April 11, 1950 T. J. GOTHARD 2,503,723

FOG NOZZLE

Filed Aug. 17, 1944

FIG. 1.

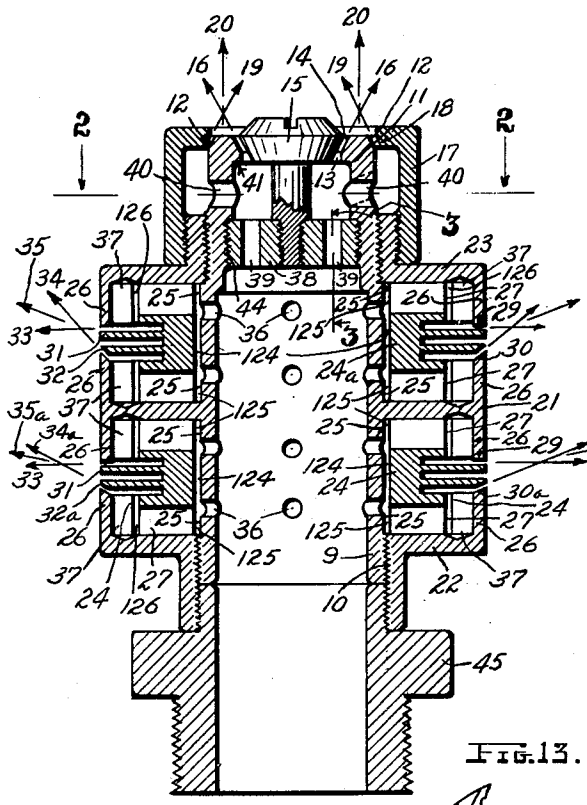


FIG. 2.

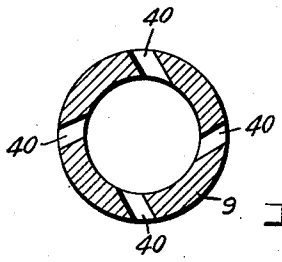


FIG. 9.



FIG. 3.

FIG. 10.

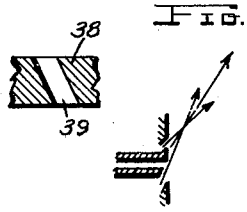


FIG. 4.

FIG. 13.

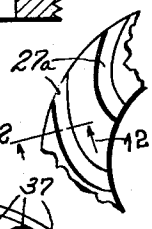


FIG. 5.



FIG. 6.

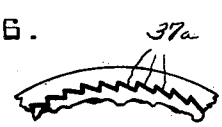
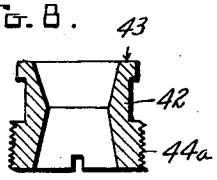


FIG. 8.



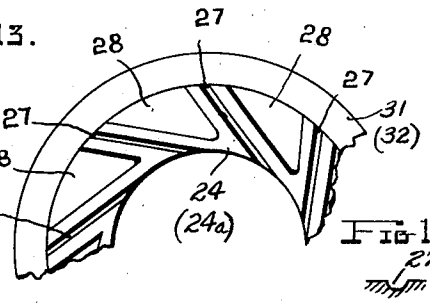


FIG. 12.

FIG. 7.

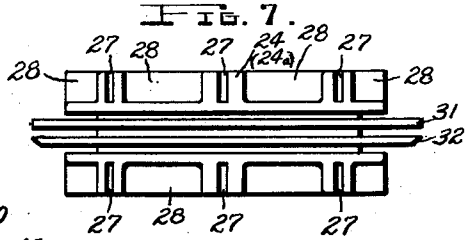
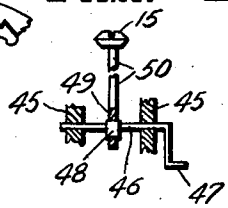


FIG. 11.



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FOG NOZZLE

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Application August 17, 1944, Serial No. 549,871

8 Claims. (Cl. 299—67)

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This invention relates to devices used for vaporizing liquids for spraying and fire-fighting purposes.

One of the objects of this invention is to provide a device with a rotor for breaking up the liquid and mounted so that the fog-nozzle develops a tendency of cleaning itself by the action of the rotor and the particular mounting of the rotor in the nozzle.

Another object is to provide the rotor with turbine-like impelling means.

Another object is to design the impelling means of an open form, to distinguish from holes, perforations, or apertures.

Another object is to provide particularly designed edges between the rotor and nozzle at points of discharge from the nozzle.

Another object is to provide such edges in cooperating pairs forming impingement discharges.

Another object is to provide discharge disturbing means opposite to the discharging end of the impelling means of the rotor.

Other objects will appear from the following description and appended claims as well as from the accompanying drawing, in which—

Fig. 1 is a longitudinal midsectional view of a device in accordance with this invention in form of a fire-fighting nozzle.

Fig. 2 is a cross section on line 2—2 through the front end of the inner supporting tubing of the nozzle.

Fig. 3 is a fragmentary cross section on line 3—3 of Fig. 1 through the perforated disc.

Fig. 4 is a fragmentary plan view of the rotor, showing the open turbine-impelling means and recesses for cutting down on the weight of the rotor.

Fig. 5 is a fragmentary plan view over the front edge of the housing of the nozzle, being of the disturbing means for the discharge.

Fig. 6 is a slight modification of the form of disturbing means.

Fig. 7 is an edge view of the rotor.

Fig. 8 is a longitudinal midsectional view of an insert in the front end of the nozzle for an open stream discharge.

Fig. 9 is a schematic sketch for discharge by edge-modification.

Fig. 10 is another schematic sketch for a slightly modified form of edge-discharge.

Fig. 11 is a schematic detail for connecting the central front cone with a control within the adapter-connection.

Fig. 12 is a fragmentary cross section on line 12—12 of Figure 13 through a turbine impelling means of a slightly modified form in shape of a shallow half-round channel instead of the deep cut in the end surface of the rotor.

Fig. 13 is a fragmentary plan view of a modified form of turbine wheel.

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The inner supporting tubing 9 is provided with a threaded portion 10 at one end, opposite to the discharging end 11. The outer edge of the discharging end is beveled at 12, and towards the center is a discharging bore 13, with a beveled edge 14.

A central cone 15 is designed and made to cooperate with the beveled edge 14 to form a narrow annular space for discharging in the direction of the arrow 16.

A cap 17 is provided with a beveled edge 18 to co-operate with the beveled edge 12 for a discharge in the direction of the arrow 19.

The discharges in the directions of the arrows 16 and 19 form an impingement for the resulting cylindrical discharge in the direction of the arrows 20.

It is merely a matter of making this discharge of a finer or coarser type in order to obtain extremely fine fog, or a coarser spray-like fog.

One, or more, rotors are mounted on the outside of the inner supporting tubing 9. In the case, as illustrated, an intermediate partition 21 is provided as an integral part of the central tubing, to which counter-pieces are added in form of caps 22 and 23, between which the two rotors 24 and 24_a are disposed.

The tubing 9 is provided with passages 36 of ample size so as to avoid clogging of these passages as much as possible, and there is ample spacing 124 between the inner face of the central part of the rotor and the tubing, for free and equal distribution of matter passing from the passages 36 outwardly around the central part of the rotor, as will be described more fully hereafter.

The spacing 125, on the other hand, is not necessarily as large as at 124; neither is the spacing at 126, which is over the outer periphery of some parts of the rotor. These spacings 125 and 126 may actually be rather narrow, to allow almost a guiding contact between rotor and stationary parts of the nozzle, though these spacings are wide enough to assure floating action of the rotor in operation as soon as the rotor centralizes itself; the unproportionally wide showing of the spacings 125 and 126 being here only adopted for sake of clearer illustration of actual spacings existing.

There are, thus, certain raised portions 25 on the tubing 9 away from the passages 36 and away from the wider spacing 124, which is actually wider for purpose of distributing of passing matter.

As a matter of fact, one of the principles of this invention involves that there should not be any actual bearings in this device, all the passages, and spaces, and channels, and impelling means having been designed to facilitate floating actions of the rotors.

The portions 26 of the caps 22 and 23, as well as of the intermediate partition 21, overlap the outlet ends of the impelling channels 27 of the rotors in such a manner that the discharge from the rotors is splashed against these portions, whereby the discharge is broken up considerably. Moreover, these portions are roughened, or provided with extra pockets 37, see Fig. 5, which may be modified variously, as for instance at 37_a in Fig. 6.

In Figs. 1, 4, and 7, the impelling channels 27, are illustrated in form of rather deep and narrow cuts; but it should be understood that these impelling means may easily be modified to comply with scientific principles used for turbines, such as the shallow channels 27_a in Figs. 12 and 13. Such channels can easily be produced; particularly, considering that such rotors may easily be made by the method of die-casting, since such channels would be in the surfaces of the rotors.

As illustrated, the rotors are rather wide, with hub-like portions, which may involve undue weights, which, in turn, may necessitate the pockets 28 for weight reduction.

The caps and intermediate partition, together with the central tubing, form the housing for the rotors.

In order to provide impinging-, or impingement-discharges from this combination-housing and rotors, the edges 29 and 30, on the one side, and the rotor-edges 31 and 32, on the opposite side, are suitably and co-operatively shaped to produce impingement-discharges in the directions of the arrows 33 and 34, with resultant discharges in the direction of the arrows 35.

From the illustration in Fig. 1 it will be clear that the resultant impingement-discharge can be varied to quite an extent by the mere variation of the angles at the edges. Moreover, such impingement-discharge can easily be provided in a plane at right angles to the central axis of the whole fog-nozzle, so as to create a wall-like fog back of the forwardly discharging central fog or spray behind which an operator can find protection while approaching an intense fire. This has been demonstrated with actual fires.

Fig. 9 illustrates thus schematically the last mentioned edge-forming; while Fig. 10 illustrates a schematical arrangement for more acute angles than those in Fig. 1, one edge being undercut to create such increased angles.

In Fig. 1, the central cone 15 is mounted on an apertured disc 38, in which the apertures, or holes 39 are preferably arranged in a slanting direction as illustrated in Fig. 3, to create a whirling of the liquid in one direction before discharging in the direction 16; while the apertures 40 in the front end of the central tubing 9 are preferably provided to create a whirling in the opposite direction before discharging in the direction of the arrow 19; this combination being intended to intensify the impinging action in the resultant discharge in the arrow 20.

All these hereinbefore described arrangements are distinctly for fog-like discharges, which have been found more effective than any heavy stream.

In cases where firemen, however, desire a heavy central stream, this can easily be provided by merely substituting the sleeve illustrated in Fig. 8. The end 43 abuts against the shoulder 41 in the end of the tubing 9; the sleeve 42 being provided with the threaded portion $44a$ to fit in place of the disc 38; the cone 15 being herewith replace in such a case.

However, some operators may desire, or even require, to have the central cone 15 or other parts arranged adjustably while in operative position within the nozzle.

For such cases and purposes, lever-controls may be embodied in the thread-adapter-piece 45. Such adapters are often necessitated by the fact that such appliances, as nozzles, must be used on apparatus-parts with different threads. In such adapters, it is not difficult to provide a small shaft 46 with a handle of some sort 47 embodying a cam 48, which actuates a member 49, to transmit motions through a connecting-rod 50 to the cone 15 in the manner indicated in Fig. 11.

From the foregoing it will be understood that the liquid can be passed to the opposite sides of the rotors from the passages 36 by way of the large distributing-spacing 124, to act with equal pressures on opposite sides of the rotors, so as to result in a floating suspension of the rotors within the housing and within the passing liquid.

Such floating suspension and operation tends to eliminate any material friction or wear-off, to assure the utmost employment of an existing force in the liquid on the rotors. This full utilization of force produces the best speed in the rotors, thereby facilitating a self-cleaning and an evenly distributed impingement all around.

Though the edges of the rotors and housing have been illustrated spaced considerably, as at the points of discharge indicated at 33 and 34, particularly, between the disc-like terminations, it should be understood that this was done only in order to avoid any blurring of lines in the appearance of the drawing. However, such spacings can be quite small when desired.

Moreover, these disc-like terminations of the rotors can be quite thin, particularly, where automatic shut-off is desired at the very edges, to avoid dripping after power-shut-off. In fact, they are desired to act in form of diaphragms, to automatically close against the opposite edges of the housing as soon as the liquid is shut off, which is of great importance in fire-fighting, such as with gasoline or gas, since drippings may start a new fire, or even an explosion. Such diaphragms, on the other hand, easily open more and more when more pressure is turned on, or applied without requiring adjusting means for the spacings.

In fact, the rotors may be made of several sheet-discs, placed back to back, or face to face, etc., with certain of discs simply formed in dies with channels, such as indicated in Figs. 12 and 13. Plain spacer-discs may then be interposed where Fig. 7 indicates portions of smaller diameter as integral parts of the rotor between the edge-pieces 31 and 32 and on opposite sides thereof next to the outer channeled portions of rotor 24 of Fig. 7.

Having thus described my invention, I claim:

1. In a fog-nozzle, a housing having inlet passages and having outlet-passages with paired edges converging towards and being annularly spaced from one another, and a rotor mounted about said inlet passages and provided with edges corresponding to and extending between said first-named edges so as to form an impingement for any matter discharging from said inlet-passages around opposite sides and over the periphery of the rotor, the rotor having channeled impelling-means in the opposite sides for actuating the rotor and forming communicating means between said inlet and outlet passages with equal distribution over the opposite sides for floating action of the rotor.

2. In a fog-nozzle, a housing having inlet passages and having outlet-passages with paired

edges converging towards and being annularly spaced from one another, and a rotor provided with turbine-like effective channels in the opposite sides with intake-ends disposed to receive matter from said inlet-passages and including corresponding edges with respect to the first-named edges and extending therebetween to form an impingement discharging means between such combined edges over the periphery of the rotor whereby a discharge of said matter may be created in a plane transversely to the central axis of the nozzle.

3. In a fog-nozzle, a housing having inlet passages and having outlet-passages with paired edges converging towards and being annularly spaced from one another, rotors provided with turbine-like effective channels in the opposite sides with intake-ends disposed to communicate with said inlet-passages and with outlet-ends disposed to communicate with said outlet-passages and including edges extending to the first-named edges to form an impingement discharging means between such combined edges over the periphery of the rotor whereby a discharge may be created in a plane transversely to the central axis of the nozzle, the edges of one rotor and corresponding housing-edges differing from another set of rotor-edges and housing-edges so as to produce a more-forwardly directed discharge in one set over the other.

4. In a fog-nozzle, a housing having distinct portions of a smaller diameter and other portions of larger diameter, the portions with smaller diameter having a central bore and inlet-passages transversely from the bore outwardly, the portions with larger diameter having spaced edges with faces converging towards one another in paired edges and forming outlet-passages therebetween, and a rotor provided with impelling channels disposed in a plane crosswise to and extending tangentially about the axis of the housing and about which the rotor turns, the channels forming communicating means between the inlet- and outlet-passages of the housing so that the combination of these channels with the co-actively designed housing is adapted to actuate the rotor by any medium passing through the passages and to also intensify the vaporizing action upon such medium over the periphery of the rotor when so actuated.

5. In a fog-nozzle, a housing having distinct portions of a smaller diameter and other distinct portions of larger diameter, the portions with smaller diameter having a central bore and inlet-passages transversely from the bore outwardly, the portions with larger diameter having paired and spaced edges with faces converging towards one another and forming outlet-passages therebetween, and a rotor provided with a channeled impelling portion in opposite sides and extending transversely from the smaller to the larger portions of the housing, the rotor being also provided with a portion projecting beyond the channeled portion and axially therebetween and extending to points between said converging faces in the outer edges of the housing and having faces corresponding therewith so as to keep portions of any medium passing through the nozzle separated to opposite sides of the rotor within the housing for impingement collision outside of the housing.

6. In a fog-nozzle, a stationary housing being otherwise closed but having distinct portions of smaller diameter and other distinct portions of larger diameter, the portions with smaller diameter having a central bore and inlet-passages transversely from the bore outwardly, the portions with larger diameter having raised and spaced edges with faces converging towards one another and forming outlet-passages therebetween, the housing having roughened portions inside of the housing near said edges, and a rotor provided with a channeled impelling portion in opposite sides and extending transversely from the smaller to the roughened portions of the housing, the rotor being also provided with a portion projecting beyond the channeled portion and axially therebetween and extending to points between said converging faces and being itself provided with faces corresponding with said first-named faces so as to bring any medium passed through the nozzle and around the rotor into impingement over the front of the rotor outside of the housing.

7. In a fog-nozzle, a housing having a smaller cylindrical portion with transverse inlet-passages and having a larger cylindrical portion with outlet-passages formed by paired edges converging towards and being annularly spaced from one another, and a rotor mounted about said inlet-passages and provided with impelling-portions between said smaller and larger cylindrical portions of the housing, the rotor having also an extension-portion with edges corresponding to and extending between said first-named edges so as to form an impinging means for any matter passed from inlet to outlet passages, the edge-forming portions of the rotor being made of thin material normally seating closely on the edges of the housing and adapted to be moved away from such seating position more or les under varying pressures of said matter.

8. In a fog-nozzle, a housing having a smaller cylindrical portion with transverse inlet-passages and having a larger cylindrical portion with outlet-passages formed by paired edges converging towards and being annularly spaced from one another, and a rotor mounted about said inlet-passages and provided with an impelling portion between said smaller and larger cylindrical portions of the housing, the rotor having also an extension-portion, the impelling portion being channeled with turbine-like effect and forming communication between the inlet and outlet passages to cause a moving of the rotor, the extension-portion of the rotor being provided with edges corresponding to and extending between said first-named edges so as to form an impinging means for any matter passed from inlet to outlet passages, the extension-portion being made of thin material normally seating closely upon the edges of the housing and adapted to be moved away from such seating position more or less under varying pressures of said matter.

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