Oct. 31, 1950 R. G. PULVER ET AL 2,527,891

VALVED NOZZLE FOR FIRE FIGHTING SPRAY GUNS

Filed Oct. 1, 1946 2 Sheets-Sheet 1

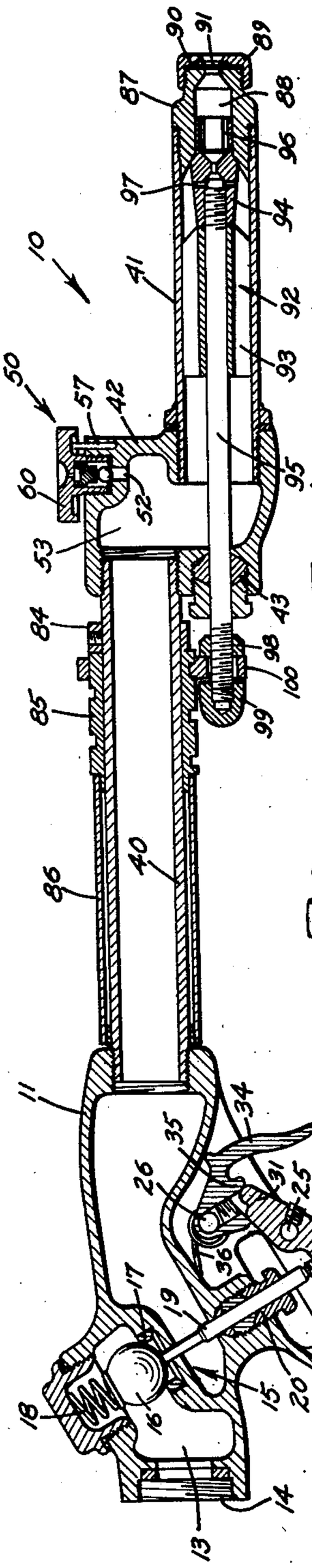

FIG. 1

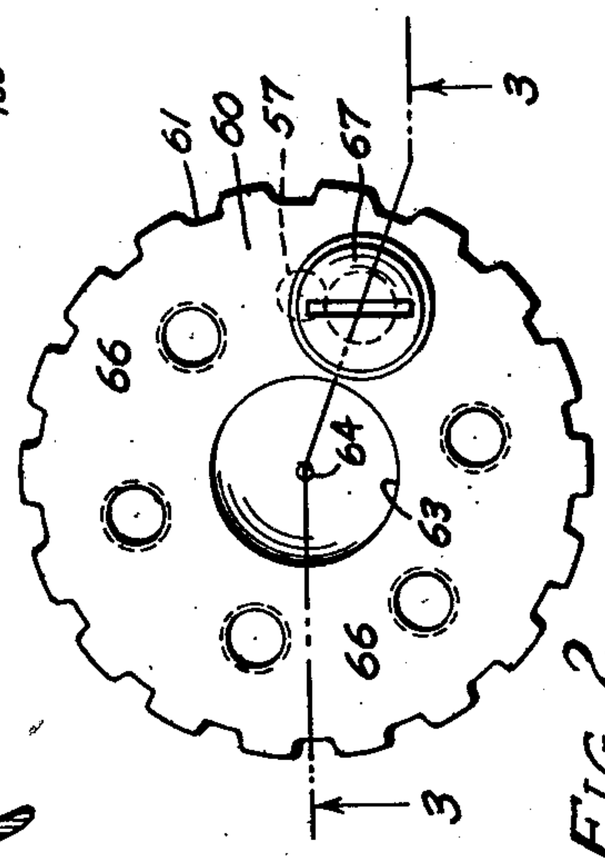

FIG. 2

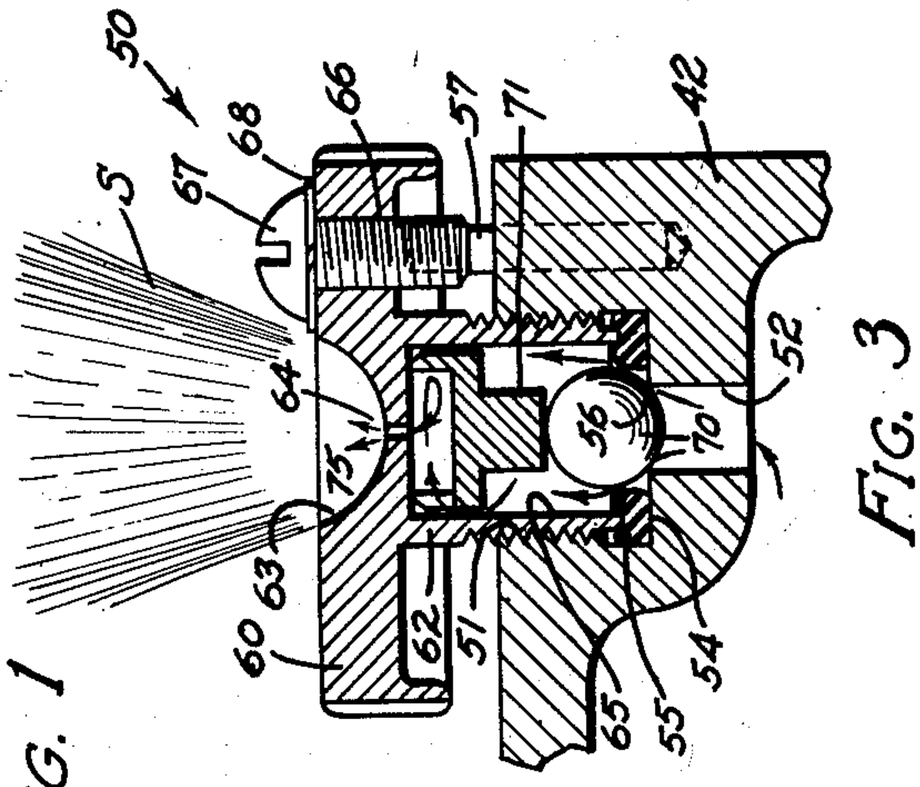

FIG. 3

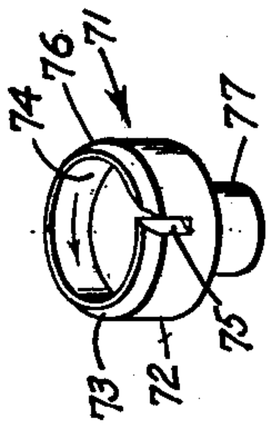

FIG. 4

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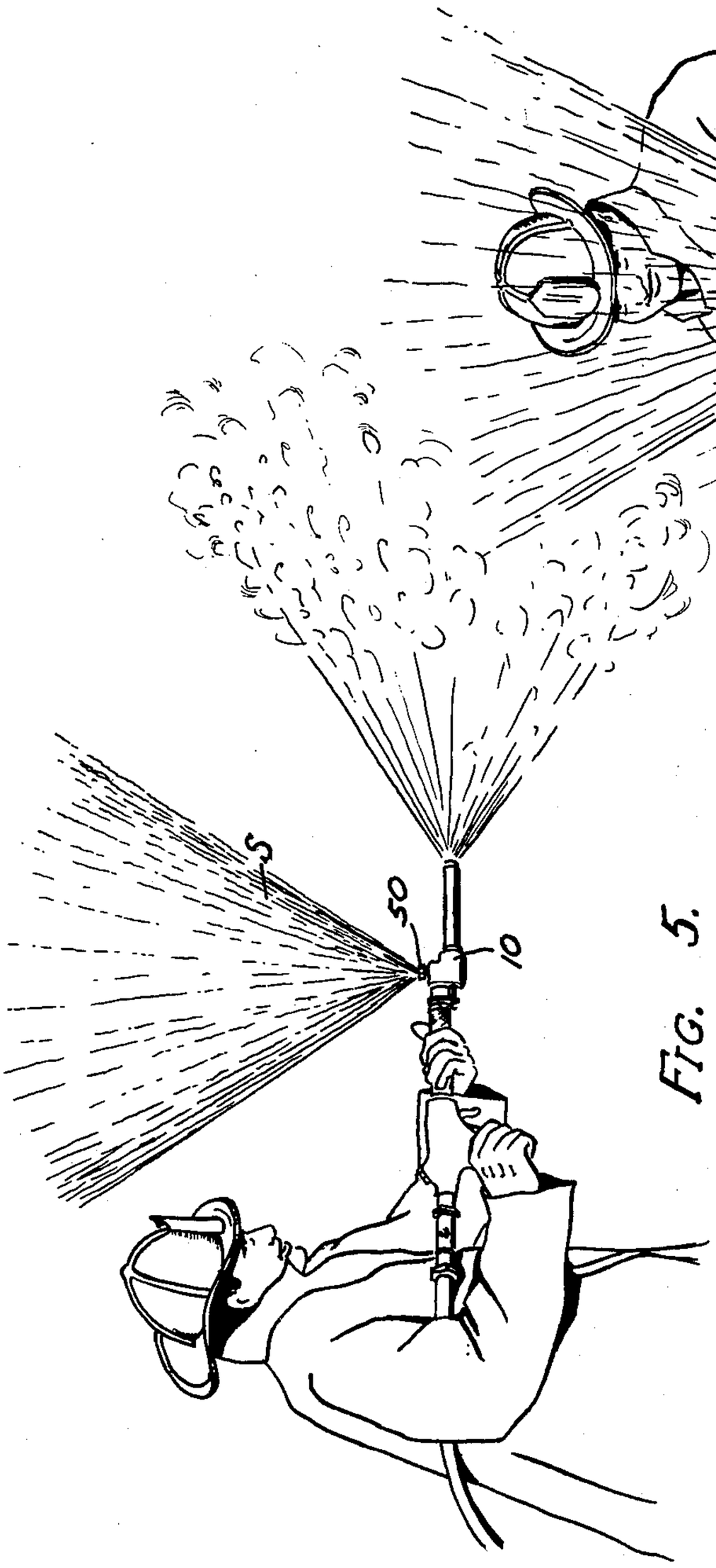

FIG. 5.

FIG. 6.

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Patented Oct. 31, 1950 2,527,891

UNITED STATES PATENT OFFICE

2,527,891

VALVED NOZZLE FOR FIRE FIGHTING SPRAY GUNS

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Application October 1, 1946, Serial No. 700,361

3 Claims. (Cl. 299—118)

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This invention relates to spray guns operating under relatively high pressures, which are employed in fighting fires by what is known as the "fog method." A spray gun found particularly useful for this purpose is disclosed in U. S. Letters Patent to H. C. Stockdale, Ser. No. 2,362,946 issued November 14, 1944.

The Stockdale gun handles water at pressures in excess of 600 pounds per square inch and is capable of projecting this water from 60 to 100 feet in the form of a fine fog. This fog is very effective in blanketing and putting out fires.

In the low pressure fire-fighting system in general use before the advent of the fog method for fighting fires, devices have been provided for diverting a portion of the water passing through the hose nozzle, which would produce a sheet of water interposed between the fire and the fireman handling the nozzle for protecting the fireman from the intense radiation of heat from the fire. This sheet of water also served, when a fireman walked through a burning room, to aid in putting out the fire.

Even though the supply of water in low pressure systems is obtained from water mains or from a nearby river and is relatively unlimited, such nozzles did not come into general use because the large amount of water which was required for producing the protective sheet of water absorbed too much of the pump capacity.

The fog method is so efficient in extinguishing fires that it is widely practiced with a light fire truck which carries a sufficient supply of water to put out an average size fire by the fog method without refilling its tanks. This permits a fire to be reached quickly by a fire-fighting crew and the fog method applied in putting out the fire, regardless of whether or not the fire is close to a supply of water.

To prevent these light fire trucks from being loaded down too heavily with water, and to give them a maximum effectiveness in fighting a fire remote from a supply of water, it would be out of the question to divert enough water from the spray gun used in this method to form a protective sheet as formerly proposed for the low pressure fire-fighting system.

It is an object of this invention to provide a fire-fighting spray gun which is suitable for use in performing the fog fire-fighting method, and which provides, by the use of a relatively insignificant amount of water and pump capacity a spray which adequately protects the face and shoulders of the fireman operating the gun.

It is another object of this invention to provide a high pressure sprinkler suitable for use on a spray gun of the Stockdale type and by which a relatively small amount of water may be diverted from the gun for the formation of a protective cone of spray and which may be quickly manipulated to turn said sprinkler on or to shut it off.

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It is still another object of the invention to provide such a sprinkler which is relatively simple in construction, made up of few parts, and which is readily adjustable to compensate for wear.

The manner of accomplishing the foregoing objects, as well as further objects and advantages, will be made manifest in the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a longitudinal sectional view of a preferred embodiment of the fire-fighting spray gun of the invention.

Fig. 2 is an enlarged plan view of the face protecting sprinkler of the spray gun of the invention.

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 2 and illustrating the sprinkler of the invention, as when open and operating to form a face protecting spray.

Fig. 4 is a perspective view of the valve tappet spray whirl member of the sprinkler of the invention.

Fig. 5 is a side elevational view of a fireman operating the fire-fighting spray gun of the invention to direct a stream of fog against the fire and illustrating the face protecting sprinkler of the invention producing a face protecting cone of spray.

Fig. 6 is a front view of a fireman operating the fire-fighting spray gun of the invention and illustrates how the face protecting cone of spray produced by the invention is positioned between the fire and the head and shoulders of the fireman manipulating the gun.

Referring specifically to the drawings, the invention is there shown as preferably embodied in a spray gun 10 which includes a butt member 11 having a pistol grip 12 to assist in supporting and controlling the gun. Formed in the butt member 11 is a liquid passage 13, there being a hose connection 14 at the outer end of this for connecting a hose to the gun. Also provided in the butt member 11 to control the passage 13 is a shut-off valve 15 including a ball 16 which is urged against a seat 17 by a pressure spring 18, and is adapted to be lifted from this seat by a valve stem 19 which enters the passage 13 through a stuffing box 20.

The pistol grip 12 is hollow and has pins 25 and 26. Mounted pivotally on the pin 25 within the grip 12 is a trigger 30, from which a latch arm 31 extends upward. The trigger 30 also has an adjustable screw tappet 32 for contacting the valve stem 19.

Pivotally mounted on the pin 26 is a latch 34 having a hook 35 which is adapted to be manually hooked over the arm 31 when the trigger 30 is compressed by the fingers of the hand holding the pistol grip 12, so as to hold the valve 15 open when the trigger is released.

The latch 34 is urged into the position in which it is shown in full lines in Fig. 1 by a coil spring 36. Thus after trigger 30 is compressed to open the valve 15, and while it is held in that position, if the latch 34 then be manually rocked to extend the hook 35 downwardly behind the arm 31, and the trigger 30 released, the latch 34 will hold the trigger in compressed position with the valve 15 open.

In order to release trigger 30 from the latch 34, it is only necessary to squeeze the trigger 30 slightly to release the hook 35 from the arm 31, whereupon the spring 36 returns the latch 34 to its full line position with respect to the trigger 30. When pressure of the fingers on the trigger 30 is now released, the spring 18 closes the valve 15 and returns the trigger 30 to its full line position.

The spray gun 10 also includes a primary barrel 40 and a secondary barrel 41, adjacent ends of which are connected in offset relation by an adapter 42.

The adapter 42 has a stuffing box 43 which is concentric with the barrel 41.

The adapter 42 also comprises a base for a face protecting sprinkler 50 this being mounted in a threaded bore 51 which is connected by a liquid supply hole 52 with the water passage 53 within the adapter 42, and through which water travels in passing from the barrel 40 to the barrel 41. The hole 52 is smaller than the bore 51 to provide an annular shoulder 54 which is extended outwardly by cutting away the threads of the bore 51 at the bottom of the latter, so as to receive a soft rubber washer 55. The shoulder 54 immediately adjacent the hole 52 also forms a valve seat 56. Pressed into a suitable hole provided in the adapter 42 is a stop pin 57, this preferably being located directly forward of the bore 51.

The sprinkler 50 also includes a sprinkler head 60 having a fluted periphery 61 for facilitating manual rotation thereof, and a threaded sleeve 62 which is screwed into the bore 51 until its lower end engages and compresses the rubber washer 55. The head 60 has a spray forming recess 63 which is connected by a spray orifice 64 with a cylindrical chamber 65 within the sleeve 62. The head 60 is also provided with a series of threaded holes 66 in one of which a screw 67 is screwed against a lock washer 68 so as to retain this screw in place for a purpose which will be made clear hereinafter.

Resting on the seat 56 within the washer 55 is a hard metal valve ball 70. Disposed in the chamber 65 above the ball 70 is a whirl member 71 which also serves the function of a valve controlling tappet. The member 71 comprises a cup 72, the side wall 73 of which encloses a cylindrical whirl chamber or pocket 74 and has provided therein a tangential slot 75 for the admission of water to said pocket. The upper edge of the wall 73 is beveled outwardly as shown at 76. Extending downwardly from the cup 72 is a ball contacting stem 77. The outside diameter of the cup 72 is such that this fits loosely in the chamber 65 with preferable clearance of approximately .025".

In assembling the sprinkler 50, the head 60 is screwed in place as shown in Fig. 3 so as to trap the ball 70 and member 71 in the chamber 65 and bring the lower end of the sleeve 62 into pressural engagement with the washer 55.

Screw 67 is then placed in that one of the holes 66 which will allow such an anti-clockwise rotation of the sprinkler head 60, when this is opened fully, as will give a desired amount of opening of the valve ball 70 to admit water through the hole 52.

The parts are so proportioned that the washer 55 is sufficiently compressed by the sleeve 62, when the upper end of the chamber 65 presses the member 71 against the ball 70 to hold the latter on its seat 56, that when the sprinkler 50 is fully open, the washer 55 is still compressed enough to make a liquid tight seal between the sleeve 62 and the bore shoulder 54.

The sprinkler head 60 is thus seen to have freedom of rotation, limited in a clockwise rotation by the seating of the ball 70 on the seat 66, and in a counter-clockwise direction by contact with the screw 67 with the pin 57.

The primary barrel 40 is screwed into the butt member 11 so as to communicate with the fluid passage 13. Provided on the barrel 40 is a stop ring 84, there being a threaded cam 85 and a knurled manual control sleeve 86 which are united together and are rotatably mounted on the barrel 40 between the butt member 11 and the ring 84.

The secondary barrel 41 has a nozzle 87 screwed into its front end, a whirl chamber 88 being formed in this nozzle. A cap 89 screws onto this nozzle to confine a disc against the front end of the nozzle, this disc having an orifice 91 through which liquid is discharged to form a fog for use in fire fighting.

Slideably mounted within the barrel 41 is a control device 92, including a stream straightener spider 93, a whirl plunger 94, and a rod 95 on which the stream straightener and whirl plunger are mounted. The whirl plunger 94 has a sleeve 96 which is tangentially slotted thereby admitting liquid tangentially into the chamber 88 when this sleeve is partly withdrawn therefrom.

The whirl plunger 94 also is provided with holes 97 which permit liquid to bypass the whirl plunger 94 and enter the chamber 88 when the whirl plunger is in plugging relation with said chamber, as shown in Fig. 1. A detailed description of the whirl plunger 94 and the beneficial functions of the holes 97, permitting the liquid to bypass in this manner, may be found in the copending application of Roy G. Pulver, filed September 5, 1946, Ser. No. 694,846, and now Patent No. 2,519,283.

The rod 95 extends rearwardly through the stuffing box 43 and has fixed thereon by nuts 98 and 99, a yoke 100 which surrounds the cam 85 and makes threaded connection with the threads of said cam so that rotation of the cam, by applying a hand to the sleeve 86, translates the rod 95 axially so as to control the character of the spray discharged through the nozzle 87.

Operation

To prepare the gun 10 for operating the same, a hose leading from a high pressure liquid pump is first attached to the hose connection 14. Sup-

posing the operator is right-handed, he carries the gun in his two hands by holding the pistol grip 12 in his right hand and the manual control sleeve 86 in his left hand. For a left-handed operator the positions of the hands would just be reversed.

Without removing either of his hands from the gun, the right-handed operator is able to open or shut the shut-off valve 15 by clenching or relaxing the fingers of his right hand on the trigger 30, or he is able, by rotation of the sleeve 86 with his left hand, to shift the whirl plunger 94 so as to withdraw this entirely from the whirl chamber 88, or to extend it varying distances into said whirl chamber. When the whirl plunger 94 is withdrawn entirely from the whirl chamber 88, a rod-like stream of highly condensed fog-spray is discharged through the spray orifice 91 which travels a relatively long distance from the gun before it breaks up and scatters in the air. With the sleeve 96 extended partially into the whirl chamber 88, a much more diffused stream of fog particles is produced.

These various types of spray are useful in different circumstances in the use of the gun 10 in fighting fires. For this gun to function properly the water spray thereto must be at a high pressure and this is customarily over 600 pounds to the square inch.

As above pointed out, the sprinkler 50, is provided to give protection to the fireman handling the gun 10 by interposing a conical spray of water between the face and shoulders of the fireman and the fire he is fighting. Such a spray is provided at any time when the shut-off valve 15 of the gun is open so that water under high pressure fills the adapter chamber 53 and when the sprinkler head 60 is rotated in an anti-clockwise direction from closed position. This releases the pressure of the sprinkler head against the ball 70, thereby allowing the liquid to lift this ball and to flow upwardly into the chamber 65, bypassing the member 71 by flowing upwardly through the annular free space between this member and the wall of the chamber 65, entering the whirl chamber pocket 74 through the tangential slot 75, and passing upwardly through the orifice 64 to form a whirling hollow cone of spray S.

With the proper location of the screw 67 and with the head 60 rotated to press this screw against the stop pin 57, the spray S rises about 30 inches in height and is of just sufficient size to provide an adequate barrier between the face and shoulders of the fireman and the fire being attacked. Being hollow, the cone of spray S gives the fireman a double wall of protection from the heat of the fire. It has been found that a high degree of protection of the fireman's face and shoulders from burning is thus afforded by the diversion of a relatively small portion of the water used to operate the gun 10. This makes it practical to provide this protection for the fireman using the spray gun 10 when the latter is served by a fire truck depending entirely for the water used in fighting fires, on water carried on the truck itself.

Whenever there is no necessity for the fireman to be protected from the heat of the fire by the spray S, the sprinkler 50 is kept shut off, this being accomplished by rotating the sprinkler head 60 until the ball 70 is firmly seated on the seat 56.

With use, involving repeatedly opening and shutting the sprinkler 50, the seat 56 becomes worn so as to require an increased clockwise rotation of the sprinkler head 60 between its open position and its closed position in order to shut off the sprinkler. This means that when the sprinkler is open, more water than is desirable is diverted through the sprinkler in the formation of the spray S. The plurality of holes 66 provided in the sprinkler head 60 are for the purpose of permitting the screw 67 to be moved from one hole to the other when it becomes expedient to decrease the amount of counter-clockwise rotation of the sprinkler head 60 which takes place when this head is turned from fully closed to fully open position, as shown in Fig. 3.

The claims are:

1. A high pressure sprinkler comprising: a base having a threaded bore therein, and a liquid supply hole connecting axially with said bore, a valve seat being formed where said hole connects with said bore; a rubber washer in said bore surrounding said seat; a threaded sprinkler head screwed into said bore against said washer, there being a cylindrical chamber in said head and a spray orifice opening from the upper end of said chamber; a valve ball in said bore and resting on said seat to form a valve; a member in said chamber for transmitting axial movement of said head to said ball to press the latter against said seat, said rubber washer having a resiliency causing it to maintain a seal between the bottom of said bore and said head at all operative positions of said head; and means limiting the rotation of said head to the range between a closed position in which said ball is held against said seat and an open position in which said ball is free to leave said seat and in which said seal is still effective.

2. A combination as in claim 1 in which said member is loosely received in said chamber between the upper end wall thereof and said ball and in which helical surfaces are formed in said member to impart a swirling movement to liquid entering said chamber when said ball is removed from said seat.

3. A combination as in claim 2 in which said member has a cup with an annular wall formed in the upper portion thereof, said wall cooperating with the upper end of said chamber to form a swirl pocket, there being at least one helical slot in said wall for the admission of liquid from said chamber into said pocket, liquid thus entering said pocket being caused to swirl therein, said swirling liquid being discharged through said spray orifice in the form of a conical spray.

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