Chapter I

PRESSURIZING VALVE AND SHUT-OFF COCK, TYPE PVS.1

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. The pressurizing valve unit, type PVS.1, proportions the flow of fuel via the main and primary manifolds to burners with main and pilot passages. It also incorporates a rack-operated shut-off cock which forms a pressure balanced valve in the high-pressure delivery pipe line, enabling the supply of fuel to the burners to be cut off to stop the engine. A drain to atmosphere is provided by slots in the valve plunger and drillings in the body casting. This drain allows surplus fuel remaining in the manifolds and burners when the engine is shut-down to be spilled to atmosphere. For this reason the unit is mounted at the lowest point in the manifold rings.

2. The installation and calibration details of the unit which differ according to particular engine requirements are denoted by suffix numbers and letters. For example, the designation PVS.1/7D is derived from installation number 7 and calibration code D. The following description applies to all units of the PVS.1 series, the type used with any particular engine being specified in the Leading Particulars of the relevant engine Air Publication.

DESCRIPTION

General

3. For convenience of description, the unit may be divided into three main sub-assemblies. These comprise the body casting and fittings, shut-off cock plunger and associated operating gear, and pressurizing valve plunger with spring assembly.

Body casting and fittings

4. The main body casting (4) is of light-alloy and contains two main bores into which are inserted steel sleeves (15) and (5) to house the shut-off cock and pressurizing valve respectively.

5. Connections in the main casting comprise a detachable main inlet casting (11) of light alloy, two outlets (10) (one on each side) to the primary manifold, two outlets (8) (one on each side) to the main manifold, a spill connection (19) to return any fuel leakage during normal operation to the low-pressure side of the system, and to re-circulate any fuel delivered while the shut-off cock is closed, and an outlet connection (14) to drain surplus fuel in the manifolds and burners to atmosphere on shutting down the engine.

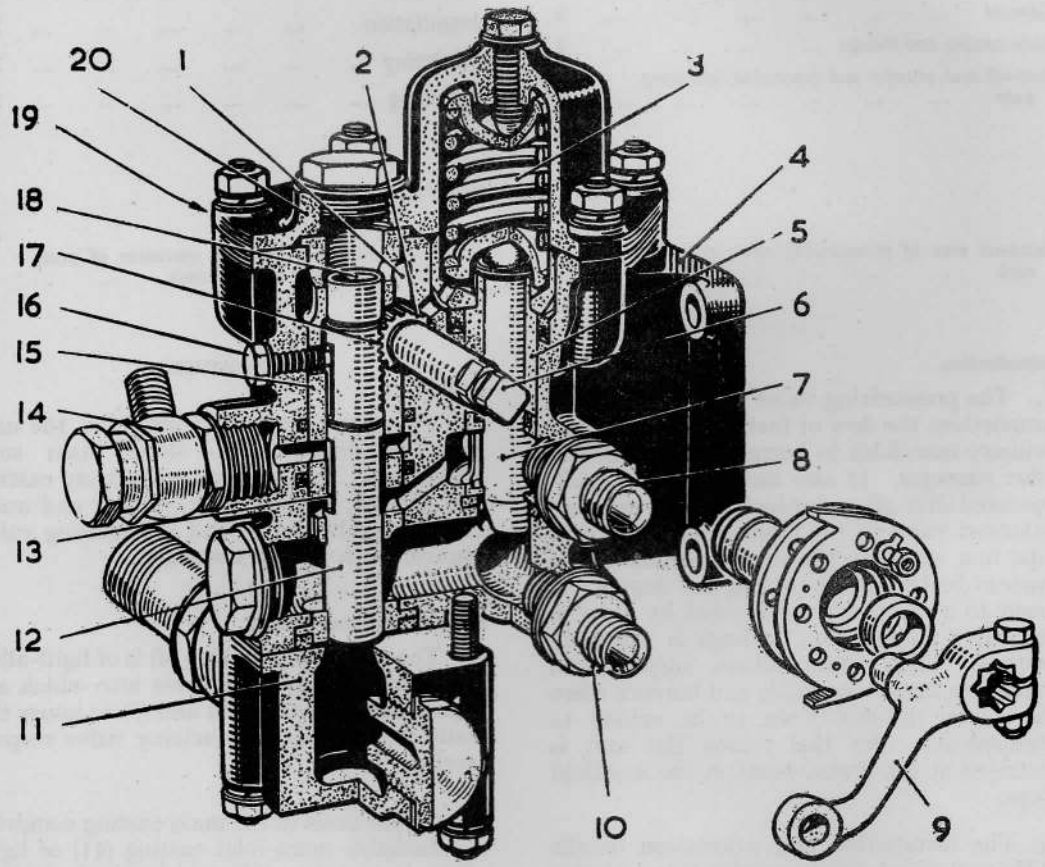
6. The top cover (20) of light-alloy houses the spring assembly (3) and seals the top of the two main bores.

Shut-off cock plunger and associated operating gear

7. The shut-off cock plunger (12) of aluminium bronze operates in a sleeve (15) in the body, and is prevented from rotating by a set-screw (16) inserted through the main casting and sleeve into a slot in the plunger. The bore (18) of the plunger permits the fuel inlet to be connected to the spill outlet (19) when the shut-off cock is closed; it also permits axial balance of pressure, while two circumferential grooves ensure radial balance of pressure, so that the operating torque is reduced to a minimum.

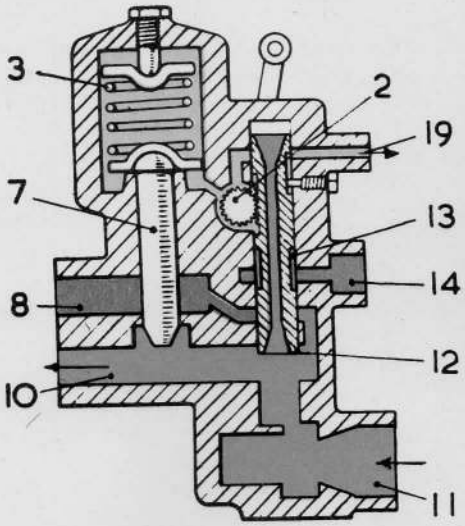
8. Diametrically opposed slots (13) machined in the plunger, together with grooves in the sleeve, connect the main and primary manifolds to atmospheric drain with the plunger closed, but these are blanked off when the plunger is in the open position.

9. The operating gear consists of a pinion (2) of steel which engages with rack teeth cut in the side of the plunger (17). The pinion has an integral shaft (6) carried in a sleeve of steel secured to the main casting with countersunk-head screws.



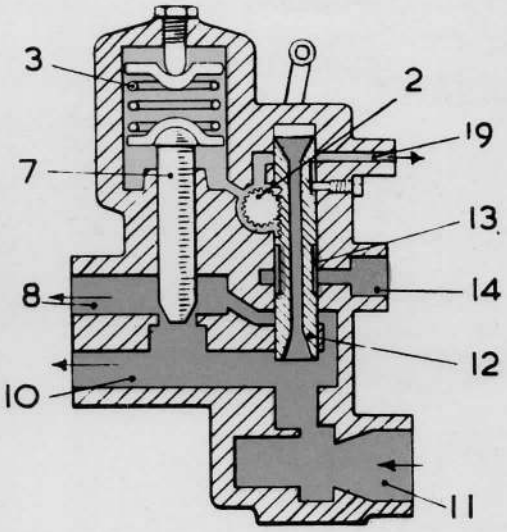
1 GROOVE IN BODY
2 PINION
3 SPRING ASSEMBLY
4 MAIN BODY CASTING
5 SLEEVE
6 INTEGRAL SHAFT
7 PLUNGER (PRESSURIZING VALVE)
8 OUTLET TO MAIN MANIFOLD
9 OPERATING LEVER
10 OUTLET TO PRIMARY MANIFOLD
11 INLET
12 PLUNGER (SHUT-OFF COCK)
13 SLOT IN PLUNGER
14 DRAIN OUTLET
15 SLEEVE
16 SETSCREW
17 RACK TEETH
18 HOLE THROUGH PLUNGER
19 SPILL CONNECTION
20 TOP COVER

Fig. 1. Sectional view of pressurizing valve and shut-off cock

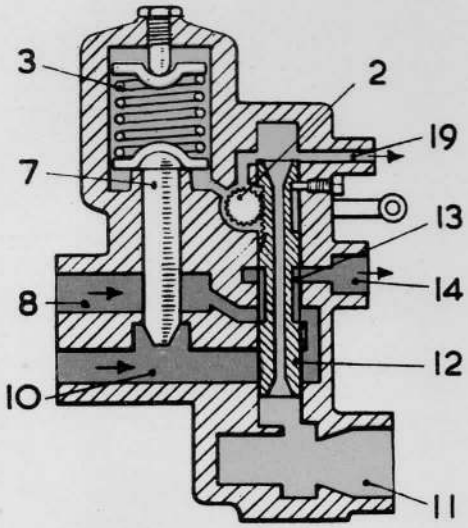


SHUT-OFF COCK OPEN.

FLOW IN PRIMARY MANIFOLD ONLY.



PRESSURIZING VALVE OPEN.
FLOW IN PRIMARY AND
MAIN MANIFOLDS.



SHUT-OFF COCK CLOSED.
MANIFOLDS CONNECTED TO DUMP.
INLET CHAMBER CONNECTED TO PUMP INLET.

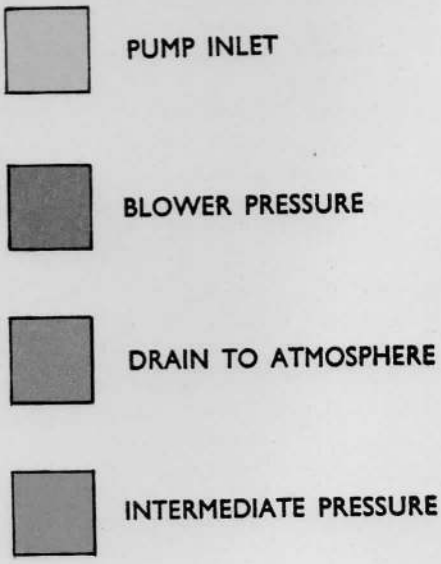


FIG.2 SCHEMATIC DIAGRAMS SHOWING OPERATION OF PRESSURIZING VALVE AND SHUT-OFF COCK

PP6590 M32748/67M/C 6/51 180 C & P Gp. 959(4)

KEY TO FIG. 2

2 PINION
3 SPRING ASSEMBLY
7 PLUNGER (PRESSURIZING VALVE)
8 OUTLET TO MAIN MANIFOLD
10 OUTLET TO PRIMARY MANIFOLD
11 INLET
12 PLUNGER (SHUT-OFF COCK)
13 SLOT
14 DRAIN OUTLET
19 SPILL CONNECTION

10. Fitting over this sleeve, and secured to studs in the main casting, is a stop plate of steel having lips against which a projection on the aluminium bronze operating lever (9) comes into contact to form stops at the travel limits of the shut-off cock plunger.

11. The end of the pinion shaft is squared to locate with the split operating lever, which is secured by a pinch bolt.

Pressurizing valve plunger with spring assembly

12. The aluminium bronze pressurizing valve plunger (7), which slides in its sleeve in the main body casting, has a hemispherical upper portion upon which seats a spring assembly (3) housed in the top cover of the unit.

13. The spring assembly consists of two steel spring plates with a helical spring interposed between them. The loading of the spring on the plunger may be varied initially, as desired, by an adjustment screw passing through the top of the cover and locating with the upper spring plate.

14. The lower portion of the plunger is specially tapered to meter the flow from the primary to the main manifolds, giving the required relationship in accordance with engine requirements.

15. The chamber housing the spring assembly is connected to the spill outlet (19) by a duct in the main body casting.

OPERATION

16. Reference to the schematic diagrams (*fig.* 2) will enable the operation of this unit to be more clearly understood. The broader function of the unit, in conjunction with the remaining fuel system components, and the corresponding effect on engine performance, is covered in the relevant engine Air Publication.

17. With the engine stationary, the shut-off cock plunger (12) is in the closed position, and the pressurizing valve plunger (7) is seated by the loading of the spring assembly (3).

18. Any fuel which is allowed to enter the unit before the shut-off cock is moved into the open position will pass through the bore of the shut-off cock plunger and be spilled through the connection (19) to the pump inlet.

19. On starting the engine with the shut-off cock plunger (12) in the open position, fuel will pass through the unit to the primary manifolds (10). As the fuel pressure increases, the pressurizing valve plunger (7) will be lifted by the rising fuel pressure overcoming spring pressure to allow the passage of fuel through the annular orifice formed by the tapered end of the plunger in its sleeve into the main manifolds (8). Thus, at low pressures, all the fuel is passed to the burners through the primary passages (10) only, and with increasing pressures, an increased amount of fuel will be passed through the main manifolds (8). This ratio is dependent upon the spring loading and profile of the pressurizing valve plunger, which is calibrated to suit engine requirements.

20. When the shut-off cock plunger is closed, fuel at inlet pressure entering the unit is again passed through the plunger bore and returned to pump inlet (19). At the same time, fuel remaining in the burners and manifolds is forced by engine compressor pressure in the combustion chambers through drillings in the body casting and slots in the high-pressure cock plunger to atmosphere.

INSTALLATION

21. Installation details are fully covered in the relevant engine Air Publication.

INHIBITING

22. Inject protective oil PX–5 (Stores Ref. 33C/777) into the inlet connection of the unit, operating the high-pressure cock during the process, then ensure that dust caps are fitted to all exposed unions.

SERVICING

23. When the unit is installed, no servicing is necessary except for a constant check of all pipe connections and unions for tightness, as no leakage is permissible.

24. Where leakage is evident, faulty joint washers or pipes must be renewed, but whenever pipes or joints are disturbed, ensure that the complete fuel system is primed, as detailed in the relevant engine Air Publication.