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DUPLEX NOZZLE

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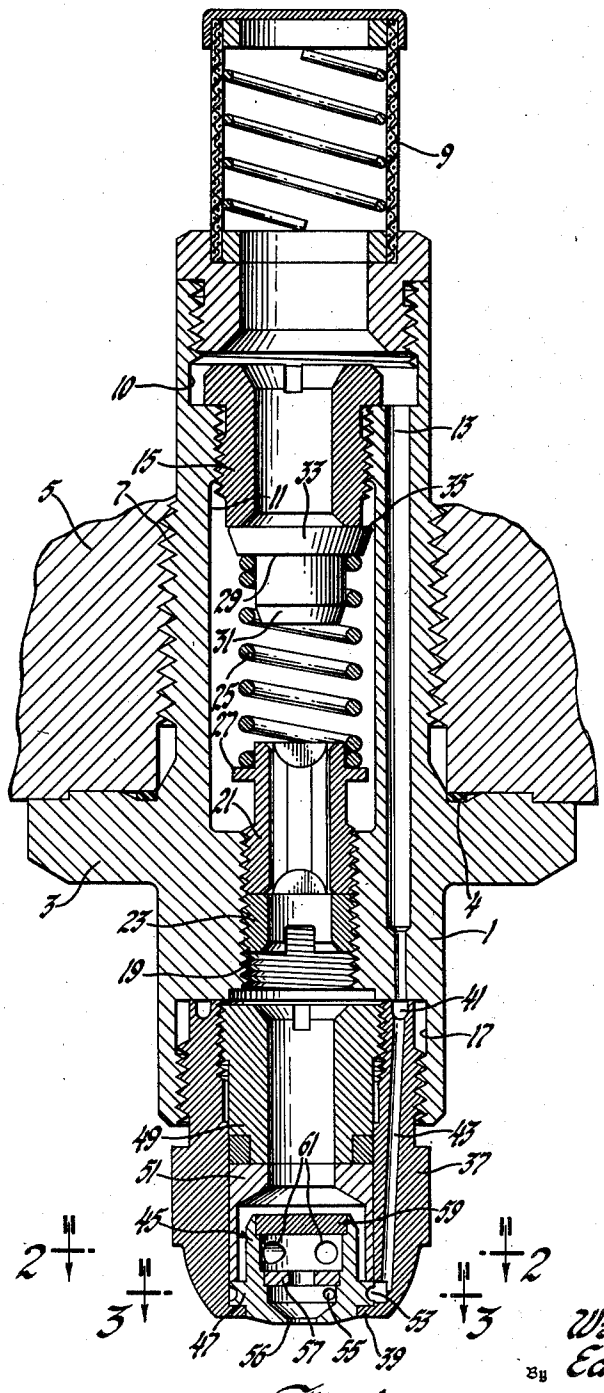


Fig. 1

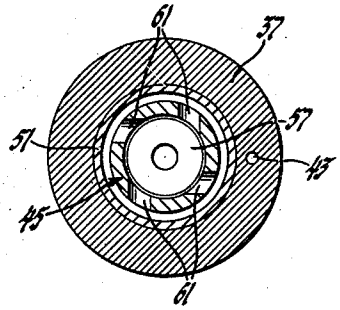


Fig. 2

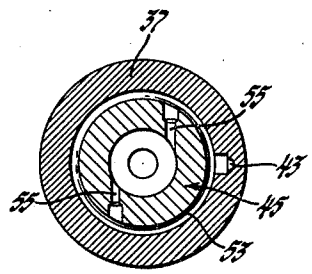


Fig. 3

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DUPLEX NOZZLE

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5 Claims. (Cl. 299—118)

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The present invention generally relates to fuel spray nozzles and more particularly to improvements in nozzles of the variable flow and spray pattern type.

The present invention is embodied in a fuel nozzle comprising few, easily formed, and readily detachable parts cooperating to form dual fuel pressure supply passages each supplying separate tangentially disposed fuel orifices leading to a whirling chamber having a common discharge orifice; and a valve seat, valve head and manually adjustable means in one supply passage, the manually adjustable means serving to retain the valve head in off-center seating relation with said seat in order to obtain uniform unseating of the valve head at a preset value of pressure acting thereon as determined by the manually adjustable means.

The preferred arangement of a nozzle in accordance with the invention is described in the following detailed description of this assembly and clearly illustrated in the accompanying drawings.

Figure 1 of the drawings is a longitudinal sectional view of the nozzle assembly in operative position with parts shown broken away and in section.

Figure 2 is a transverse cross sectional view taken on line 2—2 of Figure 1.

Figure 3 is a transverse cross sectional view taken on line 3—3 of Figure 1.

As best illustrated in Figure 1, the nozzle assembly comprises a nozzle body 1 having an external flange 3 seated in fluid tight relation by means of a sealing gasket 4 on a flanged surface of a fuel pressure receiver 5 having an internally threaded opening shown engaged by the externally threaded portion 7 of the nozzle body 1.

A fuel filter element 9 is threaded in the inner end counterbore 10 coaxial with the longitudinal axis of the nozzle body 1 and forms a fuel inlet chamber.

Large and small diameter supply passages 11 and 13 lead from the fuel inlet chamber 10 in parallel relation with respect to the longitudinal axis of this chamber and the nozzle body 1. An annular valve seat 15 is threaded into the inlet end of the large diameter supply passage 11. An internally threaded counterbore 17 is provided in the opposite or fuel discharge end of the body 1 in coaxial relation with the axis thereof. A smaller internally threaded opening 19 extends coaxially inwardly from the counterbore 17 and opens in off-center relation into the

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adjacent end of the large diameter passage 11, the smaller diameter passage 13 opening directly in off-center relation into the inner end of the counterbore 17. An annular spring seat 21 is adjustably threaded into the opening 19 and an annular lock member 23 is also threaded in the opening 19 and abuts the outer end of the spring seat. A helical compression spring 25 is seated on an exterior annular flange 27 of the spring seat 21 and the other end of the spring is seated on an exterior annular flange 29 of a valve head 31 and retains the head in off-center seating relation on the valve seat 15. The fuel pressure applied through the annular valve seat 15 to the flat seating face at one side of the axis of the valve head 31 tends to tilt the head 31 off the seat 15 against the action of the spring 25 and the head is tapered at 33 to provide a peripheral knife edge 35 on the seating face to promote this tilting unseating action of the head, the knife edge 35 engaging a point in the internal surface of the large diameter fuel passage 11 closest to this edge.

A hollow nozzle cap 37 is threaded in the counterbore 17 in the outlet end of the body 1. The cap is provided with an internal flange 39 adjacent the discharge end and the inner end face abuts the bottom face of the counterbore 17 and is provided with an annular groove 41 registering wth the smaller diameter passage 13 in the nozzle body 1. A fuel passage 43 extends from the groove 41 in the cap to a point inside the internal flange 39 thereof.

A hollow cylindrical fuel whirling chamber element, generally indicated at 45, is provided with an external flange 47 which is retained seated on the internal flange 39 of the cap 37 by an annular nut 49 screwed in the inner end of the cap 37, an annular spacer 51 being placed between the nut 49 and flange 47 of the element 45. The flange 47 of the fuel whirling element 45 is provided with a circumferential groove 53 registering with the outer end of the cap fuel passage 43. As best shown in Figures 1 and 3 two fuel passages 55 extend from the flange groove 53 of the element 45 in tangential relation to the internal surface of the element adjacent the reduced diameter outlet discharge orifice 56 in the end thereof shown extending outwardly of the cap flange 39. An annular orifice plate 57 is seated in a counterbore of the whirling element 45 axially inwardly of the tangential passages 55 and a closure plate 59 is pressed in a counterbore in the inner end of the whirling element 45. As best shown in Figures 1 and 2, four fuel pas-

sages 61 of larger diameter also extend through the wall of the element 45 intermediate the closure plate and orifice plate in tangential relation to the internal surface of the element. The outer end of the tangential passages 61 open into an enlarged internal diameter portion of the spacer 51 in the cap 37.

The operation of the above described fuel nozzle assembly is as follows: Fuel at a value of pressure below that causing the above described tilting unseating action of the valve head 31 enters through the filter 9 and inlet chamber 10 in the nozzle body 1, passes through the small diameter body passage, the groove 41 and passage 43 in the cap, and through the groove 53 and tangential passages 55 in the fuel whirling element 45, causing centrifugal whirling of the fuel in the element between the orifice plate 57 and discharge passage 56, causing fuel to be discharge therefrom in a wide angle conical spray pattern. The orifice plate 57 prevents back flow of fuel through this orifice plate and larger diameter tangential passages 61 to the interior of the annular spacer 51 and nut 49 in the cap 37 and thereby restricts back flow of fuel through the annular lock 23 and spring seat 21 to the portion of the larger diameter passage 11 behind the valve head 31. The valve head unseats by tilting action with minimum friction when the fuel pressure rises to a value just sufficient to overcome the force of the spring 25 determined by the adjustment of the spring seat 21. Fuel under pressure then passes the unseated valve head 31 and flows through the annular members 21, 23, 49 and 51 and passes through the other tangential passages 61 in the element 45, centrifugal whirling action of the fuel then takes place between the closure plate 59 and orifice plate 57, and the fuel is discharged, the orifice plate supplements the whirling action of the fuel due to the tangential passages 55 adjacent the discharge orifice 56, so that increased fuel is discharged at increased pressure through both sets of tangential passages 55—61 and a narrow angle conical spray pattern is obtained.

The above arrangement of easily formed parts cooperates in the manner described to cause uniform unseating of the valve head at the value determined by the spring adjustment each time the pressure acting in off-center relation on the head and spring occurs and also causes the valve head to be reseated in different off-center positions on the seat.

Reference is made to the applicant's copending application Serial No. 223,061 for Duplex Fuel Nozzle, filed April 26, 1951, which is a continuation-in-part of this application directed to the fuel spray tip structure.

We claim:

1. A fuel spray nozzle comprising, in combination, a body, a fuel inlet thereto, a spray tip therein, the body defining two passages therein extending from the inlet to the spray tip, a portion of one of the passages constituting a valve chamber, a valve seat at the inlet end of the chamber, a spring abutment facing the valve seat and located off center with respect to the valve seat, a valve head normally engaging the seat, and a helical compression spring disposed between the abutment and the valve head and concentric with the abutment and the head, the off-center location of the abutment causing the head to seat off-center on the valve seat, the wall of the chamber cooperating with the edge of the valve head to limit the eccentricity of the seating thereof.

2. A fuel spray nozzle comprising, in combination, a body having a fuel inlet thereto, a spray tip therein, the body defining two passages therein extending from the inlet to the spray tip, a portion of one of the passages constituting an annular valve chamber, a valve seat at the inlet end of the chamber, a spring abutment mounted in the body facing the valve seat and located off-center with respect to the valve seat, an annular valve head reciprocably mounted in the chamber normally engaging the seat, and a helical compression spring biasing the valve head against the valve seat disposed between the abutment and the valve head and centered on the valve head, the off-center location of the abutment causing the head to seat off-center on the valve seat, the wall of the chamber cooperating with the edge of the valve head to limit the eccentricity of the seating thereof and to guide the reciprocation thereof.

3. A fuel spray nozzle comprising, in combination, a body having a fuel inlet thereto, a spray tip therein, the body defining two passages therein extending from the inlet to the spray tip, a portion of one of the passages constituting an annular valve chamber, a valve seat at the inlet end of the chamber, a spring abutment mounted in the body facing the valve seat and located off-center with respect to the valve seat, an annular valve head reciprocably mounted in the chamber normally engaging the seat, and a helical compression spring biasing the valve head against the valve seat disposed between the abutment and the valve head and centered on the valve head, the off-center location of the abutment causing the head to seat off-center on the valve seat, the wall of the chamber cooperating with the edge of the valve head to limit the eccentricity of the seating thereof and to guide the reciprocation thereof, and the edge of the head being chamfered away from the seating surface thereof to provide an acute edge engaging the said wall.

4. A valve operated by fluid pressure comprising, in combination, a body defining an annular valve chamber, a valve seat at the inlet end of the chamber, a spring abutment mounted in the body facing the valve seat and located off-center with respect to the valve seat, an annular valve head reciprocably mounted in the chamber normally engaging the seat, and a helical compression spring biasing the valve head against the valve seat disposed between the abutment and the valve head and centered on the valve head, the off-center location of the abutment causing the head to seat off-center on the valve seat, the wall of the chamber cooperating with the edge of the valve head to limit the eccentricity of the seating thereof and to guide the reciprocation thereof.

5. A valve operated by fluid pressure comprising, in combination, a body defining an annular valve chamber, a valve seat at the inlet end of the chamber, a spring abutment mounted in the body facing the valve seat and located off-center with respect to the valve seat, an annular valve head reciprocably mounted in the chamber normally engaging the seat, and a helical compression spring biasing the valve head against the valve seat disposed between the abutment and the valve head and centered on the valve head, the off-center location of the abutment causing the head to seat off-center on the valve seat, the wall of the chamber cooperating

with the edge of the valve head to limit the eccentricity of the seating thereof and to guide the reciprocation thereof, and the edge of the head being chamfered away from the seating surface thereof to provide an acute edge engaging the said wall.

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