MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A
Convention Application for a Patent

We, STANADYNE, INC. of 92 Deerfield Road, Windsor, Connecticut 06095, United States of America

hereby apply for the grant of a Patent for an invention entitled

"COLLAPSIBLE SLEEVE MIXING VALVE"

which is described in the accompanying complete specification. This application is a Convention Application and is based on the application numbered 677,323 for a patent or similar protection made in

United States of America

on 15th April, 1976.

Our address for service is:

Care: SPRUSON & FERGUSON
PATENT ATTORNEYS
ESSO HOUSE, 127 KENT STREET
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AUSTRALIA.

Dated this TWELFTH day of APRIL 1977

STANADYNE, INC.

By: ____________________________
Signature of Applicant -
Registered Patent Attorney

To: The Commissioner of Patents
DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the Convention Application made for a patent for an invention entitled "Collapsible Sleeve Mixing Valve"

Full name and address of Declarant.

I, Harold G. Johnson
92 Deerfield Road, Windsor, Connecticut, United States of America
do solemnly and sincerely declare as follows:

1. I am authorised by STANADYNE, INC. to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was made in the United States of America on the 15th day of April 1976 by Alfred M. Moen.

3. I am the actual inventor of the invention referred to in the basic application.

Full name and address of Inventor(s)

Alfred M. Moen
25 Lakeview Drive, Grafton, Ohio, United States of America

is the actual inventor of the invention and the facts upon which the applicant is entitled to make the application are as follows:

Assignment dated March 29, 1976 from the actual inventor to the said applicant.

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

Declared at Windsor/Connecticut the 15th day of April 1977

Signature of Declarant

Harold G. Johnson

To:
CLAIM 1. A mixing valve comprising a valve sleeve having hot and cold water inlets and an outlet, a valve member mounted for reciprocation and rotation within said valve sleeve to control the volume and temperature of water flowing from the inlets to the outlet, a flexible sleeve positioned within said valve sleeve and masking the inside of said hot and cold water inlets, said outlet being axially beyond said flexible sleeve, means on said valve member selectively movable into register with portions of said flexible sleeve for controlling the passage of water from said inlets to the outlet; and co-operating means on said valve member and flexible sleeve for forming a closure between said inlets and outlet, including means on said valve member in contact with an end portion of said flexible sleeve when said valve member is in the closed position.
The following statement is a full description of this invention, including the best method of performing it known to me:

"COLLAPSIBLE SLEEVE MIXING VALVE"
ABSTRACT OF THE DISCLOSURE

A valve includes a generally cylindrical member and a valve member reciprocally mounted within it. There is an inlet and an outlet in the cylindrical member with movement of the valve member controlling the flow of water between said inlet and outlet. Positioned within the cylindrical member and masking its inlet is a flexible sleeve. The valve member carries a cam section selectively movable into register with portions of the flexible sleeve to control the flow of water from the inlet to the outlet. The flexible sleeve and valve member further have cooperating surfaces forming a closure between said inlet and outlet.

SUMMARY OF THE INVENTION

The present invention relates to valves of the type generally shown in prior Patents 3,103,231 and 3,204,656. The present invention particularly relates to a mixing valve of this type using a flexible sleeve to control the volume and temperature of water passing through the valve.

One purpose of the invention is a mixing valve, insertable as a cartridge within a valve housing, and including a flexible sleeve positioned between a movable valve member and a stationary sleeve.

Another purpose is a valve member of the type described in which the flexible sleeve controlling passage of water from the valve inlets when the valve is in the open position, also provides a seal when the valve is in the closed position.

Another purpose is a valve member of the type described in which the flexible sleeve can be reversed when one end of the sleeve, normally used in forming a valve
shutoff, becomes worn.

Another purpose is a valve utilizing a rubber sleeve of the type described which can be used to simply and efficiently control the passage of water from an inlet to an outlet.

Another purpose is a valve structure of the type described, functioning as a shutoff, to reliably control the passage of fluid therethrough.

Another purpose is a valve of the type described functioning as a check valve preventing back flow.

Another purpose is a valve having a pressure-assisted closing.

Other purposes will appear in the ensuing specification, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated diagrammatically in the following drawings wherein:

Figure 1 is a partial axial section through a valve of the type described;

Figure 2 is a section along plane 2-2 of Figure 1;

Figure 3 is a vertical section, similar to Figure 2, but showing the valve in an open position;

Figure 4 is a section through the valve member;

Figure 5 is a partial exploded side view of the valve sleeve;

Figure 6 is a further partial exploded side view of the valve sleeve, taken at 90 degrees to Figure 5;

Figure 7 is an exploded top sectional view of the valve sleeve bearing, taken along plane 7-7 of Figure 5;

Figure 8 is an axial section through a modified form
of valve; and

Figure 9 is an axial section through a further modified valve member.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As is described in the above-mentioned patents, the mixing valve of the present invention will customarily be positioned within a housing which is a permanent part of a plumbing installation. The movable valve member, or stem, will conventionally have a suitable operating member, either a lever or handle, for use in reciprocating and rotating the valve member to control the volume and temperature of water flowing through the valve. The valve finds application in kitchen faucets, lavatory faucets, shower installations and the like. The valve cartridge is a replaceable unit, thus permitting a faucet or shower installation to be quickly repaired by removing the faulty cartridge and replacing it with a new one.

A valve housing is indicated at 10 and is shown to be generally cylindrical in form with a closed bottom 12. The housing will have a pair of inlet ports, indicated at 14 and 16, and an outlet port 18. The outlet may go to an attached spout or to a remote discharge, such as a spray or shower head.

Positioned within the housing 10 is the valve cartridge including a valve sleeve 20 and a valve member or stem 22, which is reciprocally and rotatably mounted within sleeve 20. The valve assembly made up of the sleeve and valve member is conventionally mounted within the housing 10 by means of a spring clip 24, the legs of which are positioned in slots 26 in the sleeve and pass through openings 28 in housing 10.
The sleeve 20 is open at the bottom or inner end, as indicated at 30, and mounts a sleeve tube 32 having a flange 34. The sleeve tube 32 extends within sleeve 20, as indicated at 36, and may preferably be formed of a plastic material providing relatively low friction to permit easy movement of stem 22 relative to the sleeve. The inner end of sleeve 20 has spaced axial notches 31 which receive projections 33 on sleeve tube 32. A snap ring 35 fits within a groove 37 on the exterior of sleeve 20, passing through grooves 39 on projections 33 to thereby lock the sleeve tube to the sleeve.

Spaced outwardly from the inner end of the sleeve are inlet groups 38 and 40 which are in register with housing inlets 14 and 16. The inner end of the sleeve may be sealed by an O-ring 42 positioned within a groove 44. A diagonal O-ring 46, positioned within a diagonal groove on the exterior of the sleeve is effective to prevent crossflow between hot and cold water ports 14 and 16. Such a diagonal O-ring is shown in the above-mentioned U.S. patents. An intermediate O-ring 48 forms a seal between the exterior of the sleeve and the interior of housing 10 outwardly of inlets 14 and 16. In like manner, the outer end of sleeve 22 carries an O-ring seal 50. The sleeve may preferably be formed of a suitable plastic material, although in some applications it may also be metallic.

Positioned within valve sleeve 20 is a flexible sleeve, for example a rubber sleeve, indicated at 52. A shoulder 54 formed on the interior of valve sleeve 20 positions one end of flexible sleeve 52 while the other end is contained or positioned by end 56 of sleeve tube 32. Thus,
flexible sleeve 52 is positioned within valve sleeve 20 and at a location to mask sleeve inlet ports 38 and 40.

The sleeve inlets are associated with sleeve exterior recesses 38a and 40a, directly in communication with housing ports 14 and 16. Water moving into sleeve inlet ports 38 and 40 will be directed toward the flexible sleeve and will effect its partial collapse, which will permit the water to flow toward sleeve outlets 58. There may be two, three, four or more such outlets and they may be of varying size. The outlets open into an exterior chamber 62 formed between the interior of housing 10 and the exterior of sleeve 22, this chamber being in communication with the housing outlet port 18.

The stem or valve member 22 has an exterior portion 64 which will accommodate either a lever or handle. The far interior portion of stem 22 mounts an O-ring 66 within a groove 68 to seal the inner end of the stem to sleeve tube 32. An axially-extending passage 70 connects the inner end of the stem with atmosphere through a side passage 72 so that the stem is pressure-balanced, by atmospheric pressure, in both its open and closed positions.

Directly above that portion of the stem carrying O-ring 66 is a cam member 76, shown particularly in Figure 4. Cam member 76 has an exterior somewhat cylindrical surface 78, whose outer diameter is generally the same as the inner diameter of flexible sleeve 52. Cam member 76 extends an axial distance greater than that of flexible sleeve 52 so that it can be in contact with the interior surface of the flexible sleeve in all positions of the stem.

Cam section 76 defines an open area or recess 80
which will permit the inward flexing or collapsing of sleeve 52, as shown particularly in Figure 3, so that water from the inlet can be passed between the inner surface of valve sleeve 20 and flexible sleeve 52 to sleeve outlets 58. Thus, the position of cam 76 relative to the inlet ports determines the volume and degree of mixing of water flowing from the inlet ports to the outlets.

Positioned outwardly of cam section 76 on stem 22 is a cylindrical portion 82 having generally the same outer diameter as the inner diameter of the valve sleeve and positioned to mask the valve sleeve outlets when in the closed position of Figure 2. Note that in this position the lower edge 84 of cylindrical portion 82 is in sealing relation with the edge of flexible sleeve 52. Thus, sleeve 52 not only permits water to pass from the inlets, but forms a seal and closure with cylindrical stem portion 82 when the valve is in the closed position.

An O-ring 86 is positioned outwardly of cylindrical portion 82 and forms a seal with the interior surface of sleeve 20.

In operation, rotation of the valve member or stem will determine the degree of mixing of water from the hot and cold water ports and reciprocation will determine the volume of water passing to outlets 58. The position of cam section 76 relative to the two inlet ports determines the degree to which water is permitted to flow, by collapsing flexible sleeve 52, as particularly indicated in Figure 3. When the valve is in the full closed position of Figure 2, the inner surface 84 of cylindrical portion 82 of the stem is in sealing relation with the edge of flexible sleeve 52. When
the valve is in the full open position, a shoulder 88 formed on the interior surface of valve sleeve 20 provides a stop for the valve member or stem.

Of particular advantage is the fact that the flexible sleeve 52 not only functions to control the passage of water through the valve when it is open, but also provides a seal with the stem when the valve member is in the closed position. The tube sleeve 32, preferably formed of plastic of a type having very low frictional resistance, insures that the stem will be easily rotated and reciprocated relative to the sleeve. Both the stem and the sleeve may be formed of plastic or they may be formed of metal.

An important aspect of the invention is the fact that the flexible sleeve is water pressure equalized in both the open and closed positions of the valve. In the open position, when the flexible sleeve collapses so that water may pass to the sleeve outlets, water is present both outside of the flexible sleeve and within it. In like manner, when the valve is closed, water flows within the flexible sleeve, due to the pressure upon the sleeve, from the sleeve inlets. However, there is no possibility of leakage, as the actual closure seal for the valve is formed by the cooperating surfaces on cylindrical portion 82 and the flexible sleeve.

An additional advantage for the particular construction of flexible sleeve shown and described is that since it is cylindrical and therefore has identical ends, the sleeve may be reversed in the event that one end becomes worn due to closure of the valve stem upon it. A reversal of the sleeve effectively renews the entire valve structure.

Although the utility of the valve structure has
heretofore been described in connection with a mixing valve, it should be clear that the principles disclosed are equally applicable to both a non-mixing type faucet and to a faucet structure which does not utilize the "cartridge" principle.

Looking particularly at Figure 8, a faucet of the kitchen type includes hot and cold water conduits 90 and 92 passing within an escutcheon plate 94. Conduits 90 and 92 are connected to a housing structure 96 having a cavity 98. Mounted upon the outer portion of housing structure 96 is a spout construction consisting of a cylinder 100 and an integral spout 102. A port 104 in cylinder 100 connects spout 102 with aligned ports 106 in the upper end of housing 96 through a circumferential passage 109.

Positioned within the top of housing 96 is a sleeve member 110 having an outwardly-extending flange 112 which overlies the upper end of housing 96. Sleeve 110 has a central bore 114 which is in alignment with cavity 98 and cooperates with the cavity to mount a reciprocal and rotatable valve stem 116. Sleeve 110 has ports 108 in alignment with passage 106. Valve stem 116 may be substantially the same as valve stem 22 described in connection with the valve of Figures 1-7 and mounts a cap 113 and a lever 115.

A flexible sleeve 118 is seated upon an annular shoulder 120 formed in housing 96, with the upper end of sleeve 118 cooperating with the valve stem in the manner heretofore described to provide a closure seal and shutoff for the faucet.

The operation of the structure of Figure 8 is the same as that described in connection with the valve of Figures 1-7. The principal difference is that there is no
insertable valve cartridge of the type heretofore described. The flexible sleeve is directly positioned within the housing of the faucet.

Figure 9 shows the same principle applied to a lavatory faucet. In this case a housing body 122 mounts a cylindrical member 124, similar in interior configuration to housing 96 of Figure 8. Housing 122 includes an integral spout 126 connected by a conduit 128 to a port 130 which opens into the cavity defined by member 124. Valve stem 132, which is the same as valve stem 116 in Figure 8, is attached by means of a screw or the like 134 to a typical handle 136 which may be used to manipulate the stem so as to control the volume and temperature of water discharge through spout 126.

A flexible sleeve 138 is mounted within member 124 and seated upon a shoulder 140. A sleeve member 135, similar to member 110, is inserted within member 124. Again, the upper end of flexible sleeve 138 will cooperate with the cylindrical portion of the valve stem to form the appropriate seal and closure for the faucet. The operation of the structure of Figure 9 is the same as that of Figure 8 and of the valve disclosed in detail in Figures 1-7.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there may be many modifications, substitutions and alterations thereto.
The claims defining the invention are as follows:

1. A mixing valve comprising a valve sleeve having hot and cold water inlets and an outlet, a valve member mounted for reciprocation and rotation within said valve sleeve to control the volume and temperature of water flowing from the inlets to the outlet, a flexible sleeve positioned within said valve sleeve and masking the inside of said hot and cold water inlets, said outlet being axially beyond said flexible sleeve, means on said valve member selectively movable into register with portions of said flexible sleeve for controlling the passage of water from said inlets to the outlet, and co-operating means on said valve member and flexible sleeve for forming a closure between said inlets and outlet, including means on said valve member in contact with an end portion of said flexible sleeve when said valve member is in the closed position.

2. The structure of Claim 1 further characterized by and including seal rings mounted on said valve member and in sealing contact with the interior surface of said valve sleeve, said seal rings being positioned on opposite sides of said valve sleeve inlets and outlet.

3. The structure of Claim 1 further characterized in that the means on said valve member selectively movable into register with portions of said flexible sleeve includes an axially-extending cam member, the outer surface of which is, at least in part, generally cylindrical and of generally the same diameter as the interior of said flexible sleeve.

4. The structure of Claim 3 further characterized in that said axially-extending cam member has a greater axial length than that of said flexible sleeve.
5. The structure of Claim 1 further characterized by and including a shoulder on the inside surface of said valve sleeve for positioning said flexible sleeve therewithin.

6. The structure of Claim 1 further characterized in that said valve sleeve includes a sleeve and a sleeve tube positioned at one end thereof, cooperating projections and grooves on said sleeve and sleeve tube for forming an interlock therebetween, and a lock ring positioned upon said sleeve and extending into said projections and grooves.

7. A fluid valve, a generally cylindrical member having an inlet and an outlet, a valve control member mounted for reciprocal movement within said cylindrical member to control the flow of fluid from the inlet to the outlet, a flexible sleeve positioned within said cylindrical member and masking the inside of said inlet, said outlet being axially beyond said flexible sleeve, means on said valve member within said flexible sleeve and selectively movable into register with portions of said flexible sleeve for controlling the passage of water from said inlet to the outlet, and cooperating means between said valve member and flexible sleeve for forming a closure between said inlet and outlet, including a generally cylindrical shoulder on said valve member terminating at one end thereof in a circumferential shoulder, said shoulder being in contact with an annular end portion of said flexible sleeve when said valve is in the closed position.

8. The structure of Claim 7 further characterized by and including an inwardly-directed annular shoulder formed
on the interior surface of said generally cylindrical member, one end of said flexible sleeve being seated against said shoulder.

DATED this FIFTH day of APRIL, 1977

STANADYNE, INC.

Patent Attorneys for the Applicant
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