

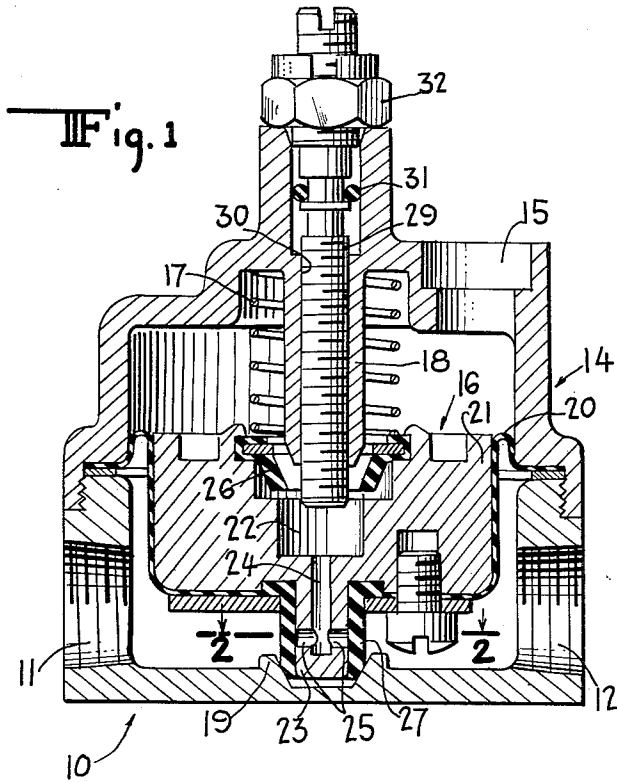
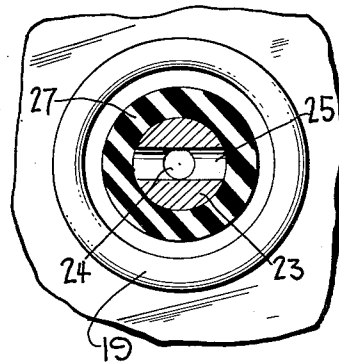
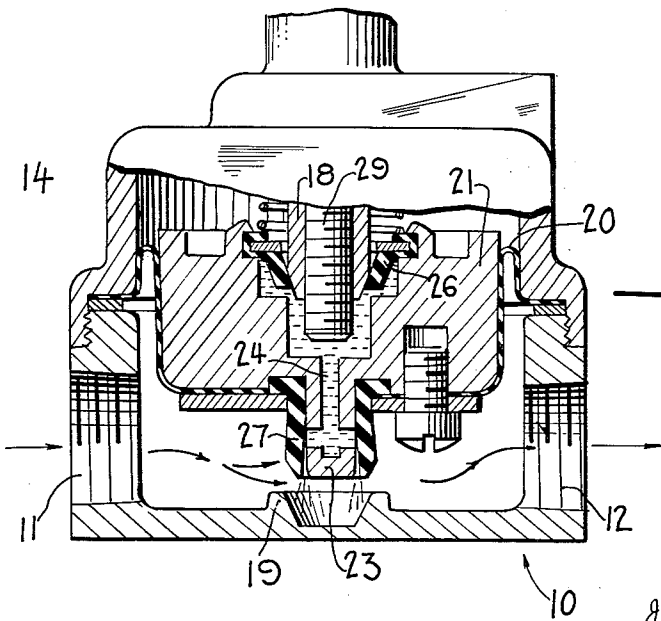
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LIQUID MIXING DEVICES

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LIQUID MIXING DEVICES

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The present invention relates to liquid mixing devices, and, more particularly, to devices for mixing a measured amount of liquid detergent with a flowing stream of water under pressure.

The present invention aims to provide such a device which will inject the detergent into the water when the stream commences to flow and will thereafter prevent additional detergent from entering the stream, whereby clear water leaves the device. Such a device is adapted for use with machines for washing one object at a time, for example drinking glasses or bottles, where it is desired to first supply water containing the detergent to wash the object and then to supply clear water for rinsing the object.

While various devices of this general character have been proposed, none of them was entirely satisfactory for one or several reasons.

Accordingly, an object of the present invention is to provide an improved liquid mixing device which is particularly adapted for supplying washing water and rinsing water to washing machines.

Another object is to provide such a device to which the detergent can be supplied by gravity.

Another object is to provide such a device which is self starting and need not be primed.

Another object is to prevent the entrapment of air bubbles which would cause malfunctioning of the device.

Another object is to provide such a device which accurately measures and injects the desired amount of detergent into the water and thereafter shuts off communication between the supply source of detergent and the stream of water so that completely clear water can leave the device and the waste of detergent is prevented.

A further object is to provide such a device which is simple and practical in construction, economical to manufacture, and reliable in operation.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification wherein:

FIG. 1 is a longitudinal sectional view of a device in accordance with the present invention illustrating the same in its inactive position.

FIG. 2 is an enlarged sectional view taken along the line 2-2 on FIG. 1.

FIG. 3 is a view similar to FIG. 1 illustrating the device in its operating position.

Referring to the drawing in detail, there is shown a liquid mixing device generally comprising a lower casing member 10 having an inlet 11 and an outlet 12 for a stream of water under pressure, an upper casing member 14 secured to the lower casing member to provide a chamber and having an opening 15 for introducing a supply of detergent, diaphragm means 16 movably mounted in the chamber and dividing the same into upper and lower chambers which serve as a detergent supply chamber and a mixing chamber respectively, and a spring 17 for urging the diaphragm means downwardly.

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The upper casing member has a downwardly extending plunger 18 and the lower casing member has an upwardly facing countersunk portion 19 between its inlet and outlet for the purposes described hereinafter.

5 The diaphragm means 16 comprises a flexible diaphragm 20 secured between the upper and lower casing members, and a piston member 21 secured to the diaphragm for movement therewith. The piston member has a well 22 therein which communicates with the upper 10 chamber, and has a cylindrical extension 23 at the bottom thereof provided with passageway means 24 including side openings 25 in communication with the well.

The spring 17 surrounds the plunger 18 and is biased between the upper casing member and the piston mem- 15 ber 21.

From the construction of the device as so far described, it will be apparent that when water under pressure flows through the lower chamber a force is exerted on the piston member to move the same upwardly whereby the 20 plunger enters the well 22 and tends to expel detergent from the well 22 to the mixing chamber.

In order to provide an efficient and practical mixing device, a resilient washer 26 is mounted on the piston member 21 adjacent the upper end of the well 22 which 25 is adapted to form a seal about the plunger 18 to prevent detergent from being forced back into the upper chamber and to assure expulsion of the detergent into the mixing chamber. Also, check valve means are provided for the side opening 25 which comprise a resilient tube 27 se- 30 cured to the piston member and tightly surrounding the extension 23 so that, when the device is inactive, detergent cannot leak into the mixing chamber. As shown in FIG. 2, the extension 23 and the tube 27 are in concentric alignment with the countersunk portion 19 so that, 35 when the spring 17 urges the piston member downwardly into its inactive position, the lower end of the tube extends into the countersunk portion 19 and locks the check valve means to make the same more fully liquid tight while the device is inactive.

40 The tube 27, upon expanding slightly due to the pressure caused by the plunger 18 in operation of the device, meters the detergent into the stream of water at a rate so that an adequate volume of water containing detergent is supplied during the cleaning operation of the 45 washing machine.

The amount of detergent expelled from the well 22 into the lower chamber can be predetermined by adjusting the stroke of the piston member by suitable stop means. As illustrated herein, such means may comprise 50 a rod 29 threaded into the bore 30 of the plunger and extending outwardly thereof to engage the bottom of the well and stop further upward movement of the piston member. A sealing ring 31 between the rod and the bore prevents leakage through the plunger. After adjusting the position of the rod, a lock nut 32 is applied to retain the rod in its desired position. 55

In operation, the upper chamber is filled with a liquid detergent, and, when the stream of water is shut off so that there is no pressure in the lower chamber, the 60 spring 17 holds the piston member 21 in its lowermost or inactive position, as shown in FIG. 1, whereby liquid detergent flows into the well 22 and fully fills the same. Since the tube 27 has its lower end inserted into the countersunk portion 19, leakage of detergent into the lower chamber is prevented. 65

When the water is turned on, pressure is established in the lower chamber, the piston member 21 moves up- 70 wardly, the lower end of the tube 27 is released, the plunger 18 enters the well 22, the washer 26 seals off the well 22 from the upper chamber, and, as the piston member continues to move upwardly, the plunger displaces the desired amount of detergent through the passageway

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means 24 to cause the tube 27 to expand and unseal the openings 25, whereby the detergent is metered in the mixing chamber (FIG. 3).

When the device is used in connection with a glass washing machine such as shown in application Serial No. 661,654, filed May 27, 1957, now Patent No. 2,955,304, water containing detergent which has been thoroughly mixed therein is supplied to the washing machine for a sufficient duration to thoroughly wash and clean a glass. As the water continues to flow and the piston member 21 is in its uppermost position with the stop rod 29 engaging the bottom of the well 22, the injection of detergent ceases, and clear water flows through the device and is supplied to the washing machine to rinse the glass.

After the glass has been so washed and rinsed and is removed from the machine, the flow of water through the device is shut off and pressure in the lower chamber decays, whereupon the spring 17 returns the piston member 21 to its inactive position (FIG. 1) where it is held until the water is turned on again.

From the foregoing description, it will be seen that the present invention provides an improved liquid mixing device. By reason of the construction and operation of the device as just described, the device is self starting because, even when empty and inactive, detergent can be introduced by gravity into the well, and the well is maintained liquid full without the entrapment of air during operation thereof.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. A liquid mixing device comprising a casing, diaphragm means movably mounted in said casing and dividing said casing into an upper chamber and a lower chamber, said lower chamber having an inlet and an outlet for connection in a valve controlled stream of unidirectional flowing liquid under pressure adapted to move said diaphragm means upwardly when flowing from said inlet to said outlet and said upper chamber having an opening for introducing another liquid to be mixed with the flowing stream of liquid, said diaphragm means having a well communicating with said upper chamber and being provided with outlet means communicating with said lower chamber, check valve means for said outlet means, a stationary plunger in said upper chamber adapted to extend into said well upon upward movement of said diaphragm means to force liquid from said well through said outlet means to said lower chamber, and a spring for urging said diaphragm means downwardly in the absence of flow of the stream.

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2. A device according to claim 1, wherein said lower chamber has means for locking said check valve means when said diaphragm is in its lowermost position.

3. A device according to claim 1, wherein said check valve means is a resilient tube surrounding said outlet means.

4. A device according to claim 3, wherein said lower chamber has an upwardly facing countersunk portion for receiving the lower end of said tube to lock said check valve means when said diaphragm means is in its lowermost position.

5. A device according to claim 1, including stop means for determining the extent of upward movement of said diaphragm means.

6. A device according to claim 5, wherein said plunger has a threaded bore and said stop means is threadedly secured in said bore to adjust the position thereof.

7. A device according to claim 1, wherein a gasket is mounted adjacent the upper end of the well adapted to form a seal about said plunger when said plunger extends into said well.

8. A liquid mixing device comprising a lower casing member having an inlet and an outlet and being formed with an upwardly facing countersunk portion between said inlet and said outlet, an upper casing member secured to said lower casing member formed with a downwardly extending plunger and having an inlet, a diaphragm secured between said casing members, a piston member secured to said diaphragm for movement therewith and formed with an extension at the bottom thereof in concentric alignment with said countersunk portion, said piston member having a well and said extension having passageway means communicating with said well and including a side opening, a resilient tube on said extension adapted to seal said side opening and unseal the same in response to the presence and absence of pressure within said well, the lower end of said tube being adapted to extend into said countersunk portion to prevent unsealing of said side opening, a washer mounted on said piston member adjacent the upper end of said well adapted to form a seal about the lower end of said plunger, and a spring biased between said upper casing member and said piston member for urging said piston member downwardly.

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