March 31, 1964 P. DOMBRE 3,126,914

MIXING TAP

Filed May 25, 1961 4 Sheets-Sheet 1

Fig. 1.

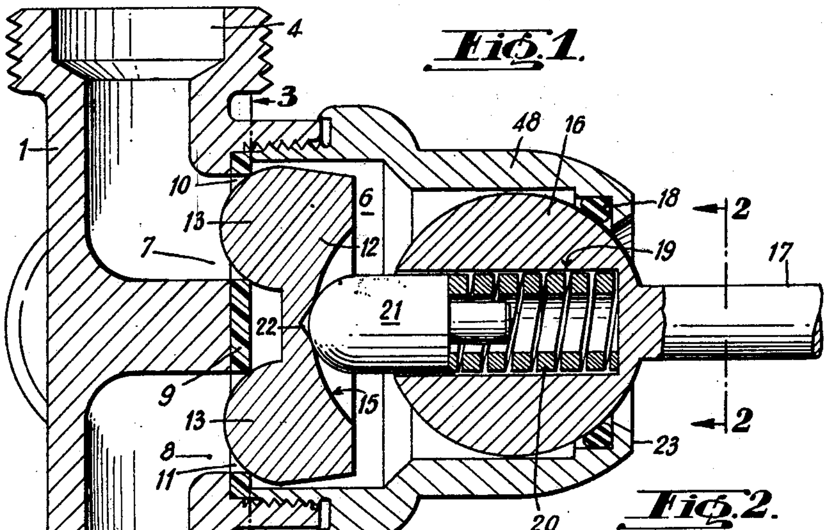


Fig. 2.

Fig. 4.

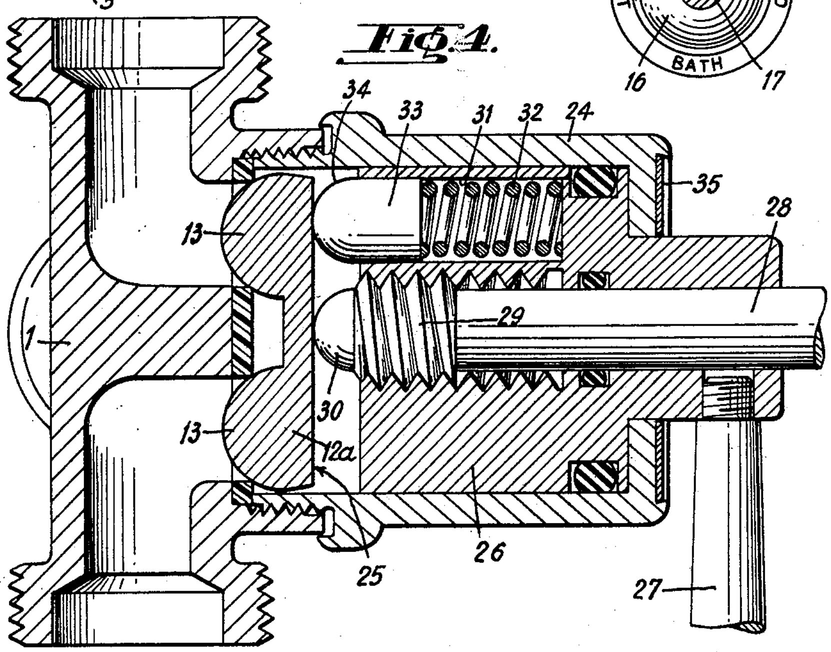


Fig. 3.

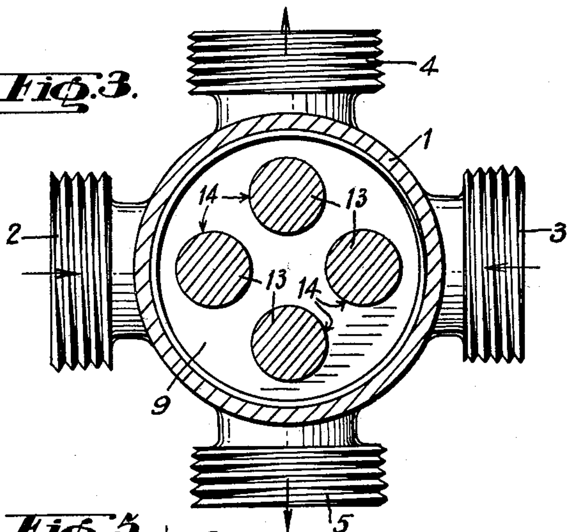


Fig. 5

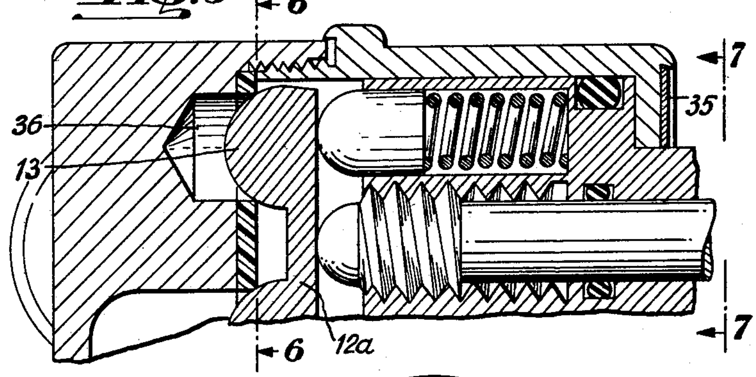
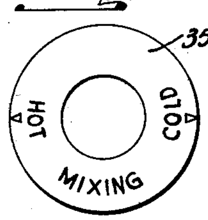


Fig. 7.



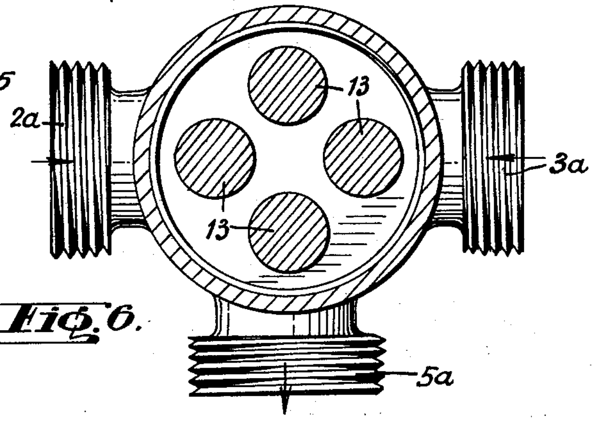


Fig. 6.

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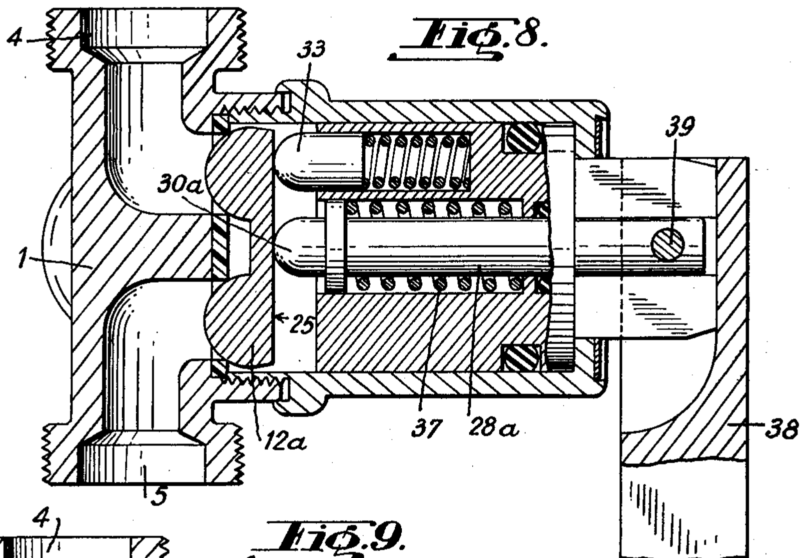


Fig. 8.

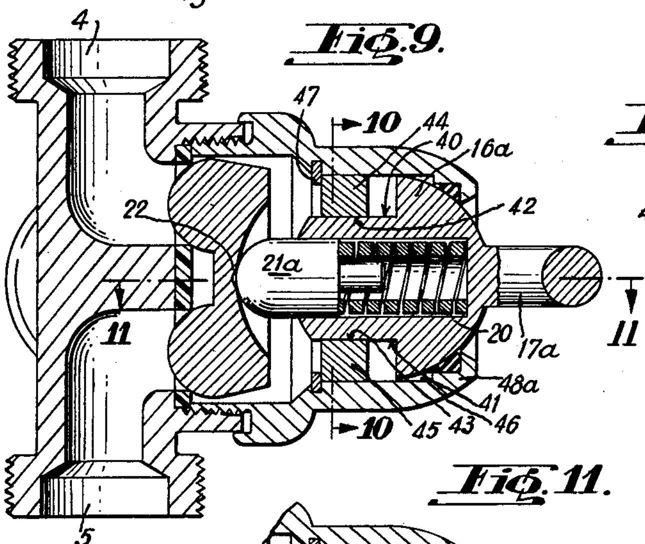


Fig. 9.

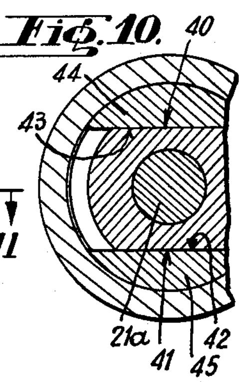


Fig. 10.

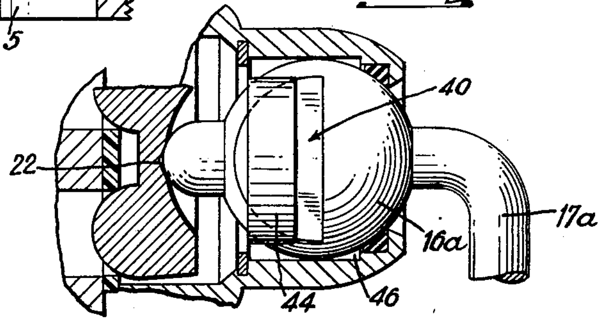


Fig. 11.

Fig. 12.

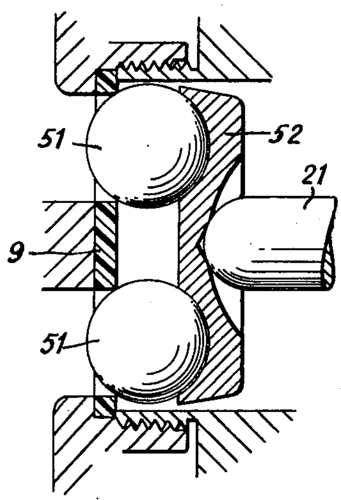


Fig. 13.

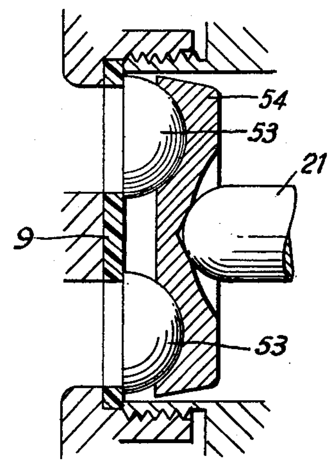
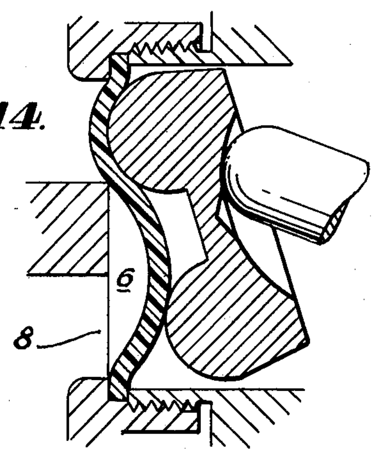


Fig. 14.



United States Patent Office

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3,126,914

MIXING TAP

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8 Claims. (Cl. 137—625.4)

The present invention relates to mixing taps and more particularly to a mixing tap having at least two inlets and at least one outlet and comprising movable valve flaps co-operating with stationary seats to control selectively at least the inlets, to independently regulate the mixture ratio and the output.

The tap according to the invention is characterized in that it comprises a flap support, carrying the various flaps and disposed freely in a mixing chamber, in that at least that part of these flaps co-operating with the seats is of spherical shape, the center of the sphere being stationary relative to this support, in that the seats are of such a shape that they each co-operate with the corresponding flap along a contact circle having a radius smaller than that of the sphere of the flap, in order that the flap support be free to rock to a certain extent, in all directions, about the center of the spherical part of any one of the flaps, without this flap moving away from its seat, and in that it comprises a control device co-operating with the said support in order to retain it at will in the fully closed position of all the flaps, and incline it as desired in direction and amount, according to the desired mixture ratio and output.

The accompanying drawing shows, by way of example, a few embodiments and variants of the mixing tap according to the invention.

FIG. 1 is a view in axial section of the first embodiment.

FIG. 2 is a view along 2—2 of FIG. 1, to a smaller scale, showing solely the front part of the tap according to FIG. 1.

FIG. 3 is a sectional view along 3—3 of FIG. 1.

FIG. 4 is a view similar to FIG. 1 of a second embodiment according to the invention.

FIG. 5 is a partial sectional view similar to FIG. 4 of a variant of the second embodiment.

FIG. 6 is a sectional view along 6—6 of FIG. 5.

FIG. 7 is a view along 7—7 of FIG. 5, to a smaller scale, showing solely the indicating plate on the front part of the mixing tap according to FIG. 5.

FIG. 8 is an axial section of a third embodiment according to the invention.

FIG. 9 is an axial section of a fourth embodiment according to the invention.

FIG. 10 is a sectional view along 10—10 of FIG. 9.

FIG. 11 is a sectional view along 11—11 of FIG. 9.

FIGS. 12 to 14 are sectional detail views of three variants of the first embodiment.

The mixing tap according to FIGS. 1, 2 and 3 comprises a body 1 having two inlets 2, 3 serving respectively for the admission of hot water and for the admission of cold water. This body also has two outlets 4, 5 leading respectively to the shower and to the bath. The inlets 2, 3 and the outlets 4, 5 communicate with a mixing chamber 6 of the body of the apparatus by four conduits two of which are visible at 7 and 8 (FIG. 1). In the chamber 6 is a plate 9 of plastic material bored with four holes (two of which are visible at 10, 11) coinciding with the four conduits. The holes 10, 11 correspond respectively with conduits 7 and 8. The right-hand edge in FIG. 1 of these four holes such as 10 and 11 constitutes a stationary seat designed to co-operate with a flap

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controlling the passage of the water through these holes.

The mixing tap comprises a flap support 12 having the general shape of a circular plate provided, on one of its faces, with four hemispherical protuberances 13, each constituting a flap designed to co-operate with one of the aforesaid seats. Each of the hemispherical flaps 13 co-operates with the corresponding seat along a contact circle 14 (FIG. 3) having a radius smaller than that of the flap. Thus, these flaps may only partly engage inside the holes 10, 11. On the other hand, the flap support 12 is disposed freely in the mixing chamber 6, and it is free, as will be seen hereafter, to rock to a certain extent, in all directions, about the center of the spherical part of any one of the flaps 13, without this flap moving away from its seat. In other words, one of the hemispherical flaps may rotate about its own center without interfering with the closing of the conduit which it controls.

The face of the plate 12 opposite to the flaps 13 is provided, in this example, with a hollow 15 in the shape of a spherical cap.

In another connection, the tap comprises a control device co-operating with the flap support 12. This device comprises a spherical element 16 integral with a hand-operated member 17, only a part of which is seen in FIG. 1. This spherical element 16 is mounted in the tap, more exactly in a cylindrical chamber of the cap 48 of this tap, so as to rotate in all directions about its own center. A sealing joint 18 is constantly held pressed, as will be seen later on, between element 16 and the cap 48, to prevent any escape of water through the central hole of the cap through which passes the operating member 17.

The spherical element 16 has a radial hole 19 in which is a compression spring 20 acting on a piston 21 engaged in this hole. The part of this piston 21 located outside the hole 19 terminates in the shape of a hemisphere and presses constantly against the surface 15, under the action of the spring 20. It is this same spring 20 which holds the spherical element 16 applied against the joint 18.

At the center of the concave surface 15 is provided a small conical notch 22 the function of which will be explained hereafter.

The cap 48 is provided on the edge of its opening 23 through which passes the operating member 17 with the indications which may be seen in FIG. 2.

The operation of this embodiment is the following:

Let us suppose, in order to facilitate the explanation, that the operating member 17 is a plain rectilinear arm co-axial with the hole 19. It is possible to incline the arm 17 in any direction. This arm is inclined towards the "bath" side in FIG. 2, by rotating the arm 17 about the center of the sphere 16, clockwise in FIG. 1. This rotation brings the piston 21 nearer to the upper flap 13 of FIG. 1, and further away from the lower flap. Under the effect of the pressure exerted by the spring 20, the piston 21 then causes the plate 12 to rock about the center of the upper flap 13, in such a way that the outlet 4 ("shower") remains closed but that, on the other hand, the outlet 5 ("bath") opens. Simultaneously, the two other flaps (those to the right and to the left in FIG. 3) rise equal amounts to permit entry, if the pressure of the hot water and of the cold water is the same, of equal quantities of hot water and of cold water, into the chamber 6 for discharge through outlet 5. If now, while keeping the member 17 inclined relative to its original position, it is moved towards the right in FIG. 2, that is to say it is brought nearer to "cold," the following occurs:

The right-hand and left-hand flaps in FIG. 3, which were before raised to the same extent, are now unequally raised. In fact, the piston 21 has moved to the left, and therefore has come nearer to the left-hand flap (FIG. 3). This left-hand flap (FIG. 3) is thus moved towards its corresponding seat, while the right-hand flap is moved further away from its seat. The result will therefore be that substantially the same total output at outlet 5 will be produced as in the first case but, the proportion of the mixture will have changed. There will be provided more cold water and less hot water. It is obvious that the angle which the arm 17 makes with the symmetry axis of the device corresponds to the output but on the other hand, the direction of this arm on the indicator ring 23 corresponds to the mixture. As long as this arm 17 remains facing the lower semi-circle of 23, the outlet 5 leading to the bath is open. If the arm 17 is brought into the upper semi-circle of 23, the lower flap 13 of FIG. 1 remains closed, while the upper flap 13 opens, thus allowing the water to issue in the outlet leading to the shower. The proportion of the mixture "hot" and "cold" is regulated according to the angular position of the arm 17 in FIG. 2.

The central conical hollow 22 is operative to fix properly the position of rest of the piston 21 at the center of the surface 15 when the member 17 is at rest. In this central position, the spring 20 maintains the four flaps 13 equally applied against their respective seats and the tap is completely closed.

In the embodiment according to FIG. 4, the body 1 of the tap is identical to that of the first embodiment, but the cap 24 is different. The flap support 12*a* is in the shape of a plate and differs from the flap support 12 of FIG. 1 in that its face opposed to that having the four flaps 13 is of flat shape as seen at 25.

The control device co-operating with the flap support 12*a* is also different from that of FIG. 1. Herein it comprises a cylindrical body 26 rotating freely in a cylindrical chamber inside the cap 24. In order to rotate body 26, there is provided a radial handle 27. In the axis of this body 26 is a rod 28 threaded at 29 and terminating at its left-hand end in FIG. 4 in a hemisphere 30 bearing against the surface 25. At its opposite end, not shown, the axial rod 28 is provided with a usual tap star-wheel.

The body 26 also has a cylindrical hole 31 parallel to the axis of the body 26 but off center. In hole 31 is disposed a compression spring 32 as well as a piston 33 with a hemispherical head 34. This piston is partially engaged in the hole 31 and projects out of this hole with the hemispherical head 34 which bears constantly against the surface 25. The cylindrical hole 31 is off center by an amount slightly exceeding the distance from the center of the spherical flaps 13 relative to the center of the plate 12*a*.

The operation of this device is the following:

When the central control rod 28 occupies the position shown (extreme left-hand position in FIG. 4), the four flaps are closed. If the rod 28 is rotated a slight extent about its axis, the end 30 is moved to the right in FIG. 4 of the drawing. Under the action of the spring 32 and of the piston 33, the plate 12*a* rocks to a certain extent about the center of the upper flap 13 in FIG. 4. The lower flap thus moves away from its seat to an extent which depends on the angle through which the rod 28 has been rotated. Simultaneously, the two other flaps are also raised from their seats but to an extent which depends for each of them on the position of the radial handle 27. If the indicator plate 35 bears the same indications as those at 23 (FIG. 2), as long as this handle 27 will be under the lower semi-circle, the water will issue through the outlet leading to the bath and the mixture ratio will depend on the position of this handle along this semi-circle. Similarly, if the handle faces the upper semi-circle, the water will go to the shower and the mixture ratio will depend on the particular position of the handle 27 on the upper semi-circle. As regards the output, it will in all cases depend solely on the axial position of the central rod 28.

Thus, in these two examples, it is possible to incline at will, in direction and in extent, the plate 12 or 12*a*, according to the desired mixture ratio and output. In the first example, there is a single operating member 17. In the second, there are two, 27 and 28.

In the variant according to FIGS. 5 to 7, the construction is similar to that of FIG. 4, with the mixing tap having a single outlet and not two. This outlet corresponds to the one indicated at 5 in FIG. 3 and is designated by 5*a*. The inlet of cold water is shown at 3*a* and the inlet of hot water at 2*a*. The plate 12*a* is identical to that of FIG. 4 and also the control device. However, there is no outlet corresponding to 4 and the upper flap 13 of FIG. 5 faces a plain blind hole 36 having no hydraulic function. In this case, the handle (FIG. 4) will only move effectively on the lower half of the indicator plate 35 shown in FIG. 7. The upper flap 13 will always remain applied against its seat and will never be raised.

The operation of this embodiment is obvious after what has been described relative to FIG. 4.

In the example according to FIG. 8 the construction is identical to that of FIG. 4 and reference will be made to describe how this third embodiment differs from the second.

The axial rod 28*a* corresponding to 28, instead of being threaded, is merely subjected to the action of a compression spring 37 urging the hemispherical end 30*a* of this rod to bear constantly against the flat surface 25 of the flap support 12*a* which is identical to the one of FIG. 4. The body 1 is identical to that in FIGS. 1 and 4.

The sliding rod 28*a* is hinged to a radial operating lever 38 by a pivot 39. It will be understood that the extent to which the handle 38 is rotated about the axis 39 allows regulating the output of the tap because it determines the position of the hemispherical end 30*a*, while the extent to which the handle 38 is rotated about the axis of the rod 28*a*, determines the angular position of the piston 33, and allows regulating the mixture ratio and choosing the outlet (4 or 5) from which the mixture will be discharged. The single handle 38 with two degrees of freedom, therefore replaces the two operating members 27, 28 each having one degree of freedom. The closure of the mixing tap takes place automatically as soon as the handle 38 is released under the action of the spring 37.

The embodiment according to FIGS. 9, 10 and 11 is similar to the one shown in FIGS. 1 to 3. It differs therefrom however in that it permits, as in the embodiment according to FIG. 8, of establishing the same mixture ratio and the same outlet after closure of the tap. In fact, in the case of FIG. 8, automatic closure takes place without affecting the angular position of the handle 38 about the axis of the rod 28*a*. As long as the handle remains in the same angular position, the same outlet will operate and the same mixture ratio will be produced when the tap is opened.

In the embodiment in FIGS. 9 and 10, the spherical element 16*a* is similar to 16 and is provided with two parallel flat portions 40, 41 which are constantly in contact with corresponding flat portions 42, 43 of two cylindrical mitres 44, 45 disposed in the cylindrical interior 46 of the tap cap 48*a*. An elastic ring 47 holds the mitres 44, 45 in the chamber 46. These mitres may rotate inside the chamber 46 about the axis of the latter, with the sphere 16*a*. The piston 21*a* operates exactly as the piston 21 of FIG. 1. However, the operating member 17*a* is bent, as is seen in FIG. 11.

The arrangement described permits selecting the outlet of the mixture at will (4 or 5) and of regulating independently one of the other the mixture ratio and the output as in the first example. Further, this latter embodiment permits maintaining the operating member 17*a* in the same plane after closure of the tap. In fact, when 17*a* is brought back to its closure position, it rotates in a plane parallel to the surfaces 40, 41. Consequently, as long as this plane remains fixed, that is to say as long as it is not rotated by acting on **17**a, the selected outlet remains the same and the mixture ratio remains fixed.

According to variants, the flaps could be, instead of hemispherical protuberances, spheres carried by the flap support and the center of which would remain fixed relative to the support. The seats of the flaps, instead of being formed by the edge of plain holes made in a plate, could be constituted by small fixed tores of plastic material.

It is obvious that the solution described in the variation according to FIG. 5 (blind hole **36**) is also applicable in the case of constructions such as FIG. 1, FIG. 8 or FIG. 9, if it is question of producing a tap with a single outlet instead of two.

In the variant shown in FIG. 12, the flaps are constituted by independent balls **51** replacing the hemispherical protuberances **13** of the flap support **12** of the first embodiment described (FIG. 1). These balls are carried by a flap support **52** on which acts the control piston **21**, as previously.

In the variant shown in FIG. 13, the flaps are constituted by independent half balls **53** which bear via their flat face against the plate **9** of plastic material. These half balls are carried by a flap support **54** on which acts the control piston **21**.

In the variant shown in FIG. 14, the plate **9** of plastic material is continuous, instead of being provided with holes such as **10** and **11** (FIG. 1). When one of the flaps leaves its seat (lower flap in FIG. 14), the pressure of the water moves the plate **9** so that the corresponding conduit **8** communicates with the chamber **6**, as in the first embodiment described.

It is obvious that any one of the three variations described above may apply to each of the various embodiments previously described.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A mixing tap having at least two fluid inlets and at least one fluid outlet and movable flaps cooperating with stationary seats to control selectively the flow of the fluid at least through the inlets, to independently regulate the mixture ratio of the fluids and the output thereof from the tap, said tap comprising a flap support supporting the flaps and disposed freely in a mixing chamber provided in the tap, said flaps including portions cooperating with the seats to control fluid flow therethrough said portions each being of spherical shape and having a center which is stationary relative to the support, the seats being of such shape that they each cooperate with the corresponding flap along a contact circle having a radius smaller than that of the spherical portion of the flap, to permit the flap support to be free to rock in all directions about the center of the spherical portion of any one of the flaps without the said one flap moving away from the corresponding seat, and control means operatively coupled to the said support to retain the same in a closed position wherein all of the flaps are seated in the corresponding seats thereof, said control means being operative to rock the support to regulate the positions of the flaps relative to the seats thereof to provide the desired mixture ratio and output of the fluids, said flap support having the general shape of a circular plate having opposite faces, the flaps projecting on one of the faces, the other face being in operative contact with the control means, said flaps being distributed in the form of a circle concentric with the plate, said control means comprising a spherical element mounted in the tap and adapted to rotate in all directions about its own center, the latter element being adapted for connection to a manually controlled member, the latter said spherical element being provided with a radial hole, a piston mounted slidably in the radial hole of the spherical element, and a compression spring also disposed in the radial hole and acting against the piston, the latter constituting a spring loaded abutment pressing constantly on the other face of the flap support, which latter face is of concave spherical shape.

2. A tap according to claim 1 wherein said spherical element is disposed in a cylindrical chamber of the tap and includes at least one flat surface constantly in contact with the flat side face of a cylindrical mitre-shaped element also disposed in this chamber so as to move therein in a circle with the spherical element.

3. A mixing tap having at least two fluid inlets and at least one fluid outlet and movable flaps cooperating with stationary seats to control selectively the flow of the fluid at least through the inlets, to independently regulate the mixture ratio of the fluids and the output thereof from the tap, said tap comprising a flap support supporting the flaps and disposed freely in a mixing chamber provided in the tap, said flaps including portions cooperating with the seats to control fluid flow therethrough, said portions each being of spherical shape and having a center which is stationary relative to the support, the seats being of such shape that they each cooperate with the corresponding flap along a contact circle having a radius smaller that that of the spherical portion of the flap, to permit the flap support to be free to rock in all directions about the center of the spherical portion of any one of the flaps without the said one flap moving away from the corresponding seat, and control means operatively coupled to the said support to retain the same in a closed position wherein all of the flaps are seated in the corresponding seats thereof, said control means being operative to rock the support to regulate the positions of the flaps relative to the seats thereof to provide the desired mixture ratio and output of the fluids, said flap support having the general shape of a circular plate having opposite faces, the flaps projecting on one of the faces, the other face being in operative contact with the control means, said control means comprising a cylindrical rotatable element coaxial with the plate carrying the flaps, two heads on said rotatable element, one of the heads being off center, and the other being centered and adjustable under the action of a hand-operated member adapted for being carried by the said cylindrical rotating element.

4. A mixing tap having at least two fluid inlets and at least one fluid outlet and movable flaps cooperating with stationary seats to control selectively the flow of the fluid at least through the inlets, to independently regulate the mixture ratio of the fluids and the output thereof from the tap, said tap comprising a flap support supporting the flaps and disposed freely in a mixing chamber provided in the tap, said flaps including portions cooperating with the seats to control fluid flow therethrough, said portions being of spherical shape, said spherical portions having a center which is stationary relative to the support, the seats being of such shape that they each cooperate with the corresponding flap along a contact circle having a radius smaller than that of the spherical portions of the flap, to permit free rocking of the flap support in all directions, about the center of spherical portion of any one of the flaps, with the said one flap remaining in contact with the corresponding seat, and control means operatively coupled to the said support to normally maintain the same in a closed position wherein all the flaps are seated in the corresponding seats and for actuating the support to regulate the position of the flaps relative to the seats thereof according to the desired mixture ratio and output.

5. A tap according to claim 4, wherein the flap support is in the shape of a circular plate having opposite faces, flaps projecting on one of the faces of the circular plate, the other face being in operative contact with the control means, said flaps being distributed in the form of a circle concentric with the plate.

6. A tap according to claim 4, wherein the flaps are hemispherical protuberances.

7. A tap according to claim 4, wherein the flaps are balls carried by the flap support.

8. A mixing tap having at least two fluid inlets and at

least one fluid outlet and movable flaps cooperating with stationary seats to control selectively the flow of the fluid through the inlets to independently regulate the mixture ratio of the fluids and the output thereof from the tap, said tap comprising a flap support supporting the flaps and disposed freely in a mixing chamber provided in the tap, said flaps including portions cooperating with the seats to control fluid flow therethrough, said flaps being of hemispherical shape and having flat faces facing and cooperating with the seats, said flaps being freely supported in the flap support to permit free rocking of the flap support in all directions about the center of the spherical portion of any of the flaps with the latter remaining in contact with the corresponding seat, and control means operatively coupled to the said support to normally maintain the same in a closed position wherein all the flaps are seated in the corresponding seats and for actuating the support to regulate the position of the flaps relative to the seats thereof according to the desired mixture ratio and output.

References Cited in the file of this patent

UNITED STATES PATENTS

1,517,956	Compton	Dec. 2, 1924
1,573,210	Whidden	Feb. 16, 1926
2,171,992	Rantine	Sept. 5, 1939
2,274,917	Carlson	Mar. 3, 1942
2,519,448	Fairchild	Aug. 22, 1950
2,646,821	Johansson	July 28, 1953
2,794,609	Perry	June 4, 1957