Dec. 23, 1969 B. M. WALKER 3,485,454

MIXING VALVE

Filed Nov. 20, 1967

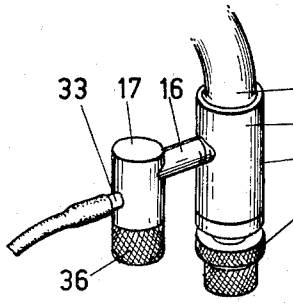


FIG. 1

FIG. 2

FIG. 3

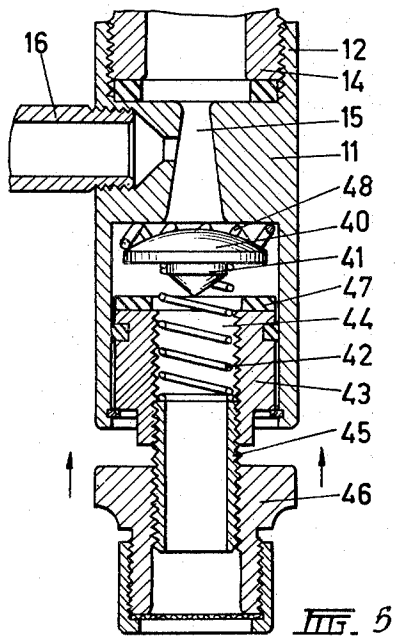


FIG. 5

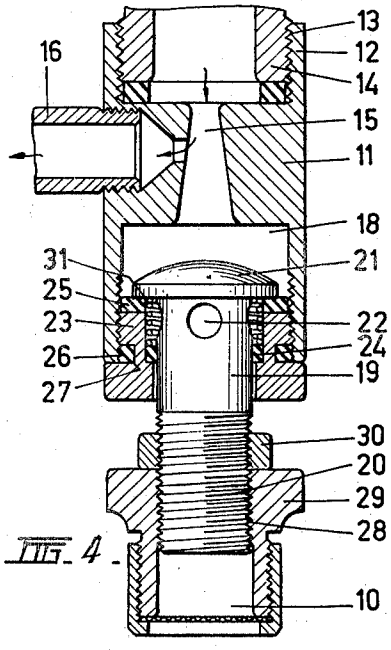


FIG. 4

Inventor
Bryon Montague Walker
By Cushman, Darby & Cushman
Attorneys

United States Patent Office

3,485,454

Patented Dec. 23, 1969

3,485,454

MIXING VALVE

Byron M. Walker, 53 Wexmar St., Cheltenham, Victoria, Australia

Filed Nov. 20, 1967, Ser. No. 684,221
Claims priority, application Australia, Nov. 23, 1966, 14,314/66
Int. Cl. B05b 7/04, 7/26
U.S. Cl. 239—434 9 Claims

ABSTRACT OF THE DISCLOSURE

A mixing valve for attachment to a water tap comprises a main outlet passage for water and a secondary outlet passage for a mixture of water and a second material or liquid. The main outlet passage has a valve therein that is normally held open to permit the flow of water through the main passage. When the valve is closed, water is diverted from the tap through the secondary outlet passage with the liquid or material being added to the water in the secondary passage from a reservoir by venturi action.

This invention relates to mixing valves and refers more particularly to mixing valves of the type wherein a venturi causes the liquid to be mixed to be drawn into the water stream for dispensing therewith.

Various types of mixing valves of the aforesaid kind have been devised for attachment to water taps whereby detergent or other liquid has been automatically mixed with the discharging water. However, these have been found unsuitable for several reasons amongst which is the risk of entry of the detergent or liquid to the water service pipes, especially in the case of multistorey buildings. Also, it has been found that the water drawn from the tap immediately after using a mixing valve contained traces of the detergent or other liquid. Further, unless the dispenser unit is rendered completely inoperative after use, there is the danger of the detergent or other liquid being drawn off accidentally with the water for domestic purposes.

It is an object of the present invention to provide a mixing valve for attachment to water taps, which is simple and economical and which overcomes the aforementioned problems. Thus, in accordance with the present invention, a mixing valve for attachment to a water tap comprises a main outlet passage having provision for attachment to a water tap, a secondary outlet passage operatively connected to said main passage through a by-pass and means for supplying a material or liquid to said secondary outlet passage to be mixed with the water, said material or liquid being drawn off by venturi action and said main outlet having valve means which in one position permits the free flow of water from the tap through said main outlet passage and which in another position prevents the flow of water through the main outlet passage and causes the water from the tap to flow through said by-pass and secondary outlet passage.

The invention will be better understood from the following description of particular embodiments which may be preferred, wherein reference is made to the accompanying drawings in which:

FIGURE 1 is a perspective view of a mixing valve according to the invention attached to a water outlet;

FIGURE 2 is a sectional elevational view of the mixing valve of FIGURE 1;

FIGURE 3 is a sectional plan view taken along line 3—3 of FIGURE 2, showing the valve in position for delivering water only through a main outlet;

FIGURE 4 is a sectional elevational view similar to FIGURE 2 but showing the valve in position for delivering water and detergent through a secondary outlet; and

FIGURE 5 is a sectional elevational view of a mixing valve in accordance with a modification of the invention.

A mixing valve in accordance with FIGURES 1 to 4 comprises a main outlet **10** in a hollow pipe-like member **11** having a top portion **12** threaded internally at **13** for attachment to the threaded bib **14** of a water tap. Immediately beneath the female threaded portion **13** of the pipe, the internal diameter is reduced to provide a venturi **15**. A by-pass tube or venturi connector **16** is screwed into the side wall of the pipe member **11** for communication with the throat of the venturi **15** and the other end of said venturi connector **16** is screwed or otherwise suitably attached to the top portion of a secondary outlet member **17**, the purpose and operation of which will be hereinafter described.

The portion **18** of the main outlet pipe beneath the venturi is of a diameter substantially equal to that of top or female threaded portion and is provided with a valve **19** and valve control means for determining whether the flow of water is to be through said main outlet pipe or said secondary outlet.

The valve **19** comprises a hollow stem **20** and a convex domed top **21** of a diameter less than the internal diameter of the portion **18** to permit water to flow over and past the top **21** and enter the hollow stem **20** through a plurality of radial holes **22** in the top of the stem **20** immediately beneath the top **21**.

A threaded plug member **23** having a central opening to permit the valve stem **20** to pass therethrough is screwed into the lower end of the pipe member **11**, thereby substantially sealing it off. The seal is completed by a ring washer **24** engaging the stem **20**. At the inner end of the plug **23** there is provided a further ring washer **25** forming a seating for the undersurface of the domed top **21** when in its lowermost or detergent dispensing position. When in this lowermost position, water is prevented from entering the holes **22** in the stem **20**. An O-ring seal **26** is retained in a circumferential groove **27** to prevent leakage of water between the plug **23** and pipe member **11**.

The lower end of the valve stem **20** is threaded externally at **28** and is adapted to receive an anti-splash nozzle **29** of conventional type. A spacer member **30** is threaded onto the stem **20** and may be adjusted to vary the uppermost position of the valve.

A helical compression spring **31** surrounds the stem **20** and is seated on the washer **24** and engages the undersurface of the domed top **21**.

The whole valve assembly is capable of limited axial movement in the main outlet bore, such movement being limited at one position by the domed valve top **21** abutting against the washer **25** on the top end of the plug member **23** and at the other position by the spacer member **30** abutting against the outer end of the plug **23**. However, the movement is sufficient to permit relatively free flow of water through the main outlet bore and delivery nozzle when the assembly is in its upper or innermost position and to divert the flow of water through the venturi connector **16** when the assembly is in its lower or outermost position.

This is achieved as follows: The helical compression spring **31** normally holds the domed valve top **21** spaced from the rubber sealing washer **25** and top of the plug member **23**, thereby permitting water to flow through the radial holes **22** in the valve stem and through the centre of the stem **20** and delivery nozzle. When it is desired to divert the flow through the venturi connector **16**, the valve assembly is pulled outwardly, thereby pulling the valve top against the action of the compression spring **31** to seal against the rubber sealing washer **25**.

The pressure of water issuing from the tap is sufficient to hold the valve in sealing engagement and thus water is discharged through the only free outlet, viz., the venturi connector. As soon as the tap is turned off, the release of water pressure on the top valve allows the compression spring to break the seal and thus, when the tap is next turned on, the water flows directly through the main outlet.

As hereinbefore mentioned, a venturi connector **16** is screwed into the main outlet pipe **11** in communication with the throat of the venturi **15**, the other end of said venturi connector **16** being screwed into the upper end of the secondary outlet **17**. The secondary outlet **17** is a pipe of diameter slightly less than that of the main outlet and as in the case of the main outlet, the secondary outlet pipe has a venturi **32** immediately beneath the water inlet. A tube **33** for connecting said secondary venturi **32** with a supply of detergent is screwed or otherwise affixed to the secondary pipe for communication with the throat of said secondary venturi **32**. Thus, when the flow of water is diverted through said secondary pipe, detergent is drawn from supply through the detergent tube **33** into the venturi throat for admixture with the water being discharged through said secondary outlet.

The lower or discharge end **34** of the secondary pipe is preferably provided with a threaded portion **35** onto which a knurled gauze retainer cap **36** is screwed. The gauze **37**, which may be of any desired material or gauge, is retained against the end of the secondary outlet by means of said retainer cap **36**.

The detergent or other liquid may be supplied through a tube having a non-return valve therein. The tube **33** has an adjustable valve **38** for controlling the amount of detergent admitted. The valve **38** is adjusted by screwing it towards or away from the secondary venturi, thereby decreasing or increasing the amount of detergent admitted.

In accordance with the embodiment of FIGURE 5, the operation of the valve assembly is similar to that as hereinbefore described in that in one position water flows through the main outlet and in another position the flow is diverted through the venturi connector. In this embodiment the valve assembly comprises a domed valve **40** having a short stem **41**. The stem **41** is carried at the top of a helical compression spring **42** mounted in a central bore of a slidable plug member **43**. The central bore **44** is threaded and receives a threaded stem **45** onto which is screwed an anti-splash nozzle **46** of conventional type. The stem **45** may be axially adjustable in the bore **44** for varying the compression of the spring **42**.

At the inner or upper end of the plug member **43** there is provided a ring washer **47** to provide a seal for the undersurface of the domed valve **40**.

On the top of the domed valve **40** there is a worm-like spring **48** which prevents the valve **40** from sealing the venturi outlet. When the valve is in the position illustrated, water flows around the domed valve and out through the central bore **44** and nozzle **46**.

In order to divert the flow through the venturi connector **16**, the valve assembly including the slidable plug member **43** is pushed inwardly against the action of the compression spring **42** (in the direction of the arrows) until the valve **40** forms a fluid seal with the washer **47**. This is preferably performed whilst the water is flowing so that when the valve **40** seals off the flow through the main outlet, the pressure of water on the top of the valve **40** pushes the whole assembly outwardly but, whilst the water continues to exert pressure on the top of the valve **40**, the compression spring **42** is unable to lift the valve to break the fluid seal. However, as soon as the water supply is cut off, the compression spring lifts the valve **40** from its seating. Thus, when the supply is turned on again, the flow of water is through the main outlet.

The construction of the mixing valve in accordance with this invention is such that the liquid mixed with water is always discharged through the secondary outlet and since the water inlet to said secondary pipe is above the venturi connection to the detergent or other liquid supply, it is impossible for the detergent or other liquid to be admitted to the main discharge pipe. Thus only clear unpolluted water is discharged through the main outlet at all times.

Further, in view of the automatic opening of the valve in the main outlet bore as soon as the water supply is shut off, it is not possible to discharge polluted water for domestic purposes by accident. The provision of a main outlet and a secondary outlet further ensures that only plain water is used for domestic purposes since plain water only is discharged through the main outlet. Should the spring fail to open the valve, the water would flow through the secondary outlet when the tap was next turned on and the user would know immediately that the water was not necessarily unpolluted and would take appropriate steps to correct the fault.

I claim:

1. A mixing valve for attachment to a water tap comprising a main outlet passage having provision for attachment to a water tap, a secondary outlet passage operatively connected to said main passage through a by-pass and means for supplying a material or liquid to said secondary outlet passage to be mixed with the water, said material or liquid being drawn off by venturi action and said main outlet having valve means which in one position permits the free flow of water from the tap through said main outlet passage, a compression spring means being provided to normally hold the valve means open for discharge of water through said main outlet, and which in another poistion prevents the flow of water through the main outlet passage and causes the water from the tap to flow through said by-pass and secondary outlet passage, the pressure of water on said valve means causing said valve means to remain in this position until the pressure of water reaches a predetermined minimum whereupon said compression spring means return said valve means to its normal open position for discharge through said main outlet.

2. A mixing valve for attachment to a water tap, comprising a main outlet passage having a threaded portion for attachment to a threaded bib of a water tap, a venturi passage immediately downstream of said threaded portion, a secondary outlet passage operatively connected to said main passage by means of a by-pass tube connected to the throat of the venturi, the other end of said by-pass tube being attached to a top portion of said secondary outlet passage, said secondary passage having a venturi and means connecting the throat of said second venturi with a supply of material or liquid to be mixed with the water, said main outlet having spring-loaded valve means slidable in said main outlet, said valve means being so constructed and arranged that in one position free flow of water from the tap is permitted through said main outlet passage, and in another position prevents the flow of water through the main outlet passage and causes the water from the tap to flow through said by-pass and secondary outlet passage.

3. A mixing valve for attachment to a water tap, comprising a main outlet passage having a threaded portion for attachment to a threaded bib of a water tap, a venturi passage immediately downstream of said threaded portion, a secondary outlet passage operatively connected to said main passage by means of a by-pass tube connecting the throat of the venturi, the other end of said by-pass tube being attached to a top portion of said secondary outlet passage, said secondary passage having a venturi and means connecting the throat of said second venturi with a supply of material or liquid to be mixed with the water, said main outlet having spring-loaded valve means slidable in said main outlet, said valve means comprising a hollow valve stem slidable axially in said main outlet passage, a domed valve member on the top of said stem

and a radical hole or plurality of radial holes in said valve stem immediately beneath said domed valve member and a helical compression spring normally holding said valve open to permit water to flow through said main outlet passage.

4. A mixing valve as claimed in claim 3 wherein an adjustable spacer is attached to said valve stem, said spacer being adjustable to limit the opening movement of said valve stem.

5. A mixing valve as claimed in claim 3 wherein said valve means are slidable axially in said main outlet passage on an axial force being applied to said valve stem.

6. A mixing valve as claimed in claim 3 wherein said main outlet passage and said secondary outlet passage are parallel and are in closely spaced relationship being spaced apart by said by-pass tube.

7. A mixing valve for attachment to a water tap, comprising a main outlet passage having a threaded portion for attachment to a threaded bib of a water tap, a venturi passage immediately downstream of said threaded portion, a secondary outlet passage operatively connected to said main passage by means of a by-pass tube connecting the throat of the venturi, the other end of said by-pass tube being attached to a top portion of said secondary outlet passage, said secondary passage having a venturi and means connecting the throat of said second venturi with a supply of material or liquid to be mixed with the water, said main outlet having spring-loaded valve means slidable in said main outlet, said valve means comprising a hollow valve stem slidable axially in said main outlet passage, a convex top closing the upper end of said valve stem, the diameter of said top being less than the bore of said main outlet passage to permit water to flow past said top when the valve is open, a radial hole or holes in said valve stem immediately beneath said convex top to permit water to enter said valve stem for discharge through said main outlet passage, a helical spring normally urging said valve means to the open position, a plug member inserted in the lower end of said main outlet passage, said plug having a passage therein to permit said valve stem to slide axially therein and sealing washers forming fluid-tight seals between said valve stem and plug member and between said plug member and bore of said main outlet passage.

8. A mixing valve for attachment to a water tap, comprising a main outlet passage having a threaded portion for attachment to a threaded bib of a water tap, a venturi passage immediately downstream of said threaded portion, a secondary outlet passage operatively connected to said main passage by means of a by-pass tube connecting the throat of the venturi, the other end of said by-pass tube being attached to a top portion of said secondary outlet passage, said secondary passage having a venturi and means connecting the throat of said second venturi with a supply of material or liquid to be mixed with the water, said main outlet having spring-loaded valve means slidable in said main outlet, said valve means comprising a slidable plug member having a central axial bore communicating with said outlet passage and a discharge nozzle, helical spring means mounted in said bore, a domed valve member located on the upper end of said spring, said valve member being of a diameter less than that of said outlet passage to permit water to flow past said valve member, a sealing washer on said slidable plug providing a seating for said valve member when said valve member is closed, preventing flow of water through said main outlet passage.

9. A mixing valve as claimed in claim 8 comprising a worm-spring interposed between said domed valve member and said venturi outlet preventing said domed valve member from closing said venturi outlet.

References Cited

UNITED STATES PATENTS

2,302,097	11/1942	Beckman	239—312
2,462,752	2/1949	Kocher et al.	239—312
3,049,303	8/1962	Kocher	239—312
3,134,545	5/1964	Armand	239—312
3,207,443	9/1965	Gilmour	239—312
3,265,082	8/1966	Perlman	239—428.5

EVERETT W. KIRBY, Primary Examiner

U.S. Cl. X.R.

239—312, 318, 428.5