

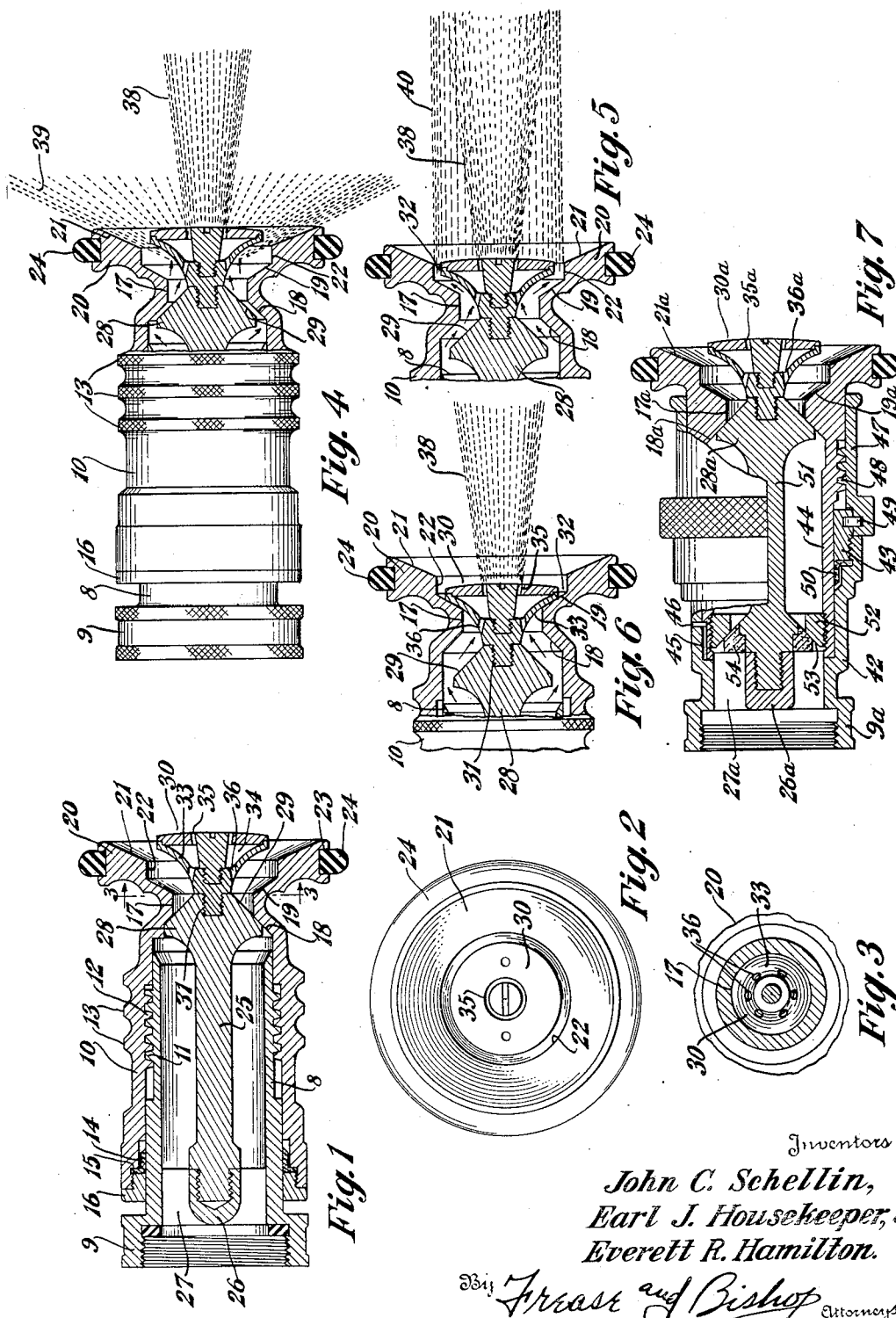
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MIST PRODUCING NOZZLE

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MIST-PRODUCING NOZZLE

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The invention relates generally to nozzles adapted for discharging fluid in the form of fog or mist, and more particularly to nozzles for selectively discharging either a stream or mist, as desired.

Prior nozzles have been provided for regulating the discharge of water from a stream to a single cone of fog, but when the water is discharged in the form of a fog it is necessarily distributed over a relatively large area in order to effectively blanket a fire, with the result that the particles of water do not penetrate into the fire to any great extent and are not projected to any material distance ahead of the nozzle.

Certain types of fires, such as deep oil reservoir fires, generate such intense heat that the single cone of fog discharged by these prior nozzles will not penetrate sufficiently to extinguish the fire, because the fine liquid particles of the fog are dissipated into steam long before they reach the seat of the fire.

On the other hand, if such a nozzle is adjusted to produce a substantially straight stream of water, the quenching effect alone of the stream must be relied upon to extinguish the fire, whereas a dense cloud of fog or mist will extinguish the fire much more effectively by blanketing or smothering it, if the fog can be made to penetrate to or near the base of the fire.

It is therefore an object of the present invention to provide an improved nozzle for discharging a mist of fluid particles capable of increased penetration toward the base of a fire.

We have discovered that by producing a relatively small and dense cone of mist within a larger outer cone of mist, not only does the mist penetrate farther into the fire, but the inner mist cooperates with the outer mist to effectively extinguish the fire.

Accordingly, another object of the present invention is to provide a nozzle which will discharge two cones of mist, one inside the other.

A further object is to provide an improved nozzle adapted for selectively discharging either a straight stream or a mist.

Another object is to provide an improved nozzle in which the size or cross-sectional area of the mist discharged can easily be varied, and which is capable of discharging a large volume of dense mist.

A still further object is to provide an improved nozzle in which the adjusting means controlling the form of discharge is adapted selectively to completely shut off the discharge of fluid or to shut off all but the inner cone of mist.

These objects and kindred others are fulfilled by the simple, compact and inexpensive nozzle construction constituting the present invention, a preferred embodiment of which is shown by way of example in the accompanying drawing, and which is hereinafter described in detail and defined in the appended claims.

The invention may be stated in general terms as including a tubular body having an outwardly flared discharge opening, a core positioned axially of said body provided with an enlarged tapered head cooperating with said flared discharge opening to provide an outer annular discharge passage, said body and core being axially adjustable to open and close said outer annular discharge passage, the enlarged head of said core having an inner annular discharge passage communicating with the interior of said tubular body, and means on the core cooperating with the tubular body for shutting off flow to both discharge passages.

Referring to the drawing in which a preferred embodiment of the improved nozzle is illustrated by way of example:

Figure 1 is a longitudinal section of the improved nozzle in closed position;

Fig. 2 is an end view thereof;

Fig. 3 is a fragmentary cross-section thereof as on line 3—3, Fig. 1;

Fig. 4 is an elevational view, partly in section, showing the nozzle in open position for discharging an outer cone of mist of large area and a smaller inner cone of mist;

Fig. 5 is a fragmentary view similar to Fig. 4, showing the nozzle in open position for discharging a substantially straight stream;

Fig. 6 is a similar view showing the nozzle in position for discharging the inner cone of mist alone and closing off the outer mist; and

Fig. 7 is a longitudinal sectional view, partly in elevation, of a modification of the improved nozzle.

Similar numerals refer to similar parts throughout the drawing.

In the embodiment shown by way of example in Figs. 1 to 6 inclusive of the drawing, the improved nozzle includes a tubular inner sleeve 8, having an enlarged female coupling portion 9 at its rear end for connection to a hose line in a usual manner.

The sleeve 8 is telescoped preferably within an outer sleeve or body member 10, the inner sleeve having external screw threads 11 interengaging internal screw threads 12 on the outer sleeve 10, whereby rotation of the sleeve 10 on sleeve 8 will produce relative longitudinal movement thereof.

The outer sleeve or body 10 may be provided with knurled ribs 13 to aid in turning the same.

A packing ring 14 is preferably provided between the inner and outer sleeve in a usual manner, being held against a shoulder 15 on the outer sleeve 10 by a jam nut 16 screwed in the rear end of said sleeve 10.

The forward end portion of the outer sleeve 10 is preferably constricted to form a cylindrical discharge passageway 17 of reduced diameter, a conical shoulder or seat 18 being formed on the rear side of said passageway 17, and a conical shoulder 19 being formed at the front side of said passageway. Beyond the shoulder 19 the forward end 20 of sleeve 10 is flared outwardly to form an enlarged conical discharge opening 21. A cylindrical counterbore or passageway 22 is provided between discharge opening 21 and conical shoulder 19, for a purpose to be described.

Preferably, the flared end 20 is provided with an external annular groove 23, and a rubber bumper ring 24 is secured in said groove for protecting the discharge end of the nozzle.

A core 25 is located axially within the inner sleeve 8, and is preferably secured thereto by screwing its rear end into socket 26 supported by ribs 27 extending radially inward from the rear end of sleeve 8. Preferably the front end of the core 25 has an enlarged conical head 28 formed thereon and the front conical surface 29 thereof is made to conform to conical shoulder 18 on sleeve 10, so that in the position of Fig. 1, the surface 29 seats on shoulder 18 to completely shut off the flow of liquid through the cylindrical passage 17. An enlarged deflector head 30 is mounted in front of the conical end 28 of the core and co-axial with the cylindrical passageway 17. Preferably the deflector head 30 is screwed into the conical end 28 of the core, as at 31, and the outer diameter of the head is somewhat smaller than the diameter of the counterbore 22 so as to form an outer annular passage between the head and the flared outlet 20 at all times, and so as to form an annular discharge passage 32 between the head and the counterbore 22 in the position of Fig. 5.

The rear wall 33 of the deflector head 28 has a surface which is substantially conical and may be slightly concavely curved as shown, and said surface is adapted to seat on shoulder 19 and shut off the outer annular discharge passage, as shown in Fig. 6.

The deflector head 28 is preferably provided with an internal annular chamber 34, and an annular inclined or conical discharge passage 35 is formed in the front end of said head for communicating with said chamber. Ports 36 are preferably provided through the rear wall 33 of the head and are spaced radially inward of the passageway 17 for providing communication between chamber 34 and the interior of sleeve 8 in all positions of the nozzle except complete shut-off position shown in Fig. 1.

In the operation of the improved nozzle, starting with the parts in complete shut-off position as shown in Fig. 1, when the sleeve 10 is rotated to move the same longitudinally or axially forward on sleeve 8, as soon as the shoulder 18 is moved slightly away from conical surface 29 the parts will be in a position such as shown in Fig. 4. In this position, water flows in the direction of the arrows through ports 36 into chamber 34, and is broken up into particles which discharge out of passage 35 in the form of a dense cone of mist 75 indicated at 38. Water also impinges on the

rear surface 33 of the deflector head 30 and is broken up and deflected out of the flared discharge opening 21 in the form of a flat cone of mist of large cross-sectional area indicated at 39. The two cones of mist are concentric, the inner cone being the more penetrating and the outer cone covering a large area, and the two cones constituting a large volume of mist for enveloping and blanketing a fire.

In fighting oil reservoir fires, it is particularly advantageous to produce the double cone of large area immediately upon opening the nozzle, because if a straight stream were produced when the nozzle was first opened, the stream would have the effect of scattering the burning oil and increasing the damage and the fire hazard. Moreover, if the improved nozzle is opened while the operator is approaching a fire, the immediate formation of the enveloping double cone of mist affords increased protection to said operator.

As the outer sleeve 10 is moved forward axially to have the effect of drawing the deflector head 30 further within the flaring outlet, the outer cone of mist 39 is accordingly varied to a narrower or steeper cone surrounding the inner cone 38, thus changing the shape of the outer mist to meet varying conditions at the seat of the fire. As the outer sleeve 10 is moved further forwardly to the position shown in Fig. 5, in which the deflector head 30 is within the counterbore 22, a straight stream of mist particles is discharged from the annular discharge opening 22, as indicated at 40. In this position, the particles of the inner cone 38 are caught up and carried along in the straight stream 40, and increase the volume thereof.

When the outer sleeve 10 is moved forwardly a sufficient distance so that the rear wall 33 of the deflector head 30 seats on the conical shoulder 19, the outer annular discharge passage is shut off entirely, but in this position the ports 36 still communicate with the interior of sleeve 8, since the ports are spaced radially inward from the cylindrical passage 17. Accordingly, in the position of Fig. 6, water flows in the direction of the arrows through ports 36 and into the chamber 34 to be discharged out of annular passage 35 in the form of the inner cone of mist particles 38. Under certain conditions, it is advantageous to be able to use the inner cone 38 alone, because a relatively small volume of water is thus discharged. For instance, in cleaning up small fires which may be still burning at various positions, after the main body of a fire has been extinguished, the relatively small inner cone serves to extinguish the same without discharging an unnecessary and damaging amount of water.

In the modification shown in Fig. 7, the female coupling member 9a is formed on the rear end of a tubular casing or sleeve 42, the forward end of which is preferably provided with an interior thread into which is screwed a ring member 43. An inner sleeve 44 is telescoped within the ring member 43 and the intermediate portion of the tubular casing 42, and the rear end of the sleeve 44 is provided with a longitudinal slot 45 in which a pin 46 secured to the casing is slidably received for preventing rotation of the sleeve 44.

An intermediate portion of the sleeve 44 is provided with an external screw thread interengaging an internal screw thread on the annular adjusting member 47 as indicated at 48. The rear end of the adjusting member 47 may have an interior annular groove registering with an exterior annular groove in the ring 43 for hous-

ing a series of rollers indicated at 49, and a packing ring 50 is preferably provided between the rear end of ring 43 and a shoulder in the casing 42. Thus the annular adjusting member 47 is rotatable with respect to casing 42 on the ring 43, and the rollers 49 prevent longitudinal movement of said member 47 while permitting rotary movement thereof.

Accordingly, rotation of member 47 causes the sleeve 44 to move longitudinally or axially of the casing 42.

A core 51 is preferably secured axially within the casing 42 by screwing its rear end into a socket 26a supported by ribs 27a extending radially inward from the casing. The front end of the core is formed into an enlarged conical end 28a which is adapted to seat on the rear conical shoulder 18a of a rib formed in sleeve 44, having a front conical shoulder 19a and forming a cylindrical passage 17a between the shoulders. A deflector head 30a is screwed on the end 28a of the core for providing an outer annular passage between the head and the flaring outlet 21a formed on the forward end of sleeve 44. The deflector head is provided with an annular discharge passage 35a for discharging an inner cone of mist, and its rear wall has ports 36a therein radially spaced inward of passage 17a for communicating with the interior of sleeve 44 even when the head 30a is seated on shoulder 19a.

At the rear end of sleeve 44 a seating ring 52 is provided having an annular conical seat 53 on its rear surface. The rear end of core 51 has a conical shoulder 54 formed thereon for conforming to the surface 53 to provide a second complete shut-off in the nozzle. The ring 52 and shoulder 54 are made to abut or seat simultaneously with the abutment of the forward end 28a of the core with shoulder 18a. Preferably, the shoulder 54 is of semi-resilient composition material for making the seat with surface 53.

Accordingly, in the position of Fig. 7, flow through the nozzle is completely shut off at the rear seat as well as the forward seat, so that if any foreign material is present which might have the effect of preventing a perfect seal in one of the seats, the other seat will function to completely shut off the nozzle.

The modification shown in Fig. 7 produces all of the advantageous results produced by the nozzle shown in Figs. 1 to 6 inclusive, and differs only in the particular adjusting means, and the addition of another shut-off working simultaneously with the forward shut-off shown in Figs. 1 to 6 inclusive.

The present improved construction provides an adjustable nozzle for discharging a relatively large volume of mist having an outer cone and a dense inner cone, or for discharging a substantially straight stream; or for discharging the inner cone alone.

The double concentric cone of mist acts effectively in extinguishing fires generating intense heat, because the inner cone is capable of increased penetration so as to more nearly approach the base of the fire than a single cone of large area. Moreover, as the inner cone penetrates towards the base of the fire, the larger outer cone completely surrounds and forms an air-excluding blanket around the fire adjacent to the inner cone, so that the fire is trapped between the two concentric cones and smothered. The double cone of mist acts to eliminate flash-backs as the nozzle is moved across the surface of a fire, because the temperature is first lowered by the

inner cone sufficiently to enable the outer cone to maintain the temperature of the burning mass below the combustion point.

Various modifications may be made in the details of construction, without departing from the scope of the invention as defined in the appended claims.

We claim:

1. Nozzle construction including a tubular sleeve, a second sleeve axially adjustable thereon and having a discharge outlet at one end, a core secured in said first sleeve axially thereof and having a deflector head forming an outer annular discharge passage within said second sleeve discharge outlet, said head having an inner annular discharge passage therethrough communicating with the interior of the nozzle, means on said second sleeve for abutting said head to shut off said outer discharge passage, and means on said core cooperating with said second sleeve for completely shutting off flow through the nozzle.

2. Nozzle construction including a tubular sleeve, a second sleeve axially adjustable thereon and having a discharge end, said discharge end having a constricted passage formed therein and a shoulder at the rear side of said passage, a core secured in said first sleeve axially thereof and having an enlarged end for seating against said rear shoulder, and a deflector head mounted on said core and overlapping said constricted passage for fitting within said discharge end to form an outer annular discharge passage, and said deflector head having discharge passages therethrough communicating with said constricted passage.

3. Nozzle construction including a tubular sleeve, a second sleeve axially adjustable thereon and having a flared discharge end, said discharge end having a cylindrical counterbore therein and a front shoulder adjacent thereto forming a constricted passage therein, a rear shoulder adjacent to said passage, a core secured in said first sleeve axially thereof and having an enlarged portion for seating against said rear shoulder to completely shut off flow through the nozzle, and a deflector head mounted co-axially on said core and for forming an outer annular discharge passage within said counterbore, said deflector head having a discharge passage therethrough spaced radially inward of said shoulders, and said head being adapted to seat against said front shoulder to shut off said outer annular discharge passage.

4. Nozzle construction including an inner tubular sleeve having a core secured axially therein, an outer sleeve axially adjustable on said inner sleeve and having a discharge end, oppositely inclined front and rear annular shoulders forming a constricted passageway in said discharge end, said core having means for seating against said rear shoulder to completely shut off flow through the nozzle, and a deflector head axially mounted on said core forming an outer annular discharge passage within said outer sleeve discharge end and adapted for seating against said front shoulder, said head having a discharge passage therethrough communicating with said constricted passageway.

5. Nozzle construction including a tubular sleeve having a discharge end, a deflector head located in said discharge end forming an outer annular discharge passage around said head, said head having an inner discharge passage therethrough communicating with the interior of

said sleeve, means for axially adjusting said sleeve relative to said head, and means for selectively shutting off the outer discharge passage only or both inner and outer discharge passages.

- 5 6. Nozzle construction including a tubular sleeve, a second sleeve axially adjustable thereon and having a constricted discharge passageway communicating with a flared outlet, a core secured in said first sleeve axially thereof and having an enlarged deflector head forming an outer annular discharge passage within said second sleeve flared outlet, said head having an inner discharge passage therethrough communicating with said constricted discharge passageway, and
10 15 means on said core cooperating with said second

sleeve for shutting off flow through said constricted discharge passageway.

7. Nozzle construction including a tubular sleeve, a second sleeve axially adjustable thereon and having a discharge outlet at one end, a core secured in said first sleeve axially thereof and having an enlarged head forming an outer annular discharge passage within said second sleeve discharge outlet, said head having a discharge passage therethrough, and means on said core cooperating with said second sleeve for closing the discharge passage in said head. 5 10

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