Feb. 9, 1943. J. O. LEWIS 2,310,798

SPRAY NOZZLE

Filed May 6, 1941

Fig. 1.

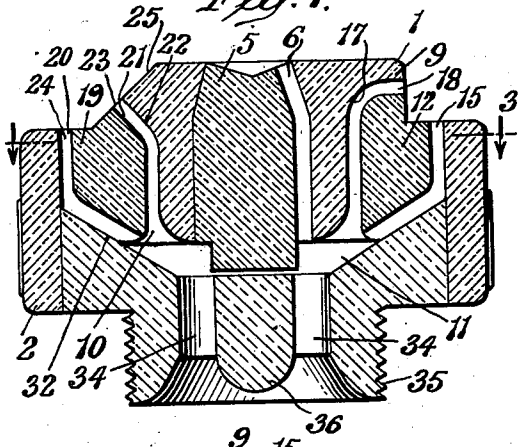


Fig. 4.

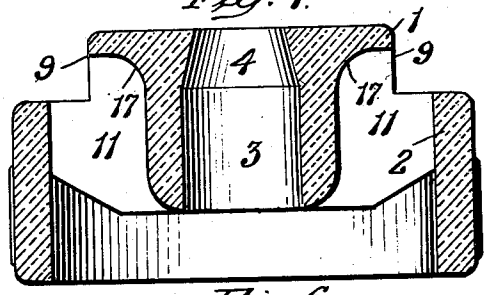


Fig. 6.

Fig. 5.

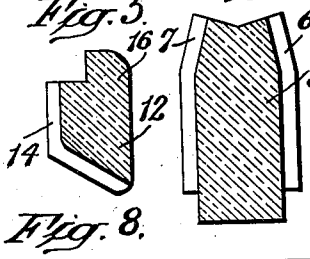


Fig. 7.

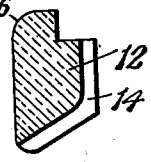


Fig. 2.

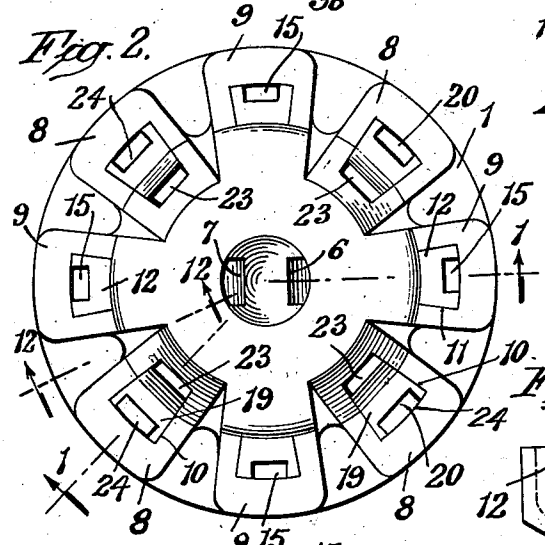


Fig. 8.

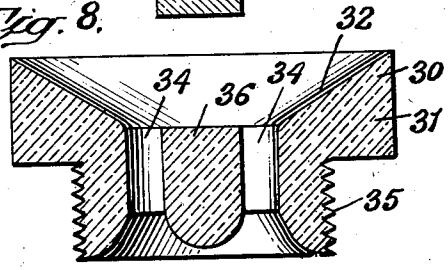


Fig. 9.

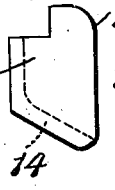


Fig. 10.

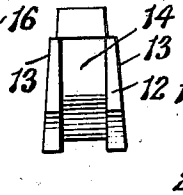


Fig. 11.

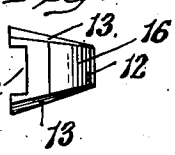


Fig. 3.

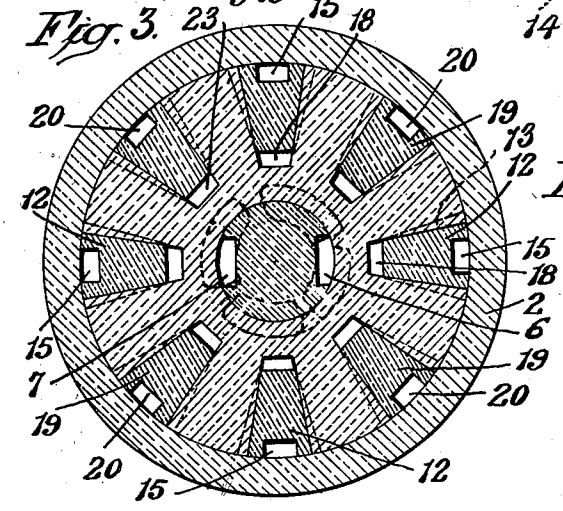
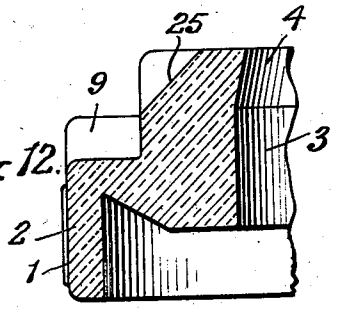


Fig. 12.



INVENTOR

John O. Lewis

BY

Harry Radzinski

ATTORNEY

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SPRAY NOZZLE

John O. Lewis, New York, N. Y., assignor of one-half to Arnold Muller, New York, N. Y.

Application May 6, 1941, Serial No. 392,057

8 Claims. (Cl. 299—143)

This invention relates to nozzles for fire extinguishing purposes, and more particularly to that type of nozzle wherein the water forced through the same is emitted in a plurality of streams which impinge against one another and are thereby broken up into a spray which spreads out over a relatively large area.

Various types of nozzles have been devised for this purpose but due to the limitations of manufacture and the inefficient design of the passages through the nozzles the results secured have not been wholly satisfactory. Due to the fact that in prior nozzles the passages through which the water is emitted, are produced by drilling operations after the body of the nozzle is made, such passages have often been sharply angular with respect to the flow of the water, thus serving to decrease the velocity of the flow and have decreased the efficiency of the nozzle. Inaccuracy in drilling of the passages also often resulted in inefficiency. In other cases improper position of the passages with respect to one another has caused "dead" areas to be produced in the cloud of spray emitted from the nozzle, and again in other cases the particles of the spray emitted from the nozzle lacked uniformity.

The primary object therefore, of the present invention, is to provide a nozzle in which the deficiencies above enumerated are eliminated, and which, by a new method of manufacture enables a nozzle to be constructed with gradually curved and gradually reduced passages, and which also permits the flow through the nozzle with a gradual increase in velocity of the water flow, as distinguished from a sharp increase in velocity and also a sharp loss of pressure, as is present when using nozzles of present-day construction.

These and other advantages are secured by the invention, a more particular description of which will appear hereinafter and be set forth in the claims appended hereto.

Reference is to be had to the accompanying drawing forming a part hereof, in which Fig. 1 is a vertical sectional view of a nozzle constructed in accordance with the invention, the view being taken on the line 1—1 of Fig. 2, looking in the direction of the arrows; Fig. 2 is a plan view of the same; Fig. 3 is a sectional view on the line 3—3 of Fig. 1, looking in the direction of the arrows; Fig. 4 is a vertical sectional view through the head or body portion of the nozzle; Figs. 5, 6 and 7 are vertical sectional views through the several inserts; Fig. 8 is a vertical sectional view through the rear end member of the nozzle; Figs. 9, 10 and 11 are respectively a side view, an end view and a plan view of the insert disclosed in Fig. 5; and Fig. 12 is a sectional view on the line 12—12 of Fig. 2, looking in the direction of the arrows.

In the construction of the improved nozzle, it is contemplated that the same shall be made by casting or moulding methods, enabling the nozzle to be made of either plastic material of suitable strength, or of cast metal. The design of the several parts of the nozzle is such that they may be economically made by moulding or by casting, and the spray passages extending through the several parts of the nozzle may be formed during the moulding or casting operation. By the design disclosed, and by the arrangement of the various parts of the nozzle, uninterrupted, gradually curved passages are provided through the nozzle offering unimpeded passages for the water.

In Fig. 4 the head or main body of the nozzle is shown at 1. The same consists of a shell provided with a circumferential wall 2 and a central passage 3 terminating in a constricted top portion 4. This central passage is adapted to receive a substantially cylindrical plug or insert 5 corresponding in shape to the interior of the passage 3 and provided with the vertically extending diametrically opposite grooves 6 and 7 which co-operate with portions of the wall of the passage 3 in forming a pair of discharge orifices adjacent the center of the nozzle. It will be noted in Fig. 6 that the upper end portions of the grooves 6 and 7 are inwardly inclined toward one another so that two streams emanating from the orifices formed by these grooves will impinge against one another and be broken into particles by such impingement.

The head or shell 1 is also formed with a plurality of radiating sections 8 and 9, the sections 9 alternating with those disclosed at 9, each of these sections having a hollowed interior chamber, that in the sections 8 being indicated at 10 and that in the sections 9 being disclosed at 11. Each of the chambers 11 is adapted to receive a plug or insert 12, such as shown in Figs. 5, 7 and 9 to 11 inclusive. Said insert is formed with side walls 13 (Fig. 11) which converge upwardly to conform to similar converging side walls of the apertures 11 which converging walls limit the extent of insertion of the inserts within the apertures. The insert 12 is also formed with a groove 14, a portion of which co-operates with the inner side of the wall 2 in forming a water orifice or passage 15. The insert 12 is also formed with an upwardly extend-

ing and curved surface 16 which when the insert is in position in the chamber 11, is spaced from the surface 17 on the inside of the chamber 11, so that this forms the water orifice 18. It will be observed that streams emanating from the orifices 15 and 18 flow in a direction to cross one another and they will therefore impinge against one another and are broken up into spray particles. With the nozzle disposed in an upright position, and substantially as disclosed in Fig. 1, the streams from orifices 15 and 18 will flow at substantially right angles to one another.

The chambers 10, provided in the sections 8, are adapted to receive inserts or plugs such as shown at 19 in Fig. 1. These plugs or inserts 19 are somewhat similar to those shown at 12 and have a groove 20 and a gradually curved surface 21 which conforms in curvature to the surface 22 on the interior of the aperture 10 thereby forming a gradually curving, radially extending orifice 23 from which a stream will flow to impinge against a stream emanating from the orifice 24. It will be noted that the head of the nozzle has an angular surface 25 formed on each of the radial sections 8 and it is from these angular surfaces 25 that the orifices 23 emerge. With the alternating arrangement of groups of orifices disclosed, the impinging streams emerging at various angles from the nozzle are completely broken up into spray; the particles of spray are uniform; the area covered by the spray is relatively large, and the spray is very evenly distributed through the area of ejection.

In Fig. 8 is shown at 30 the rear or back member of the nozzle, the same consisting of a disk portion 31 which fits snugly within the circumferential wall 2 of the head 1 and is preferably adhesively or otherwise securely affixed in place. Said back 30 has a dished or inclined surface 32 which abuts against the inner ends of the several inserts 12 and 19 and co-operates in forming portions of the orifices 15 and 24, and also acts to force or wedge the inserts 12 and 19 forwardly to the limit of their insertion within the respective chambers 10 and 11. The inserts 12 and 19 may be held in position merely by the pressure of the dished surface 32 against them, but preferably are also held in position by adhesive means or by being fused or otherwise secured in place, the means for attaching the inserts in position within the outer head or shell being largely dependent upon the nature of the material from which the several parts of the nozzle are constructed.

Located centrally of the back member 30 is the hub portion 36 which aligns with the central insert 5. The portion 36 is surrounded by the passages 34 through which water flows to pass through the several orifices heretofore described, in the nozzle. A threaded shank 35 enables the nozzle to be fitted upon the conventional hose coupling.

It will be noted that the several parts of the nozzle, namely, those disclosed at 1, 5, 12, 19 and 30 are so designed that the same may be molded or cast. It will be further observed that all of the orifices extending through the nozzle are formed by co-operating portions of the inserts and wall portions of the head or shell 1 so that said orifices may extend on curved lines and offer no material resistance to the water flow. In assembling the nozzle, the several inserts 5, 12, and 19 are placed in their respective apertures or chambers and preferably adhesively secured in place. The back member 30 is next placed in position and also adhesively secured in position and the nozzle is then ready for use.

While I have described the nozzle as being of certain shape and construction, it will be obvious that the same may be altered in many ways without departing from the spirit of the invention. The location of, number, angle of emergence and disposition of the orifices may be changed in many ways to suit various requirements. The number of inserts and shape and disposition of the same may also be altered and various other changes in structure and design may be made as will be readily understood by those skilled in this art. As herein shown, the orifices or water passages 15, 18, 24 and 25 are of substantially rectangular shape. Since these passages are formed by co-operating parts of the inserts and wall surfaces, and can be formed by molding or casting processes, it will be clear that the cross-sectional shape of these passages may be varied as desired.

Due to the gradual reduction in size of passages 6, 7, 15, 18, 20 and 23 the velocity of the water flow through these passages is gradually decreased, rather than abruptly decreased, and consequently the nozzle will operate to deliver a satisfactory spray at a reduced pressure. This makes for easier handling of the hose by the firemen, rendering it less likely to get out of control.

What I claim is:

1. A spray nozzle comprising an outer shell formed with a central opening and a plurality of radially extending openings, a plug fitted in said central opening, said plug having diametrically opposite grooves co-operating with portions of the wall of the opening in which it is fitted to form a pair of converging water passages, inserts fitted within the radially extending openings, each of said inserts co-operating with wall portions surrounding it to form a pair of converging water passages.

2. A nozzle of molded material, said nozzle having a shell formed with radially extending openings, and inserts fitted within said openings and having a groove and a surface co-operating with parts of the walls around said openings whereby each insert and the walls of the opening in which it is fitted forms a pair of converging water orifices.

3. A spray nozzle comprising a shell formed with a central aperture, a substantially cylindrical insert fitted within said aperture, said insert being provided with at least two diametrically placed longitudinal grooves co-operating with the wall around said aperture to form water orifices, said grooves converging toward one another adjacent to their point of emergence from the nozzle, said shell being provided with a plurality of radially disposed apertures, inserts disposed within said apertures, each of said inserts having surfaces co-operating with portions of the wall surface adjacent to said surfaces to form a pair of converging water passages through the nozzle, the angle of convergence of the passages of some of said pairs being greater than those of other pairs.

4. A spray nozzle comprising a shell formed with a central aperture, a substantially cylindrical insert fitted within said aperture, said insert being provided with at least two diametrically placed longitudinal grooves forming water orifices, said grooves converging toward one another adjacent to their point of emergence from the nozzle, said shell being provided with a plurality of radially disposed apertures, inserts dis-

posed within said apertures, each of said inserts having surfaces co-operating with portions of the wall surface surrounding it to form a pair of converging water passages through the nozzle, the angle of convergence of the passages of some of said pairs being greater than those of other pairs, and a back on the nozzle comprising an element fitted within the shell, said back having inclined surfaces forming wedging means operative against at least some of the inserts.

5. A spray nozzle having a plurality of pairs of converging water passages extending through it, the convergence of the passages in each pair causing impingement of the streams emanating therefrom, said nozzle including an outer shell, a back fitted within said shell, the shell and back co-operating in the formation of radially extending chambers, and a separate insert fitted in each chamber and provided with grooved portions co-operating with wall surfaces in the chamber for forming some of the water passages through the nozzle.

6. A spray nozzle comprising a shell having a circumferential side wall, a central passage through said shell, the shell having a plurality of radially disposed apertures located between the circumferential wall and the central passage, an insert located in said central passage, said insert being provided with diametrically opposite grooves forming water orifices, said grooves and the wall surfaces surrounding the same converging, inserts within the radially disposed apertures, said inserts being grooved and co-operating with wall surfaces in forming converging water orifices.

7. A spray nozzle comprising, an outer shell formed with a central opening and a plurality of radially extending openings, a plug portion fitted within said central opening and formed with diametrically opposite longitudinally extending grooves converging toward one another at one end of said plug portion, said grooves co-operating with wall surfaces of the shell surrounding the central opening in forming converging water passages from which emanating streams will impinge against one another, elements extending into the radially extending openings, said elements having grooves co-operating with parts of the shell around said radially extending openings to form water passages, and a disk-shaped part behind said elements and behind the plug portion fitting the rear of the shell, said disk portion being provided with passages communicating with those produced in the shell by the grooved elements and plug portion and the wall surfaces co-operating therewith.

8. A spray nozzle comprising, a shell, a disk-shaped rear member fitted in said shell, said shell having an end portion formed with a central opening and a plurality of radial openings independent of said central opening, inserts disposed within the central opening and within the radial openings and confined between the end portion of the shell and the inserted disk-shaped rear member, one of said inserts having surfaces co-operating with the wall surfaces of the central opening in forming a pair of converging orifices from which emanating streams impinge against one another, each of the other inserts having surfaces co-operating with the wall surfaces of the opening in which it is located in forming a pair of orifices having convergence to cause impingement of the streams emanating therefrom.

JOHN O. LEWIS.