

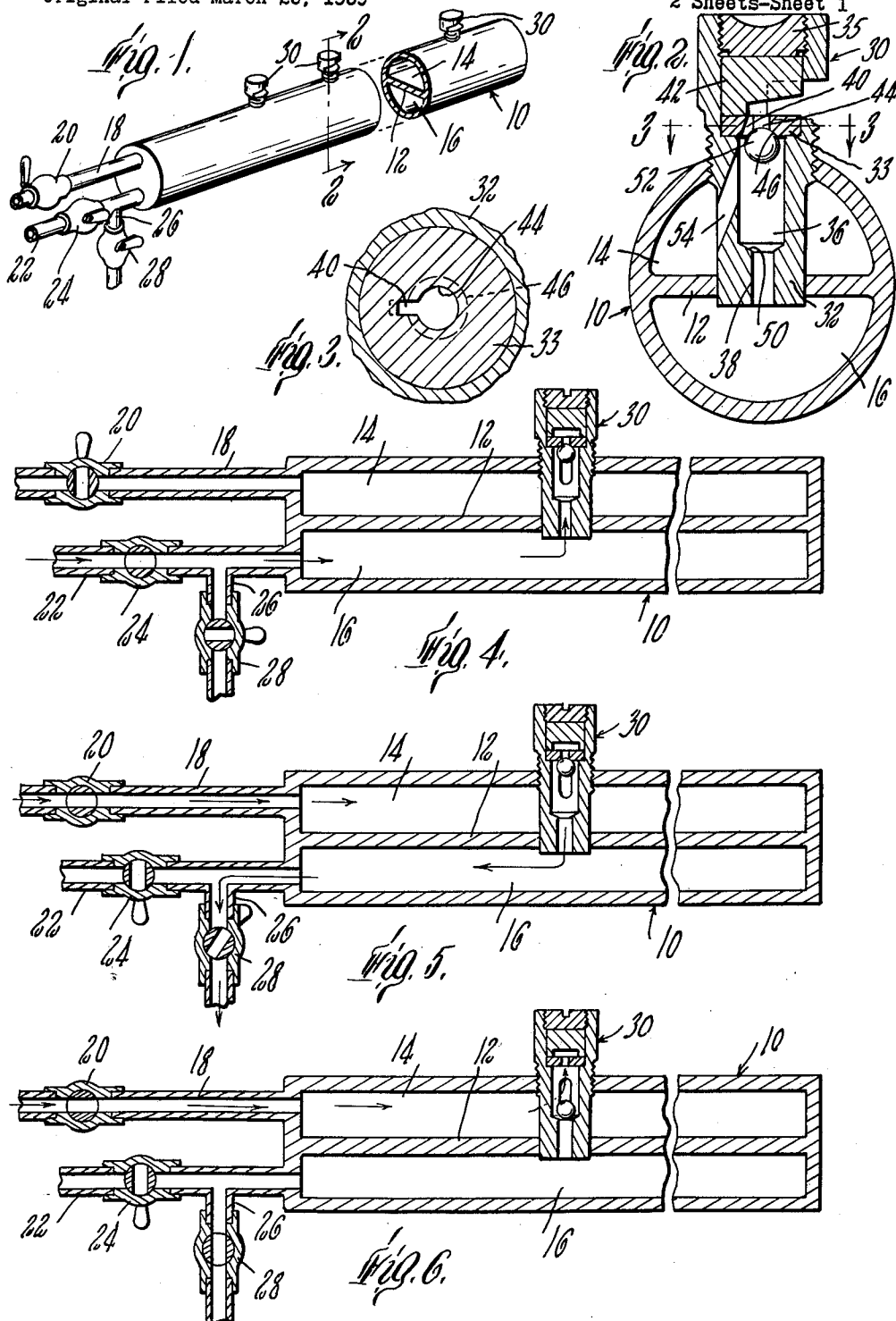
Jan. 15, 1963

D. B. BAKER

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SPRAY NOZZLE

Original Filed March 25, 1959



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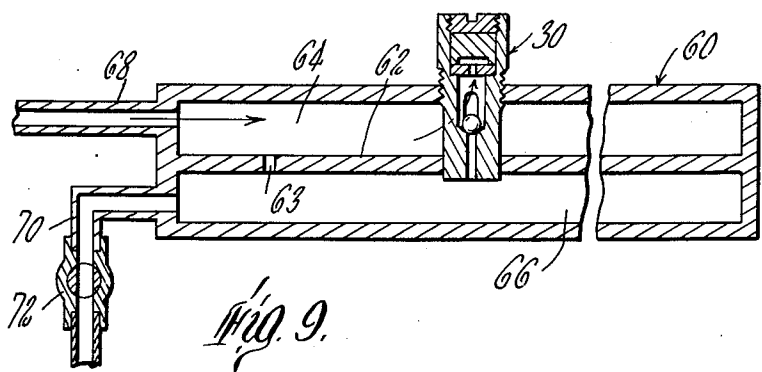
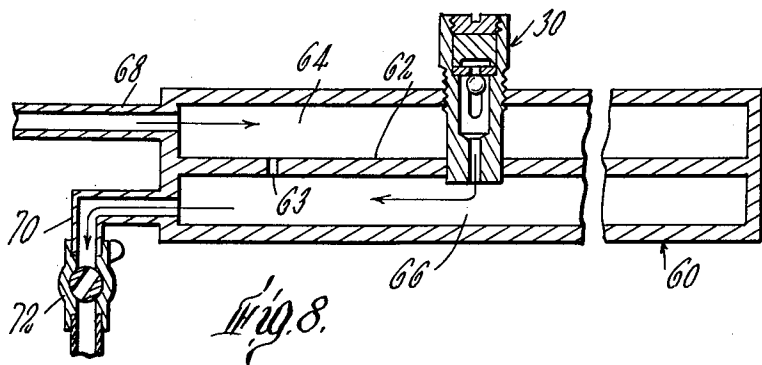
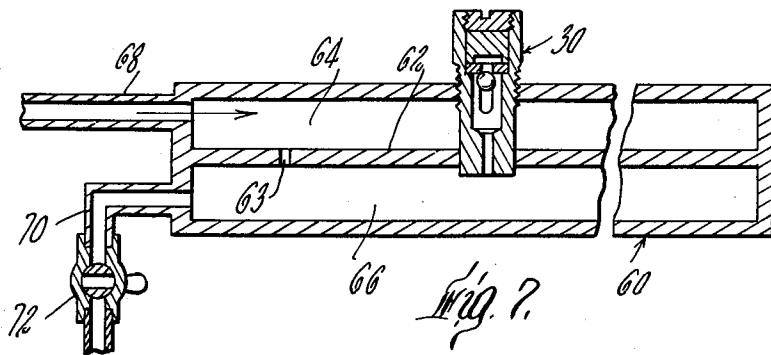
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SPRAY NOZZLE

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Continuation of application Ser. No. 801,829, Mar. 25, 1959. This application Apr. 2, 1962, Ser. No. 183,496
10 Claims. (Cl. 239—113)

This invention relates to a spray nozzle and pertains more specifically to a shower pipe having a plurality of spray nozzles furnishing a shower of water or other liquid and designed so that the nozzles and pipe can readily be cleaned. Such a shower pipe and spray nozzles are useful in a variety of industrial processes, particularly in washing filter cakes, paper pulp, and the like.

The water or other liquid employed in such spray nozzles and shower pipes frequently contains appreciable quantities of solid particles which tend to plug up or obstruct the nozzle outlets during the course of use over an extended period of time. For example, in the paper industry the washing liquid employed in such nozzles and pipes is usually white water containing residual very small paper fibers. These paper fibers and other solid materials tend to accumulate on the surfaces of the nozzles and shower pipes with which the water comes in contact, particularly the outlet apertures of the nozzles. Accordingly, it is necessary to design such equipment so that it can readily be cleaned when necessary.

One object of the present invention is to provide a spray nozzle and shower pipe in which the direction of flow of liquid through at least the principal part of the device can be temporarily reversed to dislodge accumulated solids and to flush or purge both the nozzle and the pipe.

Another object is to provide spray nozzles having internal valves actuated by a reverse flow of liquid there-through to open an auxiliary outlet passage so as to provide an enlarged aperture for the purging of accumulated solid material through the spray nozzle outlet.

Another object is to provide a spray nozzle and shower pipe which can readily be cleaned without disassembly of the parts and which is of simple and inexpensive construction.

Other and further objects will be apparent from the drawing and from the description which follows.

In the drawings:

FIG. 1 is an isometric view of one embodiment of this invention showing a shower pipe having a plurality of spray nozzles mounted on it;

FIG. 2 is a view in cross section on an enlarged scale taken along line 2—2 of FIG. 1;

FIG. 3 is a view taken along line 3—3 of FIG. 2;

FIG. 4 is a view in longitudinal section showing the parts of the device as they appear during normal operation of the shower pipe;

FIG. 5 is a view corresponding to FIG. 4 showing the device arranged for reverse flow of liquid through the spray nozzles and shower pipe;

FIG. 6 is a view corresponding to FIG. 4 showing the device with the auxiliary spray nozzle outlet open to permit flushing or purging of the nozzle through the outlet;

FIG. 7 is a view similar to FIG. 4 showing another embodiment of the invention as it appears during normal operation of the device;

FIG. 8 is a view corresponding to FIG. 7 showing the device arranged for reverse flow of liquid through the spray nozzle chamber; and

FIG. 9 is a view corresponding to FIG. 7 showing the device with the auxiliary spray nozzle outlet open.

As shown in FIGS. 1 to 6 of the drawings, one embodiment of the present invention comprises an elongated, generally cylindrical pipe member 10 divided by means

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of a longitudinally extending web 12 into a pair of manifolds 14, 15. An inlet pipe 18 together with a shut-off valve 20 provide means for introducing a supply of liquid into manifold 14 while pipe 22 and shut-off valve 24 provide means for introducing a supply of liquid into manifold 16. Immediately adjacent pipe 22 and valve 24 is an outlet or exhaust pipe 26 which together with shut-off valve 28 provide a means for withdrawing liquid from manifold 16 to waste.

Mounted along the length of pipe 10 are a plurality of spray nozzles 30, 30, the number of nozzles depending upon the length of pipe 10, the nature of the spraying liquid, and the pressure at which it is supplied, as well as the total volume output of spraying liquid desired. A typical shower pipe for use on a Fourdrinier wire might have, for example, thirty-two spray nozzles spaced at 3 inches center to center.

Each spray nozzle comprises a body member 32 along with removable outlet plate 33 and spray deflector 42, both of which latter members are held in place by screw plug 35. This assembly provides an elongated, generally cylindrical valve chamber 36 which has a port 38 at one end, communicating with manifold 16, serving inlet and a main outlet 40 in outlet plate 33 at the other end which permits a jet of liquid to pass through it and impinge against the inclined face of a spray deflector 42. An auxiliary outlet 44 is provided adjacent main outlet 40, outlet 44 preferably being of considerably greater capacity than main outlet 40, as shown in FIG. 3. In the preferred embodiment, auxiliary outlet 44 is cylindrical in shape and is provided with an annular valve seat 46 at its inner end while main outlet 40 is in the form of a slot extending radially outwardly from auxiliary outlet 44 and communicating therewith along its extent. An annular valve seat 50 is also provided at the inner end of main inlet 38. Confined within valve chamber 36 and free to move from one end to the other is a spherical valve member 52 which is arranged to seat against either valve seat 46 or 50, as the case may be, in order to close either the auxiliary outlet or the main inlet.

There is also provided a port 54, in the wall of valve chamber 36, which communicates with manifold 14 and which serves as an auxiliary inlet in this embodiment of the invention. The auxiliary inlet is preferably in the form of an aperture which angles through the wall of valve chamber 36 to direct a stream of liquid toward main outlet 40 at one side of valve member 52 when the latter is seated on valve seat 46 to close the auxiliary outlet 44.

In normal operation of the shower pipe as shown in FIG. 4, valve 20 is kept closed so that no liquid flows through manifold 14, while valve 24 is kept open and withdrawal valve 28 is kept closed to provide a flow of spraying liquid such as white water into manifold 16, whence it passes through main inlet 38 of each spray nozzle and out through main outlet 40, the rate of flow of liquid being sufficiently great to maintain valve member 52 seated on valve seat 46 to close auxiliary outlet 44. During operation in this manner, any solid particles in the white water supply may impinge against any of the surfaces with which the white water comes into contact and adhere there to build up a deposit. This deposit is particularly apt to occur on the walls of main outlet 40 and affects the rate of flow of white water which can issue through the individual spray nozzles. In addition, some particles may be present in the feed water which are too large to pass through main outlet 40.

Whenever it is desired to purge or flush the nozzles and shower pipe in order to remove any accumulated deposit or large particles, valve 20 is opened and valve 24 is then closed to provide a supply of liquid to manifold 14 while temporarily interrupting the supply to manifold

16. Closing valve 24 effectively closes inlet port 38. At the same time or subsequently thereto, withdrawal valve 28 is partly opened, as shown in FIG. 5, to permit limited flow of the liquid from manifold 14 through auxiliary inlet 54 and through main inlet 38 of each spray nozzle, whence the liquid flows through manifold 16 toward withdrawal valve 28. Opening valve 28 effectively opens port 38 to waste. At the same time a portion of the liquid continues to emerge through main outlet 40, the flow through main inlet 38 into manifold 16 being restricted by limiting the extent of opening of valve 28. This continued flow through main outlet 40 serves to maintain valve member 52 seated against auxiliary outlet 44. At the same time the reverse flow of a portion of the liquid through the valve chamber of each nozzle and through manifold 16 serves to dislodge accumulated solid particles from these portions of the device and sweep them out through the withdrawal valve 28 along with loose large particles present.

When the purging operation described above has been completed, withdrawal valve 28 is opened full, as shown in FIG. 6, thus decreasing the back pressure in manifold 16 and valve chamber 36 and permitting valve member 52 to move from the position where it closes auxiliary outlet 44 and permitting it to seat upon valve seat 50 to close the main inlet 38. This forces all of the liquid entering through manifold 14 to pass through both main outlet 40 and auxiliary outlet 44 simultaneously. The greatly enlarged capacity of the two outlets combined permits any solid particles lodged within the main outlet to be readily swept out of the nozzle. As soon as the nozzle has been purged, the several valves 20, 24, 28 are returned to the position shown in FIG. 4 which automatically returns valve member 52 to its original position, closing auxiliary outlet 44, and normal operation of the device is continued until further purging is required.

As shown in FIGS. 7 to 9 inclusive, in another embodiment of the invention an elongated, generally cylindrical pipe member 60 is divided by means of web 62 into a pair of manifolds 64, 66. An inlet pipe 68 is provided for introducing a supply of liquid into manifold 64 while outlet pipe 70 and shut-off valve 72 provide means for withdrawing liquid from manifold 66 to waste. A plurality of spray nozzles 30 are mounted along the length of the pipe 60, the nozzles 30 being identical in construction with the nozzle shown in FIGS. 3 and 4. In this embodiment port 54 serves as the main inlet to the spray nozzle, while port 38 serves as a temporary or intermittent outlet to waste.

A small port 63 in web 62 provides a leakage path between manifold 64 and manifold 66 which serves to equalize the pressures in the two manifolds when valve 72 is closed, the reason for which will be explained below.

In operation of the device shown in FIG. 7 to 9 inclusive, valve 72 is kept closed during normal operation, effectively closing ports 38 so that there is no flow through them, the spray water entering manifold 64 through inlet pipe 68 and passing thence through port 54 into chamber 36 from which it proceeds through main outlet 40.

When it is desired to clean or flush the spray nozzles 30, valve 72 is partly opened, as shown in FIG. 8, permitting limited flow of liquid through port 38 and scouring the interior of chamber 36 with a flow in a direction the reverse of normal flow, while permitting continued flow at reduced volume through main outlet 40. When valve 72 is opened full, as shown in FIG. 9, valve member 52 is moved from its position closing auxiliary outlet 44 and seats upon valve seat 50 to close port 38. All of the liquid entering through port 54 is now forced to pass simultaneously through both main outlet 40 and auxiliary outlet 44, just as in the case of the embodiment of FIGS. 1 to 6.

In order to return the device to normal operation, it is simply necessary to close valve 72, whereupon manifold 66 soon fills with liquid leaking through port 63, the

pressures in the two manifolds thus being equalized. Because of continued flow of liquid through port 54 and thence through the outlets 40, 44, the pressure in chamber 36 is less than that in manifold 64, port 54 acting as an orifice. Consequently valve member 52 is forced away from its seat 50 by the pressure differential across aperture 38 and is drawn against seat 46 by the liquid flow, closing auxiliary outlet 44 and placing the device in condition for normal operation again.

This application is a continuation of applicant's co-pending application Serial No. 801,829 filed March 25, 1959 and now abandoned.

Although specific embodiments of the invention have been described herein, it is not intended to limit the invention solely thereto, but to include all of the obvious variations and modifications within the spirit and scope of the appended claims.

What is claimed is:

1. A spray nozzle having a valve chamber provided with a main outlet and an auxiliary outlet adjacent said main outlet, a pair of ports in said chamber, a valve member movable to and from open and closed positions at said auxiliary outlet and one of said ports, said valve member being closed on said auxiliary outlet during normal operation of the nozzle and said main outlet remaining open in all positions of said valve member, means for introducing liquid into said nozzle through the second of said ports to discharge a spray stream through said main outlet, and means for closing the first said port independently of said valve member and for temporarily opening it to waste whereby when it is temporarily opened the outward flow through it scours said valve chamber and moves said valve member to open said auxiliary outlet and to close said first port to flush both said main outlet and said auxiliary outlet.

2. A spray nozzle having a main inlet port and main outlet, an auxiliary outlet adjacent said main outlet, a valve member movable to and from open and closed positions at said main inlet port and auxiliary outlet, said main outlet remaining open in all positions of said valve member, an auxiliary inlet, means for introducing a flow of liquid into said main inlet port to urge said valve member to a position closing said auxiliary outlet while discharging a spray stream through said main outlet, and means for interrupting the flow of liquid into said main inlet port, and means for temporarily opening said main inlet port to waste and for temporarily introducing a flow of liquid into said auxiliary inlet to move said valve member to open said auxiliary outlet and to close said main inlet port whereby both said auxiliary outlet and said main outlet are flushed.

3. A spray nozzle comprising a body member including a valve chamber having a main inlet at one end and a main outlet at the other end, an auxiliary outlet of larger capacity than said main outlet disposed immediately adjacent said main outlet, a valve member within said chamber movable to and from open and closed positions at said main inlet and said auxiliary outlet, said main outlet remaining open in all positions of said valve member, an auxiliary inlet in the wall of said chamber between said main inlet and main outlet arranged to direct a stream of liquid toward said outlets, means for introducing a flow of liquid into said main inlet to urge said valve member to a position closing said auxiliary outlet while discharging a spray stream through said main outlet, and means for interrupting the flow of liquid into said main inlet and for opening said main inlet to waste and for temporarily introducing a flow of liquid into said auxiliary inlet alone to move said valve member to open said auxiliary outlet and to close said main inlet whereby both said auxiliary outlet and said main outlet are flushed.

4. A shower pipe comprising a plurality of spray nozzles, each said nozzle having a main inlet and a main outlet, an auxiliary outlet adjacent said main outlet, a

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valve member movable to and from open and closed positions at said main inlet and said auxiliary outlet, said main outlet remaining open in all positions of said valve member, and an auxiliary inlet between said main inlet and said main outlet directed toward said outlets, a first manifold communicating with each said nozzle through its main inlet with a second manifold communicating with each said nozzle through its auxiliary inlet, means for introducing a supply of spraying liquid into said first manifold and means for withdrawing liquid from said first manifold closely adjacent thereto, means for shutting off said withdrawal means, means for introducing a supply of liquid into said second manifold, the supply of liquid to said second manifold and the withdrawal means normally being shut off to provide a normal flow of liquid from the supply through said first manifold and spray nozzles, and means for temporarily interrupting the supply of liquid to said first manifold while opening the supply to the second manifold and for opening the withdrawal means to provide a flow of liquid through the auxiliary inlet of the spray nozzles which temporarily passes through said first manifold in a direction the reverse of normal flow and which subsequently moves said valve member to open said auxiliary outlet and to close said main inlet whereby both the auxiliary outlet and the main outlet are purged.

5. A spray nozzle comprising a body member including a valve chamber having a main outlet, an auxiliary outlet of larger capacity than said main outlet disposed immediately adjacent said main outlet, and first and second ports, a valve member within said chamber movable to and from open and closed positions at said auxiliary outlet and said first port, means for closing said first port independently of said valve member during normal operation of the device and for temporarily opening said first port to waste, and means for introducing liquid through said second port whereby said valve member is maintained in closed position on said auxiliary outlet during normal operation of the device and a spray stream is discharged through said main outlet, and whereby said valve member is moved to open said auxiliary outlet and close said first port when said first port is opened to waste.

6. A shower pipe comprising a plurality of spray nozzles, each said nozzle having a valve chamber provided with a main outlet, an auxiliary outlet adjacent said main outlet, and first and second ports, a valve member disposed within said chamber movable to and from open and closed positions at said auxiliary outlet and said first port, a first manifold communicating with each said nozzle through said first port, a second manifold communicating with each nozzle through said second port, means for withdrawing liquid from said first manifold to waste and means for shutting off said withdrawal means, a leakage passage between said first and second manifolds to equalize pressures therein when said withdrawal means is shut off, means for supplying liquid to said second manifold, said withdrawal means nor-

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mally being shut off to provide a normal flow of liquid through said second manifold and spray nozzles and being adapted to be opened temporarily to provide a flow of liquid through said first port and first manifold to waste which flow subsequently moves said valve member to open said auxiliary outlet and to close said first port whereby both the auxiliary outlet and the main outlet are purged.

7. A spray nozzle comprising a casing having a valve chamber provided with a main outlet, an auxiliary outlet adjacent said main outlet, and a pair of ports, and disposed within said chamber a valve member movable to and from alternative closed positions at said auxiliary outlet and one of said ports in accordance with the rate and direction of flow through said ports and outlets, said main outlet remaining open in all positions of said valve member.

8. A spray nozzle comprising a casing having a valve chamber provided with a main outlet, an auxiliary outlet of larger capacity than said main outlet disposed immediately adjacent thereto, and a pair of ports, and disposed within said chamber a valve member movable to and from alternative closed positions at said auxiliary outlet and one of said ports in accordance with the rate and direction of flow through said ports and outlets, said main outlet remaining open in all positions of said valve member.

9. A spray nozzle comprising a casing having a valve chamber provided with a main inlet at one end and a main outlet at the other end, an auxiliary outlet of larger capacity than said main outlet disposed immediately adjacent said main outlet, an auxiliary inlet in the wall of said chamber between said main inlet and main outlet arranged to direct a stream of liquid toward said outlets, and a valve member disposed within said chamber freely movable to and from alternative closed positions at said auxiliary outlet and said main inlet in accordance with changes in rate and direction of flow through said inlets and outlets, said main outlet remaining open in all positions of said valve member.

10. A spray nozzle comprising a casing having a valve chamber provided with a main outlet, an auxiliary outlet adjacent said main outlet, and a pair of ports, and disposed within said chamber a valve member movable to closed position at said auxiliary outlet and also movable away from said auxiliary outlet toward one of said ports in accordance with the rate and direction of flow through said ports and outlets, said main outlet remaining open in all positions of said valve member.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,073,529

January 15, 1963

Donald B. Baker

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 30, for "On" read -- One --; column 2, line 23, after "serving" insert -- as a main --; column 5, line 15, for "sut" read -- shut --.

Signed and sealed this 1st day of October 1963.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents

