

Chapter 5

PRESSURE OPENING AND PRESSURE CLOSING VALVE

(Part No. OP.16751/3)

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Introduction

1. The pressure opening and pressure closing valve (fig. 1) is incorporated in certain liquid oxygen converter systems to control the system working pressure.

DESCRIPTION

2. The body of the valve (fig. 2) has two interconnected housings in which are located identical bellows assemblies, each controlling a valve assembly. The valve connections are threaded internally to receive pipe adapters and are identified by the letters A, B, C and D.

3. Each bellows assembly consists of a bellows with a nut soldered to the top and an end cap sub-assembly soldered to the bottom. An external thread on the nut enables the bellows assembly to be screwed into its housing, while an internal thread receives an adjuster. The adjuster houses a spring and is secured by a locknut. The end cap sub-assembly comprises an end cap with a centrally-positioned bearing plate.

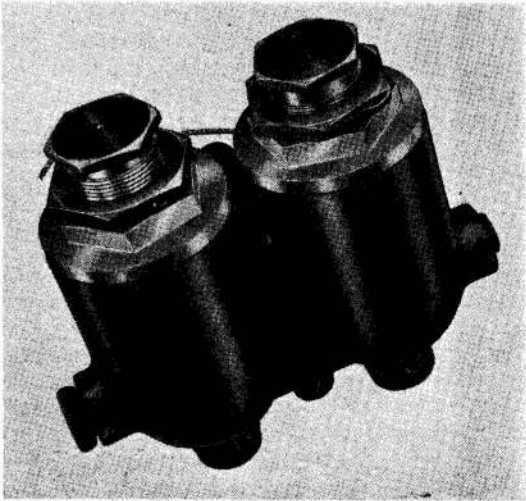


Fig. 1. Pressure opening and pressure closing valve

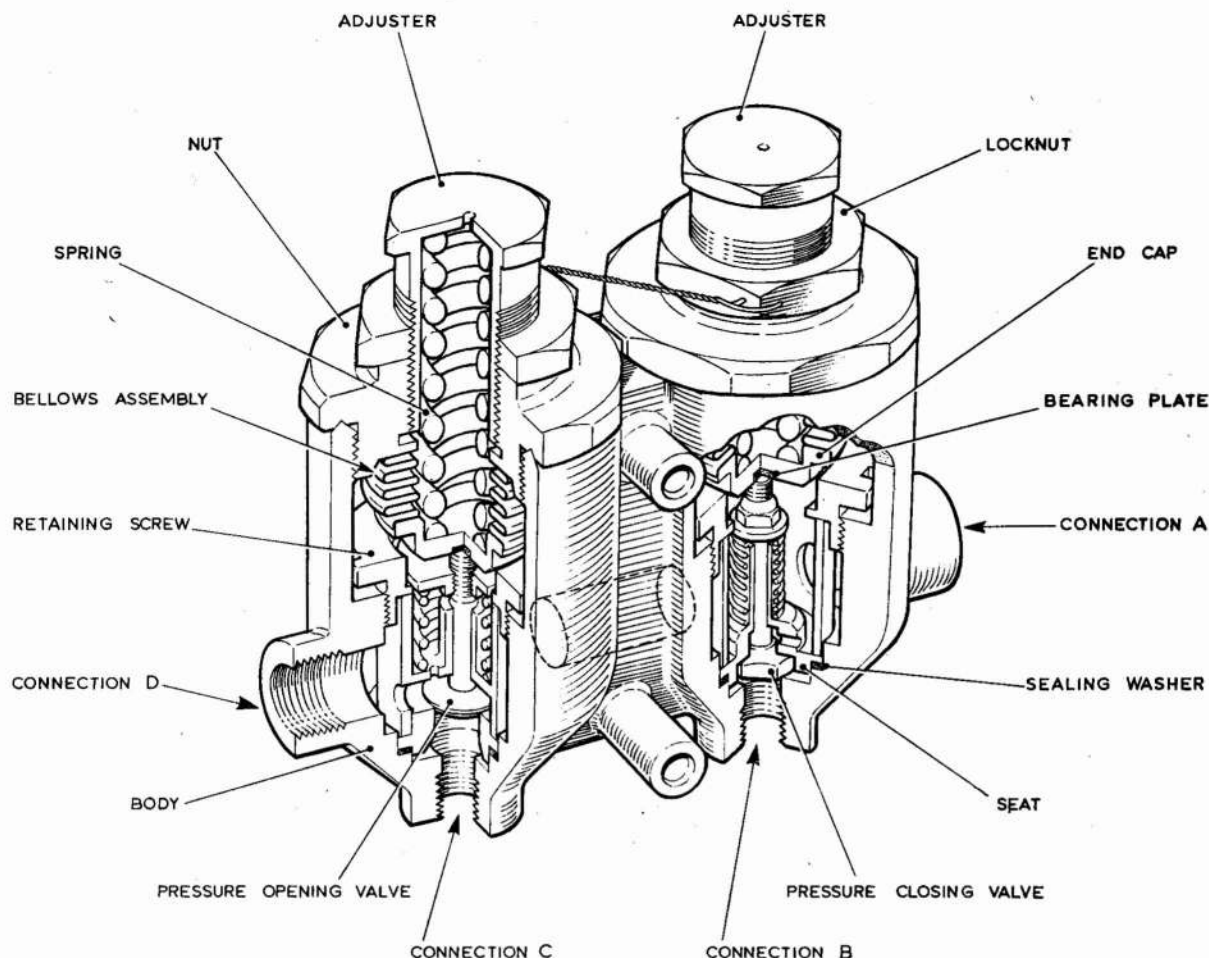


Fig. 2. General arrangement

4. Below each bellows assembly is its associated valve assembly, the pressure closing valve being fitted within connection B and the pressure opening valve within connection C. The pressure closing valve is assembled to a valve seat and is retained by a spring, a washer and a stiffnut. The valve stem bears on to the bearing plate of the bellows assembly, the valve closing with contraction of the bellows. The valve assembly is retained by a retaining screw locked with varnish, the loading of the screw being transmitted to a flange on the seat by a tube. A seal between the valve assembly and the body is achieved by a sealing washer interposed between the seat flange and a shoulder in the body.

5. The pressure opening valve is assembled to a valve guide, and retained by a spring and an adjuster. The valve seat is pressed into the guide after the valve has been fitted. The valve stem bears on to the bearing plate of the bellows assembly, the bellows opposing the loading of the valve spring and maintaining the valve closed. Contraction of the bellows allows the valve to open. The valve assembly is retained and sealed in the same manner as the pressure closing valve assembly (para. 4).

OPERATION

6. The two bellows assemblies of the valve (fig. 3) respond to pressure changes in the liquid oxygen

converter system. Initially, the pressure closing valve is open and the pressure opening valve is closed. At a predetermined build-up pressure, the bellows controlling the pressure closing valve contracts sufficiently to allow this valve to close; the interior of the main body however, remains in communication with the gas phase of the system through connection C. The pressure continues to rise, provided that demands are not made upon the system, until at a second predetermined pressure, the contraction of the bellows above the pressure opening valve allows this valve to open. For details of the valve operation in relation to a liquid oxygen converter system, reference should be made to Part 1, Sect. 3, Chap. 2.

INSTALLATION

7. If it is required to test the valve before installation, apply the standard serviceability tests (App. 1). The valve should be fitted in accordance with the instructions contained in the appropriate chapter (Sect. 4) which deals with the associated package unit.

SERVICING

8. For details of routine servicing, reference should be made to the relevant Servicing Schedule; the valve should not be dismantled. If a defect is

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suspected, the valve should be tested (App. 1). Normally the valves should not require adjustment, but minor adjustments to the pressure settings can be made by the two adjusters. The operating pressure of the pressure closing valve is adjusted by means of the adjuster directly above connection B, clockwise rotation of the adjuster increasing the pressure at which the valve closes. The pressure opening valve is adjusted by means of the adjuster above connection C and clockwise rotation of this adjuster raises the pressure at which the valve opens. After making adjustments, tighten the locknuts, taking care not to disturb the settings of the adjusters, then wire-lock using wire (Ref. No. 30A/3339).

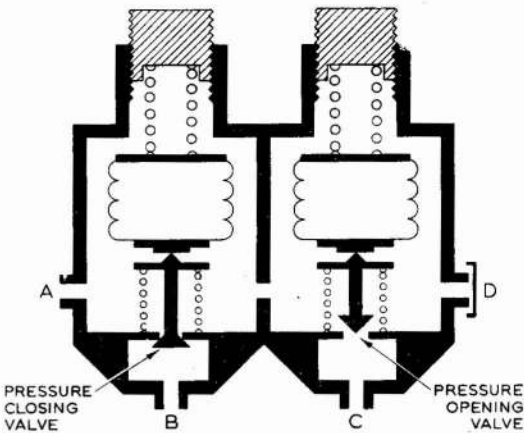


Fig. 3. Schematic diagram

Appendix 1

STANDARD SERVICEABILITY TESTS for PRESSURE OPENING AND PRESSURE CLOSING VALVE (Part No. OP.16751/3)

Introduction

1. The tests detailed in this appendix are to be applied before the valve is fitted to a package unit, when the serviceability of the valve is in doubt and at the appropriate examination periods at Equipment Depots.

Test equipment

2. The equipment required for the tests is as follows:—

- (1) Breathing oxygen test supply (200 lb/in²)
- (2) Oxygen pressure gauge, 0 to 250 lb/in² (Ref. No. 6C/263)
- (3) Oxygen differential pressure gauge capable of indicating differential pressures up to 30 lb/in²
- (4) Three control valves Mk. 10A (Ref. No. 6D/2313)

Particulars of tests

3. Soap solution for 'no leakage' tests should be prepared in accordance with the instructions contained in Part 1, Sect. 2, Chap. 1. Precautions must be taken to prevent the solution entering the unit during the test, and all traces of the solution must be removed as soon as the test is completed.

WARNING . . .

Many materials, particularly oil and grease, are subject to spontaneous combustion when exposed to undiluted oxygen under pressure. Precautions must be taken, therefore, to exclude oil, grease, dust and

metal particles from the valve and the test equipment.

TEST PROCEDURE

Leak test

4. With connections B, C and D blanked, apply a pressure of 200 lb/in² to connection A and, using soap solution check the joints of the valve for evidence of leaks. There should be no leakage. Release the pressure and dry the valve thoroughly.

Operating tests

5. For the purpose of the operating tests, the valve must be connected to the test rig shown diagrammatically in fig. 1.

Pressure closing valve

6. With valves B and C closed, open valve A gradually and apply a slowly increasing pressure to the valve. Observe the differential pressure gauge. When the pointer of this gauge commences to move from zero, the supply pressure should be between 165 and 167 lb/in². Repeat this test three times and determine the mean pressure.

Pressure opening valve

7. Apply a minimum pressure of 155 lb/in² and, maintaining this pressure, open valve B. Increase the supply pressure slowly and observe the differential pressure gauge. When the pointer of this gauge commences to move towards zero, the supply pressure should be between 180 and 182 lb/in².

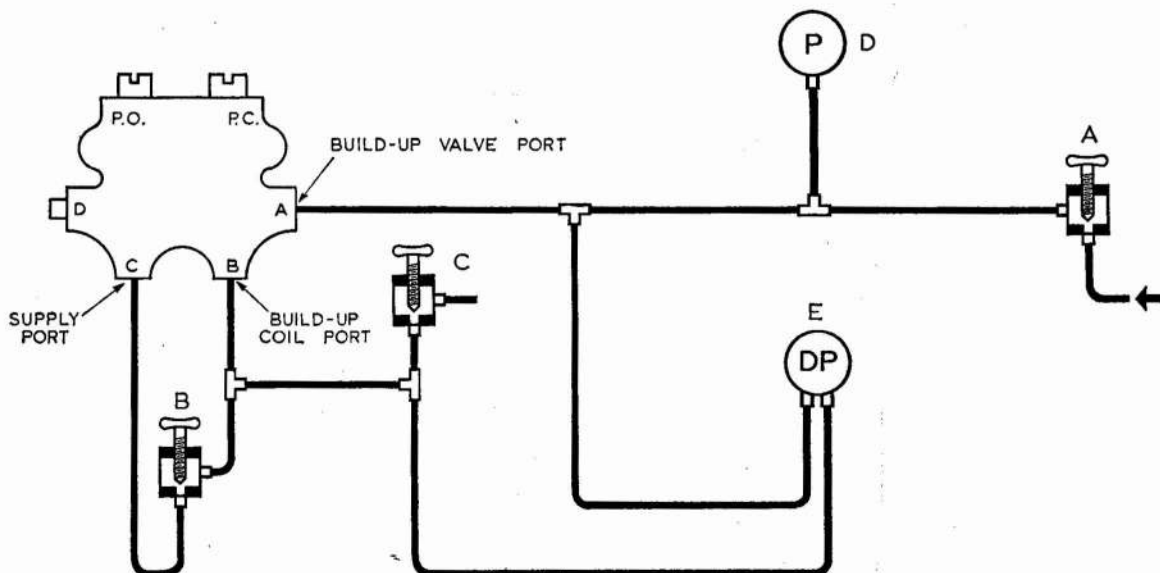


Fig. 1. Schematic arrangement of test rig

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