

April 9, 1935.

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1,996,884

FOG PRODUCING NOZZLE

Filed Nov. 23, 1934

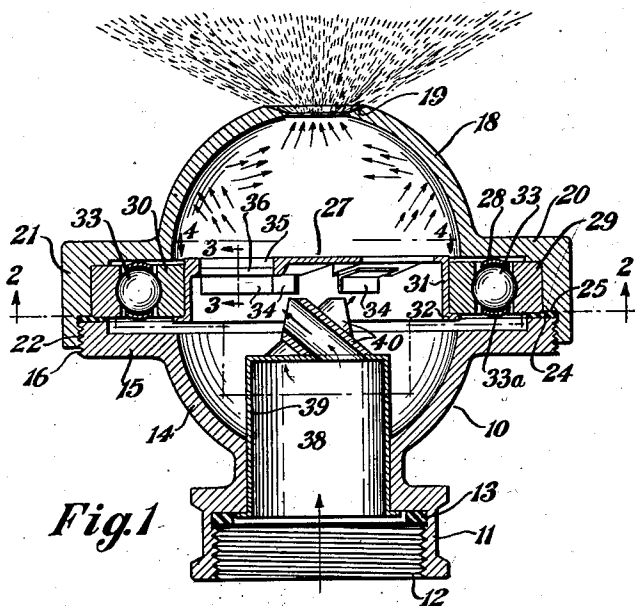


Fig. 1

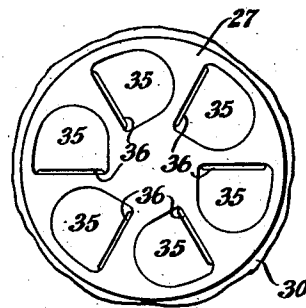


Fig. 4

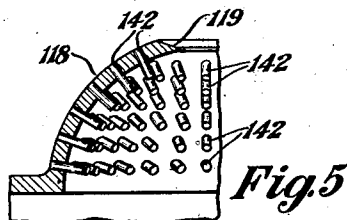


Fig. 5

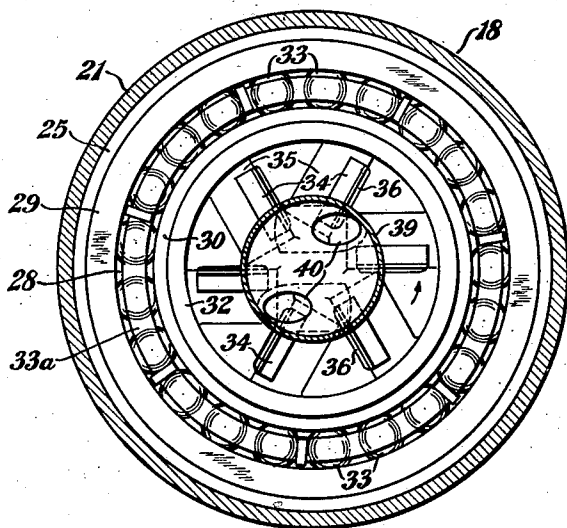


Fig. 2

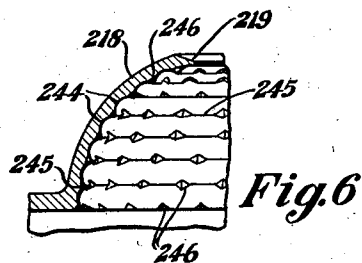


Fig. 6

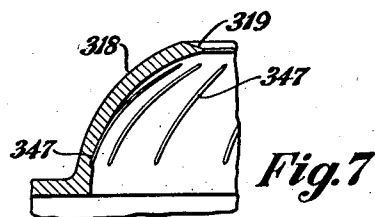


Fig. 7

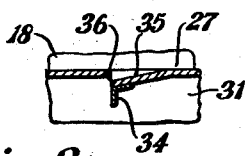


Fig. 3

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1,996,884

FOG-PRODUCING NOZZLE

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Application November 23, 1934, Serial No. 754,439

12 Claims. (Cl. 299—114)

The invention relates in general to nozzles for breaking up and distributing fluid media, and more particularly to a nozzle adapted for breaking up fluid media passing therethrough under pressure to such an extent that the same will be discharged and distributed in a state of maximum particle fineness.

The improved fog-producing nozzle is particularly adapted for extinguishing fires, including oil fires, forest fires and fires in lacquering plants; but it may be used with equal facility in connection with any pressure fluid line where a spray or what may be termed a fog composed of extremely fine particles is desired, as for example in spraying vegetation, in breaking up latex rubber into flake form, or in breaking up salt in an aerating process.

Prior nozzle constructions have been provided for distributing water or other fluids in the form of a spray, but none of these prior constructions are adapted to produce a spray having particles of maximum fineness so as to form a fog or vapor, the nearest approach to a fog obtained by these prior constructions being a mist consisting of small droplets of the liquid.

When any of these prior nozzle constructions are used in connection with a water line for extinguishing fires, the extinguishing efficiency of the spray is dependent upon the quenching effect of the droplets or particles of water. Consequently, in order to safely provide for the extinguishment of any substantial area of fire, a relatively large number of nozzles is required; as exemplified by the large number of spray nozzles required in the ordinary sprinkler systems installed in large buildings.

By using my improved nozzle in connection with a water line, a dense fog or vapor of relatively large volume is produced, such fog having particles of such extreme fineness that a relatively large area of fire may be quickly extinguished in a minimum of time, because the fog acts to envelop and shut off all air from the flames and form a substantial vacuum within the fog, with the result that the fire is blanketed or smothered instead of being quenched, as in the case of the ordinary spray nozzles.

Because of the relatively large volume of fog of extremely fine particles produced by my improved nozzle, and because the full heat-absorbing capacity of the water is utilized, a very small amount of water will suffice to blanket and completely extinguish a relatively large area of fire. Accordingly, relatively few of my improved noz-

zles would be required in a sprinkler system to insure adequate protection.

In the spraying of vegetation with liquid chemicals which kill insects, larvæ and the like, the improved fog producing nozzle has the capacity for treating a relatively large area of vegetation in a minimum of time, because the extreme fineness of the particles creates a large volume of fog for a given amount of liquid. Moreover, the effectiveness of the chemical is greatly increased because the extremely fine particles of the fog completely envelop and come in contact with all surfaces of the vegetation.

It is therefore an object of the present invention to provide an improved nozzle construction for pressure fluid lines which will produce a fog having particles of maximum fineness.

Another object is to provide an improved nozzle construction which is adapted to produce a fog of maximum volume for a given amount of fluid passing through the nozzle.

Another object is to provide an improved fog producing nozzle which is adapted for easy connection to any portable or stationary pressure fluid line.

A further object is to provide an improved fog producing nozzle for water lines, which nozzle is capable of extinguishing a relatively large area of fire with greater effectiveness and with greater rapidity than has been previously possible.

A still further object is to provide an improved fog producing nozzle construction which is simple and compact and relatively light in weight.

These and other objects are accomplished by the improvements comprising the present invention, which may be stated in general terms as including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a central discharge aperture therein, walls forming an entrance chamber in the entrance end of said housing, a rotor rotatably mounted between the entrance chamber and the dome-shaped portion and having radial blades on the side thereof toward said entrance chamber, angularly disposed jets for directing fluid from said entrance chamber toward said blades for rotating the rotor, and the rotor having circumferentially arranged angularly disposed ports for discharging fluid particles into said dome-shaped portion of said housing.

Referring to the drawing forming part hereof Figure 1 is a longitudinal sectional view of the improved nozzle;

Fig. 2 is a transverse sectional view thereof as on line 2—2, Fig. 1, looking toward the entrance side of the rotor;

Fig. 3 is a fragmentary sectional view through the rotor as on line 3—3, Fig. 1, showing one of the radial blades and an angular discharge port adjacent thereto;

Fig. 4 is a fragmentary plan view taken on line 4—4, Fig. 1, showing the discharge side of the rotor;

Fig. 5 is a fragmentary sectional view of a modified form of the dome-shaped portion of the housing;

Fig. 6 is a similar view of another modification thereof; and

Fig. 7 is a similar view of still another modification thereof.

Similar numerals refer to similar parts throughout the several views of the drawing.

The improved fog producing nozzle preferably includes a separable housing or casing, and as shown in the drawing, may be formed in two parts. One of these parts may constitute the tail member 10 having a female coupling portion 11 at its entrance end internally threaded as shown at 12 for attachment with a pressure fluid line such as a hose line. A rubber gasket 13 is provided in the coupling portion 11 in a usual manner for making a tight connection between the pressure line and the nozzle.

The tail member 10 is preferably provided with a substantially hemispherical portion 14 having its open sides at the opposite end of the tail member from the coupling portion 11. A peripheral flange 15 is preferably provided around the open side of the hemispherical portion 14, and is provided with external threads thereon as shown at 16.

The other part of the separable housing may constitute the hemispherical or dome shaped head member 18, having the central discharge aperture 19 at its closed side and the peripheral flange 20 at its open side. The flange 20 is preferably provided with an annular portion 21 on which are provided internal threads as indicated at 22 for screwing onto the external threads 16 of the tail member 10.

When the tail member 10 and the head member 18 are thus screwed together they form a separable housing having a hollow dome-shaped portion at the discharge end and having means for connection with a pressure fluid line at the entrance end.

Preferably, a gasket 24 of rubber or the like is inserted between the peripheral flange 15 of the tail member and a shoulder 25 on the annular flange 21 of the head member for making the joint between the members leak proof.

A rotor indicated generally at 27 is mounted for rotation between the head and tail members 18 and 10 respectively, and is preferably located in a plane normal to the longitudinal axis of the nozzle. Preferably, the rotor is rotatably journaled in the housing by means of a bearing of well known construction, which may be a ball bearing as indicated generally at 28.

The outer race 29 of the bearing 28 may be secured in the annular flange portion 21, and the inner race 30 is secured to an annular flange 31 formed on the rotor 27 and having an angular flange portion 32 engaging the entrance side of the inner race 30. A series of balls 33 roll on and between the races 29 and 30, and are maintained in spaced relation by the cage 33a, in a usual manner.

The rotor 27 is provided on its underside, that is, the side toward the entrance end of the nozzle, with a series of radial blades 34 which may be formed integral therewith, or may be angles secured thereto as by welding. The rotor plate 27 is preferably provided in its upper surface with depressed or recessed portions 35 which form angular discharge ports 36 through the plate, one adjacent each blade, and the discharge ports 36 and depressed portions 35 are adapted to cooperate to direct fluid passing through the ports angularly outward and upward against the inner wall of the dome-shaped portion 18.

An entrance chamber 38 is formed in the tail member 10 for receiving fluid entering the nozzle through the female coupling portion 11. This entrance chamber 38 may be formed in various ways, and as shown in the drawing is formed by a cylindrical sleeve 39 having its open end secured in the female coupling portion 11. The upper or closed end of the sleeve 39 is provided with one or a plurality of angularly disposed jets 40 communicating with the entrance chamber and adapted to direct fluid from the entrance chamber toward the blades 34 for rotating the rotor, two jets 40 being present in the embodiment of the invention shown in the drawing.

When the improved nozzle is connected to a pressure fluid line, such as a water hose line, the water enters the entrance chamber in the direction of the arrow shown in Fig. 1, and is projected angularly outward therefrom through the jets 40 to impinge upon the blades 34 and rotate the rotor 27 at high speed.

As the rotor 27 rotates in the bearing 28, particles of water will be discharged from the ports 36 angularly and upwardly outward to form a rapidly whirling vortex, the particles of which impinge upon the spherical walls of the dome 18 from which they are deflected and further broken up as indicated by the arrows in Fig. 1 until they finally issue or discharge from the aperture 19, which may be outwardly flared as shown, to form a whirling hollow cone-shaped fog or vapor which rapidly expands and covers a relatively large volume.

In the modified form of dome-shaped head member 118 shown in Fig. 5, a plurality of pegs or pins 142 are secured in the walls of the head member and project inwardly from the inner surface of the dome to provide means for further breaking up the particles of fluid discharged from the rotor into the dome, before said particles are discharged from the discharge aperture 119.

In the modified form of dome-shaped head member 218 shown in Fig. 6, the inner surface of the dome is provided with a series of preferably concentric grooves 244, and the grooves preferably have sharp edges 245 which may be serrated or notched as shown at 246. The grooves and serrations provide means for further breaking up the particles of fluid discharged from the rotor into the dome, before said particles are discharged from the discharge aperture 219.

In the modified form of dome-shaped head member 318 shown in Fig. 7, the inner surface of the dome is provided with spirally arranged grooves 347, which aid in further breaking up and directing the particles toward the discharge aperture and in imparting whirling movement thereto before the particles are discharged from the discharge aperture 319.

It has been found by experiment that the improved fog-producing nozzle produces a fog having extremely fine particles and having a rela-

tively large volume for a given amount of fluid passing through the nozzle, and that consequently a relatively large area may be effectively treated by a single nozzle with maximum effectiveness in a minimum of time.

In putting out a fire with a pressure fluid line having the improved fog-producing nozzle applied thereto, it has been found that the fire is completely enveloped and extinguished with greater rapidity and greater effectiveness than has heretofore been possible with prior types of nozzles.

The improved fog-producing nozzle is simple and inexpensive to construct, compact and relatively light in weight, and is adapted for quick and easy attachment to portable or stationary pressure fluid lines.

While I have described the improved nozzle in detail in connection with a water line, the operation and effect of said nozzle is substantially the same when used with other pressure fluid lines.

Various modifications may be made in the construction and arrangement of the parts and combinations embodied in the improved nozzle, without departing from the scope of the invention as defined in the appended claims.

I claim:—

1. Nozzle construction including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a discharge aperture therein, walls forming an entrance chamber in the entrance end of the housing, a rotor rotatably mounted in the housing between the dome-shaped portion and the entrance chamber, radial blades on the side of the rotor toward the entrance chamber, angularly disposed jets for directing fluid from said entrance chamber toward said radial blades for rotating the rotor, and the rotor having circumferentially arranged angularly disposed ports for discharging fluid particles upwardly and outwardly into said dome-shaped portion of said housing.

2. Nozzle construction including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a discharge aperture therein, walls forming an entrance chamber in the entrance end of the housing, a rotor rotatably mounted in the housing between the dome-shaped portion and the entrance chamber, blades on the side of the rotor toward the entrance chamber, a jet for directing fluid from said entrance chamber toward said blades for rotating the rotor, and the rotor having ports for discharging fluid particles upwardly and outwardly into said dome-shaped portion of said housing.

3. Nozzle construction including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a discharge aperture therein, walls forming an entrance chamber in the entrance end of the housing, a rotor rotatably mounted in the housing between the dome-shaped portion and the entrance chamber, blades on the side of the rotor toward the entrance chamber, means for directing fluid from said entrance chamber toward said blades for rotating the rotor, and the rotor having angularly disposed ports for discharging fluid particles upwardly and outwardly into said dome-shaped portion of said housing.

4. Nozzle construction including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a discharge aperture therein, walls forming an entrance chamber in the entrance end of the housing, a rotor rotatably mounted in the housing between the dome-shaped portion and the entrance chamber, blades on the side of the rotor toward the entrance chamber, means for directing fluid from said entrance chamber toward said blades for rotating the rotor, and the rotor having ports for discharging fluid particles into said dome-shaped portion of the housing.

5. Nozzle construction including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a discharge aperture therein, walls forming an entrance chamber in the entrance end of the housing, a rotor rotatably mounted in the housing between the dome-shaped portion and the entrance chamber, blades on the side of the rotor toward the entrance chamber, means for directing fluid from said entrance chamber toward said blades for rotating the rotor, the rotor having ports therethrough, each port being adjacent to a blade, and said ports being adapted to discharge fluid particles into said dome-shaped portion of said housing.

6. Nozzle construction including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a discharge aperture therein, walls forming an entrance chamber in the entrance end of the housing, a rotor rotatably mounted in the housing between the dome-shaped portion and the entrance chamber, blades on the side of the rotor toward the entrance chamber, means for directing fluid from said entrance chamber toward said blades for rotating the rotor, the rotor having depressed portions in its discharge side forming angularly disposed ports through the rotor, and said ports and said depressed portions being adapted to cooperate to discharge fluid particles toward the inner wall of the dome-shaped portion of the housing.

7. Nozzle construction including a separable housing having a hollow dome-shaped portion at its discharge end and adapted at its entrance end for connection with a pressure fluid line, said dome-shaped portion having a discharge aperture therein, a rotor rotatably mounted in the housing below the dome-shaped portion and having blades thereon on its opposite side, means for directing fluid entering the entrance end of said housing toward said blades for rotating the rotor, and the rotor having a port therethrough for discharging fluid particles into said dome-shaped portion of the housing.

8. Nozzle construction including a housing having a discharge end and an entrance end, a rotor rotatably journaled in the housing in a plane normal to the longitudinal axis of the nozzle, blades on the entrance side of the rotor, means for directing fluid entering said housing toward said blades for rotating the rotor, and the rotor being provided with angularly disposed ports for discharging fluid particles outwardly and upwardly therefrom.

9. Nozzle construction including a housing having a discharge end and an entrance end, a

rotor rotatably journaled in the housing in a plane normal to the longitudinal axis of the nozzle, blades on the entrance side of the rotor, means for directing fluid entering said housing toward said blades for rotating the rotor, the rotor having depressed portions in its discharge side forming angularly disposed ports through the rotor, and said ports and said depressed portions being adapted to cooperate the discharge fluid particles outwardly and upwardly from the rotor.

10 10. Nozzle construction including a housing having a discharge end and an entrance end, walls forming a discharge chamber in the discharge end of the housing and provided with a discharge aperture, a rotor rotatably journaled in the housing in a plane normal to the longitudinal axis of the nozzle, blades on the entrance side of the rotor, means for directing fluid entering said housing toward said blades for rotating the rotor, and the rotor being provided with ports for discharging fluid particles into said discharge chamber.

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11. Nozzle construction including a housing having a discharge end and an entrance end, a rotor rotatably journaled in the housing, blades on the entrance side of the rotor, means for directing fluid entering said housing toward said blades for rotating the rotor, and the rotor being provided with angularly disposed ports for discharging fluid particles outwardly and upwardly therefrom.

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12. Nozzle construction including a housing having a discharge end and an entrance end, walls forming a discharge chamber in the discharge end of the housing and provided with a discharge aperture, a rotor rotatably journaled in the housing, blades on the entrance side of the rotor, means for directing fluid entering said housing toward said blades for rotating the rotor, and the rotor being provided with ports for discharging fluid particles into said discharge chamber.

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