end fitting.
- (27) Ensure that the sealing rings are fitted to the bleeder adapters and screw the adapters into the body. Screw the bleeder plugs into the adapters.
- (28) Slide the body over the spindle and insert the restrictor stem into the spindle bore.
- (29) Fit the sealing rings to the banjo union for connection 1, slide the union over the spindle and secure it with the cap nut.
- (30) Fit the sealing rings to the banjo union for the transfer pipe assembly and secure the union to the body with the banjo adapter post.

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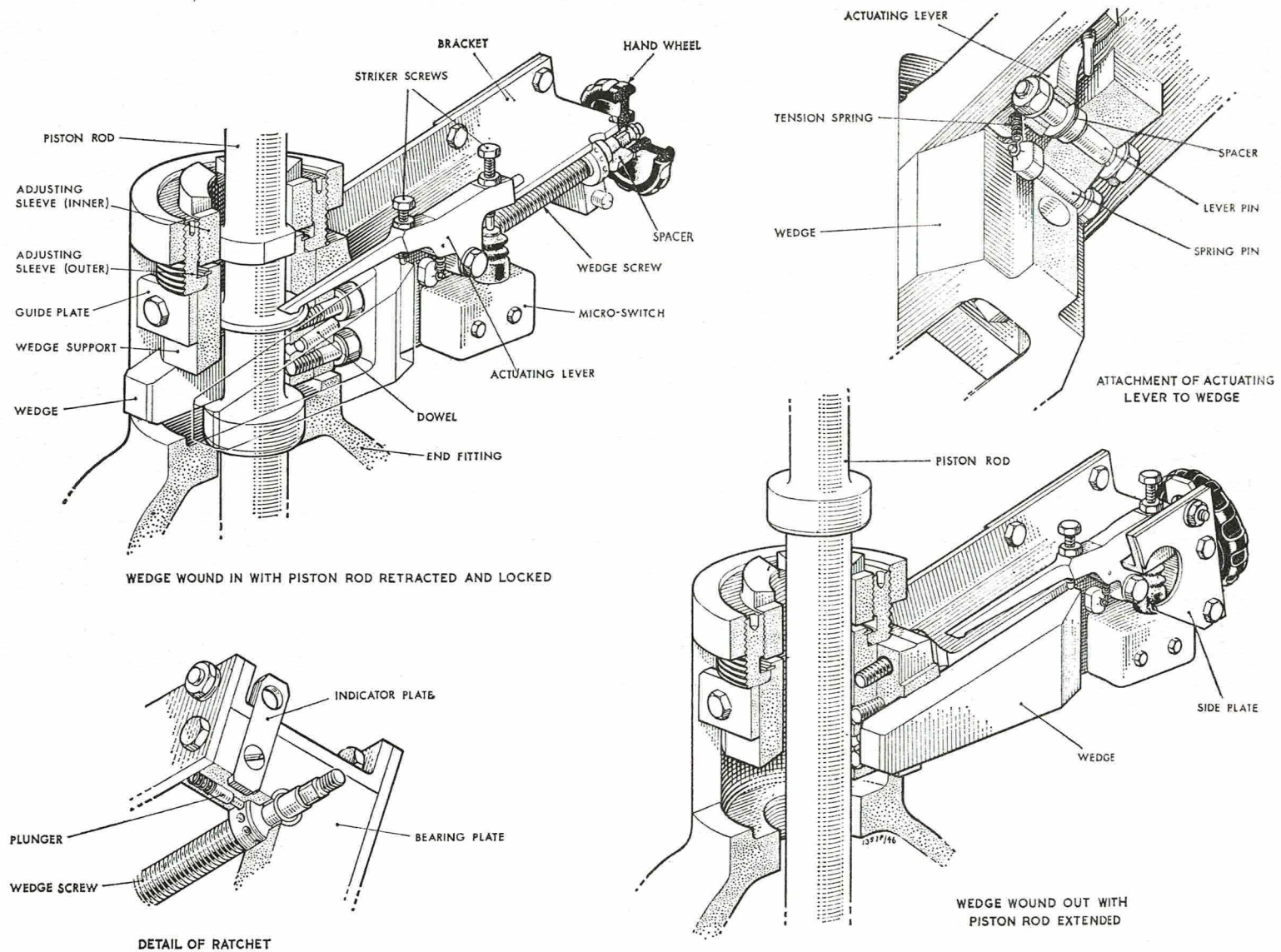


Fig. 3. Wedge Assembly

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(31) Ensure that the sealing rings are fitted to the banjo union for the opposite end of the transfer pipe, and secure the union to the end fitting with the banjo bolt.

(32) Locate the transfer pipe assembly to the respective banjo unions and secure the assembly with the collars and sleeves.

(33) After final assembly and test, the following items must be positively wire-locked.

(a) The end fittings to the cylinder.

(b) The pipe sleeve at connection 2 to the adjacent banjo union and then to the body.

(c) The cap nut to the banjo union for connection 1.

(d) The bleeder adapters together.

(e) The pipe sleeve at the opposite end of the transfer pipe to the adjacent banjo bolt.

(34) The following items will be finally wire-locked when the jack is installed in the aircraft.

(a) The inner and outer adjusting sleeves together and the outer sleeve to the end fitting.

(b) The bolts securing the bracket to the wedge support.

(c) The bolts securing the side plates to the bracket.

Testing

13. ◀ A static hydraulic test rig will be required. The jack is to be hydraulically operated at least six times in each direction before testing to expel all air.

(1) With the wedge fully wound out and clear of the piston rod, connect the supply line of the static hydraulic test rig to connection 2. Apply pressure to fully extend the jack and then release the pressure. Gradually apply a pressure of 300 lbf/in², checking for leakage between 0 and 100 lbf/in² and then slowly increase the pres-

sure to 1500 lbf/in². Leakage is not permissible. Release the pressure and disconnect the supply line.

(2) Connect the supply line to connection 1 and apply pressure to fully close the jack. Release the pressure. Gradually apply a pressure of 300 lbf/in², checking for leakage between 0 and 100 lbf/in² and then slowly increase the pressure to 4500 lbf/in². Leakage is not permissible. Release the pressure and disconnect the supply line.

(3) Connect the supply line to connection 2 and operate the rig to fully extend the jack. The pressure required to extend the jack must not exceed 150 lbf/in². Release the pressure and disconnect the supply line.

(4) Connect the supply line to connection 1 and operate the rig to fully close the jack. The pressure required to close the jack must not exceed 160 lbf/in². Release the pressure and disconnect the supply line. ▶

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Appendix 1

HOIST JACK

Type No. 1.00411.004

1. This jack is identical to the type described in the chapter.

Appendix 2

HOIST JACK

Type No. 1.00411.028

1. This jack is similar to the type described in the chapter, but differs by the fitment of a chamfered inner adjusting sleeve and a piston rod with a smaller diameter actuating lever flange.

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