

## Chapter 12

### COMBINED CONTROL UNITS, TYPE CCU.100 SERIES

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#### **Description** (fig. 1 and 2)

1. The unit consists of a combined throttle valve and h.p. shut-off cock (23), idling by-pass (20), pressurizing valve, automatic dump valve (28) and a barometric pressure control (b.p.c.).

2. The throttle valve and h.p. shut-off cock, idling by-pass, pressurizing valve and dump valve are housed in a common body, to one face of which is attached the barometric pressure control. The units are interconnected by internal drillings and a fuel transfer tube.

#### *Throttle valve and h.p. shut-off cock*

3. The throttle valve and shut-off cock are manually controlled and linked to the pilot's throttle lever. The throttle valve comprises a fluted rotary shutter (23) operating in a sleeve (21) that incorporates a series of staggered ports; the shutter is coupled to a throttle shaft to which is attached the throttle control lever. Opening movement of the throttle lever will rotate the shutter in the sleeve to uncover a progressively increasing number of ports. The valve also serves as the h.p. shut-off cock. The throttle lever has a range of movement of 90 degrees.

#### *Idling by-pass*

4. The by-pass is an adjustable needle which regulates the flow through an orifice and, during the idling range of the throttle valve, supplies fuel to the pressurizing valve.

#### *Pressurizing valve*

5. The valve consists of a piston (4) operating in a sleeve (3) which has seven metering slots (26) interconnected by radial drillings to the seven main supply connections (25) to the burners. The piston is spring-loaded and adjustment for the spring is (27) housed in the top of the spring housing.

6. The tail of the piston is fitted with a carbon sleeve (30) which, in addition to stabilizing the piston, minimizes leakage from a pressure balance chamber (32) formed by an annulus below the carbon sleeve. Any leakage past the sleeve is drained to the inlet side of the pump via the seal drain (31).

7. A non-return valve (18) in the drain duct prevents fuel passing to the burners if the aircraft fuel booster pump is switched on when the engine is stationary.

#### *Dump valve*

8. The dump valve is a spring-loaded valve which ensures complete drainage of fuel from the pilot manifold, the spring (29) keeping the valve open when the engine is stationary.

#### *Barometric pressure control*

9. The barometric pressure control has a capsule chamber (5) and a valve chamber (12) separated by a support plate (10). The plate carries a centrally pivoted rocker lever (13) which extends into both chambers. The end

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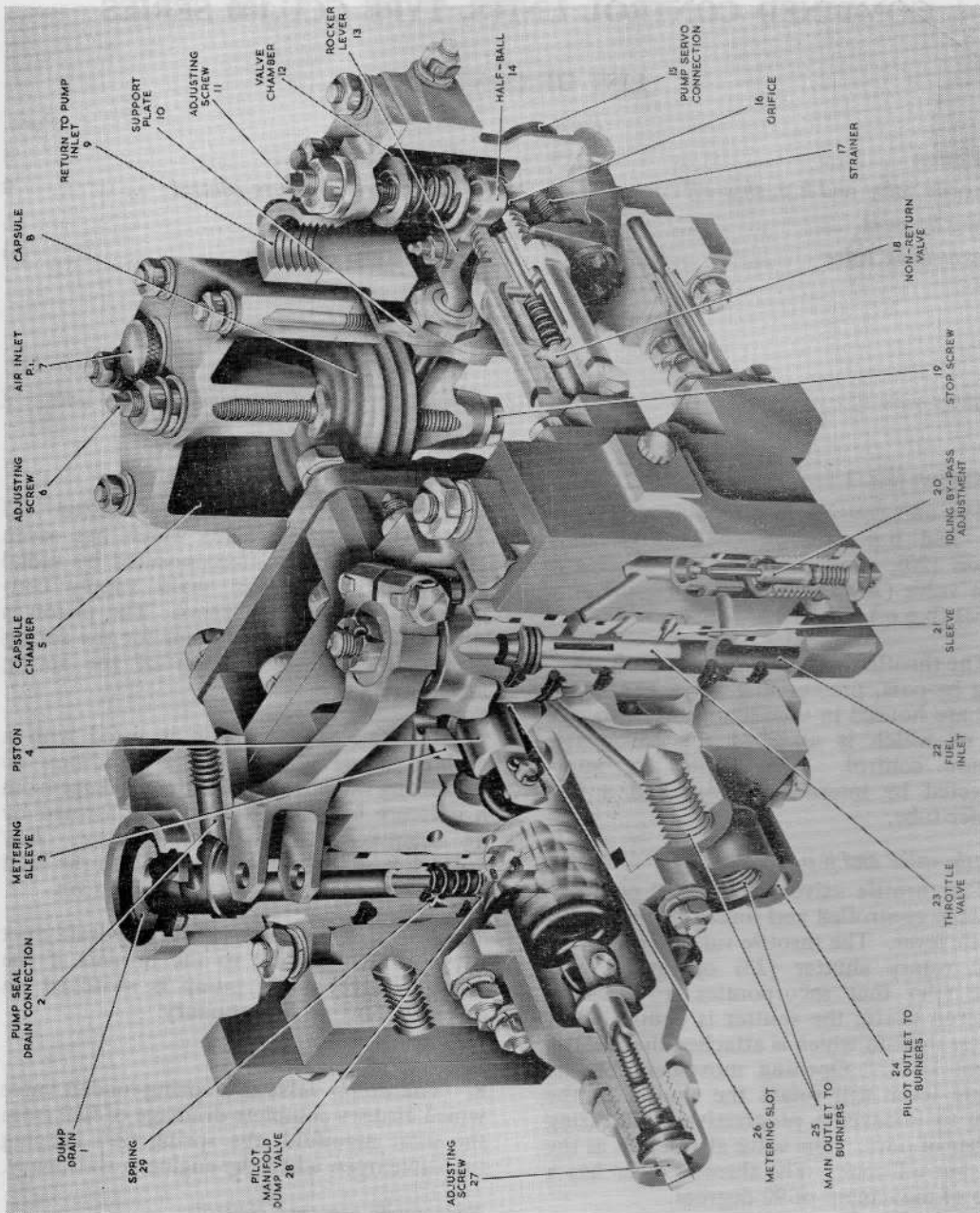


Fig. 1. Cut-away view of c.c.u.

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of the rocker lever extending into the capsule chamber contacts the capsule (8), which is supported by a shrouded adjustment screw (6) housed in the capsule chamber cover plate. The extent of travel of the rocker lever is determined by an adjustable stop screw (19) in the base of the capsule chamber.

**10.** The opposite end of the rocker lever extending into the valve chamber is spring-loaded and accommodates a half ball valve (14) which controls an orifice (16) that is in communication with the fuel pump servo system (15). In the valve chamber between the valve and rocker lever pivot is a push rod (35) operating in an eccentric sleeve. One end of the push rod contacts an adjusting screw in the rocker lever, the other end contacts a piston (34) in a sleeve contacting a diaphragm (33).

#### Operation

**11.** When the engine is started, fuel from the pump flows to the throttle valve and shut-off cock; this will be set to the idling position, with some of the ports in the throttle valve sleeve uncovered.

**12.** Some of the fuel passes through the idling by-pass, to the spring chamber of the pressurizing valve and the dump valve. The initial fuel pressure entering the dump valve is just sufficient to overcome the tension of the spring and commence to move the valve. Increasing pressure will open the valve fully and allow fuel to flow through the pilot manifold to the burners. The low pressure fuel at the beginning of the starting cycle is delivered to the pilot burners (24).

**13.** The action of the dump valve opening to allow a fuel flow to the pilot manifold, closes the drain outlet of the valve (1).

**14.** As the fuel flow increases, the pressure in the pressurizing valve spring chamber reaches a point where it overcomes the spring loading of the piston. Movement of the piston uncovers the metering slots interconnected to the seven main connections to the burners, and allows an increase in fuel flow to meet the rising requirements of the engine. When the maximum operating flow is available from the throttle valve, the metering slots are fully uncovered and the piston is in the fully open position.

**15.** Under steady running conditions at fixed throttle settings the barometric pressure control regulates the fuel flow, thus compensating for changes in aircraft speed and altitude.

**16.** Under conditions of stabilized air intake pressure, i.e. constant speed and height, the capsule force is determined by air intake pressure. This is balanced by the fuel pump delivery pressure acting on the diaphragm and tending to open the half ball valve, and the spring-loading above the rocker lever tending to close the valve.

**17.** Any decrease in air intake pressure due to decreased speed or increased altitude, or a combination of these factors, will unbalance these forces. The capsule force therefore becomes the greater and actuates the rocker lever to open the half ball valve and allow fuel to bleed from the servo system. This decreases the pump servo pressure, causes the pump servo piston to move, and reduces the pump stroke until the forces are again in balance.

**18.** Conversely, an increase in air intake pressure will cause the half ball valve to close and give an increase in flow until the balance is again restored.

**19.** Closing the throttle valve covers the ports in the throttle valve sleeve and decreases the pressure. The pressurizing valve spring moves the piston to close off the metering slots of the main supply to the burners. When the throttle lever is fully closed, all ports are closed and the dump valve is open to allow fuel in the pilot manifold to drain away.

#### Installing and servicing

**20.** Instructions on the installing of the unit are given in the engine Air Publication.

**21.** No servicing is required, except for a regular inspection of all pipes and connections for leakage.

**22.** If connections are disturbed, the fuel system must be bled as described in the engine Air Publication.

**23.** The unit should be inhibited with oil OM-11 or OM-13 and have all apertures blanked off.

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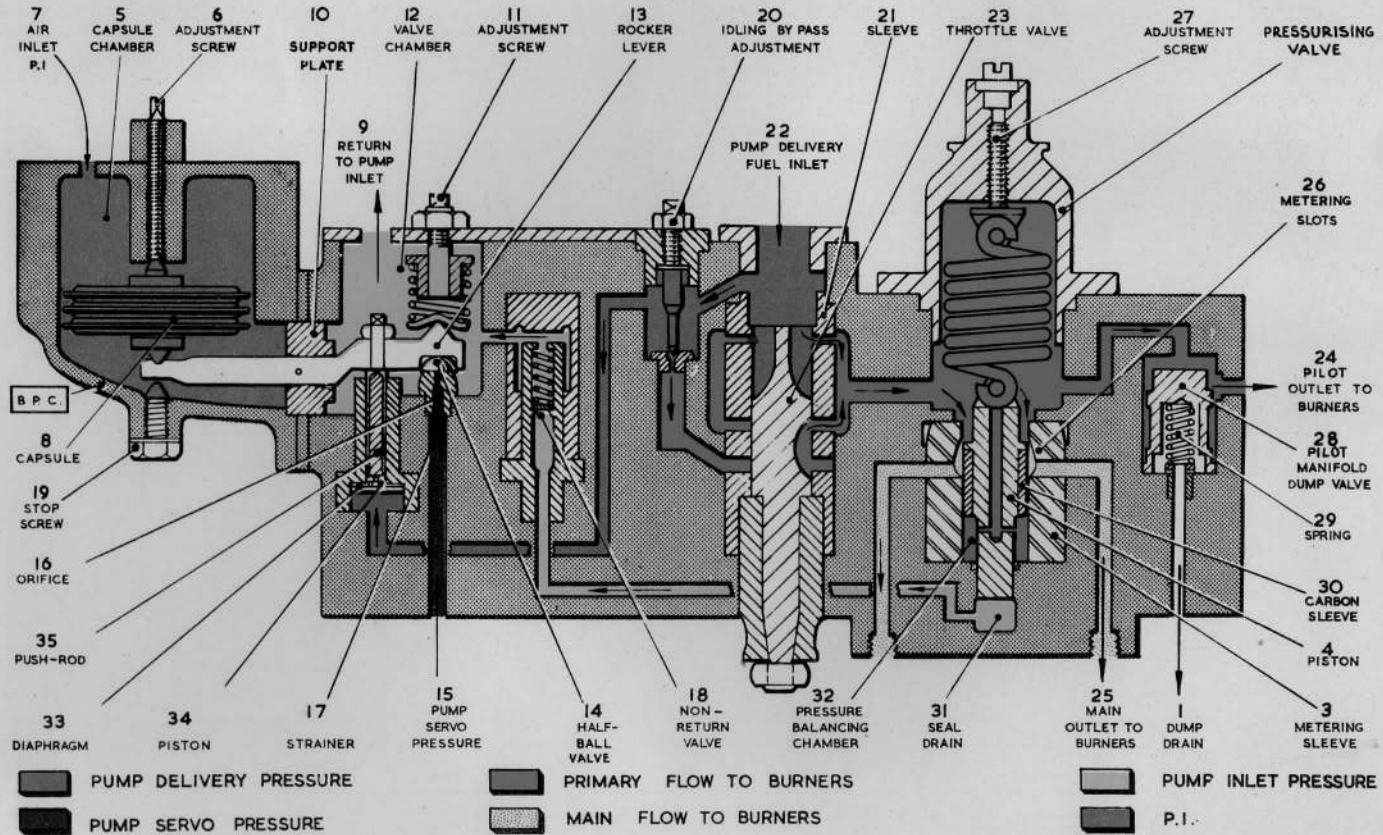


Fig.2 Schematic view of combined control unit

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