Jan. 23, 1951 T. W. MURPHY 2,539,315

METHOD OF MIXING AND NOZZLE THEREFOR

Filed March 29, 1945

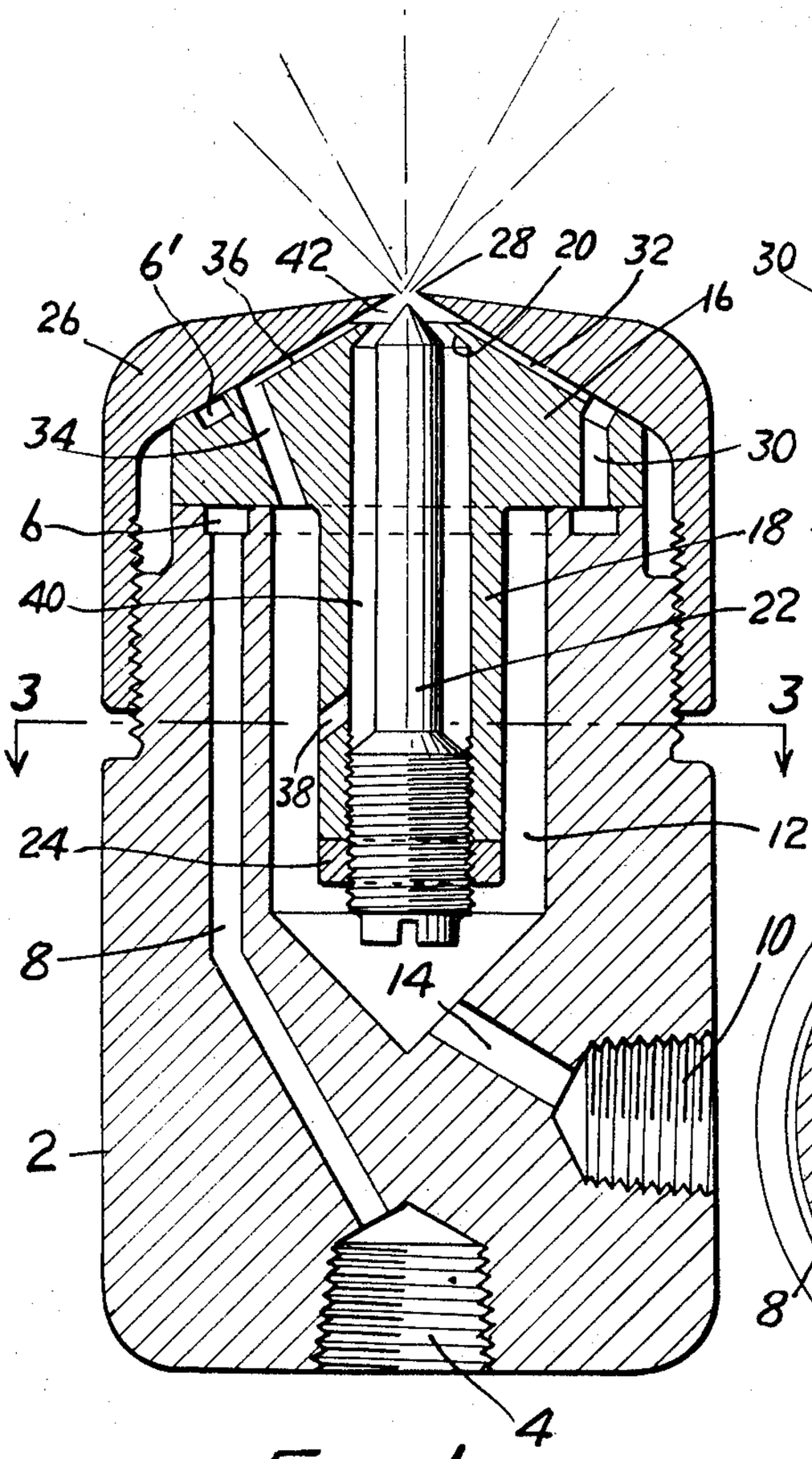

FIG. 1.

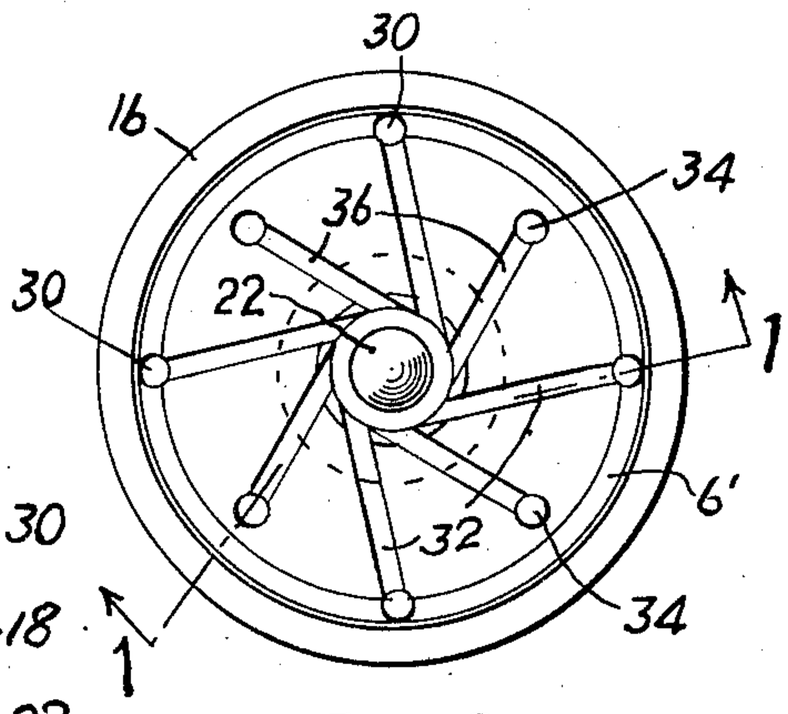

FIG. 2.

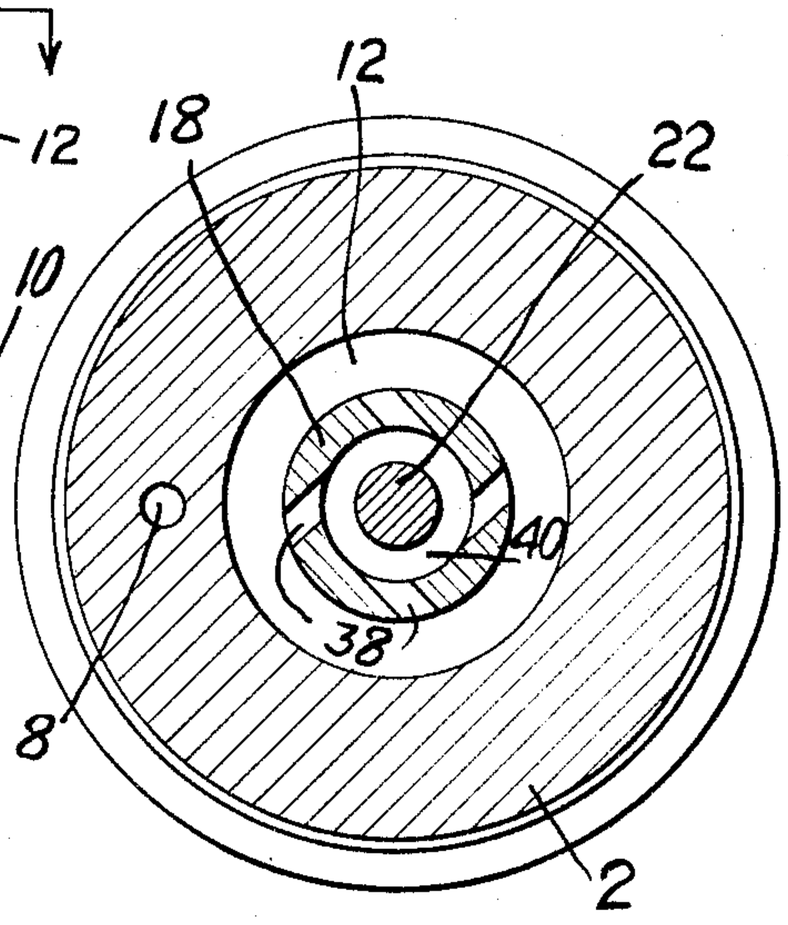

FIG. 3.

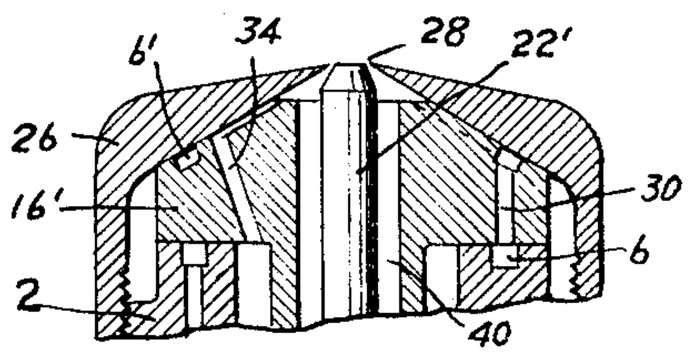

FIG. 4.

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METHOD OF MIXING AND NOZZLE THEREFOR

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This invention relates to a method and spray or atomizing nozzles to be used for atomizing liquids by the use of air or steam as an elastic fluid, or the mixing of one gas with another, and in which both of the elements to be mixed are fed to the nozzle under pressure.

The nozzle illustrated is particularly applicable to the atomization of fuel oil for delivery as an oil burner, and in which the oil is atomized to the required fineness to produce perfect combustion and thus prevent carbonization and prevent the building up of carbon on the walls of the furnace.

In accordance with the present invention the oil is delivered to the swirl chamber by a plurality of jets in a tangential direction, between jets of air or steam delivered to the swirl chamber in the same direction, over a stream of air or steam directed into the swirl chamber, swirling in the same direction, whereby the alternate jets of air or steam will atomize the oil while the swirling stream of air or steam will commingle with the mist of oil combined with air or steam formed by the jets and before the atomized mixture passes through the orifice of the nozzle.

One of the objects of this invention is to provide a nozzle which is to be operated by pressure upon the elastic fluid and liquid, and differentiates from a system in which any of the elements are delivered by ejector means, or a vacuum principle.

Another object of my invention is to provide a nozzle in which the pressure of the elastic fluid may be either higher or lower than the pressure of the liquid to be atomized, depending on the relationship of the passageways. Thus the nozzle may be constructed to deliver air and liquid under equal pressure, and the volume discharged may be controlled by the needle valve, whereby the pressure may be kept reasonably high for the best results under certain conditions.

Another object of my invention is the provision of a nozzle in which the size thereof may be increased, and in turn increasing the size or the number of air passages in the face of the disc, and decreasing the size or the number of the liquid slots, so that a greater volume of low pressure air may be used, for example, air under a few ounces of pressure instead of from, possibly, between 2 and 20 lbs. needed for certain oils and conditions to be met.

The foregoing objects and other objects of the invention particularly relating to details will become apparent from the following description, read in conjunction with the drawings, in which:

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Fig. 1 is an irregular axial section of one form of nozzle constructed in accordance with my invention, on the line 1—1 of Fig. 2;

Fig. 2 is a plan view of the nozzle with the cap removed;

Fig. 3 is a sectional view of the nozzle on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view of a modified form in which the needle valve may be used to throttle the discharge from the orifice.

Referring to the drawings, the nozzle comprises a body 2, having a threaded opening 4, for an oil, other liquid or gas delivery pipe, an annular chamber 6 in its upper face and a passage 8 leading from the oil delivery opening 4 to the annular chamber 6.

10 designates an opening in the body which is threaded for the reception of a delivery pipe, leading from an elastic fluid supply, such as air or steam under pressure, and the central portion of the body is provided with a relatively large elastic fluid chamber 12, open at the top of the body, and connected by a passage 14 at the bottom thereof with the opening 10 to which may be connected a pipe leading from a supply of elastic fluid under pressure.

Seated on the top of the body 2 is a disc 16 having a downwardly extending stem 18 which extends into the chamber 12, while the bottom of the disc forms a closure for chambers 6 and 12.

The stem 18 is bored out from the bottom throughout its length with a reduced opening at its upper end, the wall of the bore at the upper end converging from the full diameter of the bore to the smaller diameter of the outlet, as indicated at 20.

The lower portion of the bore in the stem 18 is threaded, and adjustably mounted in the threaded portion of the bore is a needle valve 22, having threads on its lower end in engagement with the threads in the bore of stem 18, and 24 is a lock-nut for locking the needle valve in its adjusted position.

The disc 16 is provided with a conical face on its upper end and the disc is held in close contact with the upper face of the body 2, by means of a cap 26 having a threaded connection with the upper end of the body 2.

The inner face or bottom of the cap is bored at the same angle as the tapered face of the disc 16 and converges towards the nozzle orifice 28.

6′ designates a channel in the upper face of disc 16, substantially directly above channel 6 in the head and extending through disc 16, connecting channels 6 and 6′, are passages 30. Tan-

gential grooves 32 are provided in the upper face of the disc 16, one end of each of which communicates with groove 6', at the junction of a passage 30.

34 designates a plurality of passages extending through the disc 16, each of which communicates at one end with the elastic fluid chamber 12 in the body of the nozzle, and at the other end with a tangential groove 36 in the upper face of the disc 16.

In the present instance there are four oil grooves 32 and four elastic fluid grooves 36 in the top of disc 16, which alternate with each other, although the number may be decreased or increased, in accordance with the requirements for which the nozzle is designed.

38 designates upwardly and tangentially extending passages communicating with the elastic fluid chamber 12 and the bore of stem 18 of the disc, which might be termed an inner elastic fluid chamber 40.

A swirl chamber 42 is formed at the orifice 28, between the cap 26 and the top of disc 16, to which jets of oil from grooves 32, and alternate jets of elastic fluid from grooves 36 are directed in a tangential direction to atomize the oil by the elastic fluid and cause the mist to swirl in chamber 42, and as the passages 38 are directed upwardly and tangentially a stream of elastic fluid from the chamber 40 will enter the swirl chamber 42 with a swirling motion and commingle with the swirling mixture of elastic fluid and liquid before passing from orifice 28 to the combustion chamber or other receptacle.

In the form shown, it will be noted that if it is desired to adjust the needle valve 22, it will be necessary to remove the disc from the body 2. Such a structure is desired where it is essential that the adjustment be made only by authorized parties, but it will be readily appreciated that the structure may readily be varied slightly to permit adjustment of the valve from the exterior of the nozzle.

This can readily be accomplished by having the tapped openings 4 and 10 in the sides of the body and connecting them to chambers 6 and 12, by means of their respective passages 8 and 14. In such a structure the stem of the valve 22 where it enters the bore of the stem 18 of the disc 16 could be of the same diameter as the bore for a short distance, while the lower portion of the stem might be threaded in the body 2, and the nut 4 could then be adapted to lock the valve in adjusted position by jamming it against the body 2.

In Fig. 1, the throttle valve 22 is arranged to throttle the discharge from chamber 40 to the swirl chamber 42.

In Fig. 4, I have shown a portion only of the delivery end of the nozzle in which the bore in the stem of the disc 16', is extended through the disc, to permit the needle valve 22' to be adjusted to throttle the discharge from the nozzle orifice 28'.

It will be evident that numerous variations of the invention may be made without departing from the principles thereof, as defined in the following claims:

What I claim and desire to protect by Letters Patent is:

1. A nozzle comprising a cap member, a seating surface in said cap member terminating substantially at the outer surface of said cap member and forming a discharge orifice in said cap member, a body member mounting said cap member, inlet ports in said body member, a disc member mounted between said cap member and said body member, a swirl chamber between said disc and said cap seating surface terminating in said orifice, said disc having a surface adapted to sealingly engage said cap seating surface, channels formed in said disc surface tangentially to said swirl chamber providing passages communicating with said swirl chamber, means including passages in said disc and said body member for directing fluid material from one of said body inlet ports to a plurality of said channels in said disc, and means for directing fluid material from a second body inlet port to the remaining channels in said disc, the fluid materials passing through said channels commingling in said swirl chamber and discharging through said discharge orifice.

2. A nozzle comprising a cap member, a conical seating surface in said cap member terminating substantially at the outer surface of said cap member and forming a discharge orifice in said cap member, a body member mounting said cap member, inlet ports in said body member, a disc member mounted between said cap member and said body member, a swirl chamber between said disc and said cap seating surface terminating in said orifice, said disc having a surface adapted to sealingly engage said cap seating surface, channels formed in said disc surface tangentially to said swirl chamber providing passages between said disc and said cap communicating with said swirl chamber, means including passages in said disc and said body member for directing fluid material from one of said body inlet ports to alternate channels in said disc, and means for directing fluid material from a second body inlet port to the remaining channels in said disc, the fluid materials passing through said channels commingling in said swirl chamber and discharging through said discharge orifice.

3. A nozzle comprising a cap member, a seating surface in said cap member terminating substantially at the outer surface of said cap member and forming a discharge orifice in said cap member, a body member mounting said cap member, inlet ports in said body member, a disc member mounted between said cap member and said body member, a swirl chamber between said disc and said cap seating surface terminating in said orifice, said disc having a surface adapted to sealingly engage said cap seating surface, channels formed in said disc surface tangentially to said swirl chamber providing passages communicating with said swirl chamber, fluid means including passages in said disc and said body members for directing fluid material from one of said body inlet ports to a plurality of said channels in said disc, means for directing fluid material from a second body inlet port to the remaining channels in said disc, the fluid materials passing through said channels commingling in said swirl chamber and discharging through said discharge orifice, an axial passage communicating with said swirl chamber, and means for delivering a swirling stream of fluid through said axial passage into said swirl chamber.

4. A nozzle comprising a cap member, a seating surface in said cap member terminating substantially at the outer surface of said cap member and forming a discharge orifice in said cap member, a body member mounting said cap member, inlet ports in said body member, a disc member mounted between said cap member and said

body member, a swirl chamber between said disc and said cap seating surface terminating in said orifice, said disc having a surface adapted to sealingly engage said cap seating surface, channels formed in said disc surface tangentially to said swirl chamber providing passages communicating with said swirl chamber, means including passages in said disc and said body members for directing fluid material from one of said body inlet ports to a plurality of said channels in said disc, means for directing fluid material from a second body inlet port to the remaining channels in said disc, the fluid materials passing through said channels commingling in said swirl chamber and discharging through said discharge orifice, an axial passage communicating with said swirl chamber, fluid means for delivering a swirling stream of fluid through said axial passage into said swirl chamber, and an adjustable needle valve extending through said axial passage and said swirl chamber and adapted to control the flow through the discharge orifice.

THOMAS W. MURPHY.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,023,707	Anthony	Apr. 16, 1912
1,326,488	Fisher	Dec. 30, 1919
1,448,106	Binks	Mar. 13, 1923
1,462,395	Thompson	July 17, 1923
1,533,042	Sloper	Apr. 7, 1925
1,568,427	Strachan et al.	Jan. 5, 1926
1,592,982	Loepsinger	July 20, 1926
1,641,581	Egan	Sept. 6, 1927
1,785,803	Adams	Dec. 23, 1930
1,785,804	Adams	Dec. 23, 1930
1,864,795	Boyd	June 28, 1932
2,313,298	Martin et al.	Mar. 9, 1943