

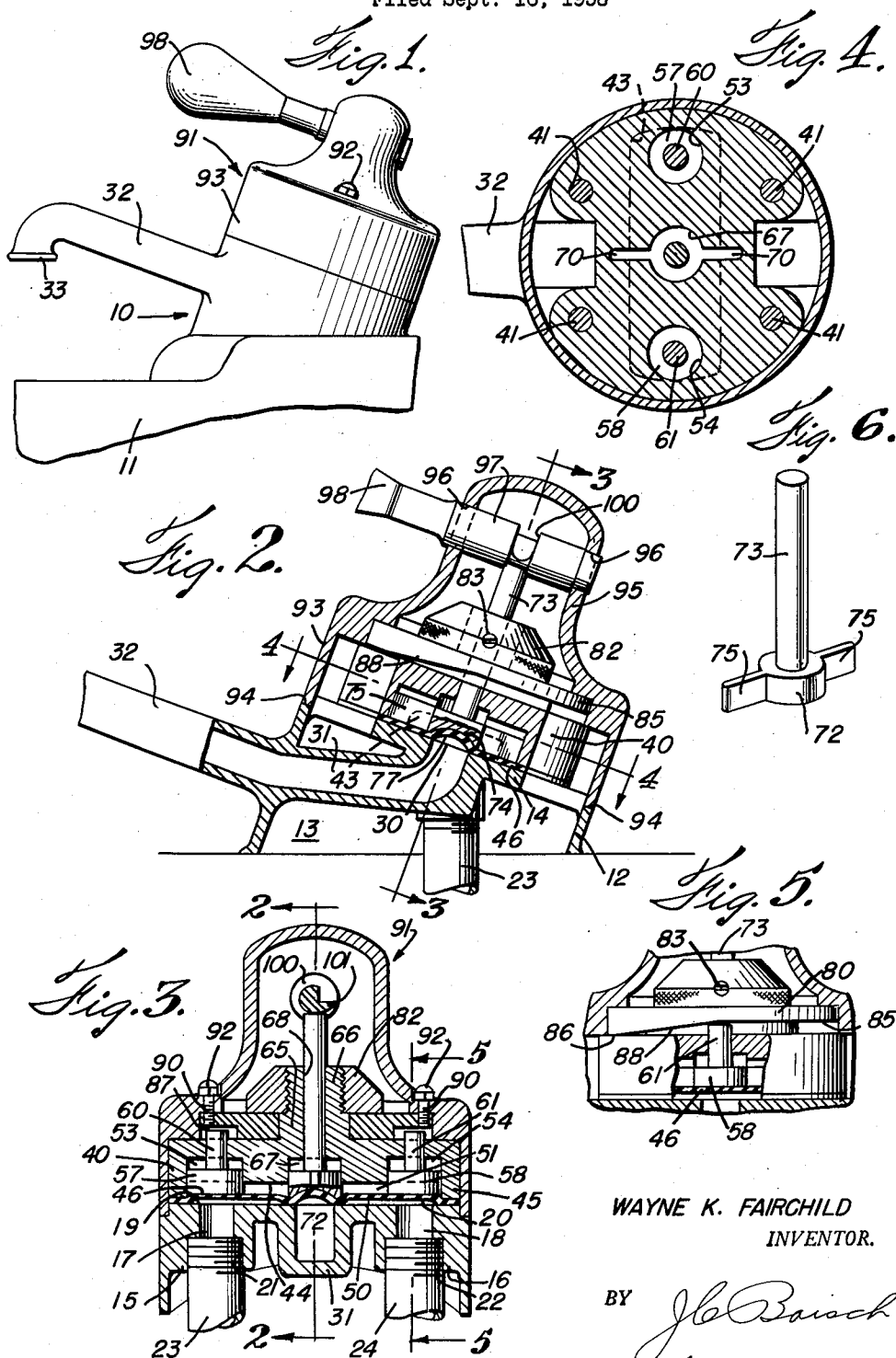
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FLUID MIXING DEVICES

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FLUID MIXING DEVICES

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This invention relates generally to fluid mixing devices and relates more particularly to valve means for mixing fluids of different temperatures.

While the invention has particular utility in connection with domestic water systems and the like, and is shown and described herein as embodied in such a system, it is to be understood that its utility is not limited thereto.

It is an object of the invention to provide an improved valve for the mixing of hot and cold water which embodies a single regulating or control handle common to both the hot water and the cold water sides of the device, and in which said handle is adapted to control both the proportionate amounts of hot and cold water and the total volume of the stream delivered from said valve.

Another object of the invention is to provide a device of this character wherein cross over between the hot and cold sides is prevented when the outlet or delivery port is closed.

Still another object of the invention is to provide a device of this character having means for minimizing or eliminating pounding, chattering and the like.

A further object of the invention is to provide a device of this character having improved control of the outlet or delivery port.

A still further object of the invention is to provide improved control of the hot and cold water valve members.

Another object of the invention is to provide a device of this character that is simple in construction and operation.

Still another object of the invention is to provide a device of this character that is extremely easy to assemble, and easy to disassemble for repair or replacement of parts.

A further object of the invention is to provide a device of this character wherein the entire cam assembly is secured to the top structure of the unit.

A still further object of the invention is to provide a device of this character wherein the actuating cam for the outlet valve member is formed in the handle shaft, there being a groove thus provided in which the stem of said outlet valve member is received when the unit is assembled thereby retaining said handle in position.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which illustrate one embodiment. After considering this example, skilled persons will understand that many variations may be made without departing from the principles disclosed, and I contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

Referring to the drawings:

Fig. 1 is a side elevational view of a mixing valve embodying the present invention and shown as installed on a wash bowl;

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Fig. 2 is an enlarged sectional view taken on line 2—2 of Fig. 3;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3; and

Fig. 6 is a perspective view of the outlet valve member.

Referring more particularly to the drawings the device is shown as comprising a hollow base, indicated generally at 10, mounted by any suitable, well known means, not shown, to a wash basin or sink 11, or the like. The base 10 has a cylindrical wall 12 defining a chamber 13, the upper end of said chamber being defined by a top wall 14 in a plane normal to the axis of the device. As the lower end of the base 10 is on an angle such that the axis of the device is inclined upwardly and rearwardly, the wall 14 is inclined downwardly and rearwardly, as best shown in Figs. 1 and 2. The free lower edge of the cylindrical wall 12 rests on the upper, generally horizontal portion of sink 11.

On the under side of the wall 14 are bosses 15 and 16 which are bored to provide hot and cold water inlet passages 17 and 18 respectively terminating at the top surface of wall 14 in hot and cold water inlet ports 19 and 20 respectively which are flush with the top surface of the wall 14. Internally threaded counterbores 21 and 22 are adapted to receive externally threaded ends of hot and cold water pipes 23 and 24 for supplying hot and cold water to the device.

Inlet ports 19 and 20 are arranged substantially diametrically of each other and between said ports and axially of the device is a water outlet port 30 which is also flush with the top surface of the wall 14. Port 30 communicates with a discharge pipe 31 which terminates in an upwardly inclined discharge spout 32 having a short depending outlet portion or nozzle 33 (Fig. 1) which arrangement minimizes or eliminates dripping when the water is turned off. Pipe 31 and spout 32 are shown as formed integrally with the base although these parts are not necessarily integral with said base.

A plate 40 is secured to the wall 14 by means of screws 41, said plate having a recess 43 in its under side having a top wall 44 and side walls 45. Plate 40 is of somewhat smaller diameter than the outside diameter of the base 10 and a flexible diaphragm 46 is clamped between the plate 40 and the wall 14. Thus the diaphragm 46 is adapted to flex within the recess 43 which will accommodate said flexing. The diaphragm constitutes a flexible wall which defines, with wall 14, a mixing chamber 50 at the lower side of said diaphragm; and defines, with the walls of recess 43, a valve chamber 51 at the upper side thereof.

Plate 40 is provided with cylindrical bores 53 and 54 which extend upwardly, as best shown in Figs. 2, 3 and 5, from the recess 43 and are arranged diametrically at opposite sides of the axis of the device so as to be aligned with the ports 19 and 20. From the upper ends of the bores 53 and 54 are reduced diameter bores which extend upwardly to the upper side of said plate. Valve members 57 and 58 are slidably disposed in the respective bores 53 and 54, said valve members having upwardly extending stems 60 and 61 respectively which have free end portions extending above the upper surface of said plate 40. It is to be understood that the valve members 57 and 58 are loose enough in the bores 53 and 54 to permit air to pass said valve members and prevent undesirable pressures above said members such as would interfere with the proper functioning thereof. It is also to be noted that the valve stems 60 and 61 are loose enough in their respective bores to permit air to pass said stems and relieve any pressure in the chamber 51 which might otherwise occur, air being adapted

to also pass the valve members 57 and 58 as already described.

There is an axial cylindrical boss 65 extending upwardly of the top surface of the plate 40 and a reduced diameter, externally threaded portion 66 which extends upwardly from the cylindrical boss 65. The plate 40 has an axial bore 67 extending upwardly of the recess 43 and from said bore a reduced diameter bore 68 extends axially through said boss 65 and extension 66. At each side of the bore 65 is an outwardly extending groove 70 (Fig. 4), said grooves 70 extending outwardly beyond the sides of the recess 43 and upwardly above the top of said recess. An outflow control valve member 72 is slidably received in the bore 67, said valve member having an axial stem 73 extending upwardly above the top of the extension 66 as best shown in Figs. 2 and 3. Wings 75 extend outwardly in opposite directions from the valve member 72 and are slidably received in said grooves 70, said wings being formed integrally of said valve member 72. The valve member 72 and wings 75 are operably but loosely received in the bore 67 and grooves 70.

The under side of the valve member 72 is concave as at 74 and the adjacent part 77 of the diaphragm 46 is molded in concave convex shape for reception in the concavity 74. This arrangement minimizes or eliminates turbulence at the outlet port 30 and provides for smooth flow. This arrangement also eliminates certain tendencies to produce noise when the valve member 72 is raised.

A cam plate 80 is rotatably mounted on the cylindrical boss 65, said cam plate 80 being of substantially the same thickness as the height of said boss 65, and said plate 80 is retained on said boss 65 by a nut 82 screwed onto the extension 66 and held in position by a set screw 83 in a radial, internally threaded opening provided therefor.

The under side of the cam plate 80 has a peripheral portion which is cut away to provide a semicircular part 85 parallel with the plane of the top surface and in a plane substantially normal to the axis of the device. The remaining part of the cut away part is provided with a cam surface which tapers from a region 86 of substantially the same thickness as the full thickness of the cam plate. From said region 86 there are oppositely arranged cam surfaces 87 and 88 which extend toward and merge with the part 85. The region 86 is opposite the central point of the semicircular part 85. The free ends of stems 60 and 61 are adapted to be engaged by the respective cam surfaces 87 and 88 and it is to be noted that when the cam plate is centered, as will be more fully explained hereinafter, the free ends of said stems 60 and 61 just ride on the ends of said cam surfaces where said ends merge with the part 85, as shown in Figs. 3 and 5.

The cam plate 80 is provided with upstanding externally threaded bolts 90 which are received in openings provided therefor in a cover, indicated generally at 91, and nuts 92 secure said cover on said bolts. The cover 91 is hollow and includes a cylindrical body portion 93 of substantially the same outside diameter as the diameter of the base 10 and the free edge of the cylindrical wall of said body portion is closely adjacent to a shoulder 94 formed by an annular recess in the upper edge portion of said base. The shoulder 94 is spaced below the top surface of wall 14 and the arrangement is such as to keep dirt and other foreign matter from the interior of the cover and thus protect the working parts of the valve from said material.

The upper portion 95 of the cover is streamlined, of reduced diameter and dome shaped. There are aligned openings 96 which rotatably receive a shaft portion 97 of a handle 98 extending forwardly of the device. The axis of the handle and shaft portion 97 intersects the axis of the valve stem 73 and in this region the shaft

97 is formed to provide a groove 100 normal to the axis of the shaft portion 97 and within which is a cam 101. The free end of valve stem 73 is received in said groove 100 and is engaged by said cam 101. Thus, when the device is assembled, the free end portion of valve stem 73 within said groove 100 prevents inadvertent removal of the handle from the cover.

Control of the temperature of the water discharged from the spout and nozzle is effected by rotation of the cover on its axis. This causes the cam plate 80 to rotate and raise or lower the valve members 57 and 58, depending upon the direction of rotation of said cover, and the position of the valve stems 60 and 61 on the respective cam surfaces. Of course, when a valve stem rides on the portion 85 of the cam plate the valve thereof does not move. Water pressure on the under side of the diaphragm 46 urges the valves open while the surfaces 87 and 88 of the peripheral portion of the under side of the cam plate determine the position of said valves.

Rotation of the handle 98 on its longitudinal axis controls the position of the outlet valve member 72 and it is to be noted that water pressure on the under side of said diaphragm 46 also urges valve member 72 in the opening direction. When the valve member 72 is in the closed position the wings 75 thereof press down on the upper surface of the diaphragm and prevent water from the hot and cold sides from passing the barrier thus formed. Also, when the valve member 57, 58 and 72 are moved downwardly the part of the diaphragm 46 beneath said members is seated about the respective ports 19, 20 and 30 and effect closing of said ports.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it is thought that it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing all of its material advantages, the form described being merely one embodiment.

I claim:

1. In a mixing valve: a base having a top wall with three separated ports, one port being located axially of the base with the other ports located at respective sides of said one port; a flexible diaphragm on said top wall; a plate secured to said base and securing said diaphragm to said top wall, said plate having a recess therein over said ports, one side of said diaphragm and said top wall defining a mixing chamber, the other side of said diaphragm and the walls of said recess defining a valve chamber, said plate having bores aligned with the respective ports, said one port located axially of the base being the outlet port for the mixing chamber, one of the other ports being for admission of hot water to said mixing chamber and the remaining port being for admission of cold water to said mixing chamber; a valve member for each of said bores and adapted to bear upon a related part of the diaphragm, said valve members being slidable in said bores from and into a position depressing the respective related parts of the diaphragm into sealing engagement with a portion of the top wall of the base about said ports to thereby control fluid flow through said ports, said valve members having respective stems extending upwardly above the top of said plate; a cam member rotatably secured to said plate and coaxial with said base, said cam member having oppositely extending arcuate cam faces engageable with the respective stems of the valves controlling the hot and cold water ports, rotation of said cam member in one direction from a neutral position being adapted to actuate the valve member controlling the hot water port in the closing direction, and actuation of said cam member in the opposite direction from said neutral position being adapted to actuate the valve member controlling the cold water port in the closing direction; a cover secured to said cam member

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and adapted to rotate same when said cover is rotated; a handle rotatably mounted in said cover; a cam on said handle, said cam being engageable with the upper end of the stem of the valve member for the outlet port for actuation of said valve upon rotation of said handle on its longitudinal axis, said handle also being adapted for use for rotation of said cover; and wings on the valve member for the outlet port, said wings extending outwardly of said valve member and bearing upon related portions of the diaphragm and cooperating with said diaphragm for pressing said related portions thereof against said top wall of the base to seal off cross flow of water between the hot and cold sides of the mixing chamber when the outlet valve is seated.

2. In a mixing valve: a base having a top wall with three separated ports, one port being located axially of the base with the other ports located at respective sides of said one port; a flexible diaphragm on said top wall; a plate secured to said base and securing said diaphragm to said top wall, said plate having a recess therein over said ports, one side of said diaphragm and said top wall defining a mixing chamber, the other of said diaphragm and the walls of said recess defining a valve chamber, said plate having bores aligned with the respective ports, said one port located axially of the base being the outlet port for the mixing chamber, one of the other ports being for admission of hot water to said mixing chamber and the remaining port being for admission of cold water to said mixing chamber; a valve member for each of said bores and adapted to bear upon a related part of the diaphragm, said valve members being slidable in said bores from and into a position depressing the respective related parts of the diaphragm into sealing engagement with a portion of the top wall of the base about said ports to thereby control fluid flow through said ports said valve members having respective stems extending upwardly above the top of said plate; a cam member rotatably secured to said plate and coaxial with said base, said cam member having oppositely extending arcuate cam faces engageable with the respective stems of the valves controlling the hot and cold water ports, rotation of said cam member in one direction from a neutral position being adapted to actuate the valve member controlling the hot water port in the closing direction, and actuation of said cam member in the opposite direction from said neutral position being adapted to actuate the valve member controlling the cold water port in the closing direction; a cover secured to said cam member and adapted to rotate same when said cover is rotated; a handle rotatably mounted in said cover; a cam on said handle, said cam being engageable with the upper end of the stem of the valve member for the outlet port for actuation of said valve upon rotation of said handle on its longitudinal axis, said handle also being adapted for use for rotation of said cover; wings on said valve member for the outlet port, said wings extending oppositely of each other and bearing upon related portions of the diaphragm and cooperating with said diaphragm for pressing said related portions thereof against said top wall of the base to seal off cross flow of water between the hot and cold sides of the mixing chamber when the

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outlet valve is seated; and means for retaining said wings in position to engage said related portions.

3. In a mixing valve: a base having a top wall with three separated ports, one port being located axially of the base with the other ports located at respective sides of said one port; a flexible diaphragm on said top wall; a plate secured to said base and securing said diaphragm to said top wall, said plate having a recess therein over said ports, one side of said diaphragm and said top wall defining a mixing chamber, the other side of said diaphragm and the walls of said recess defining a valve chamber, said plate having bores aligned with the respective ports, said one port located axially of the base being the outlet port for the mixing chamber, one of the other ports being for admission of hot water to said mixing chamber and the remaining port being for admission of cold water to said mixing chamber; a valve member for each of said bores and adapted to bear upon a related part of the diaphragm, said valve members being slidable in said bores from and into a position depressing the respective related parts of the diaphragm into sealing engagement with a portion of the top wall of the base about said ports to thereby control fluid flow through said ports, said valve members having respective stems extending upwardly above the top of said plate; a cam member rotatably secured to said plate and coaxial with said base, said cam member having oppositely extending arcuate cam faces engageable with the respective stems of the valves controlling the hot and cold water ports, rotation of said cam member in one direction from a neutral position being adapted to actuate the valve member controlling the hot water port in the closing direction, and actuation of said cam member in the opposite direction from said neutral position being adapted to actuate the valve member controlling the cold water port in the closing direction; a cover secured to said cam member and adapted to rotate same when said cover is rotated; a handle rotatably mounted in said cover; a cam on said handle, said cam being engageable with the upper end of the stem of the valve member for the outlet port for actuation of said valve upon rotation of said handle on its longitudinal axis, said handle also being adapted for use for rotation of said cover, said valve member for the outlet port being provided with parts bearing upon related portions of the diaphragm between the hot and cold ports and cooperating with said diaphragm for pressing said related portions thereof against said top wall of the base to seal off cross flow of water between the hot and cold sides of the mixing chamber when the outlet valve is seated.

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