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FLUID MIXING DEVICE

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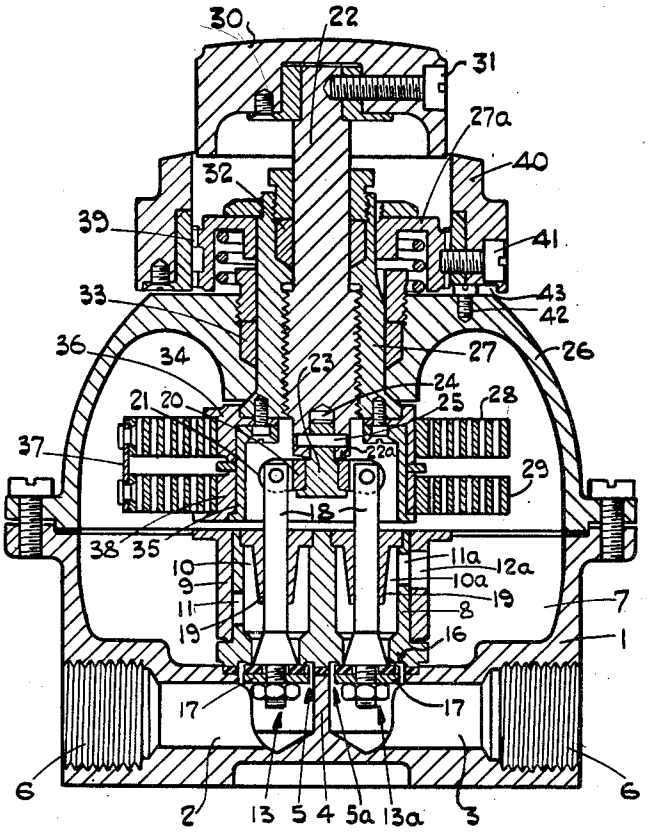

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FLUID MIXING DEVICE

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This invention has reference to a device for mixing streams of fluid at different temperatures to produce a fluid mixture at a constant predetermined temperature, the mixture temperature being determined by a thermally sensitive unit which is housed within the device and adjusts a valve for varying the relative proportions of the fluid streams fed into the device and mixed together.

It is customary to install in each of the pipes through which the fluid streams are fed to the mixing device, a separate manually operated control cock for terminating the flow of any one or more of the said streams, as and when desired.

The prinicpal object of the present invention is to obviate the necessity of providing such separate stop cocks and still enable the flow of the fluid streams to the device to be terminated as and when desired.

Another object of the invention is to provide a fluid mixing device for providing a fluid mixture of a predetermined temperature which incorporates stop cocks for terminating the flow of fluid to the device.

Still another object of the invention is to enable the simultaneous actuation of all the stop cocks for terminating the flow of fluid to the mixing device by the operation of a single knob or handle.

Yet another object of the invention is to ensure that all the stop cocks for terminating the flow of fluid to the mixing device, may be closed even though one of the said cocks may assume its closed position before any other.

These and other objects of the invention will be apparent from the following particular description of a typical fluid mixing device as shown in the accompanying drawing.

The accompanying drawing is a cross-sectional elevation of a thermostatically controlled device for mixing a stream of cold water with a stream of hot water or steam, to produce a mixture at a desired predetermined temperature.

The fluid mixing device shown comprises a base 1 having two radial and co-axial supply passages 2, 3, which extend to opposite sides of a partition 4 where each is formed with a fluid outlet port 5, 5a. The passages are tapped at their fluid inlet ends 6 to enable the fluid supply pipes (not shown) to be connected therein and to the base 1.

The base 1 is formed with an internal well 7 wherein a mixing valve, comprising a cylindrical body 8 which is surrounded by a sleeve 9, is accommodated. The valve body is secured upon the floor of the well and is formed with two

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parallel passages 10, 10a, which register with the ports 5, 5a respectively. Two systems of ports are formed in the cylindrical body 8 to enable the fluid streams to flow into the well 7, the ports in each system being spaced at equi-angular distances apart around the body and the ports of one system being located mid-way between two ports of the other system. One system of ports, of which one is shown at 11, communicate directly or through complementary passages formed in the body in a plane at right angles to the body axis, with the passage 10 and are located adjacent the bottom of the body, whereas the other system of ports, of which one is shown at 11a, communicate directly or through complementary body passages with the passage 10a and are located adjacent the top of the body 8.

The sleeve valve 9 is likewise formed with two systems of ports which are located, respectively, in the planes of the body ports 11 and 11a. These sleeve ports are so arranged that when the upper ports, of which one is shown at 12a, register with the body ports 11a, the lower ports (not shown) are located wholly to one side of the body ports 11; similarly, when the lower sleeve ports are taken into register with the body ports 11 by displacement of the sleeve 9 around the body 8, the upper ports 12a are located wholly to one side of the ports 11a; further, the disposition of the two systems of sleeve ports is such that as soon as the sleeve 9 is moved to take the upper ports 12a out of register with the ports 11a, the lower ports begin to overlap and move into register with the body ports 11. Consequently any movement of the sleeve around the body varies the relative proportions of the two fluid streams flowing into the well 7 through the passage 2, port 5, passage 10, ports 11 and the lower sleeve ports, and through the passage 3, port 5a, passage 10a, ports 11a, and ports 12a respectively.

A stop valve 13 is provided at the fluid inlet end of the body passage 10 and an identical stop valve 13a is provided at the inlet end of the body passage 10a. Each stop valve comprises a seating 16 and a washered disc 17 adapted to impinge the seating for closing the stop valve. The disc is carried upon the end of a stem 18 having a truncated conical portion 17 which is located within the seating 16 with its larger diameter end adjacent the disc 17, so that, as the stop valves are opened, the flow of fluid commences gradually thereby eliminating or minimising the creation of shocks on the internal mechanism of the device. The disc is of greater diameter than the larger diameter end of the said conical portion

and forms a peripheral shoulder around the latter.

Each stem 18 extends through a complementary bush 19 and is a sliding fit therein. The bushes are secured respectively within the upper ends of the body passages 10 and 10a and enable the stems to be reciprocated axially within the body 8 whilst preventing any angular or tilting movement thereof.

The stems are suspended from a yoke 20, their upper ends being pivotally connected to the outer ends of radial arms 21 of the said yoke.

The yoke is connected to the inner end of the spindle 22 by a stud 23 which passes through an eye in the centre of the yoke and projects into a pocket 24 formed in and axially of the spindle, the stud being secured within the said pocket by a pin 25. The stud is, therefore, rotatable within the yoke and the latter is, normally, located in a plane at right angles to the stud and spindle; however, to ensure that both the washered discs 17 may be brought into valve closing contact with their respective seatings 16 should one stop valve be closed before the other, the face 22a of the yoke-supporting end of the spindle is inclined inwardly and downwardly towards the centre of the spindle so that the yoke is capable of making a limited rocking movement upon the stud should unequal forces be applied thereto by the stems 18.

The spindle 22 extends through the crown of a cover 26 which is bolted to the top of the base 1, and has a screw-connection with a bush 27 which is rotatably mounted within the said cover crown and carries, on its inner end, a thermally sensitive unit comprising two spiral bimetallic coils 28, 29, which initiates the movement of the ported sleeve 9 around the body 8 of the mixture control valve, should the temperature of the fluid mixture vary from a predetermined valve, to vary the relative proportions of the two fluid streams entering the well 7, and restore the said predetermined temperature.

The outer end of the spindle 22 has a knob 30 secured thereto by a screw 31 whereby the said spindle may be manually rotated within and relatively to the bush 27 and the screw connection between the spindle and bush, also causes relative longitudinal movement of the spindle, yoke and stems. In the accompanying drawing, the stop valves 13, 13a are shown closed. and have cut off the flow of the fluid streams from the passages 2 and 3 into the well 7; rotation of the knob 30 and spindle 22 in the appropriate direction relatively to the bush 27, opens the valves simultaneously and permits the flow of the fluid streams. The streams are mixed within the well 7 and the mixture is caused to flow therefrom into the cover 26 and over the coils 28, 29, and is then discharged through an outlet port (not shown). Leakage of mixture from the device past the spindle 22 and bush 27, is prevented by packing glands 32 and 33 respectively.

The bush 27 is formed with a flange 34 around its inner end and an inverted-thimble 35 wherein the yoke 20 is housed, is secured to the said flange together with a collar 36 to which the inner end of the bimetal coil 28 is anchored and which is disposed around the upper thimble end. The outer end of the coil 28 is coupled to the outer end of the coil 29 by a rigid strap 37 of which the inner end is coupled to a second collar 38 disposed around the lower part of the thimble; the collar is provided with diametrically opposed and depending pins (not shown) which engage complementary recesses in the upper edge of the

mixing valve sleeve 9 for imparting drive from the thermally sensitive unit to the said sleeve.

To and around the outer end of the bush 27, there is keyed a nut 27a having a system of serrations 39 around its periphery, the said serrations being engaged by teeth formed around the internal periphery of a knob or handle 40 socketted on to the said nut and secured to the latter by a bolt 41.

When it is desired to adjust the thermally sensitive unit to change the temperature of the discharged fluid mixture, the knob 40 is partially rotated upon the cover 26, its movement being limited by the head of a screw 42 on the cover engaging a recess 43 in the knob; this rotational movement is transferred, through the nut 27a, to the bush 27 and spindle 22 and yoke-carrying stud 22a without displacing the yoke 20, and from the bush 27 to the thimble 35 and collar 36, thus tensioning or relieving the tension in the coils 28, 29.

On the other hand, the opening and closing of the stop valves 13, 13a, by rotation of the knob or handle 30 and spindle 22, is not transferred to the bush 27 so that the actuation of the said valves is effected without upsetting the adjustment either of the thermally sensitive unit or the sleeve of the mixing valve.

It is to be understood that the fluid mixing device described and shown is only one example of carrying out the present invention, and that various modifications may be made without departing from the spirit and scope of the following claims.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. A fluid mixing device comprising a casing having two aligned fluid supply passages each opening into the interior of the casing through a corresponding inlet port, a cylindrical body secured to and internally of the casing and having two longitudinal fluid transfer passages formed therein and registering respectively with the said inlet ports, and a system of peripheral fluid outlet ports for each transfer passage, a ported sleeve mounted and rotatable around the said body, a thermally sensitive unit housed within the casing and coupled to the ported sleeve for displacing the latter upon the said body under the control of temperature variations within the casing, and varying the relative proportions of the fluid streams flowing through the said passages and ports, a seating formed around the fluid inlet end of each of the said transfer passages, a guide bush secured in and co-axially of the opposite end of each of the transfer passages, a rigid stem extending through each of the said transfer passages and guide bushes, a washered disc mounted on each of the said stems for contacting the corresponding seating, a spindle carried in and axially displaceable relatively to the said casing and a yoke mounted on the said spindle, the said rigid stems being connected by their ends which project beyond the corresponding guide bushes, to the said yoke.

2. A fluid mixing device comprising a casing a wall surrounding said casing having two aligned fluid inlet passages each opening into the interior of the casing through a corresponding inlet port, a cylindrical body secured to and internally of the casing and having two longitudinal fluid transfer passages formed therein and registering respectively with the said inlet ports, and a system of fluid outlet ports for each transfer passage, a ported sleeve mounted and rotat-

able around the said body, a thermally sensitive unit housed within the casing and coupled to the ported sleeve for displacing the latter upon the said body under the control of temperature variations within the casing, and varying the relative proportions of the fluid streams flowing through the said passages and ports, a seating formed around the fluid inlet end of each of the said transfer passages, a guide bush secured in and co-axially of the opposite end of each of the said transfer passages, a rigid stem extending through each of the said guide bushes and transfer passages and carrying a washered disc for impacting and closing the corresponding seating, both stems being connected to a common yoke having a central eye therein, a stud extending freely through said eye and being secured within a pocket in the adjacent end of a spindle extending through a wall of the casing, the said spindle end being formed with an inwardly inclined face to permit the yoke to rock in the plane of the spindle and the spindle being longitudinally displaceable relatively to the casing, and a handle secured to the said spindle externally of the said casing for effecting the said longitudinal displacement and taking the said washered discs into and out of impact with the said seatings.

3. A fluid mixing device comprising a casing having a plurality of fluid supply passages, an internal mixing chamber for fluids supplied through the said passages, and a mixture outlet, a body fixed within the said chamber, having longitudinal fluid transfer passages each in communication with a corresponding supply passage, and peripheral ports establishing communication between the said transfer passages and the said chamber, a ported sleeve disposed around the said body, a thermally sensitive unit within the said chamber being coupled to the said sleeve for adjusting the latter relatively to the said body, a stop valve in each transfer passage on the supply side of said peripheral ports for controlling the flow of fluid through each supply passage and the corresponding transfer passage, a guide bush in said supply passage on the opposite side of the said peripheral ports to the said stop valve a rigid stem connected to each stop valve, extending along the corresponding transfer passage and through the corresponding guide bush into the said mixing chamber, a spindle mounted in and axially displaceable relatively to the casing, and a yoke rotatably carried on the said spindle internally of the said chamber and having radial arms equal in number to the said links, the links being connected to the said yoke arms.

4. A fluid mixing device comprising a casing having a plurality of fluid supply passages, an internal mixing chamber for fluids supplied through the said passages, and a mixture outlet, a body fixed within the said chamber, having longitudinal fluid transfer passages each in communication with a corresponding supply passage, and peripheral ports establishing communication between the said transfer passages and the said chamber, a ported sleeve disposed around the said body, a thermally sensitive unit within the said chamber being coupled to the said sleeve for adjusting the latter relatively to the said body, a stop valve in each transfer passage on the supply side of the said peripheral ports for controlling the flow of fluid through each supply passage and the corresponding transfer passage, a guide bush in the said supply passage on the opposite side of the peripheral ports to the said stop valve a link connected to each stop valve and extending along the corresponding transfer passage and through the corresponding guide bush into the said mixing chamber, a spindle mounted in and axially displaceable relatively to the casing, and a yoke carried on the said spindle internally of the said chamber and having radial arms equal in number to the said stems, the stems being connected to the said yoke arms and the yoke being rockable about its connection to the spindle.

5. A fluid mixing device comprising a casing having a crown portion and a plurality of fluid supply passages in the base thereof, an internal mixing chamber for fluids supplied through the said passages, and a mixture outlet, a body fixed to an internal wall of the said chamber base having longitudinal fluid transfer passages each in communication with a corresponding supply passage, and peripheral ports establishing communication between the said transfer passages and the said chamber, a ported sleeve disposed around the said body, a bush having a tapped bore, rotatably mounted in the crown of the casing co-axially with the said body and projecting into the interior of the said chamber towards the said body, a thermally sensitive unit carried by said tapped bush within the said chamber, being operatively coupled to the said sleeve for adjusting the latter relatively to the said body, a screw threaded spindle extending through and having a screw engagement with the said tapped bush, a stop valve in each transfer passage on the supply side of said peripheral ports for controlling the flow of fluid through each supply passage and the corresponding transfer passage, a guide bush in each transfer passage on the opposite side of the peripheral ports to the said stop valve, and a rigid stem connected to each stop valve and extending along the corresponding transfer passage and through the corresponding guide bush into the said mixing chamber, all the said stems being connected to the end of the said spindle within the said chamber.

6. A fluid mixing device comprising a casing having a plurality of fluid supply passages, an internal mixing chamber for fluids supplied through the said passages, and a mixture outlet, a body fixed within the said chamber, having longitudinal fluid transfer passages each in communication with a corresponding supply passage, and peripheral ports establishing communication between the said transfer passages and the said chamber, a ported sleeve disposed around the said body, a bush having a tapped bore, rotatably mounted in a wall of the casing co-axially with the said body and projecting into the interior of the said chamber, a thermally sensitive unit carried by the said tapped bush within the said chamber being operatively coupled to the said sleeve for adjusting the latter relatively to the said body, a screw threaded spindle extending through and having a screw engagement with the said bore, a stop valve in each transfer passage on the supply side of the said peripheral ports for controlling the flow of fluid through each supply passage and the corresponding transfer passage, a guide bush in each transfer passage on the opposite side of the peripheral ports to the said stop valve, a rigid stem connected to each stop valve, extending along the corresponding transfer passage and through the corresponding guide bush into the said mixing chamber, a yoke rotatably and rockably mounted on the said spindle within the said chamber, the

said yoke having a number of radial arms equal to the number of stop valves, and each of the said stems being pivotally connected to a corresponding yoke arm.

7. A fluid mixing device comprising a casing having a plurality of fluid supply passages, an internal mixing chamber for fluids supplied through the said passages, and a mixture outlet, a body fixed within the said chamber, having longitudinal fluid transfer passages each in communication with a corresponding supply passage, and peripheral ports establishing communication between the said transfer passages and the said chamber, a ported sleeve disposed around the said body, a bush, having a tapped bore, rotatably mounted in and extending through a wall of the casing in co-axial relationship with the said body, an inverted thimble secured to the said bush within the said chamber, at least one bimetallic coil disposed around and secured by one end to the said thimble, the other end of the said coil being coupled to the said sleeve for adjusting the latter relatively to the said body, a screw-threaded spindle extending through and engaging within the said bore and extending into the interior of the said thimble, a yoke rotatably and rockably mounted on the spindle end within the thimble and having a number of radial arms equal to the number of supply and transfer passages, a stop valve in each transfer passage on the supply side of the said peripheral ports for controlling the flow of fluid through each supply passage and the corresponding transfer passage, a guide bush in each transfer passage on the opposite side of the peripheral ports to the said stop valve, and a rigid stem connected to each stop valve, extending along the corresponding transfer passage and through the corresponding guide bush into the said thimble, where it is pivotally connected to a corresponding yoke arm.

8. A fluid mixing device comprising a casing having a plurality of fluid supply passages, an internal mixing chamber for fluids supplied through the said passages, and a mixture outlet, a body fixed within the said chamber, having longitudinal fluid transfer passages each in communication with a corresponding supply passage, and peripheral ports establishing communication between the said transfer passages and the said chamber, a ported sleeve disposed around the said body, a bush, having a tapped bore, rotatably mounted in and extending through a wall of the casing in co-axial relationship with the said body, an inverted thimble secured to the said bush within the said chamber, at least one bimetallic coil disposed around and secured by one end to the said thimble, the other end of the said coil being coupled to the said sleeve for adjusting the latter relatively to the said body, a screw-threaded spindle extending through and engaging within the said bore and extending into the interior of the said thimble, a yoke rotatably and rockably mounted on the spindle end within the thimble and having a number of radial arms equal to the number of supply and transfer passages, a stop valve in each transfer passage on the supply side of the said peripheral ports for controlling the flow of fluid through each supply passage and the corresponding transfer passage, a guide bush in each transfer passage of the opposite side of the peripheral ports to the said stop valve and a rigid stem connected to each stop valve, extending along the corresponding transfer passage and through the corresponding guide bush into the said thimble, where it is pivotally connected to a corresponding yoke arm, an annular knob assembled to the said tapped bush externally of the casing, and a knob assembled to the spindle outwardly of and concentrically to the said annular knob.

9. A fluid mixing device comprising a casing having a plurality of fluid supply passages, an internal mixing chamber for fluids supplied through said passages, and a mixture outlet, a body fixed within the said chamber having longitudinal fluid transfer passages one end of each of which is in communication with a corresponding supply passage, and peripheral ports establishing communication between each said transfer passage and the said mixing chamber, a ported sleeve disposed around the said body, a thermally sensitive unit within the said chamber being operatively coupled to the said sleeve for adjusting the latter relatively to the said body, a stop valve in each transfer passage on the supply side of the said peripheral ports, a guide bush in the other end of each transfer passage, a rigid stem extending from each stop valve through the corresponding transfer passage and guide bush into the said mixing chamber, and a spindle mounted in and axially displaceable relatively to the casing, all the said stems being connected to the said spindle internally of the said chamber.

10. A fluid device comprising a casing having a plurality of fluid supply passages, an internal mixing chamber for the fluids supplied through the said passages, and a mixture outlet, a valve housed within the said casing and controlling the fluid streams flowing from the said supply passages to the said chamber, a thermally sensitive unit housed within the casing and coupled to the said valve for varying automatically the relative proportions of the said fluid streams with variations in the temperature of the fluid mixture, a bush mounted and rotatable about its axis in the said casing and having a tapped bore, the said thermally sensitive unit being carried by the said bush, a screw threaded spindle extending through and having a screw engagement with the said bore, a separate stop valve accommodated within each of the said fluid passages, a guide bush rigidly secured in and co-axially of each of the said passages on the fluid outlet side of the corresponding stop valve, a yoke mounted internally of the casing upon the said spindle, the latter being rotatable relatively to the said yoke, a separate rigid stem extending through each of the said guide bushes and connecting the movable member of the corresponding stop valve to the said yoke, and a handle mounted on the said spindle externally of the casing for rotating the said spindle in the bush so as to effect longitudinal displacement of the spindle, yoke and stem relatively to the said bush to open and close the stop valves.

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