Jan. 3, 1933. H. N. RIDER 1,893,210

FLUID DISTRIBUTING DEVICE

Filed June 22, 1931

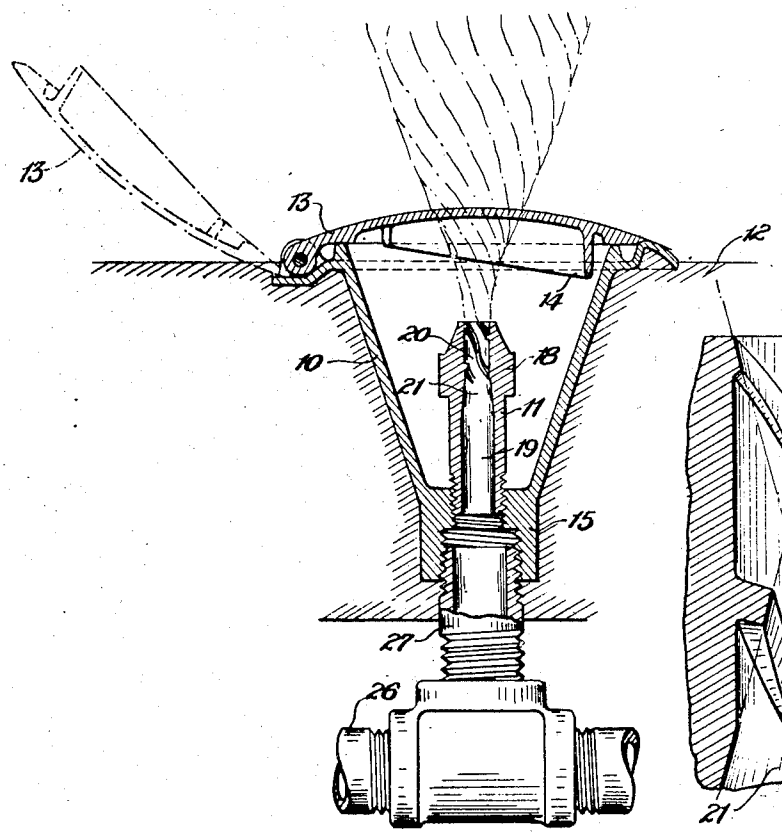

FIG. 1

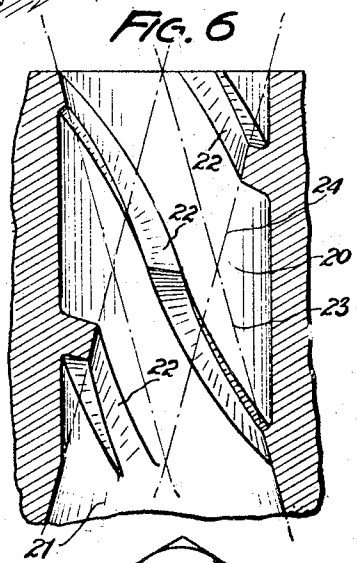

FIG. 6

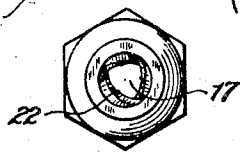

FIG. 4

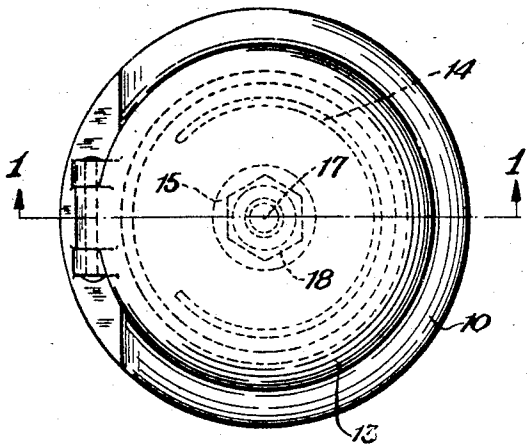

FIG. 2

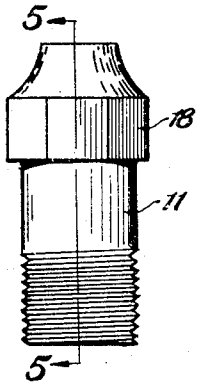

FIG. 3

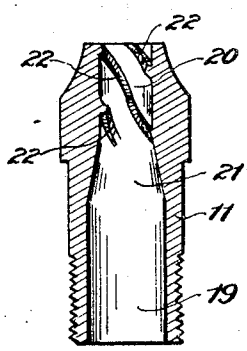

FIG. 5

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UNITED STATES PATENT OFFICE

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FLUID DISTRIBUTING DEVICE

Application filed June 22, 1931. Serial No. 545,876.

This invention relates generally to fluid distributing devices, and more particularly to a sprinkler head for fire extinguishing systems, which is an improvement over the sprinkler heads disclosed in the Hamilton Patent No. 1,837,322, granted December 22, 1931.

In the development of an efficient sprinkler head for use in the floors of aircraft hangers or other structures, I have found that for maximum fire-fighting effectiveness, it is essential in the operation of a device of this kind that the stream of extinguishing fluid be projected for a considerable distance with definite directional movement so as to reach the surface to be protected, and also that proper dispersion of the stream be obtained to afford coverage of a large surface area. Moreover, I have found that such effective fluid distribution can best be obtained by providing means for breaking up the fluid stream into relatively large gobs or slugs to which appreciable velocity and definite directional movement can be imparted, and by providing means for imparting rotation to the streams to thereby subject these gobs or slugs to the action of centrifugal force.

Therefore, as an object of this invention, I aim to provide an improved fluid distributing device of the kind mentioned which embodies novel means for projecting a stream of fluid in the desired direction and imparting rotational movement to the stream to expand the same.

Another object of this invention is to provide an improved form of nozzle for delivering a stream comprising relatively large drops of liquid and also imparting rotational movement to the stream to progressively expand the same.

Other objects and advantages of this invention will be apparent from the following description when taken in conjunction with the accompanying sheet of drawing, in which

Fig. 1 is a sectional elevation of a fluid distributing device embodying my invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a side elevational view of the fluid discharge nozzle;

Fig. 4 is an end elevation thereof;

Fig. 5 is a longitudinal sectional view of the nozzle taken on line 5—5 of Fig. 3; and

Fig. 6 is a partial sectional view on an enlarged scale showing the nozzle orifice.

In the drawing to which detailed reference will presently be made, I have illustrated a fluid distributing device of a form especially suitable for use with fire extinguishing systems located in or below the floors of aircraft hangars, and other structures, and although the sprinkler head illustrated represents the preferred construction, it will be understood, of course, that my invention may be embodied in sprinkler heads of various forms and which may be intended for other than fire extinguishing purposes.

As shown in Fig. 1, my fluid distributing device comprises a casing 10 and a fluid discharge nozzle 11 mounted therein in substantial alignment with the vertical axis of the casing. The casing itself may be of any suitable form or shape but, as here shown, is substantially conical and adapted to be embedded in the material of the floor 12 so that the base of the cone is almost flush with the surface of the floor. A cover 13 of suitable form, preferably a hinged cover, may be provided for closing the casing so as to prevent damage to the nozzle, the entry of foreign material, and to maintain the floor surface substantially smooth for movement of articles thereon. On its under surface, this cover is preferably provided with an arcuate depending rib 14 to facilitate the opening thereof by the stream of fluid delivered from the nozzle 11. At its lower end, or in other words at the apex of the inverted cone, the casing is provided with a boss 15 having a threaded passage extending axially of the casing in which is mounted the nozzle 11.

The nozzle itself comprises an elongated metal body which may be formed as a die casting, and which is provided with an open and unobstructed passage 17 extending axially therethrough. At its lower end the stem of the nozzle is threaded for engagement in the threaded opening of the boss 15, and at its other end is provided with a nutlike head 18 which is adapted to be engaged by a suit-

able tool for screwing the nozzle into the boss. As shown in Figs. 1 and 5, the passage extending through the lower portion of the nozzle is substantially cylindrical in form, as indicated at 19, while at the upper end of the nozzle the passage is of reduced diameter to form a discharge opening or orifice 20. Intermediate the orifice and cylindrical portion 19, the passage is tapered or, in other words, formed of progressively reducing diameter as indicated at 21.

To impart rotational movement to the stream of fluid being delivered by the nozzle, so that the same may be progressively expanded by centrifugal force, as will be more fully explained hereinafter, I provide a plurality of helical fins or threads 22 which project into the orifice 20. These helical threads may be formed integral with the body of the nozzle, and may be provided in suitable number to produce the desired rotational effect on the column of liquid. It will be seen that these helical fins or threads correspond, to some extent, with the rifling provided in the bore of a gun, in that they produce rotation of the body of liquid in the same manner that the rifling produces rotation of the projectile.

In order that the centrifugal force may act upon the liquid with maximum effectiveness in expanding the stream, and also to provide the gobs or drops of water to which desired directional movement and velocity can be imparted, I construct the orifice 20 of a convergent-divergent form, which is best illustrated in Fig. 6 of the drawing. As shown in this figure, the taper of the passage 21 is extended upwardly into the threading or rifling for substantially half the length of the orifice. This may be accomplished by employing a suitable tool, such as a drill, having a cutting surface tapered as indicated by the converging dotted lines 23. The remaining or upper half of the orifice is provided with a divergent taper by means of a tool or drill having a cutting surface tapered as indicated by the dotted lines 24. It will be seen in Fig. 6 that the wall or inner surface of the orifice 20 may be substantially cylindrical in form, and that the converging and diverging tapers are formed by cutting away and shaping the tops of the fins 22. As a result of these tapering operations, the tops of the fins constitute a part of the surfaces of the imaginary cones represented by the dotted lines 23 and 24. Although the wall of the orifice is cylindrical, as stated above, the tapering of these fins, in effect, produces a convergent-divergent nozzle orifice.

The water, or other fire extinguishing agent to be discharged, may be supplied to the nozzle by means of a distributing pipe 26, which could be embedded in the material of the floor, but which is preferably disposed below the pavement as shown in Fig. 1. Fluid from this distributing pipe is delivered to the nozzle through the threaded passage of the boss 15 to which it is conducted by suitable connecting means, such as the pipe nipple 27.

In operation of my fluid distributing device, fluid from the distributing pipe is forced upwardly through the nozzle and is discharged against the cover 13 by the orifice 20. The force of the fluid against the cover swings the same to the open position, indicated in dotted lines, where it remains during the discharging operation. As the fluid passes through the orifice 20, the convergent-divergent shape of this portion of the nozzle, results in the column of liquid being broken up into a stream composed of relatively large drops or gobs of liquid. Likewise, as the fluid passes through the orifice 20, the helical fins 22 impart rotational movement to the stream of liquid. This rotational movement causes centrifugal force to act upon the drops or gobs composing the stream which results in progressive divergence or separation of these bodies as they travel away from the nozzle.

It will be noted that although the fins 22 of the orifice project for a short distance into the fluid passage of the nozzle, this passage is clear and open and substantially unobstructed for the full length of the nozzle. This unobstructed passage through the nozzle provides for a flow of liquid with minimum resistance, so that an adequate volume of fluid may be projected in a desired direction, and with sufficient velocity, to effectively accomplish a desired fire-extinguishing function.

It will now be readily seen that I have provided a simple and efficient form of fluid distributing device embodying a nozzle having a normally unobstructed opening through which a large volume of fluid may be discharged in a desired direction. Additionally, it will be seen that the provision of the convergent-divergent orifice at the discharge end of the nozzle results in the stream of liquid being broken up into relatively large drops or gobs of liquid to which appreciable velocity and directional movement can be imparted. Furthermore, the provision of the helical fins in the discharge orifice for producing a rotational movement of the stream, results in the latter being centrifugally expanded so that a proper dispersion of liquid is obtained to cover or protect a large surface area.

While I have illustrated and described the device of my invention in a detailed manner, it will be understood, however, that I do not intend to limit myself to the precise details of construction and arrangement of parts illustrated and described, but regard my invention as including such changes and

modifications as do not involve a departure from the spirit of the invention and the scope of the appended claim.

Having thus described my invention, what I claim is:

A nozzle of the character described, comprising an elongated body having an open fluid passage extending axially therethrough, said passage having a cylindrical section at the inlet end of the body and a cylindrical section of smaller diameter at the discharge end of the body and a conically tapering convergent section connecting said cylindrical sections, and a plurality of helically disposed fins on the inner surface of the second mentioned cylindrical section, the tops of said fins being tapered convergently of said passage for approximately one-half of the length of said second mentioned section and divergently for the other portion of said second mentioned section, the convergent taper of said tops being a continuation of the convergent taper of the connecting section of said passage whereby the ends of the fins merge smoothly into the wall of said connecting section.

In testimony whereof, I hereunto affix my signature.

HARRY N. RIDER.