July 2, 1957 E. P. AGHNIDES 2,797,906

CONVERTIBLE AERATORS

Filed Nov. 23, 1953

FIG. 1.

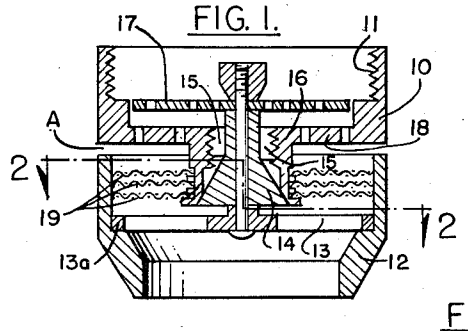


FIG. 3.

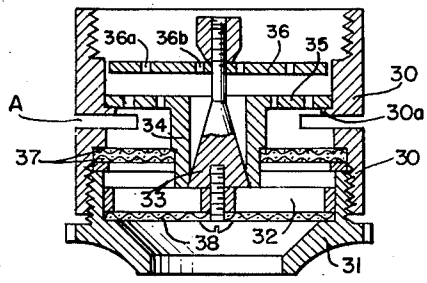


FIG. 9.

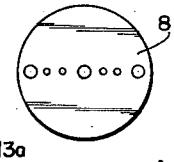


FIG. 2.

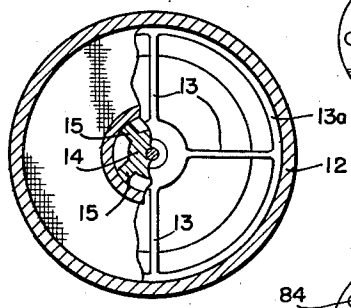


FIG. 4.

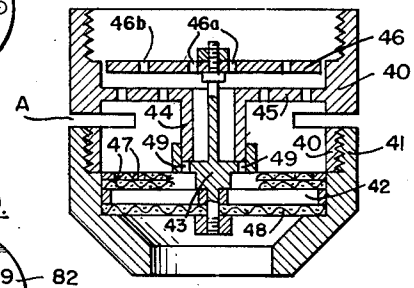


FIG. 10.

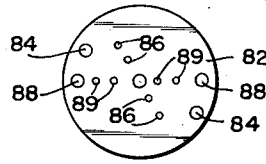


FIG. 5.

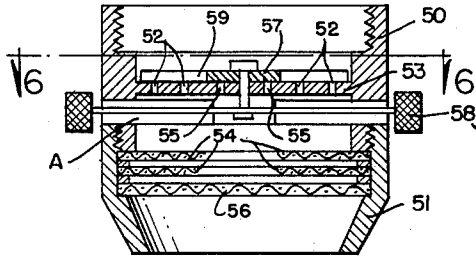


FIG. 6.

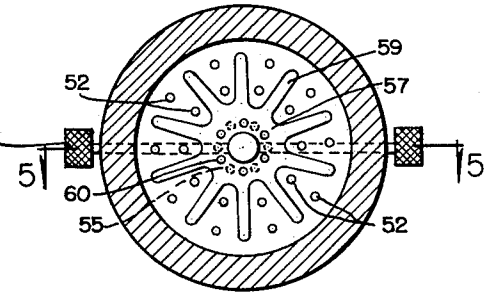
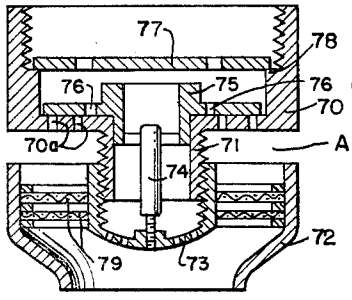


FIG. 7.



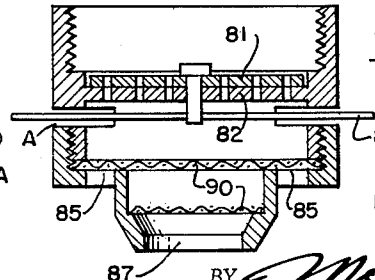


FIG. 8.

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CONVERTIBLE AERATORS

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Application November 23, 1953, Serial No. 393,587

6 Claims. (Cl. 261—76)

This invention relates to aerators and more particularly to aerators for water faucets or other outlets.

In my prior U. S. Patent 2,210,846, I illustrated a device for aerating water. The present invention is an improvement upon the basic principles of that patent and consists in certain modifications of the device whereby the device may be selectively operated to produce either an aerated stream or a spray.

The advantage of the present invention will become immediately apparent when it is realized that while the coherent bubbly aerated stream of my said prior patent has great advantages in many situations, there are other situations in which a spray has greater advantages. The present invention enables one to select either stream.

It is, therefore, the primary object of this invention to provide a device for selectively producing an aerated coherent stream or a spray.

It is a further object of the invention to provide a device which produces either an aerated stream or a spray, or a stream that has some characteristics of both of the streams.

It is a still further object of this invention to provide a device for selectively producing an aerated coherent bubbly stream or a rain-like mist or spray.

In carrying out the foregoing objects, I provide an aerator with two paths that the water may take while flowing through the device. Means are provided to switch the water from one path to the other. When it flows in one path there are means in its path to produce a spray, and when it flows through the other path the means in that path of the water produces an aerated stream.

This application is a continuation-in-part of my prior copending applications S. N. 135,645, filed December 29, 1949, entitled Fluid Mixing Device, and S. N. 319,710, filed November 10, 1952, now Patent No. 2,670,942, issued March 2, 1954, entitled Aerator.

In the drawings:

Figure 1 is a cross-sectional view of one form of the invention.

Figure 2 is a sectional view taken along line 2—2 of Figure 1.

Figure 3 is a cross-sectional view of another form of the invention.

Figure 4 is a cross-sectional view of still another form of the invention.

Figure 5 is a cross-sectional view of still another form of the invention.

Figure 6 is a sectional view taken along line 6—6 of Figure 5.

Figure 7 is a cross-sectional view of still another form of the invention.

Figure 8 is a cross-sectional view of still another form of the invention.

Figure 9 is a plan view of the lower perforated disc of Figure 8.

Figure 10 is a plan view of the upper perforated disc of Figure 8.

Referring to Figure 1 the upper cap-shaped element **10** has internal threads **11** for attaching it to a faucet. A lower cap-shaped element **12** is connected by rods or bars **13** to the central conical body **14**. The rods or bars **13** are part of and integral with a press-fit ring **13***a* which is carried by casing **12**. The body **14** has vertical webs **15** the outer edges of which are threaded and cooperate with the threads on the inside of boss **16** which is of course integral with the upper cap **10**. An upper perforated disc **17** is carried as part of the same unit as conical body **14**. A ledge **18** on cap **10** has perforations which are out of line with those in disc **17** so that when the disc **17** moves downward until it is flat upon the surface of ledge **18** the holes in **17** and **18** are out of line and a very small volume of water, if any, flows through said holes.

The operation of the device of Figure 1 is as follows. When the lower cap **12** is rotated to the position shown, the water passes through the perforations in disc **17**, then through the perforations in ledge **18** and then is directed upon the screens **19** in the form of high velocity streamlets. The result is a coherent jet containing numerous air bubbles all as described in my prior United States Patents 2,210,846 and 2,316,832. In this position water does not flow through the hole in boss **16** since the conical member **14** engages the lower end of boss **16**, as shown in Figure 1, and blocks all flow of water through the hole in the boss **16**. However, if the lower cap **12** is rotated until the perforated disc **17** is lying directly on ledge **18**, very little, if any, water passes through the perforations in **17** and **18** but flows through the opening in boss **16**. The lower part of the cone **14** causes the water to fan out in the form of a diverging spray as it leaves the lower end of the device.

In the modified form of Figure 3 the outer cap **30** has internal threads for connection to a water faucet. The lower end of cap **30** carries the threaded outlet **31** which by means of spokes **32** (which are similar to rods or bars **13** of Figure 2) is connected to the conical body **33** which closes the outlet of cylinder **34** in the position shown. Cylinder **34** is integral with and is carried by disc **35** which rests on a ledge **30***a* carried by cap **30**. Disc **35** is press-fitted into the casing **30**. An upper perforated disc **36** has holes **36***a* which are staggered as respects the holes in disc **35** so that when disc **36** is lowered and is resting on disc **35** the holes in disc **35** are all covered and little, if any, water flows therethrough. On the other hand holes **36***b* are located above the opening in cylinder **34** and when disc **36** is lowered the cone **33** is likewise lowered hence water may flow out the lower end of cylinder **34**.

When the device of Figure 3 is in the position shown the lower end of cylinder **34** is closed and the water passes through orifices **36***a* and **36***b*, perforations in disc **35**, and strikes the mixing screens **37**. These screens finely break up the water and mix it with air to form a coherent jet of the type mentioned in my said prior Patents 2,210,846 and 2,316,832. The screen **38** aids in this mixing function. However, when the cap **31** is rotated to lower disc **36** onto disc **35** water flows through the cylindrical opening in member **34** and strikes the lower part of conical member **33**. Hence, the water is slightly deflected and it thereafter strikes screen **38** which is of such mesh as compared to the volume and velocity of the water striking it that a mist-like spray is produced at the outlet.

Referring now to Figure 4 the upper cap **40** has internal threads for attaching it to a faucet. The lower cap **41** is threaded onto the outside of cap **40**. The lower cap is connected by means of spokes **42** to a central cup **43** which when in its uppermost position (as shown) blocks the outlet of cylindrical member **44** which is integral with disc **45** which is in turn integral

with upper cap **40**. The upper disc **46** has perforations **46***a* located above the opening in cylinder **44**, and also has perforations **46***b* which are so staggered with respect to the perforations in disc **45** that when the disc **46** is lowered enough to rest on disc **45** no water will flow through the perforations **46***b* or those in disc **45**. When the cap **41** is lowered, the water flows through cylinder **44** and out through perforations **49** in cup **43**.

When the lower cap **41** of Figure 4 is rotated to the position shown, water enters perforations **46***a* and **46***b*, thence passes through the perforations in disc **45** and thereafter impinges upon screens **47**. Screens **47** and **48** finely break up the water and mix it with air to form a coherent jet of aerated water as described in my prior U. S. Patent 2,210,846 and 2,312,832. When, however, the lower cap **41** is lowered so much that disc **46** rests on disc **45**, the water passes through perforations **46***a*, cylinder **44**, and perforations **49**. Since water from perforations **49** does not strike screens **47** the aeration action mentioned in my prior patents will not occur. Instead the outlet stream will be a rain-like spray, due to the water streamlets from orifices **49** striking screen **48**.

Figure 5 illustrates another form of invention having an upper cap **50** to which lower cap **51** is threaded. There are two paths that the water may take through the device as follows: (1) it may go through perforations **52** in disc **53** onto screens **54** where it will be mixed with air to form a bubbly stream, or (2) it may pass through perforations **55** in disc **53** in which event it will strike only screen **56** which is of such mesh as to convert the stream striking it into a rain-like spray. To switch between these two paths is a valve element **57** which may be rotated by handle **58**. The element **57** has blades **59** which cover perforations **52** in one position of rotation and open them in another. When blades **59** cover perforations **52**, the perforations **60** in element **57** are in alignment with perforations **55** whereby streamlets are directed from perforations **55** directly upon screen **56**. When blades **59** uncover perforations **52** the element **57** covers perforations **55** and hence the only streamlets are those which pass from perforations **52** to screens **54**. There is an intermediate position in which some water may flow through perforations **52** and **55** to give a hybrid having some characteristics of a spray and some of an aerated stream.

Figure 7 illustrates a cap **70** having internal threads adapted for connection to a faucet. Cap **70** has a cylindrical hollow boss **71** having external threads. The lower cap **72** carries central cup **73** which has perforations in the bottom thereof and internal threads which mesh with the threads on the outside of boss **71**. Cup **73** carries post **74** which in turn carries valve element **75**. The latter is open at its top and carries a flange having perforations **76** therein. An upper perforated polyethylene disc **77** rests on ledge **78** and is held firmly against that ledge by the faucet, when the cap **70** is screwed onto the faucet. The perforations in disc **77** are out of line with the main central opening in valve element **75** so that when the valve element **75** is moved upward its central opening will be closed by disc **77**. In that case water will pass through the perforations in disc **77**, thence through perforations **76**, thence through perforations **70***a* in cap **70**, and will impinge upon screens **79** to produce a bubbly coherent screen. When cap **72** is rotated until the central opening in valve element **75** is open and the perforations **76** are closed by the cap **70**, the water passing through the perforations in disc **77** will enter the central opening in valve element **75** and will pass out of the perforations in the bottom of cup **73**. Since the bottom of this cup is somewhat curved the spray emanating therefrom will be in the form of diverging streamlets.

In the device of Figure 8 the perforated discs **81** and **82** have rows of holes respectively as shown in Figures

9 and **10**. The upstream perforated disc **81** can be rotated by means of handle **83** to three different positions; first the outer or peripheral row of holes **84** only open. This gives a spray (like an ordinary shower) if a screen **85** is not placed in its path, and a diverging stream of droplets if a screen **85** is placed in its path. In the second position the central holes **86** only would be open. The water from these holes strikes the aerating screens **90**. This gives a coherent bubbly jet type of discharge from the orifice **87**. In the third position, holes **88** in the periphery and holes **89** in the center would all be open so as to obtain two different kinds of streams simultaneously. Air may enter through ducts A. It is understood that Figures 9 and 10 show only one cooperating group of holes and that other similar groups may be added.

It is noted that in all forms of the invention there is an air inlet A corresponding to air inlet 38 of my U. S. Patent 2,210,846 and air inlet 25 of my U. S. Patent 2,316,832. Also when the device is used to produce aerated water in the form of a coherent jet having small bubbles disseminated throughout the jet, each form of my device has an upstream diaphragm corresponding to diaphragm 36 of my U. S. Patent 2,210,846 and diaphragms 23 and 24 of my U. S. Patent 2,316,832. In my present disclosure these diaphragms are designated by reference numbers **17, 18, 35, 36, 45, 46, 53, 77, 70***a*, and **81**. The size and number of holes in these diaphragms are so related to the number of and mesh of the screens that the coherent jet of said earlier Patents 2,210,846 and 2,316,832 is produced. It follows that each form of my present disclosure has screens complementary to screens 40 and 42 of my U. S. Patent 2,210,846 and screens 26, 27 and 28 of my U. S. Patent 2,316,832. The screens in the present case which are complementary to those of the prior patents are designated by reference numbers **19, 37—8, 47—8, 54—6, 79** and **90**.

In all forms of the invention there is one position in which a pure coherent aerated bubbly jet is produced. There is another position in which a pure spray is produced. However, in each case there is an intermediate position in which the water is divided between its two paths whereby the output is a hybrid having some characteristics of an aerated stream and some of a spray. The term "spray" used herein above and in the claims includes not only sprays of the type produced by the ordinary shower head but also rain-type sprays, as well as all other sprays. In each form of the invention a rain-type of spray may be produced if a screen of proper mesh is placed in the path of the streamlets constituting spray. Those skilled in the art are aware of the way to determine the proper screen mesh to produce a rain-like spray.

I claim to have invented:

1. A device for producing either an aerated stream of water or a spray comprising a conduit adapted to be attached to the end of a faucet and defining a chamber having substantially the same lateral dimensions as those of the faucet, relatively vertically movable first and second elements both interposed across said chamber and the second element being a dual path foraminous diaphragm downstream of the first, the second element having means located near the axis of the chamber and dividing any water entering the means into a spray and discharging the water from the device as a spray, the second element also having apertures located farther from said axis than the first-named means and forming any water entering them into jet-like high velocity streamlets, said conduit having air inlet openings for feeding atmospheric air into the space through which said streamlets pass, mixing means located in the path of said streamlets to break up the water and mix it with air to form a coherent bubbly jet, said first and second elements being constructed and arranged so that in one

relative position thereof the water entering the conduit is primarily directed through said first-named means and in another relative position the water is primarily directed through said apertures, and means for moving at least one of said elements to place the elements in either of said relative positions or in an intermediate position wherein water flows through both said first-named means and said apertures.

2. A device for producing either an aerated jet or a spray comprising a cylindrical element having an upstream end adapted to be inserted over the outside of a faucet and having an open mixing chamber whose outer diameter is substantially equal to the outside diameter of the faucet, dual path foraminous diaphragm means located in the cylindrical element to define two separate concentric paths through which water from the faucet may flow through the element, said means having jet producing orifices in the outer of the two paths to form high velocity streamlets, said element defining air inlet holes leading to said outer path, mixing means located below the air inlet holes and in the path of said streamlets for finely dividing the water and mixing it with air to form a coherent bubbly jet, said first-named means forming the water passing through the central path into a spray and including means for switching the water from the faucet into either of said two paths or into both of said paths simultaneously.

3. A device for producing either an aerated bubbly stream or a spray, a cylindrical member having an upstream end arranged to be connected to a faucet, a ledge within said body member, a foraminous diaphragm resting on said ledge, the bottom of said cylindrical member having a plurality of apertures therein and a relatively large central cylindrical opening defined by a depending cylindrical wall threaded on one side thereof, an inner diaphragm within said cylindrical member between said first named diaphragm and said bottom and provided with a central upstanding valving boss around said central cylindrical opening, said boss being arranged to bear against said diaphragm to block fluid flow through said central cylindrical opening and further arranged to be

lowered and open said central cylindrical opening to fluid flow, said inner diaphragm having a series of holes out of alignment with the holes in said bottom whereby when said inner diaphragm is raised flow occurs through said inner diaphragm and said bottom and when said inner diaphragm is lowered flow occurs centrally through said central cylindrical opening, a lower body member threaded to said depending cylindrical wall and having means acting on said inner diaphragm to move it from one fluid control position to another, said lower body member having central spray producing means cooperating with said central cylindrical opening and screen members cooperating with said bottom to produce an aerated bubbly stream, and means to admit air to the assembly above said screen members.

4. The combination set forth in claim 3, said means acting on said inner diaphragm comprising a central upstanding element connecting said cylindrical member and said lower body member.

5. The combination set forth in claim 4, said central spray producing means comprising a foraminous curved member surrounded by said screen members and separated therefrom by an inner circular wall forming part of said lower body member.

6. The combination set forth in claim 5, said central upstanding element being mounted in the center of said central spray producing means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,210,846	Aghnides	Aug. 6, 1940
2,316,832	Aghnides	Apr. 20, 1943
2,333,767	Davis	Nov. 9, 1943
2,359,455	Williamson	Oct. 3, 1944
2,388,508	Timpson	Nov. 6, 1945
2,395,227	Lewis et al.	Feb. 19, 1946
2,447,123	Jones	Aug. 17, 1948
2,487,023	Lehmann	Nov. 1, 1949
2,603,469	Bedford et al.	July 15, 1952