Sept. 21, 1943. J. GILSENAN 2,329,711

APPARATUS FOR SPRAYING FLUIDS

Filed June 14, 1939

Fig. 1.

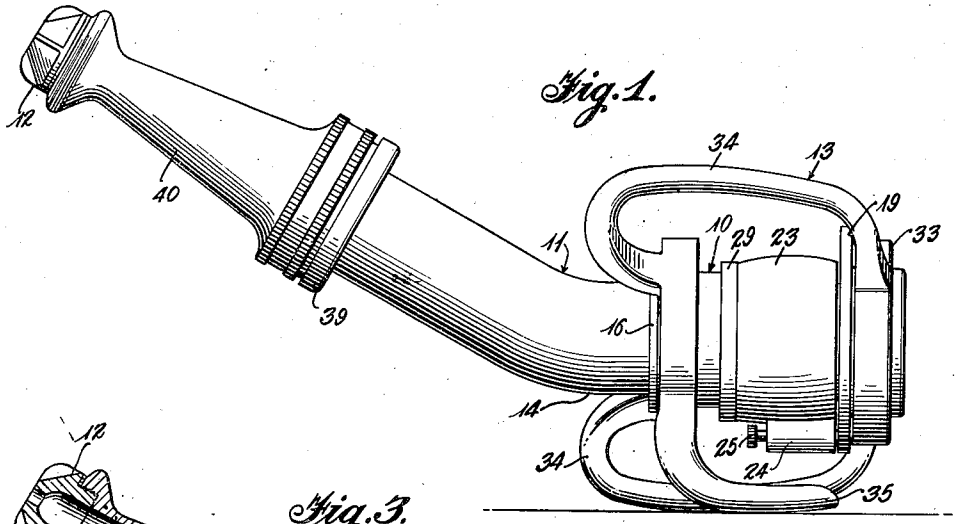


Fig. 3.

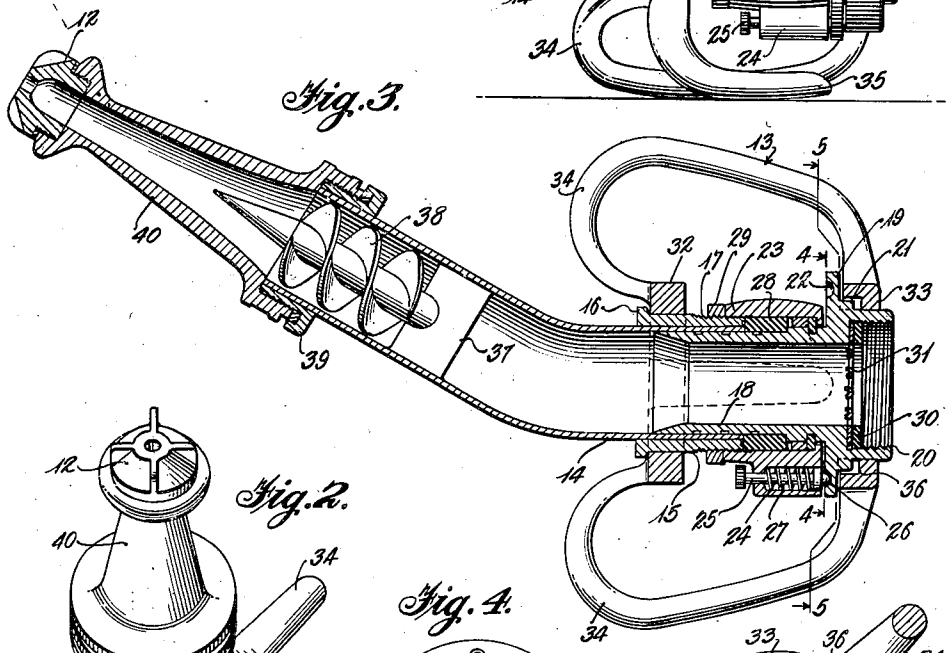


Fig. 2.

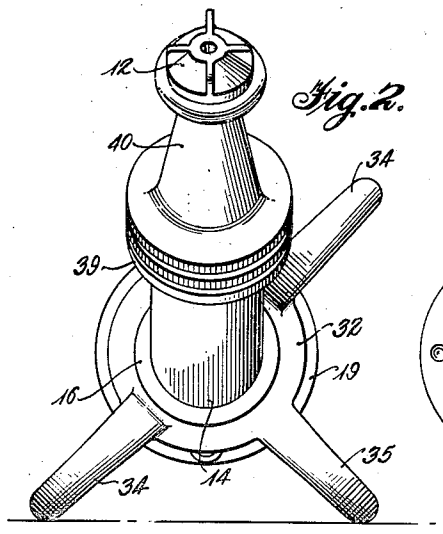


Fig. 4.

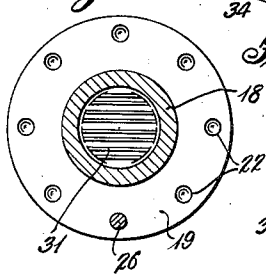
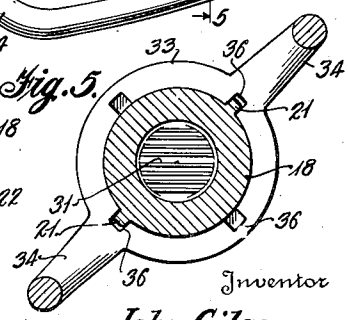


Fig. 5.



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APPARATUS FOR SPRAYING FLUIDS

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Application June 14, 1939, Serial No. 279,303

5 Claims. (Cl. 299—112)

This invention relates to apparatus for spraying fluids, and more particularly to the extinguishing and localizing of conflagrations and to heavy duty high pressure nozzles for such purposes.

The need for highly efficient means for extinguishing fires has long been apparent and many types of equipment have been developed for this purpose. While it has long been known that advantages can be had in fire fighting operations as a result of using streams varying in different degrees between a solid stream and an atomized stream, extreme difficulty has been experienced in producing efficient equipment in relatively simple form and of a character not excessively expensive for this purpose. Then too, the equipment used for creating high pressure streams has produced powerful reactions and it has therefore been necessary to employ several men to maintain a single nozzle in desired position, or as an alternative, heavy fastenings and supports have been required.

This invention is intended to overcome difficulties encountered in fire fighting such as referred to and it contemplates the provision of a nozzle adaptable to many applications and subject to ready adjustment to produce a wide variety of fluid streams for use in extinguishing conflagrations. By the employment of the apparatus of the present invention, it is possible to produce from one nozzle a stream of widely dispersed water particles in the form of a mist or fog which may be directed as accurately as heavy high pressure streams now in use as the vaporized stream produced is of small diameter and generally uniform cross section throughout its length. It is further contemplated to produce such a stream through the entire range of pressures from ordinary hydrant pressures to the high pressures obtained with the usual pumping equipment, the character of the stream being reasonably uniform while the carrying qualities thereof vary in proportion to the pressure used. By an adjustment of the same nozzle from which the aforementioned fog is produced, it is possible to produce a flared heavy spray of fluid in the form of drops, the amount of water used being greater than that contemplated where the fogging effect is desired. By further manipulation, a solid stream of large diameter or a solid stream of small diameter may be produced.

In recent years it has been recognized that water losses incident to the use of heavy streams in fire fighting frequently exceeded the actual damage caused by the fire. One of the earlier practices adapted to prevent such water damage involved the use of chemical extinguishers. However, it has now been found that use can be made of nozzles which break the stream into droplets of widely separated water particles in the form of a conical spray or fog for extinguishing a fire and that the water damage will be greatly reduced. Such a spray, when directed against a conflagration, will be instantaneously transformed into steam and the vapor thus formed will effectively blanket and extinguish the fire. Because of the fact that the spray produced is conical, as distinguished from a long stream of constant diameter, much water is wasted by being directed at localities adjacent the burning area. This, of course, results in the loss of water and inefficient extinguishing action. It is an object of the present invention to produce a vaporized stream of substantially uniform diameter in cross section over a relatively long path whereby the extinguishing advantages of the fog may be attained without the necessity for spraying water beyond the burning areas, thus reducing water loss and rendering more efficient the extinguishing action. With an ordinary fire nozzle, seventy-five to eighty gallons of water are discharged each minute, whereas by the use of the present invention nozzle in its atomizing adjustment, only three or four gallons of water are discharged in a minute, all of such water being efficiently employed in extinguishing the fire.

The present invention additionally contemplates the production of a light-weight nozzle which may operate at high pressure when placed on a surface without being secured thereto and which may be handled during operation by one man with comparative ease.

In order that the advantages of the nozzles of the present invention may be available to the fullest extent during emergency, novel means are employed for altering the direction of the stream substantially instantaneously and without the interruption of the fluid flow therethrough. The adjustment contemplated may be effected in two ways, one involving a major alteration of the direction and the other a minor alteration. One of the locking means is retained in position through the back pressures incident to use, while the other locking mechanism is independent thereof and readily operable during operations.

Other objects and advantages of the invention will appear upon detailed consideration of the following description when taken in conjunction with the annexed drawing wherein:

Figure 1 is a view in side elevation of one form

of a nozzle constructed in accordance with the present invention;

Figure 2 is a front elevational view of the nozzle shown in Figure 1;

Figure 3 is a longitudinal sectional view of the nozzle shown in Figure 1, the position of the handles being altered for better illustration;

Figure 4 is a sectional view taken along the line 4—4 of Figure 3; and

Figure 5 is a sectional view taken along the line 5—5 of Figure 3.

In referring specifically to Figures 1 to 5 inclusive of the drawing, it will be seen that the nozzle illustrated has an inlet portion 10, a curved reaction chamber 11 and a round straight discharge portion extending from the reaction chamber 11 to removable tip 12. Handle unit 13 is rotatably mounted about the inlet portion 10 to render the nozzle and the handles relatively movable.

The nozzle has been found to be particularly suitable for long and hard usage when it is fabricated of stainless steel as it then resists the corrosive action of fluids passed therethrough. A bent tubular member 14 forms the curved reaction chamber and its respective extensions constitute a part of the inlet portion and a part of the straight tubular discharge portion. This member 14 has sweated thereon adjacent one end a sleeve 15 which has an outwardly extending flange 16 at its forward end and a threaded section 17 at its rearward end which terminates flush with the end of member 14. Within the intake end of the body portion 14 there is a sleeve 18 provided at its forward end with an outwardly tapered inner wall and extending at its opposite end beyond the member 14 where it is joined with a radially extending flange 19 and an interiorly threaded portion 20 of enlarged diameter for connection to a source of fluid supply. On the rear portion of the flange 19, two axially projecting lugs 21 are provided and the flange has on its forward face a plurality of hemispherical recesses 22 arranged in a row adjacent its perimeter. Threadedly attached to the sweated sleeve 15 is an outer sleeve 23 having a protruding drilled portion 24 formed thereon. A pin 25 having a rounded end 26 is housed within the drill hole of portion 24 together with an encircling coil spring 27, which spring engages against a shoulder in the drill hole and a flange formed on the pin and urges the rounded portion thereof into a selected one of the hemispherical recesses 22. Intermediate the sleeve 15 and sleeve 23, suitable packing material 28 is interposed to insure a fluid-tight joint. Two annular members are disposed rearwardly of the packing 28 in cooperative relation with the rearward flange on sleeve 23. Their function is to prevent the separation of tube 14 from sleeve 18. An annular threaded lock nut 29 cooperates with the thread 17 on the sleeve 15 to retain the sleeve 23 fixed against stresses incident to operation. A strainer 31 of a construction to be hereinafter more fully discussed is received within the enlarged threaded portion 20 and is retained in position by the shoulder formed at the base of the enlargement and a packing ring 30.

Handle unit 13 referred to above is formed as a casting with handles and a hook and two rings 32 and 33, one of which surrounds sleeve 15 and the other of which encircles portion 20 and is adapted to contact the rear face of the flange 19. Radially extending from and bridging rings 32 and 33 are handles 34. A hook 35 extends radially from ring 32 and depends in a position generally parallel to the axis of the intake portion of the nozzle. Ring 33 is provided with four recesses 36 in which are selectively received the lugs 21 depending from the flange 19. It will be noted that the handles through the rings on which they are mounted are subject to limited axial movement which axial movement is sufficient to disengage the lugs from the recesses. When the lugs are disengaged the handle unit may be turned with respect to the remainder of the assembly. It should be noted that the relative positions of the handles and hook are such that one of the handles and the hook may cooperate to form a ground support for the nozzle as appears from Figures 1 and 3. It will be seen that aside from the adjustment of the handle unit with respect to the assembly as a whole that the key effected through the pin 25 in cooperation with recesses 22 may be manually broken so that the nozzle may be given a swivel action while the handles and the interior sleeve 18 remain locked in fixed position. While this key may be disengaged from its recess by manually rotating the nozzle, the latch resists such movement sufficiently so that the nozzle will remain in a selected position when subjected to the vibrations and stresses incident to normal use.

At the forward part of the nozzle beyond the curved reaction chamber 11 an axially extended diametrical baffle 37 is provided and a double-flight spiral 38 formed with a bifurcated end which fits over baffle 37 for rendering the swirler readily removable when desired. An additional sleeve 39 is sweated over the end of the tubular member 14 remote from sleeve 15, and this sleeve is threaded to receive a large conical portion 40 which is in turn interiorly threaded to receive the aforesaid tip portion 12. It will be noted that the diameter of the conical portion 40 adjacent the threaded connection with the tubular member 14 is sufficiently reduced so that the spiral 38 when moved forwardly by fluid passing through the nozzle will engage the wall thereof and be retained in operative position, although loosely held, so that it may be readily removed by unscrewing the conical member 40 from the tubular member 14.

In the operation of the nozzle shown in Figures 1 to 5 inclusive, the attendant will first connect the threaded portion 20 of the sleeve 18 to a conduit to provide a suitable source of fluid supply, the connection being rendered fluid tight by virtue of packing 30. Thereafter the relative position of the handles 34 with respect to the nozzle body as a whole and the conduit will be effected by movement of the rings 32 and 33 with the handles 34 in a rearward axial direction to thereby disengage recesses 36 from lugs 21 so that stresses from the supply source may be accommodated, and the nozzle outlet directed toward the conflagration. When the lugs 21 have been aligned with the selected recesses 36, the supply for the water or other fluid may be turned on. This will cause the nozzle as a whole to move somewhat in the direction of the source of fluid supply, thus locking the handle unit in position. In the event adjustments of the direction of discharge are desired, the large conical portion 40 may be grasped and the nozzle rotated thereby to the desired position. This action will cause the hemi-spherical spring thrust member 26 to be retracted from one of the recesses 22 and to engage and dis-

engage the other recesses until the desired adjustment has been made, whereupon it will be received in and held in position by the spring. While the disengagement of member 26 from recess 22 may be manually effected through the nozzle, the lock is of sufficient strength to withstand the vibrations incident to ordinary high pressures used.

In the event the operator is desirous of supporting the nozzle upon a solid surface such as the ground, the handles 34 may be adjusted as shown in Figure 2, one of such handles cooperating with the hook 35 and the hose connection to form a support. As in the case where the nozzle is manually supported, minor directing adjustments may be effected through the rotation of the nozzle body 14 and sleeves 15 and 23 secured thereto to selectively place the hemi-spherical member 26 in the desired recess 22. The independent removability of members 38 and 12 renders it possible to produce by the nozzles formed in accordance with this invention a variety of types of streams with any one nozzle. When the spiral 38 and the small tip 12 are both in position the swirling broken stream after leaving the spiral 38 will be atomized as it is passed to and through tip 12 thereby producing a stream of widely separated fluid particles, the stream being characterized by a uniform cross section throughout its length, as distinguished from a 45° to 160° cone stream such as produced by conventional vaporizing nozzles.

The advantages of a stream of this type will be apparent when it is realized that it will carry forty or more feet during which time it will throughout its length present a substantially constant cross sectional diameter. This is advantageous in that the water may be more accurately directed to the conflagration and used thereon instead of being broadcast throughout a wide area with resultant waste of water and injury to property.

Because of the structure of the nozzle of the present invention, when members 12 and 38 are both in position a fog may be produced at ordinary hydrant pressures as well as at pumping pressures used, producible by ordinary fire extinguishing equipment. As the pressure is increased, the quality of the fog will remain relatively constant while the carrying quality of the stream will be increased. In the event a stream of the foregoing character is not desired, a dispersion in the form of drops having a fairly wide spread may be obtained. This is accomplished by removing the atomizing tip 12 from the conical portion 40 while making use of the spiral 38. The stream thus produced will have a greater spread and will be heavier. Such a stream is advantageous in cooling tanks and other surfaces where it is desired to cover a large surface with a fairly great amount of water.

A solid thin stream will be produced by the use of the tip 12 without the spiral 38. Such a stream has excellent carrying qualities and may be of advantage in extinguishing fires remote from the fire fighting equipment and of small size. A conventional type fire extinguishing stream may be had by removing spiral 38 and tip 12.

The four widely separate effects discussed above may all be produced with a single nozzle due to the provision for detaching member 12 from member 40, and member 40 from sleeve 39 for the removal of spiral 38 from baffle 37. It should be noted that even in the event a conventional fire stream is produced, undesirable swirling with incident air pockets will be substantially eliminated because of baffle 37 and the elimination of eddy-causing surfaces within the nozzle.

During operation, the curved reaction chamber indicated generally at 11 in Figure 1 is of considerable advantage since a nozzle formed as illustrated may be utilized even with high pressure operations and yet be held by one man without great exertion. It has been found that the pressure may be changed or the supply may be cut on or off entirely without material "kick-back" and in fact it has been found that the nozzle may be left unattended upon the ground without whipping or swerving. While the reasons for this remarkable and unexpected result are not entirely understood, it is believed that the normal back pressure is balanced by the forward pressure created by the fluid as it contacts the curved surface within the nozzle. It seems to be the result of the different pressures cancelling each other. Whatever may be the exact reason for this phenomenon, the fact is that the desired result is produced, thus obviating the necessity of securely fastening the nozzle to a support or manually maintaining the same by the employment of several attendants. This advantage of course will be obtainable irrespective of the type of stream produced.

Although the discussion of the various forms of structures made in accordance with this invention has been directed substantially to the extinguishing and localization of conflagrations, it is to be understood that this invention contemplates the use of the nozzles for a wide variety of purposes including hydraulic mining, phases of the chemical industries, and in the cleaning arts generally.

I claim:

1. In a fluid discharge nozzle having a bend therein intermediate portions defining its intake and discharge ends, a sleeve releasably keyed to the intake portion, said sleeve having axially extending lugs thereon to cooperate with slots in an annular rotatable member surrounding said portion and having handles and hook thereon, said rotatable member being subject to limited axial movement to disengage said lugs from said slots, said releasable key being operable independently of the lock effected by said lugs.

2. In a fluid discharge nozzle having a bend therein intermediate portions defining its intake and discharge ends, a sleeve keyed to the nozzle adjacent its intake end, said sleeve having axially extending lugs thereon cooperating with slots in an annular rotatable member, surrounding said intake portion and having handles and a hook thereon, said rotatable member being subject to limited axial movement to permit disengagement of said lugs from said slots, whereby handles and hook may be selectively secured in various radial positions with respect to the axis of the intake portion of the nozzle.

3. A spray nozzle comprising a substantially cylindrical chamber portion to which fluid is supplied, means defining a discharge orifice co-axial with and communicating with said chamber portion, and a dome shaped portion connecting said orifice with said chamber, said orifice having a a depth at least equal to its diameter.

4. A spray nozzle comprising in combination a substantially cylindrical chamber portion having a bend of from 25 to 35 degrees to which fluid is supplied, means defining a discharge orifice co-

axial with and communicating with said chamber portion, and a dome shaped portion connecting said orifice with said chamber, said orifice having a depth at least equal to its diameter.

5. A spray nozzle comprising in combination, a cylindrical chamber, means at one end of said chamber for connecting it to a single source of fluid, means at the other end of said chamber defining a fluid discharge orifice, means defining a base, said chamber being bent upwardly from said base at a point between the base and the means defining the discharge orifice, the bend in said chamber being of a magnitude within the range of 25 to 35 degrees and being such as to set up components acting toward the base when fluid under pressure is passed through the chamber.

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