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ADJUSTABLE NOZZLE

Filed Sept. 16, 1937

Fig. 1.

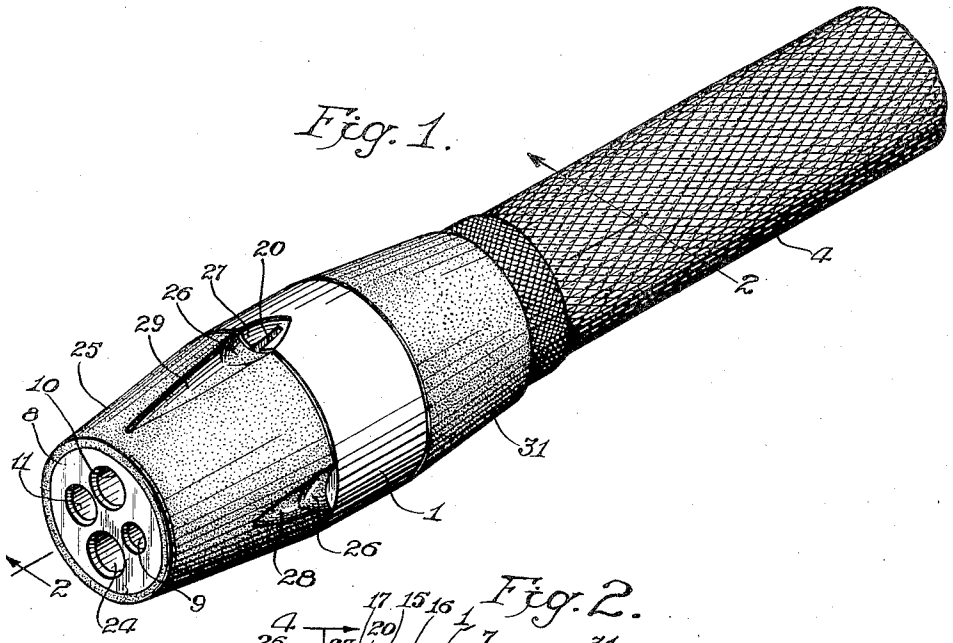


Fig. 2.

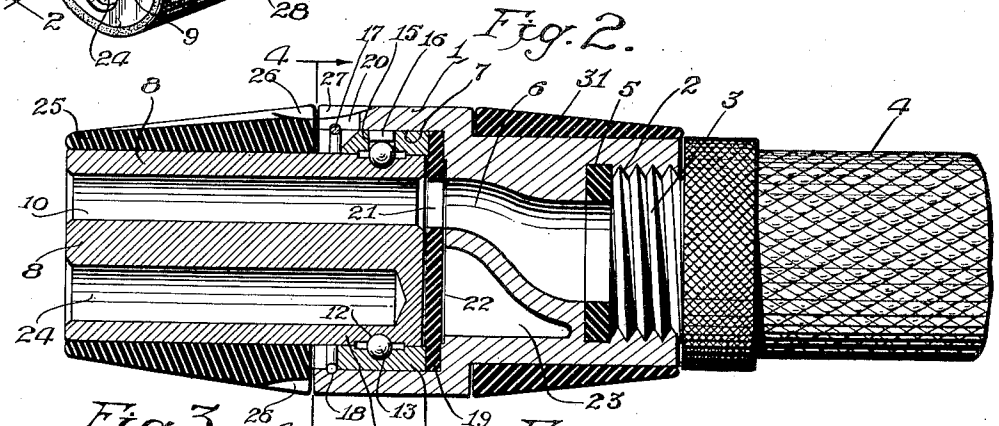


Fig. 3.

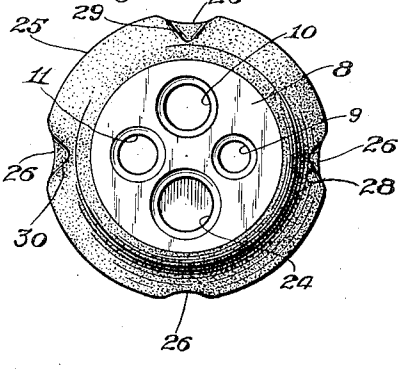
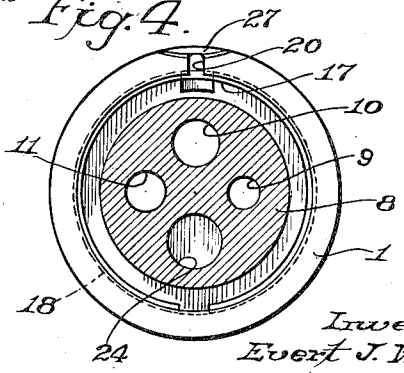


Fig. 4.



Inventors:—
Evert J. Wendell
Richard B. Sargent
by their Attorneys
Howson & Howson

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2,132,333

ADJUSTABLE NOZZLE

Evert J. Wendell, Wayne, and Richard B. Sargent, Erdenheim, Pa., assignors to The Hale Fire Pump Co., Inc., Conshohocken, Pa., a corporation of Pennsylvania

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6 Claims. (Cl. 299—139)

This invention relates to adjustable nozzles, more particularly of the type employed with fire hose. The nozzle, however, is not restricted to use in fire apparatus, and may find useful application in other fields.

A principal object of the invention is to provide a nozzle capable of adjustment to vary the size and pressure of the projected stream of liquid, said nozzle being characterized by relative simplicity of form and manufacture, high operating efficiency, ease of adjustment under operating conditions, and substantial freedom from leakage.

Other and more specific objects of the invention will appear hereinafter, the novel construction by which the various objects are attained being illustrated in the attached drawing, in which

Figure 1 is a view in perspective of a nozzle made in accordance with our invention;

Fig. 2 is a longitudinal section on the line 2—2, Fig. 1;

Fig. 3 is a front end view of the nozzle, and

Fig. 4 is a transverse section on the line 4—4, Fig. 2.

With reference to the drawing, the nozzle therein illustrated as an embodiment of our invention comprises a cylindrical body or base member 1 having at one end a screw-threaded countersunk recess 2 for reception of the threaded terminal fitting 3 of a hose 4. At the bottom of the recess 2 is a rubber or other suitable washer 5 which effectively seals the joint between the nozzle body 1 and the hose. That end of the interior passage 6 of the body member 1 which terminates in the countersunk recess 2 is concentric with the longitudinal axis of the body member, and the passage 6 decreases gradually in cross sectional area toward its opposite end and is also gradually offset from the axis of the body member so that that end is eccentric to the said axis, as clearly illustrated in Fig. 2.

The said eccentric end of the passage 6 terminates in the bottom of a countersunk recess 7 in the end of the body member 1, and this recess is adapted for reception of an adjustable nozzle section or tip 8 which projects from the body member 1 beyond the outer end of the recess and is adapted to turn in said recess about the longitudinal axis of the nozzle. The nozzle section 8 is provided with a plurality of through passages 9, 10 and 11, respectively, which differ from each other as a matter of diameter, and these passages are arranged in series about the axis of the nozzle so that their inner ends may register with the aforesaid eccentrically positioned end of the passage 6. By rotatably adjusting the nozzle section 8 with respect to the body member 1, in other words, the passages 9, 10 and 11 may be brought selectively into registration with the nozzle passage 6. The ends of the passages 9, 10 and 11 are beveled, and the outer diameter of the inner beveled end of the passage 9 corresponds substantially to the diameter of the outer eccentric end of the passage 6 of the body member 1.

The nozzle section 8 is provided, at a position adjoining its inner end, with a circumferential groove 12 which is adapted for reception of antifriction bearings 13. This grooved inner portion of the nozzle section 8 is embraced by a sleeve 14 which is internally grooved to accommodate the bearings 13 and which in effect constitutes the outer race for these bearings. The bearing elements 13 are introduced into the channel between the nozzle section 8 and the sleeve 14 through an aperture 15 in the latter, and after introduction of the elements 13, this aperture may be closed by means of a suitable plug 16. The nozzle section 8 is secured rotatably in the body member 1 by means of a snap ring 17 which seats in an annular groove 18 in the wall of the recess 7 of the body member and engages the outer end of the sleeve 14, and this ring functions also to hold the inner end of the sleeve 14 in forcible clamping engagement with a flexible, preferably resilient, diaphragm 19 which seats in the bottom of the recess 7 and is interposed between the body member 1 and the nozzle section 8. The diaphragm 19 may be composed of rubber or other suitable material. In order to facilitate removal of the snap ring 17 to release the nozzle section 8 from the body member 1, the latter is provided with a slot 20, see Figs. 1 and 2, which intersects the groove 18 and which provides access to the outer side of the ring so that the latter may readily be compressed for extraction from its groove.

It will be noted that in this construction, the ring 17, functioning as described to normally hold the nozzle section 8 in the body member 1, also functions by pressure and frictional engagement to clamp the sleeve 14 and the diaphragm 19 immovably in the body member 1. Under these circumstances, rotative force applied to the nozzle section or tip 8 will cause that section to turn with respect not only to the body member 1, but also with respect to the diaphragm 19 and the sleeve 14. As shown in Fig. 2, the diaphragm 19 is provided with a port 21

which registers with the end of the nozzle passage 6 of the body member 1.

The inner end of the sleeve 14 extends slightly beyond the inner end surface of the nozzle section 8, so that in assembly the outer face of the diaphragm 19 is normally slightly spaced from the inner end face of the nozzle section 8. Similarly the bottom of the recess 7 of the body member 1 is depressed at 22 so that except for the outer peripheral portion of the diaphragm which is clamped directly by the sleeve 14, the inner face of the diaphragm is slightly spaced from the adjoining surface of the body member 1. When fluid pressure is applied to the hose 4, this pressure is exerted through the recess 22 and the chamber 23 in the body member 1 upon the inner face of the diaphragm 19 and the diaphragm is thereby forced outwardly against the inner end face of the nozzle section 8. The diaphragm, thus held against the inner end of the nozzle section 8, acts to preclude leakage between the said section 8 and the sleeve 14. At the same time and by reason of the bearings 13, the nozzle section 8 may readily be turned in the body member 1, without necessity for relieving the fluid pressure, so as to bring one or other of the nozzle passages 9, 10 and 11 into operating position, or to cut off the flow of the fluid from the nozzle by bringing the blank section of the inner end face of the tip 8 into position opposite the port 21 of the diaphragm.

With regard to this blank section, it will be noted by reference to Fig. 2 that the nozzle section 8 is provided with a bore 24 from its outer end which parallels the passages 9, 10 and 11 but which terminates short of the inner end of the nozzle section. That portion of the inner face of the nozzle section 8 in line with the dead end bore 24 constitutes a blank surface which may be utilized, as described above, to cut off the flow of fluid through the nozzle. The purpose of the bore 24 is to reduce the weight of the nozzle.

Means is provided for assuring a proper registration of the selected one of the passages 9, 10 and 11 with the port 21 of the diaphragm 19 and with the outer end of the passage 6 of the body member 1. By reference to Fig. 2, it will be noted that the exposed end of the nozzle section 8 is provided with a rubber sleeve 25. In radial alignment with each of the passages 9, 10 and 11, respectively, and with the bore 24, this sleeve 25, which is securely cemented to the nozzle section 8, is provided at its inner end with a depression or recess 26. This depression preferably is of a shape and dimension to more or less neatly receive the thumb of one holding the nozzle. A similar recess 27 is provided at the outer end of the body member 1. In the present instance, the bottom of this latter recess is intersected by the slot 20, this slot and the intersected recess being in radial alignment with the outer end of the nozzle passage 6 of the body member. When, therefore, one of the recesses 26 is brought into registration with the recess 27, one or other of the passages 9, 10 and 11, or the bore 24, will necessarily be in registration with the passage 6 and port 21. In order to differentiate between these positions, each of the recesses 26 corresponding to the passages 9, 10 and 11 is provided with an extension towards the outer end of the sleeve, and these extensions, as shown in Fig. 1, differ in length. Preferably the recess extension 28 associated with the passage 9 is of relatively short length; the recess extension 29 associated with the passage 10 is of the greatest length; and the recess extension 30 associated with the passage 11 of intermediate size is of intermediate length. By this means, the operator by sense of touch may determine which of the passages is in the operative position. By retaining the thumb in the recess formed jointly by the recess 26 and the recess 27, the operator may be assured that the adjusted position of the nozzle section 8 will be maintained. The recess 26 associated with the bore 24, which provides the cut-off position of the nozzle section 8, is distinguished by the absence of a recess extension, as indicated at the bottom of Fig. 2.

The body member 1 is provided at its inner end with a tapered rubber sleeve 31, which with the sleeve 25 affords the nozzle a relatively smooth lozenge-like contour free from projections. The sleeves 25 and 31 function to protect the nozzle, and also to protect against damage articles or structure with which the nozzle may inadvertently come into forcible contact.

In assembling the nozzle, the diaphragm 19 is inserted into the body member 1 with the port 21 in registration with the outer end of the passage 6. The sleeve 14 and the antifriction bearing elements are then assembled with the nozzle section 8, and this assembly is inserted in the countersunk recess 7. Pressure is now applied to force the nozzle section 8 inwardly in the body member 1, and the inner end of the sleeve 14 into compressive engagement with the peripheral portion of the diaphragm 19. The spring clip 17 is then slipped into position to retain the sleeve 14 in this compressive engagement with the diaphragm 19 whereby the latter is solidly clamped in position, as also is the sleeve 14. As previously described, this preloading of the diaphragm 19 insures a liquid-tight seal between the two relatively movable portions of the nozzle and prevents the diaphragm from turning in the body member when the nozzle section 8 is adjusted. The resilient sleeve 25 is now cemented to the nozzle section 8 in position in which the respective recesses 26 are in proper radial alignment with the respective passages 9, 10 and 11 and with the bore 24. Under these circumstances, as previously described, these passages and the shut-off portion of the inner end face of the nozzle section 8 may be brought accurately into registration with the port 21 and the outer end of the nozzle passage 6.

It is apparent that there may be some modification without departure from the invention as defined in the appended claims.

We claim:

1. A nozzle comprising a base element having a longitudinal passage, a tip element connected with said base and having a plurality of longitudinal passages of differing diameters, said tip being adjustable with respect to the base to bring said differing passages selectively into registration with the base passage, a flexible diaphragm confined between the proximate ends of said base and tip and having a port registering with the end of said base passage, and means for detachably interlocking the tip with the base, said means comprising an element relatively fixed with respect to the base and having clamping engagement with the diaphragm.

2. A nozzle comprising a base element having a longitudinal passage, a tip element connected with said base and having a plurality of longitudinal passages of differing diameters, said tip being adjustable with respect to the base to bring said differing passages selectively into registration

with the base passage, a flexible diaphragm confined between the proximate ends of said base and tip and having a port registering with the end of said base passage, a sleeve loosely engaging the inner end of said tip, means for preventing relative axial movement between said tip and the sleeve, and means for locking said sleeve in the base element in clamping engagement with the diaphragm.

3. A nozzle comprising a base element having a longitudinal passage, a tip element connected with said base and having a plurality of longitudinal passages of differing diameters, said tip being adjustable with respect to the base to bring said differing passages selectively into registration with the base passage, a resilient diaphragm confined between the proximate ends of said base and tip and having a port registering with the end of said base passage, a sleeve loosely embracing the inner end of said tip, means for preventing relative axial movement between said sleeve and the tip, and a detachable locking ring seating in a circumferential recess in said base and holding said sleeve in compressive clamping engagement with the diaphragm.

4. A nozzle comprising conjoined tubular elements relatively adjustable about the longitudinal axis of the nozzle, one of said elements having a countersunk recess for reception of the proximate end of the other of said elements, a washer seated in the bottom of said recess, a sleeve loosely embracing said other element, anti-friction bearings confined and preventing relative axial movement between said sleeve and the element, and means for locking said sleeve in the countersunk recess in forcible engagement with the washer.

5. An adjustable nozzle comprising conjoined tubular elements relatively movable about the longitudinal axis of the nozzle, one of said elements having a countersunk recess in an end thereof for reception of the proximate end of the other of said elements, a diaphragm confined in the bottom of said recess between said elements, said diaphragm having an aperture for passage of fluid through the nozzle, a sleeve loosely embracing the second nozzle of said elements, means for preventing relative axial movement of said sleeve and element, means for locking said sleeve in the countersunk recess in forcible engagement with the peripheral portion of said diaphragm, and means providing a space between the central portion of said diaphragm embracing said aperture and the bottom of said recess for access of fluid pressure behind the diaphragm to force the diaphragm against the inner face of said second-named element.

6. An adjustable nozzle comprising conjoined tubular elements relatively movable about the longitudinal axis of the nozzle, one of said elements having at an end thereof a section of increased diameter having a countersunk recess for reception of the proximate end of the other of said elements, a rubber sleeve cemented to the first-named of said elements at one side of the said section of increased diameter and tapering towards the opposite end of the said element, and a rubber sleeve cemented to the exposed portion of the other of said elements, the inner end of said sleeve adjoining the countersunk end of the conjoined element and tapering toward the outer end of the element, said sleeves forming with the portion of the one element of increased diameter a smooth external surface free from projections.

EVERT J. WENDELL.
RICHARD B. SARGENT.