Sept. 18, 1956 E. H. HANSEN ET AL 2,763,514

SPRAY NOZZLE FOR FIRE HOSE AND THE LIKE

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Fig. 1.

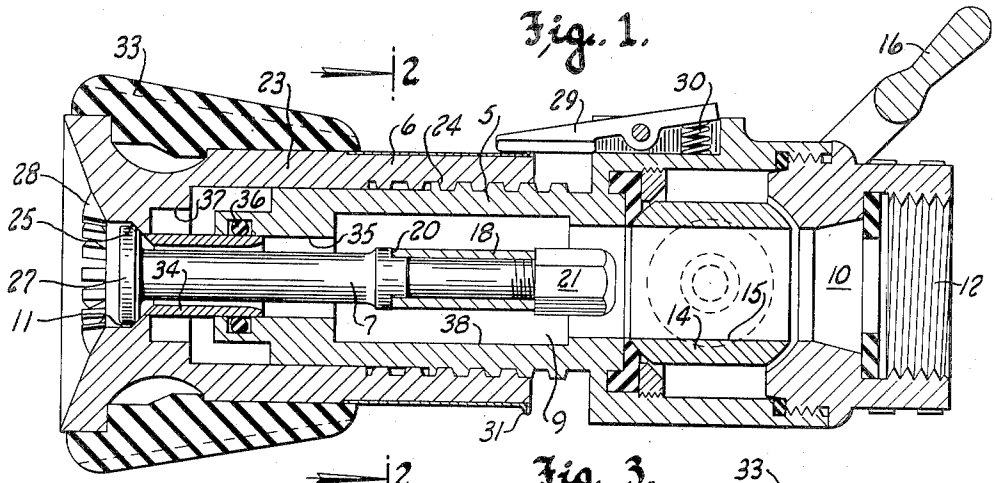


Fig. 2.

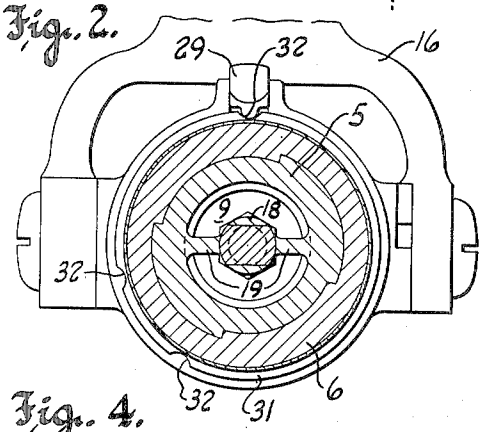


Fig. 3.

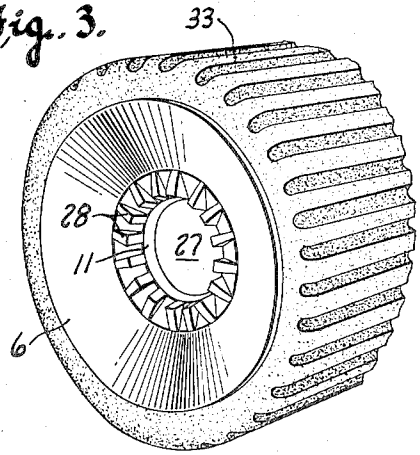


Fig. 4.

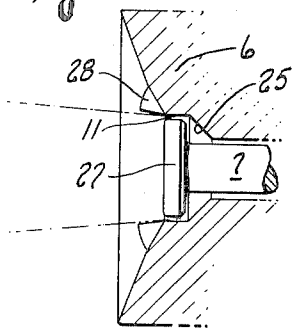


Fig. 5

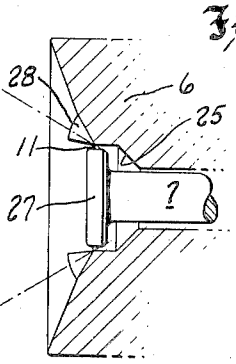
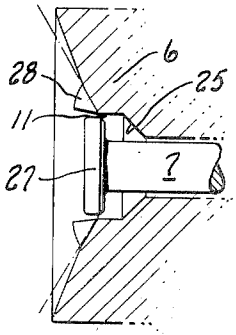


Fig. 6.



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SPRAY NOZZLE FOR FIRE HOSE AND THE LIKE

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1 Claim. (Cl. 299—131)

This invention relates to nozzles for fire hoses and the like and refers more particularly to a nozzle of the type whereby water under pressure may be expelled from a hose either as a direct stream or as a finely dispersed spray or "fog."

A nozzle of the general type here under consideration is shown in Patent No. 2,089,304, issued to Paul Stein, August 10, 1937. In general, such a nozzle comprises telescoped cylindrical inlet and outlet sections, the bores of which provide a continuous passage through the nozzle opening to an outlet at its front, and an elongated valve member comprising a stem portion anchored at its rear in the inlet nozzle section and extending forwardly through the passage, terminating at its front in an enlarged head. The nozzle outlet is defined by a bore and a forwardly opening counterbore in the outlet nozzle section, the bottom of the counterbore being defined by an outwardly divergent wall which provides a valve seat with which the enlarged head on the valve stem member cooperates.

The inlet and outlet nozzle sections have a threaded connection whereby the outlet nozzle section may be rotated on the inlet section and such rotation is translated into axial motion of the outlet nozzle section to carry its valve seat to and from positions of seating engagement with the underside of the head on the valve member. When the valve head is nearly seated, water issues from the outlet in a steady, substantially cylindrical stream, guided by the annular orifice defined by the wall of the outlet counterbore and the valve head, while axial adjustment of the outlet nozzle section to positions in which the underside of the valve head approaches the mouth of the counterbore results in emission of water from the nozzle in the form of a spray or mist diverging conically and covering a greater or lesser area depending upon the nozzle adjustment.

In nozzles of the type under consideration, it has heretofore been customary to provide a forwardly converging passage in the outlet nozzle section, leading to the nozzle outlet. As exemplified in the aforesaid patent to Stein, the convergence of this passage was brought about by the fact that the outside diameter of the inlet nozzle member, where it telescopes into the outlet nozzle member, is necessarily greater than the diameter of the nozzle outlet, in order to avoid the necessity for an excessively large head on the valve. Because of the very high pressures employed in modern fire fighting apparatus, and which is required for efficient fog-type spray dispersal, this convergence of the fluid passage in the outlet nozzle section brought about a very serious condition. The stream of water through the nozzle exerted a forward force upon the transverse area provided by the convergent walls of the passage, which force was sufficient to cause the outlet nozzle section to creep forwardly (i. e., to its closed position) relative to the inlet member.

While such creeping of the outlet nozzle member could be overcome or controlled by suitable locking means on the nozzle, whereby the inlet and outlet nozzle sections might be releasably secured in various fixed positions with respect to one another, the necessity for operating such a lock would in itself be a source of great annoyance, particularly since apparatus of the type in question is usually employed under the stress of emergency conditions. More important, however, was the fact that the pressure exerted by the stream of water upon the convergent wall portions of the outlet nozzle section exerted a force upon the outlet member which tended to resist movement thereof from its closed to its open position and from its steady stream to its spray positions, so that manual adjustment of the nozzle was extremely difficult at times when it was subjected to full pumping pressure.

With these objections to prior types of nozzles in mind it is an object of the present invention to provide a fire hose nozzle of the character described wherein the outlet nozzle member has a passage therethrough which is substantially uniform in diameter throughout its length, so as to minimize the tendency for fluid pressure to interfere with axial adjustment of the outlet nozzle member.

Another object of this invention resides in the provision of a nozzle of the character described wherein the fluid passage through the outlet nozzle member is defined by a sleeve having a substantially close sliding fit in a bore in the inlet nozzle member, which bore forms a portion of the fluid passage in the inlet nozzle member, and wherein the sleeve has a relatively thin wall which presents a relatively small transverse area to a fluid stream flowing under high pressure through the outlet nozzle member so that the forward force exerted by the fluid upon the outlet nozzle member will be negligible.

Another object of this invention resides in the provision of a fire hose nozzle of the character described having telescoping inlet and outlet nozzle sections, the inlet section having a bore forming part of the passage which has its outlet in the outlet nozzle section, featuring the provision of means engaged with the inlet nozzle section and at all times providing an extension of said bore therein, which extension leads directly to the nozzle outlet and nowhere has a diameter greater than that of the nozzle outlet, so as to minimize the forward pressure exerted upon the outlet section by a high pressure stream flowing through the nozzle.

A further object of this invention resides in the provision of a sturdy, compact and simple fire hose nozzle of the character described which may be adjusted to emit water either as a straight stream or as a spray, and wherein manual manipulation of the nozzle to afford such adjustment thereof does not require the expenditure of an inconvenient amount of effort.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claim, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claim.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal sectional view of a nozzle embodying the principles of this invention;

Figure 2 is a cross-sectional view taken on the plane of the line 2—2 in Figure 1;

Figure 3 is a fragmentary perspective view of the front or outlet end portion of the nozzle; and

Figures 4, 5 and 6 are fragmentary sectional views more

or less diagrammatically illustrating various positions of adjustment of the nozzle.

Referring now more particularly to the accompanying drawing, in which like numerals designate like parts throughout the several views, the nozzle of this invention comprises, in general, a substantially cylindrical inlet nozzle body section **5**, a substantially cylindrical outlet nozzle body section **6** telescoped over the inlet body section, and an elongated valve member **7** fixed in the inlet body section and extending therefrom through the outlet body section.

The inlet and outlet nozzle body sections cooperate to define a fluid passage **9** communicating an inlet **10** at the rear of the nozzle with an outlet **11** at its front. The inlet is preferably provided with internal threads, as at **12**, to accommodate a standard hose connection, and just ahead of the inlet the nozzle may be provided with a ball cut-off valve of well-known type comprising a rotatable valve element **14** which has a bore **15** therethrough and which is mounted in the duct for manual rotation, by means of a handle **16**, to and from an open position in which the axis of its bore aligns with that of the passage.

The elongated valve member **7** is concentrically anchored in the inlet nozzle member by having the rear portion of its stem extend through a cylindrical boss **18** which is in turn supported concentrically in the inlet nozzle section by means of radially extending webs **19** which connect the boss with adjacent portions of the passage wall. A rearwardly facing shoulder **20** on the stem portion of the valve member, engaging the front of the boss, cooperates with a nut **21** on the threaded rear end of the stem portion, engaging the rear of the boss, to preclude axial displacement of the valve member with respect to the inlet nozzle member.

The outlet nozzle section has a rearwardly extending skirt **23** which embraces and is journaled on the inlet nozzle section and has a threaded connection therewith, as at **24**, whereby rotation of the outlet nozzle member relative to the inlet nozzle member is translated into axial movement between the nozzle members. The outlet **11** in the outlet nozzle section is a counterbore, the bottom of which converges inwardly to provide a seat **25** for an enlarged head **27** on the front end of the stem portion of the valve member.

Thus as the outlet nozzle section is rotated on its threaded connection with the inlet nozzle section, the outlet nozzle section is carried back and forth, to and from positions in which the valve head seats against the bottom of the counterbore to close the nozzle, so that the adjusting valve serves as a supplement to the ball valve in enabling cut-off of water issuing from the nozzle when the outlet nozzle member is in its most forward position. As the outlet nozzle section is moved rearwardly on the inlet nozzle section to a position in which the valve head is just off its seat, as shown in Figure 4, water is permitted to issue from the outlet as a steady, substantially cylindrical hollow stream, being guided for such flow by its passage through the annular orifice jointly defined by the valve head and the wall of the outlet counterbore. Further relative movement between the outlet nozzle section and the valve head disposes the valve head about half way out of the counterbore, as shown in Figure 5, so that water is somewhat dispersed as it issues from the outlet. Axial movement of the outlet nozzle section to its most rearward position, illustrated in Figure 6, adjusts the nozzle for a fine, widely dispersed spray or "fog" since the wall of the counterbore provides virtually no guidance for the expelled water and the valve head tends to deflect all parts of the stream laterally.

A number of small ribs or lands **28** on the front of the outlet section, disposed at circumferentially spaced intervals around the mouth of the outlet, deflect portions of the spray stream inwardly so that the "fog" is relatively uniform throughout the area which it covers.

The several positions of adjustment of the nozzle may be defined by detent means comprising a lever **29** mounted on the inlet nozzle section for pivotal motion about an axis transverse to that of the nozzle. A compression spring **30** reacting between the outlet nozzle section and the rear end of the lever biases the front end of the lever into yielding engagement with a small circumferential flange **31** on the rear of the skirt on the outlet nozzle section, and this flange is provided with small radial notches **32** (see Figure 2) in which the front end portion of the lever engages with a detent action to define the various positions of adjustment of the nozzle shown in Figures 4, 5 and 6. Suitable indicia of the nature of the spray produced by each nozzle setting may be delineated on the skirt of the outlet nozzle in line with the notches which define such settings. A longitudinally ridged rubber grip **33** on the front of the outlet nozzle member facilitates manipulation of the nozzle and affords protection to it against blows against hard surfaces.

In the nozzle of the present invention the outlet nozzle section presents a minimum of surface area transverse to the path of the stream of water flowing therethrough because the water is constrained to flow to the nozzle outlet through a rearwardly projecting sleeve **34** on the outlet nozzle section which is telescoped in a substantially closely fitting bore **35** in the inlet nozzle section. The sleeve is formed of tubing having a relatively thin wall, bonded or otherwise secured at its front end to the front of the outlet nozzle section. Thus the sleeve at all times provides an extension of the bore **35** in the inlet nozzle section, which extension leads directly to the nozzle outlet and nowhere has a diameter greater than that of the nozzle outlet. Because the inside diameter of the sleeve is uniform throughout substantially its entire length and is smaller than that of the nozzle outlet, the only area transverse to the stream flow which is presented by the outlet nozzle member is the relatively small cross sectional area of the sleeve, against the rear end of which the stream impinges as it enters the same.

A resilient O-ring **36** in a circumferential groove in the inlet nozzle member provides a seal between the two nozzle members. It will be understood that the sleeve is concentric with the skirt on the outlet nozzle member and cooperates therewith to define a rearwardly opening annular well **37** in which the front end of the inlet nozzle member is received. Obviously the bore **35** in the front of the inlet nozzle member should have a uniform diameter throughout at least that portion of it in which the sleeve is telescopingly received, but preferably it communicates at its rear with a counterbore **38** which opens to the rear of the outlet nozzle member. The additional width of the passage at the rear portion of the inlet nozzle member is of course desirable in order to minimize interference with stream flow through the passage due to the presence of the anchoring means for the valve stem.

It will be obvious that the relations of the bore **35** and sleeve **34** may be reversed; that is, the sleeve may be secured to the inlet nozzle section, extending forwardly therefrom into a bore in the outlet nozzle member, which bore would of course have a diameter no greater than that of the nozzle outlet.

From the foregoing description taken together with the accompanying drawing it will be apparent that this invention provides a fire hose nozzle of the type which is adjustable to provide either a straight, substantially cylindrical stream or a fog type of spray, which nozzle will not have a tendency to creep out of adjustment, toward its closed position, and will be readily manipulatable from one of its positions of adjustment to another without the necessity for exerting excessive effort in making such adjustment.

What we claim as our invention is:

An adjustable hose nozzle having telescoped threadedly connected tubular inlet and outlet sections, the latter having a valve seat at its outlet cooperable with a valve

member on the end of a valve stem which is fixed in the inlet section and extends axially through both sections, to adjust the stream issuing from the nozzle as the outlet section is moved axially with respect to the inlet section in consequence of relative rotation between the sections, said nozzle being characterized by an open ended bore of uniform diameter defining the downstream end of the inlet section; and an open-ended sleeve fixed in and defining the downstream end of the outlet section and leading to the valve seat, said sleeve having a close sliding fit in said bore of the inlet section and having a relatively thin wall so that the bore of the sleeve is but slightly smaller than said bore of the inlet section in which it slides and the cross sectional area of the sleeve wall at its open upstream end where the sleeve communicates with said bore of the inlet section presents a minimum obstruction to flow through the nozzle, thereby minimizing the tendency for fluid pressure to interfere with the relative axial adjustment of the nozzle sections required to adjust the stream issuing from the nozzle.

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