

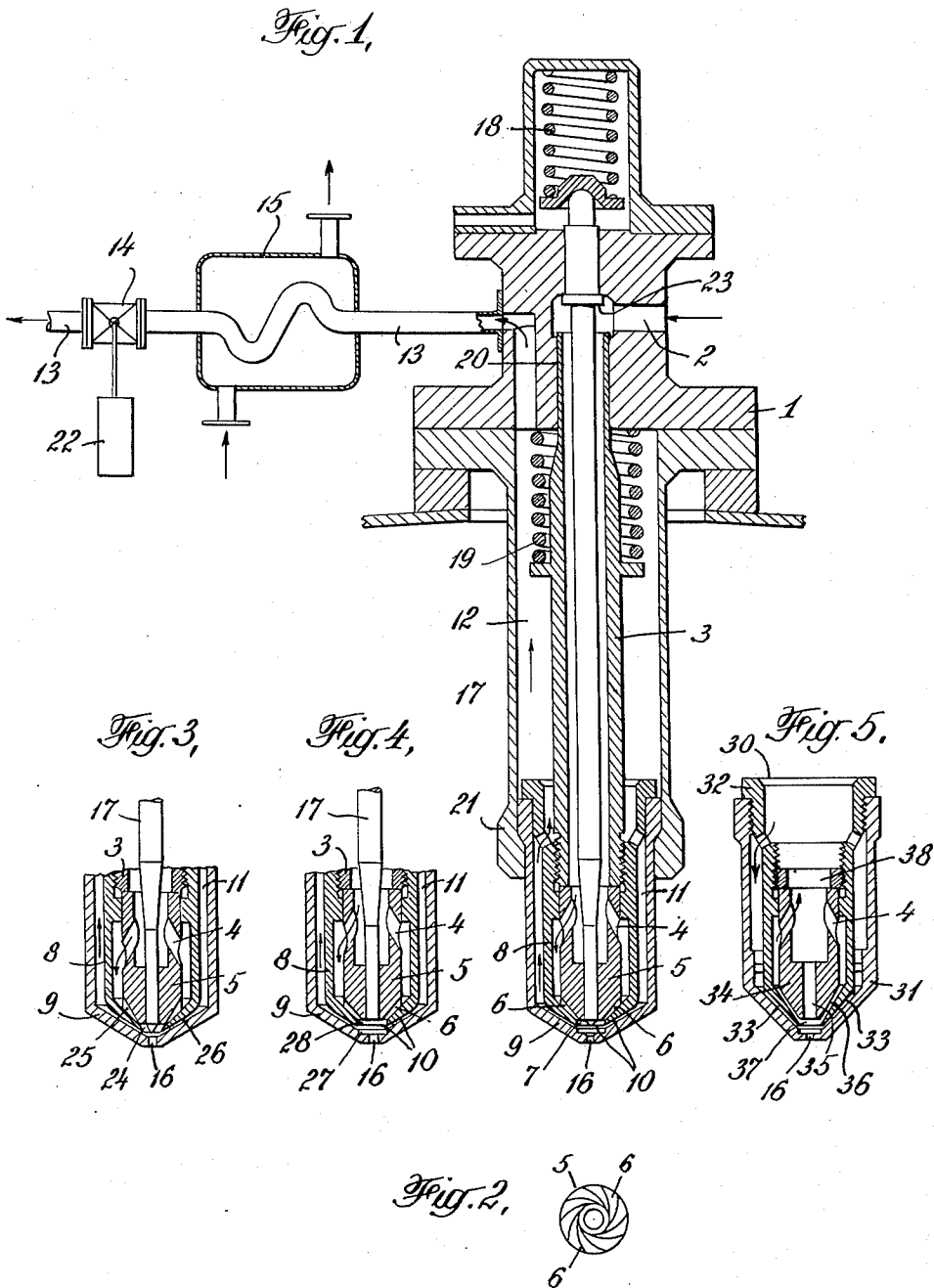
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W. HUBER

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BURNER FOR LIQUID FUELS

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INVENTOR
WALTER HUBER
BY
Patent, Davis, Mann & Co.
ATTORNEYS

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BURNER FOR LIQUID FUELS

Walter Huber, Winterthur, Switzerland, assignor
to Sulzer Freres, Societe Anonyme, Winterthur,
Switzerland

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The invention relates to a burner for liquid fuels having immediately before the combustion chamber a nozzle chamber in which the fuel performs a rotary movement and to which a return pipe for fuel is connected.

It is known in burners for liquid fuels to supply more fuel to the nozzle chamber than is injected into the combustion chamber and to return the surplus fuel through a return pipe. The fuel then rotates in the nozzle chamber and leaves this chamber through openings situated in the axis of the burner. This has the disadvantage that the injection of the fuel into the combustion chamber is impaired, in that irregularities may arise in the interior of the rotating fuel ring on account of the fuel flowing out of the nozzle chamber in the burner axis, and these irregularities may cause a disturbance in the fuel emerging and thus an irregular and even slanting flame formation.

This disadvantage is overcome by the invention in that the nozzle chamber is provided in the region of its outer circumference with a return flow opening which connects it to the return pipe.

The drawings show embodiments of the invention in a diagrammatic form.

Fig. 1 is a longitudinal section through the burner.

Fig. 2 is a view of the fuel supply passages.

Figs. 3 to 5 show further designs of the nozzle chamber.

The fuel enters the burner 1 through the passage 2 and flows through the centrally placed burner pipe 3 and the openings 4 of the swirl body 5 with the spiral grooves 6 (Fig. 2), in which the pressure is converted into velocity. The spiral grooves 6 open tangentially into the nozzle chamber 7, which is formed by the end face of the swirl body 5, the intermediate piece 8 and the nozzle cap 9.

On the outer circumference of the nozzle chamber 7, between the intermediate piece 8 and the nozzle cap 9, is provided the slot-shaped outlet 10, which connects the nozzle chamber 7 to the return pipe 11, 12, 13. Built into the return pipe is the throttle member 14, which regulates the flow through the pipe 13. The cooler 15 for cooling the returning fuel prevents the formation of froth and thus any impairment of throttling in the regulating member 14.

The nozzle opening 16 in the burner cap 9 is closed by the spring 18 acting on the needle 17 when the fuel pressure falls below a certain value. The burner pipe 3 is screwed into the intermediate piece 8 and serves to hold fast the swirl body

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5. By means of the spring 19 and also through the pressure of the fuel on the end 20 of the pipe 3 the intermediate piece 8 is pressed firmly against the cap 9, which is supported on the jacket pipe 21 of the burner 1. The end 20 of the nozzle pipe 3 is fitted into the outer end of the burner 1 so as to have a sealing effect, but is also displaceable in order to prevent any change in the slot 10 in case of expansion of the various parts of the burner.

The regulating valve 14 is adjusted by means of a setting device 22 which is in itself known and which works in dependence on a determinant service magnitude of the plant according to the purpose for which the burner 1 is used and regulates the quantity of fuel returning. Obviously the valve 14 may also be adjusted by hand, either exclusively or in combination with the device 22.

The regulation of the quantity of fuel returning permits a pressure sufficient for the faultless atomisation of the fuel injected to be maintained before the grooves 6 even when the load is low. This regulation even renders it possible to prevent the atomisation of fuel by opening the valve 14 completely, and thus to turn off the burner in such a way that on the one hand no dripping takes place and on the other, by a sudden closing of the valve 14, the immediate atomisation of the complete fuel quantity becomes possible.

Regulation can take place in such a way that the quantity of fuel entering the burner 1 is kept constant for all loads. The returning quantity of fuel, however, can also be kept constant, in which case this quantity must be so great that the pressure before the grooves 6 remains high enough at all conditions of loading to ensure good atomisation of the fuel quantity emerging through the opening 16.

The needle 17 is opened at a certain fuel pressure on the surface 23. It is desirable for this fuel pressure to be so great that atomisation of the fuel to be injected through the nozzle opening 16 is ensured.

In Fig. 3 the nozzle chamber 24 has a tapered form, the narrow end of the taper being directed towards the nozzle opening 16, so that the cross-section of the nozzle chamber 24 diminishes towards the opening 16. Fuel is supplied through spiral grooves 25 at the base of the tapered chamber 24. The outlet 26 for the returning fuel is placed on the outer circumference of the nozzle chamber 24 towards the narrow end. In this way the circumference of the slot 26 becomes smaller, and as a result the width of the slot may be greater for a given cross-section and the re-

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turn flow may thus require a lower fuel pressure.

The nozzle chamber 27 of Fig. 4 has a cylindrical form as in Fig. 1, but the nozzle opening 16 is in this case sharp-cornered, that is to say, it is connected to the nozzle chamber 27 without any rounding or chamfering of the edges. The end face 28 of the needle 17 is of plane design and in the open position is flush with the upper wall of the nozzle chamber 27.

In Fig. 5 the head 30 of the burner is designed in such a way that the cap 31 is screwed tight to the intermediate piece 32. The grooves 33 between the two pieces serve for the supply of fuel and are spirally designed for this purpose. The inner part 34 with the guiding means 35 of the burner needle forms together with the intermediate part 32 the fuel return flow opening 36 leading from the nozzle chamber 37. The inner part 34 is screwed tight to the intermediate piece 32 by means of the nut 38.

All three parts can be built together in the workshop, tested for efficient working and accurately adjusted, in order to be screwed as a whole to the burner pipe 3 before service and to be inserted with this pipe in the burner 1. The nozzle chamber 37 may have any desired form.

The invention offers the advantage that atomisation is not disturbed or influenced by the returning fuel quantity, and further that the manufacture of the burner head and the guiding and sealing means of the nozzle needle are simplified. Instead of a slot-shaped return flow opening 10, 26 or 36, single passages distributed around the circumference of the nozzle chamber may also be provided, or the slot may be divided up in some other manner.

I claim:

1. A burner for liquid fuel which comprises a supporting structure having conduits for supply and return of fuel and a composite end portion attached to said structure, said end portion consisting of three nested coaxial parts forming a nozzle chamber having an inner end toward said supporting structure, a side wall and an outer end away from said supporting structure, the outermost of said three parts having a nozzle opening centered on the common axis and leading through the outer end of said chamber to the outside, the intermediate of said three parts having a relatively large opening centered on the common axis and forming the side wall of said chamber, the innermost of said three parts forming the inner end of said chamber, said outermost, intermediate and innermost parts being spaced apart to form two annular fuel passages one on either side of said intermediate part, one of said passages leading from the fuel supply conduit and the other to the fuel return conduit, the supply passage being

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provided with a spiral arrangement for swirling fuel into said chamber.

2. A burner according to claim 1 in which the annular space between the intermediate part and the innermost part of the end portion forms the supply passage therein.

3. A burner according to claim 1 in which the annular space between the intermediate part and the outermost part of the end portion forms the supply passage therein.

4. A burner according to claim 1 in which the nozzle chamber is cylindrical.

5. A burner according to claim 1 in which the nozzle chamber is conical.

6. A burner according to claim 1 in which a pipe is connected to the conduit for return of fuel and a regulating valve is provided for adjusting the quantity of fuel flowing through said pipe thereby adjusting the amount of fuel discharged from the nozzle opening.

7. A burner according to claim 1 in which the intermediate and innermost parts of the end portion are carried by a coaxial conduit within the supporting structure and in which expansion and contraction means in operative engagement with said structure and said conduit are provided to maintain a proper relative position between the three coaxial parts during heating and cooling of the burner.

8. A burner according to claim 1 in which the innermost part is provided with a coaxial opening therethrough and a valve member is arranged slidable in said opening forming in its retracted position an integral portion of the inner end of the nozzle chamber and in its extended position sealing the nozzle opening in the outer end of the nozzle chamber.

WALTER HUBER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,326,488	Fisher	Dec. 30, 1919
1,644,372	Gray	Oct. 4, 1927
1,824,952	Graham et al.	Sept. 29, 1931
2,079,430	Bargeboer	May 4, 1937
2,177,781	Haynes et al.	Oct. 31, 1939
2,313,298	Martin et al.	Mar. 9, 1943
2,315,172	Voorheis	Mar. 30, 1943
2,345,402	Lubbock et al.	Mar. 28, 1944
2,369,046	Harvey et al.	Feb. 6, 1945
2,374,041	Saha	Apr. 17, 1945

FOREIGN PATENTS

Number	Country	Date
751,391	France	Sept. 2, 1933