Chapter 23

FIN DOOR JACK

Type No. 1.00419.001

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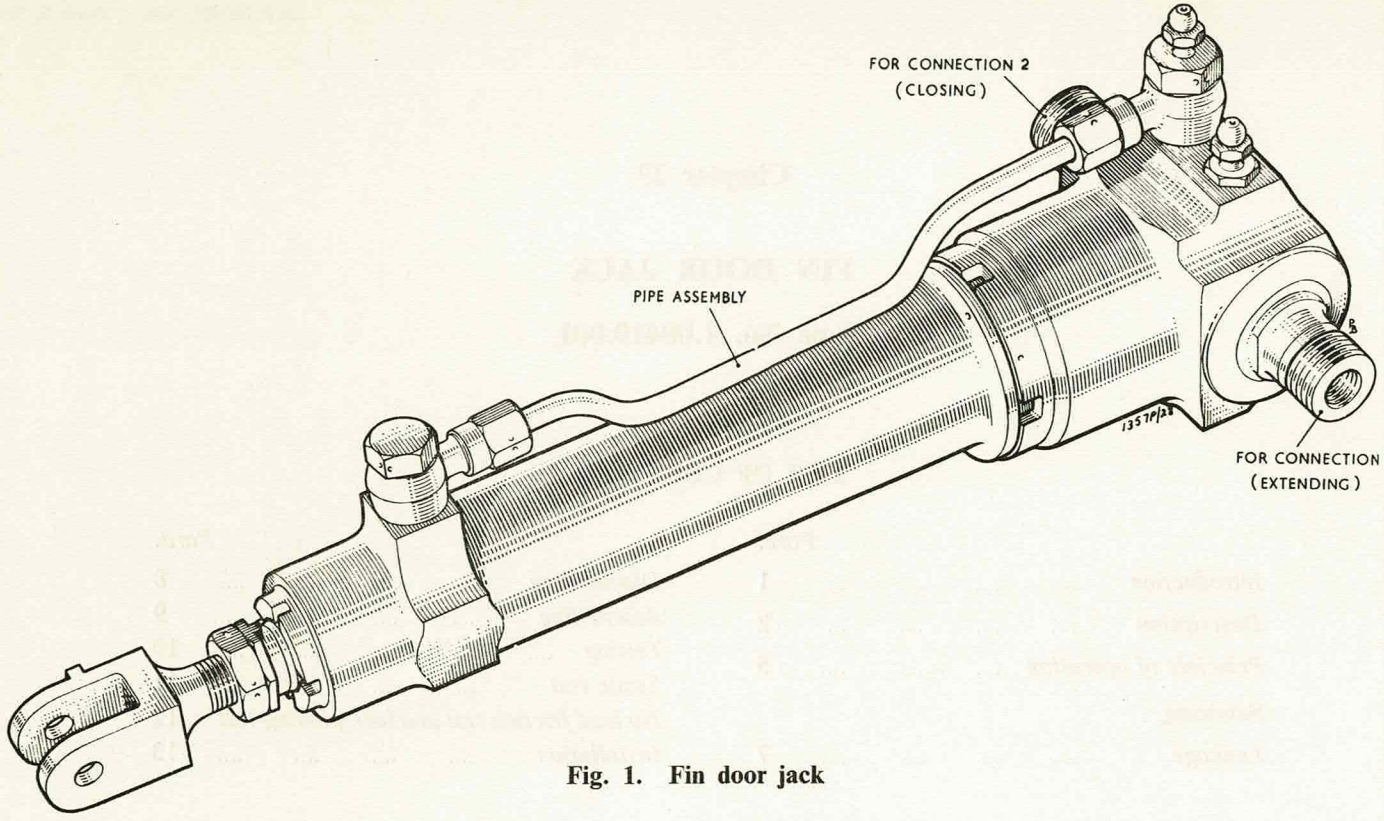

Fig. 1. Fin door jack

Introduction

1. This jack is incorporated in a specific hydraulic system and functions to open and close the fairing doors enclosing the fin of a store. The jack consists of a piston assembly operating within a cylinder to which the fluid lines are connected through a drilled spindle. The spindle has a dual purpose as a swivel coupling and as a trunnion mounting for the jack in the airframe. The jack incorporates an internal mechanical lock which secures the piston in the closed position, and which must be hydraulically released before the piston can move to the extended position.

Description

2. The cylinder, which is closed at one end by an end fitting, is recessed for a sealing ring supported by a backing ring. The opposite end of the cylinder receives a gland assembly to seal and support the piston rod. This assembly comprises a gland nut screwed into the cylinder to retain a gland ring and a spacer against a shoulder in the bore. The gland nut is grooved for a wiper ring to prevent the ingress of dirt when the piston rod is retracted. A boss, formed on this end of the cylinder receives a screwed banjo bolt of a transfer pipe assembly, the other end of which connects with the end fitting.

3. The end fitting, which screws over the cylinder, houses the dual purpose spindle and is grooved for sealing rings supported by backing rings. The end fitting clamps a claw locking ring against the cylinder and shims are interposed between the ring and the cylinder for alignment purposes. The spindle is threaded and tapped at the outer ends for the reception of fluid connections, and these, together with attachments securing the spindle in the end fitting, are supplied by the aircraft manufacturer. Drillings from the spindle tappings are joined by radial holes which coincide with annular grooves in the end fitting, one of which is directly linked by a diagonal hole to the cylinder. Two further tappings in the end fitting communicate, through radial holes with the annular grooves and provide for the reception of a bleeder banjo bolt for the transfer pipe assembly and a bleeder adapter respectively. Collars and nuts, fitted to the ends of the spindle for transit and storage purposes, are removed when the jack is installed.

4. A piston head, fitted with a sealing ring and two supporting split rings, is formed

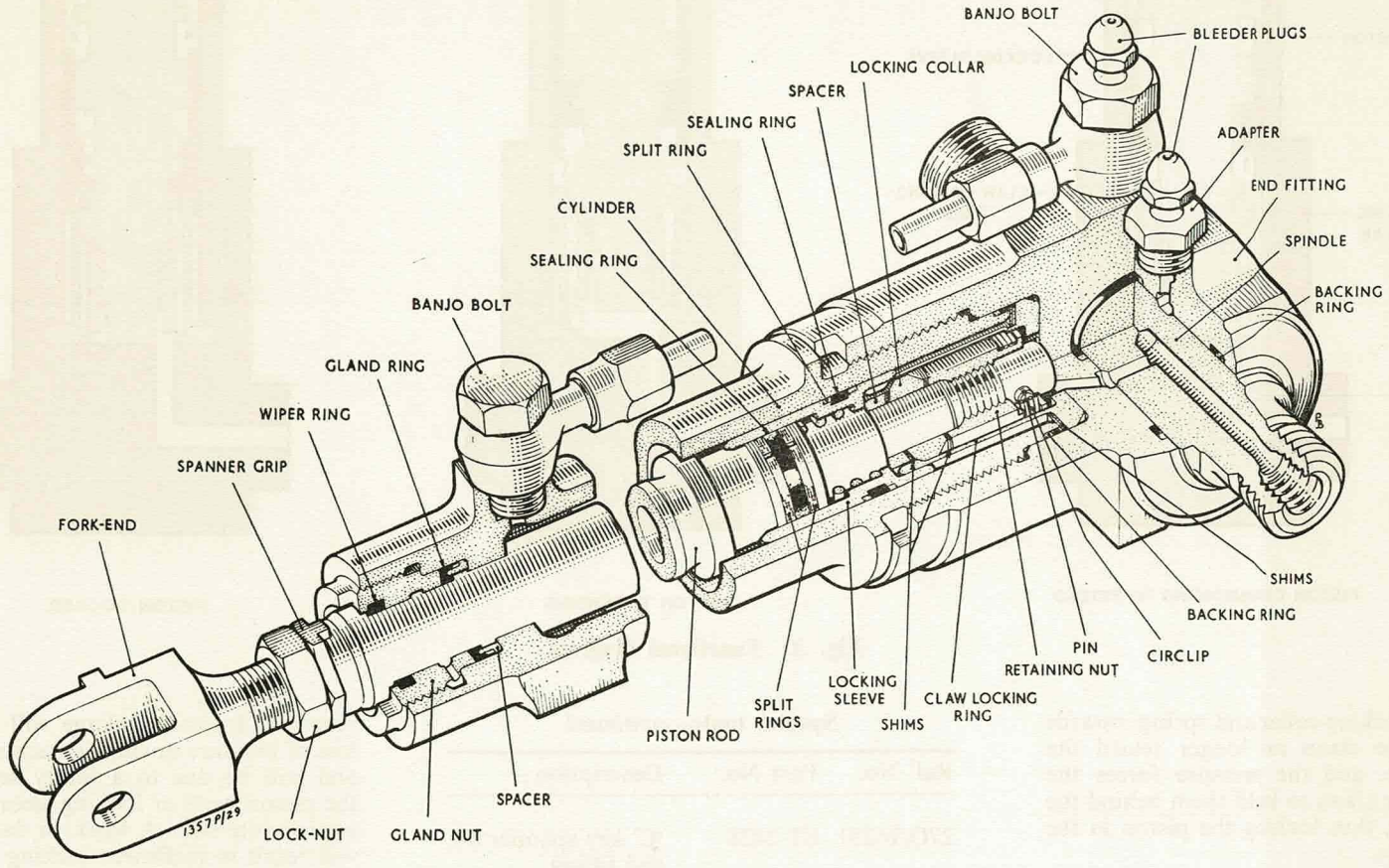

Fig. 2. Fin door jack assembly

integral with and adjacent to the inner end of a flanged-piston rod. The outer end of the rod is slotted to engage the tongues of a spanner grip and receives a screwed fork-end secured by a lock-nut. A locking sleeve, grooved for a sealing ring and two supporting split rings slides over the piston head and is retained by a spacer and a locking collar. The sleeve and collar assembly is secured by a retaining nut screwed on to the rod and locked with a pin and two circlips. A spring loads the locking sleeve away from the piston head. The locking collar engages with the claw locking ring on closure of the jack. Shims fitted on each side of the locking collar, allow for the adjustment of the backlash in the engaged condition.

Principle of operation (fig. 1 and 3)

5. When the jack is operated to extend, fluid is applied at connection 1 and flows into the cylinder. The lock prevents the piston moving to the extended position until the pressure on the locking sleeve has overcome the spring and the sleeve slides off the claws of the locking ring. The piston commences to move to the extended position and the locking collar flexes the claws outwards on its passage through the locking ring. The piston rod then moves to the fully extended position.

6. To close the jack, fluid is applied at connection 2 and flows through the pipe assembly to the opposite end of the cylinder. The piston moves towards the closed position. On approaching this position, the claws of the locking ring are spread outwards by the locking collar. This results in the claws contacting the locking sleeve and arresting it while the piston continues its closing movement, sliding through the sleeve to compress the spring. This condition prevails until the claws

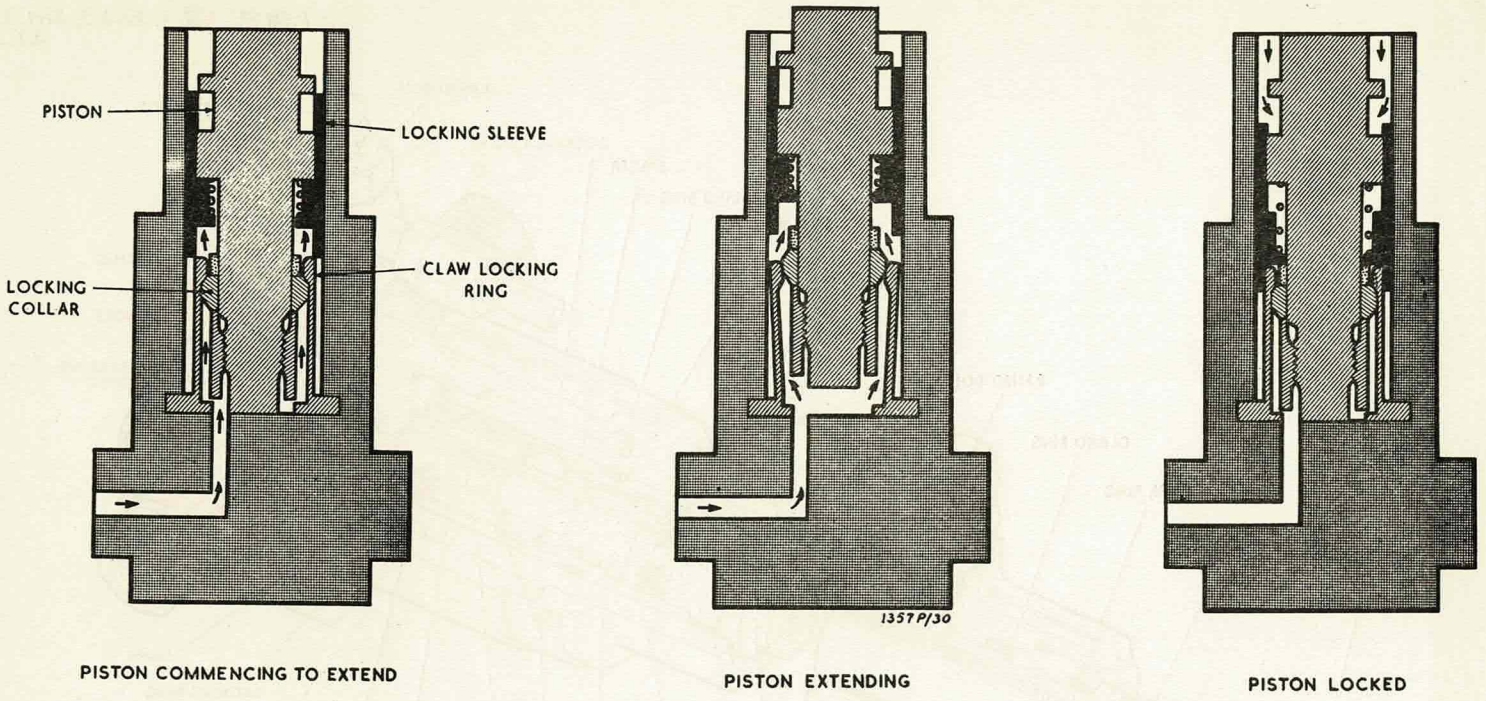

Fig. 3. Functional diagram

override the locking collar and spring inwards behind it. The claws no longer retard the locking sleeve, and the pressure forces the sleeve over the claws to hold them behind the locking collar, thus locking the piston in the closed position.

TABLE 1

Special tools

Ref. No.	Part No.	Description
27Q/12289	ST.1214	Vice clamp for piston rod
27Q/22159	ST.1214 Mk. 3	Collett for vice clamp
27Q/	ST.1272	Tube spanner for retaining nut
27Q/16303	ST.2401	'C' key spanner for gland nut

Special tools—*continued*

Ref. No.	Part No.	Description
27Q/16251	ST.2428	'C' key spanner for end fitting
27Q/	03270TA01	Piston rod fitting for lock loading rig
27Q/	4.60001.062	Cylinder end fitting for lock loading rig
27Q/	4.60001.064	Fork-end fitting for lock loading rig
27Q/	4.60001.065	Assembly tool for gland ring

SERVICING

Leakage

7. External leakage will indicate a faulty sealing ring or gland ring which must be renewed. Internal leakage will be shown by loss of pressure or sluggish action of the jack, and will be due to a faulty sealing ring of the piston head or locking sleeve. Renew the appropriate seal. A weak or damaged spring will result in inefficient locking of the piston and the spring must be renewed.

Dismantling

Note . . .

The jack is to be hydraulically operated to the extended position to disengage the internal lock, before the dismantling procedure is commenced.

8. (1) Remove the transfer pipe assembly and unscrew the bleeder adapter from the end fitting.

(2) Slacken the lock-nut and remove the fork-end and the spanner grip from the piston rod.

(3) Unscrew the gland nut from the cylinder and slide the nut off the piston rod. Remove the wiper ring from the nut.

(4) Unscrew the end fitting from the cylinder and withdraw the claw locking ring, together with the shims.

(5) Withdraw the spindle from the end fitting and remove the sealing rings and backing rings from the fitting. Remove the sealing ring and backing ring from the cylinder.

(6) Withdraw the piston assembly from the cylinder.

(7) Detach the circlips, withdraw the locking pin and unscrew the retaining nut from the piston rod. Withdraw the shims, the locking collar, the spacer, the locking sleeve and the spring from the rod. Remove the sealing rings and split rings from the piston head and the locking sleeve.

(8) Withdraw the gland ring and spacer from the cylinder.

Assembling

9. All sealing rings are to be lightly coated with Grease XG–315 (34B/9100519) before being assembled in the unit.

(1) 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. Slide the spring over the piston rod to rest against the piston head, and then slide the locking sleeve over the head. Do not fit the sealing ring and split rings to the sleeve at this stage of assembly.

(2) Locate three thick and seven thin shims to the end of the locking collar adjacent to the spacer and slide the assembly, preceded by the spacer, over the piston rod. It will be necessary to adjust the the shim pack at a later stage.

(3) Screw the retaining nut tightly onto the piston rod to secure the spring, the locking sleeve, the spacer, the shims and the locking collar.

(4) Fit the locking pin and secure it with the circlips. If the pin cannot be inserted, screw back the retaining nut sufficiently until a slot in the nut aligns with the drilling in the piston rod to allow the pin to be fitted. After adjustment, extra shims of the thicker gauge are to be fitted to the end of the locking collar adjacent to the retaining nut, to ensure that there is no end-play in the sub-assembly when the pin is inserted.

(5) Fit the shims to the claw locking ring. Slide the locking sleeve of the piston assembly back against the pressure of the spring and locate the claw locking ring over the locking collar.

(6) Insert the piston assembly into the appropriate end of the cylinder. Do not fit the sealing ring and backing ring to the cylinder at this stage. Screw the end fitting tightly over the cylinder to clamp the claw locking ring and shims against the cylinder end.

Note . . .

With the locking sleeve rings temporarily omitted at this stage of assembly, care must be taken to avoid scoring the cylinder bore.

(7) When assembled, the centre line of the tapped cylinder boss must be in alignment with a point midway between the two tappings in the end fitting. If necessary, remove the end fitting, withdraw the piston assembly and adjust the thickness of the shims to achieve this alignment. When the correct alignment has been obtained, replace the piston assembly and screw the end fitting tightly over the cylinder.

(8) Slide the spacer and the gland ring over the piston rod and position them against the shoulder in the cylinder bore. Fit the wiper ring to the gland nut, slide the nut over the piston rod and screw it tightly into the cylinder.

(9) Hold the complete jack assembly in a vice.

(10) Check the backlash (end-play) between the claw locking ring and the locking collar (fig. 4). A dial test indicator reading off the end of the piston rod is recommended. The permissible backlash is within the limits of 0·004 to 0·007 in.

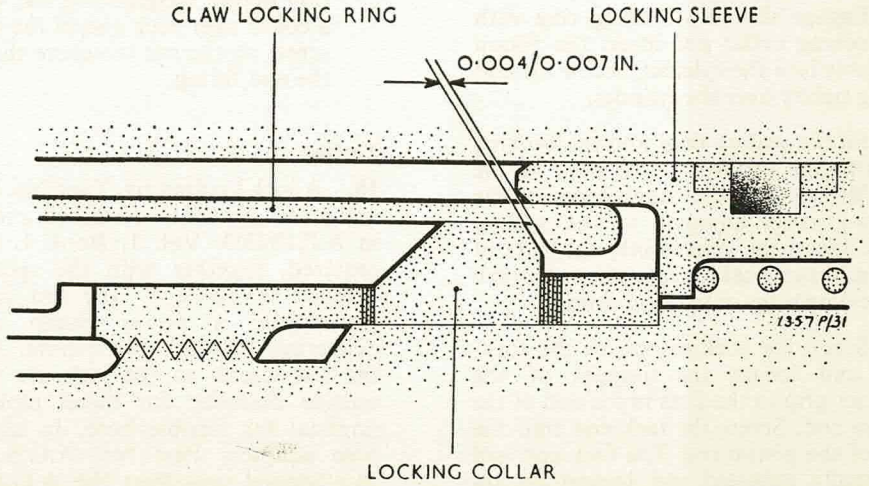

Fig. 4. Adjustment of lock

(11) If it is necessary to adjust the backlash, unscrew the end fitting from the cylinder and withdraw the piston assembly. Slide the locking sleeve back and disengage the claw locking ring. Detach the circlips, remove the locking pin and unscrew the retaining nut. Adjust the thickness of the shim pack at each end of the locking collar by transferring shims from one end of the collar to the other as necessary to obtain the correct backlash.

(12) Re-assemble the piston assembly with the claw locking ring engaged and the retaining nut locked with the pin and circlips. Insert the piston assembly into the cylinder and screw the end fitting tightly over the cylinder. Check the backlash as in operation (10).

(13) When the backlash has been adjusted satisfactorily, remove the end fitting and withdraw the piston assembly. Fit the sealing ring and the backing ring to the cylinder, with the rough face of the backing ring adjacent to the sealing ring. Fit the sealing ring and the split rings to the locking sleeve. 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.

(14) Engage the claw locking ring with the locking collar and insert the piston assembly into the cylinder. Screw the end fitting tightly over the cylinder.

(15) Fit the sealing rings and the backing rings to the grooves in the bore of the end fitting, with the rough faces of the backing rings adjacent to the sealing rings. Insert the spindle into the bore of the end fitting, taking care not to disturb the sealing rings or backing rings.

(16) Screw the lock-nut on to the fork-end and locate the tongues of the spanner grip to the slots in the end of the piston rod. Screw the fork-end into the end of the piston rod. The fork-end will be finally adjusted and locked on installation of the jack in the aircraft.

(17) Ensure that the bleeder plugs are free from obstruction and screw the plugs into the adapter and banjo bolt respectively.

(18) Fit a sealing ring to the adapter and screw it into the appropriate tapping in the end fitting. The adapter must be screwed into the tapping which communicates with this end of the cylinder.

(19) Ensure that the sealing rings are fitted to the banjo unions of the transfer pipe assembly. Secure the banjo union of the pipe assembly to the cylinder boss with the banjo bolt, and secure the opposite end of the assembly to the tapping in the end fitting with the bleeder banjo bolt.

(20) After final assembly and test, wire-lock the following:—

(a) The end fitting to the cylinder flange.

(b) The gland nut to the adjacent cylinder boss.

(c) The banjo bolt of the transfer pipe assembly to the adjacent cylinder boss and pipe union.

(d) The bleeder banjo bolt of the pipe assembly to the end fitting and the adjacent pipe union.

(21) Before despatching the unit, locate a collar over each end of the spindle and screw on the nut to secure the spindle in the end fitting.

Testing

10. A lock loading rig, Type No. 03260TA01 and a test circuit as described and illustrated in A.P.1803D, Vol. 1, Book 1, Sect. 1 are required, together with the special fittings detailed in Table 1. The test circuit is to incorporate a power pump capable of delivering 3·45 gal. per minute. All pipes of the test circuit to the jack are to be $\frac{3}{8}$ in. outside diameter for metal pipes or $\frac{3}{8}$ in. nominal for flexible hose. In addition, two pipe adapters Part No. A.G.S.1104B and two bonded seals Part No. A.G.S.1186B are also required for testing. The jack is to be hydraulically operated at least six times in each direction before testing, to expel all air.

Static test

11. (1) Fit a bonded seal to each pipe adapter and screw the adapters tightly into their respective spindle tappings. Connect the supply line of the hand pump to connection 1 and gradually apply pressure to fully extend the jack. Release the pressure. Gradually apply a pressure of 300 lb/in^2, checking the leakage between 0 and 100 lb/in^2 and then slowly increase the pressure to 6,000 lb/in^2. Leakage is not permissible. Release the pressure and disconnect the supply line.

(2) Connect the supply line to connection 2 and gradually apply pressure to fully close the jack. Release the pressure. Gradually apply a pressure of 300 lb/in^2, checking for leakage between 0 and 100 lb/in^2 and then slowly increase the pressure to 6,000 lb/in^2. Leakage is not permissible. Release the pressure and disconnect the supply line.

No load friction test and lock proving test

12. (1) Connect the supply lines of the power pump to the jack and apply pressure at connection 1 to extend the jack. The pressure required to fully extend the jack must not exceed 90 lb/in^2 and the time required to effect the extension must not exceed 3 seconds.

(2) Apply pressure at connection 2 to close the jack. The pressure required to fully close the jack must not exceed 120 lb/in^2 and the time required to effect the closure must not exceed 6 seconds.

(3) Apply pressure alternately at the connections for closing and extending the jack to engage and disengage the lock. The pressures required to engage and disengage the lock under "no load" conditions must not exceed 120 and 195 lb/in^2 respectively. Release the pressure.

(4) Connect the cylinder end fitting, Part No. 4.60001.062 to the lock loading

rig 03260TA01 (refer to the chapter for the rig).

(5) Remove the fork-end from the piston rod of the jack and screw in the piston rod fitting, Part No. 03270TA01. Remove the spring box assembly from the rig and screw the threaded end of the spring box shaft into the piston rod fitting.

(6) Mount the jack on the rig and connect the jack to the cylinder end fitting.

(7) Connect the supply lines of the power pump to the jack connections and apply pressure to close the jack and engage the internal lock.

(8) Adjust the position of the spring box on the rig to compress the springs in the box to an end load of 900 to 1,100 lb.

(9) Apply pressure at the connection for extending the jack to disengage the lock, and then apply pressure at the connection for closing the jack to engage the lock against the 900 to 1,100 lb. end load. Note the pressure required to engage the lock, and then apply pressure at the connection for extending the jack to disengage the lock.

(10) Set the by-pass valve of the power pump to the pressure as noted +100 lb/in^2.

(11) Engage the lock, close the supply valve of the power pump and reverse the position of the control valve. The lock must not disengage until the power supply valve is opened. Repeat this operation twice.

(12) Operate the lock for 240 cycles.

(13) Repeat the test in (11).

(14) Remove the spring box and piston rod fitting from the piston rod. Assemble the spanner grip to the piston rod, screw the fork-end into the rod and secure it with the lock-nut.

(15) Screw the fork-end fitting Part No. 4.60001.064 to the piston rod of the lock loading rig slave jack. Locate the fork-end of the test jack to the fork-end fitting and secure the fork-end to the fitting with the pin and split pin.

(16) Referring to fig. 2 of the chapter for the lock loading rig, adjust the two jacks until dimension Z is within the limits of 0·5 to 2·5 in. and dimension Y does not exceed 14·525 in. with the test jack fully closed.

(17) Select the control valve of the power pump to supply fluid to the connection for extending the test jack. Open the bleeder cock. Operate the hand pump to close the slave jack and extend the test jack by 2·5 to 3·0 in. At the same time, operate the power pump to supply fluid to the test jack. Discontinue the operation of the pumps and close the bleeder cock of the hand pump supply line. Select the hand pump control valve to extend the slave jack.

(18) Select the power pump control valve to close the test jack and apply a pressure of 2,000 lb/in^2. Gradually open the bleeder cock to allow the test jack to slowly close. When the lock commences to engage, the travel of the test jack will be momentarily arrested, and the bleeder cock must be opened still further to allow the jack to fully close and engage the lock.

(19) Release the pressure at the test jack. Operate the hand pump to a pressure not exceeding 100 lb/in^2 to close the slave jack and attempt to extend the test jack. If the check indicates that the test jack is not locked, the jack is to be rejected.

(20) Repeat operations (17) to (19). The lock must engage satisfactorily each time.

(21) Remove the jack from the lock loading rig.

Installation

13. When the jack is installed, the fork-end is to be adjusted to suit the airframe pick-up points. The dimension between the pin centres must be within the limits of 14·225 to 14·525 in. with the jack in the fully closed position. The piston travel is 5·68 to 5·82 in. After adjustment, wire-lock the fork-end, the lock-nut and the spanner grip together. Wire-lock the bleeder plugs to the adapter and banjo bolt respectively.

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