July 28, 1959 H. SHAMES ET AL 2,896,863

NON-CLOGGING AERATOR FOR FAUCETS

Filed Sept. 10, 1956

FIG. 1

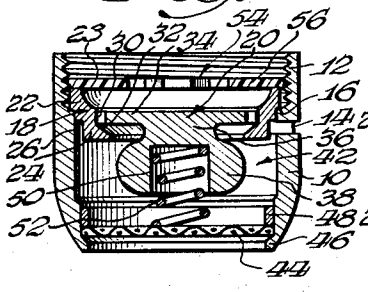


FIG. 2

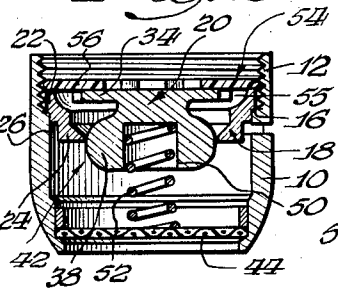


FIG. 3

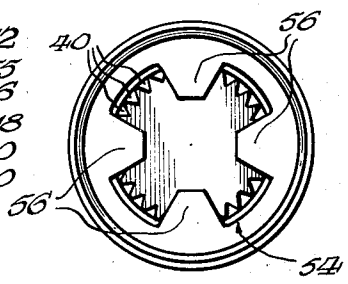


FIG. 4

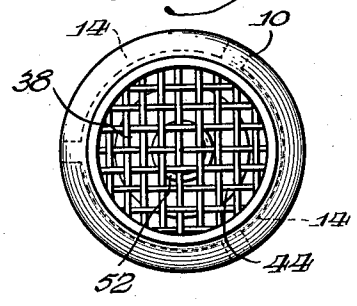


FIG. 5

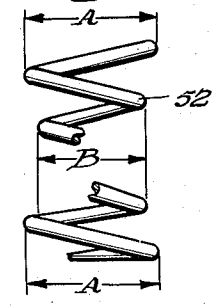


FIG. 6

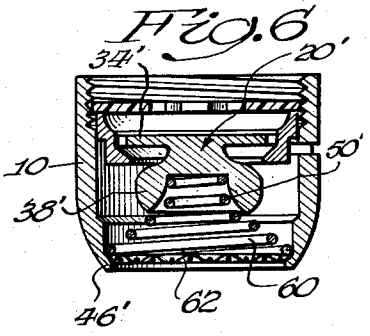


FIG. 7

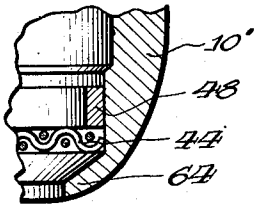


FIG. 8

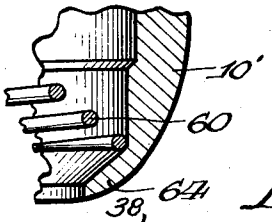


FIG. 9

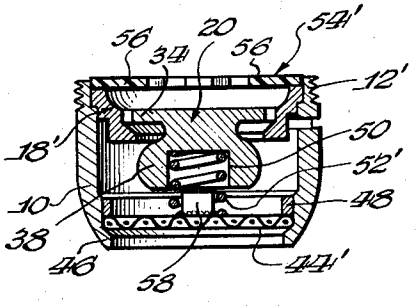
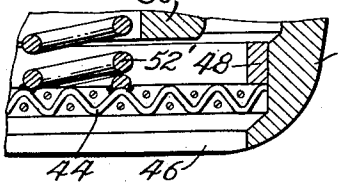


FIG. 9A



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2,896,863

NON-CLOGGING AERATOR FOR FAUCETS

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Application September 10, 1956, Serial No. 608,754

23 Claims. (Cl. 239—431)

This invention relates to an aerator for faucets or the like and more particularly to a non-clogging faucet aerator.

Faucet aerators for use in kitchens and bathrooms have within the past ten years been of increasing popularity. However, all aerators that have been sold in the United States in the past ten years, which is estimated to number more than 30 million units, have had the undesirable feature that the jet forming means thereof clog up with debris during use thereof. The water that passes through the aerator may have suspended therein fine particles of sand, or grit, and these particles deposit on the jet forming means adjacent the jet-forming apartures therein, and little by little the particles accumulate and gradually shut down the effective area of the jet forming means and thus cut down the flow of water delivered from the aerator.

Now the afore-described clogging of aerators occurs in all aerators, regardless of whether the aerators are the type which use perforated plate members, or screens, or mating members to define the water jet forming means, and regardless of whether the break-up means against which the water jets are directed are screen-type elements, or solid, ball or plug, type elements.

It is noted that the screen-type element aerator has the further deficiency over the ball or plug type aerator in that even the screens often being to clog up with debris that passes through the jet forming means. However, regardless of the type of aerator, the jet forming means presents elements which tend to clog up with use.

It is noted that our issued Patent No. 2,707,624 discloses and claims an invention which greatly alleviates the problem of clogging of the jet forming means by providing that the upstream end of the jet forming means may become partially clogged with debris without diminishing the amount of water which is passed by the water metering portion of the jet forming means. However, with time and use, even in the device of our aforesaid patent the deposit of debris eventually becomes sufficient to affect the operation of the device. Thus, while the solution to the problem disclosed and claimed in said Patent No. 2,707,624 is a substantial and novel advance in the art of aerating devices, nevertheless, the ultimate desired solution of a non-clogging faucet aerator has not been commercially produced heretofore.

Toward the end of developing a commercially acceptable non-clogging faucet aerator, we have devised a non-clogging aerator that is useful with all types of liquids to be aerated, including water or machine tool coolants, which non-clogging aerator is described and claimed in our co-pending application identified as Serial No. 427,925, filed May 6, 1954. In the respect that there is some common subject matter disclosed herein and in said co-pending application, the instant application is a continuation-in-part of said co-pending application, Serial No. 427,925, filed May 6, 1954.

The object of this invention is to provide a new and improved aerator which is primarily for use on domestic

faucets and which avoids the problems of clogging hereinabove set forth.

Another object of this invention is to provide a new and improved non-clogging aerator.

A further object of this invention is to provide a non-clogging aerator which is effective in use and is characterized by its simplicity and inexpensiveness of construction and by its superiority of performance.

Further objects and advantages of this invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

A preferred embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a vertical cross-section view of a female-threaded aerator embodying the elements of this invention and showing the parts when in aerating position;

Figure 2 is a view similar to Figure 1 and showing the parts displaced away from the aerating position, and in the cleaning or flushing position;

Figure 3 is a top plan view of the device of Figures 1 and 2 and particularly shows the sealing washer used;

Figure 4 is a bottom plan view of the aerator of Figures 1 and 2 and shows the wide mesh screen that is used;

Figure 5 is an enlarged fragmentary view showing a detail of construction of the spring used in the aerator construction of Figures 1–4;

Figure 6 shows a modified form of non-clogging aerator utilizing a conical spring;

Figure 7 is an enlarged fragmentary view of the discharge end of an aerator of the type shown in Figures 1 and 2 and including a modification of the aerator housing;

Figure 8 is an enlarged fragmentary view of the discharge end of a modified form of aerator which includes, in combination, certain of the elements shown in Figures 6 and 7;

Figure 9 is a vertical cross-section view similar to Figure 1 showing a male threaded aerator, and provided with a modified form of construction for the spring for retaining the spring in proper assembled condition; and

Figure 9*a* is an enlarged fragmentary view which illustrates a modified form of connection of the spring to the screen-type support.

Referring now to the drawings, there is shown in Figure 1 a female threaded aerator adapted for connection to a kitchen or bathroom faucet, and comprising a generally cylindrical casing **10** having an upper inlet end and a lower discharge end. The inner wall of the cylindrical casing **10** is threaded at **12**, thus providing the female threads for connection to a source of liquid under pressure. Below the threads **12**, the casing **10** is slitted or apertured, as at **14**, to provide air inlets through which air may be ingested, or sucked in, for mixing, within the casing **10**, with liquid which is passing through the aerator. While any number of apertures **14** may be provided, in the instant disclosure three such apertures are shown. The casing is also formed to define an annular shoulder **16** adjacent the lower end of the threads **12**.

Within the casing **10** there is positioned an annular guide ring, generally indicated at **18**, and a plug member, generally indicated at **20**, disposed centrally of said guide ring. The annular guide ring is shaped to define an outwardly extending flange **22** which is adapted to seat on shoulder **16** of the casing **10**. A portion **24** of the annular guide ring below the flange **22** is spaced inwardly from the inner wall of the casing **10** to define an annular recess, or space, **26** therebetween.

The inner surface of the guide ring **18** is shaped to define an upwardly facing concave surface **28**, a cylin-

drical surface portion 30 located downstream of the concave portion 28 and also disposed radially inwardly of said concave surface 28, and a flow-directing conical surface portion 32 located downstream of the cylindrical surface portion and being sloped to converge in a direction downstream. The greatest diameter of the conical surface portion 32 is, preferably, no greater than the diameter of the cylindrical surface portion 30.

The plug member 20 is shaped to define a cylindrical liquid dividing gear-disc portion 34, a narrowed neck portion 36 extending downstream of gear-disc 34, and a generally ball-shaped splash member 38 located downstream of the neck portion 36. The maximum diameter of the cylindrical disc portion 34 is substantially the same, but just slightly less than the diameter of the cylindrical surface portion 30 in the guide ring 18. The maximum dimension of the splash member 38 is less than the minimum dimension of guide ring 18. This arrangement is such that the plug member 20 fits into guide ring 18 as shown in Figure 1 and disc portion 34 cooperates with the cylindrical surface portion 30 to define therebetween a plurality of axially extending flow passageways which are indicated at 40 and best seen in Figure 3. The peripheral edge of the disc portion 34 is toothed or formed like a gear, as best shown in Figure 3. It will be understood that no specific tooth spacing is required.

Now the foregoing arrangement is such that the splash member 38 fits through the ring 18 and the disc 34 engages the conical surface portion 32 of the guide ring 18, thus providing means for supporting the plug member 20 within the guide ring 18. The arrangement of the conical surface 32 in combination with the edges of the gear disc 34 is such that the conical surface portion 32 receives the streams of liquid which pass through the flow passageways 40 and turns and directs said streams of liquid for movement downstream in a conically converging manner along the conical surface 32. The downstream edge of the gear disc 34 cooperates with the conical surface 32 to provide the actual stream metering means for the inwardly directed streams of water. Thus, portions of the vertical flow passageways 40 may become partially clogged with debris without affecting the flow passing characteristics of the stream metering means.

When the parts are positioned as in Figure 1, the splash member 38 is positioned to have the conically directed streams of liquid directed thereagainst. The liquid which strikes the splash member 38 has substantial velocity, and the striking of the liquid thereagainst effects a breakup of the liquid within the mixing chamber 42 defined within the barrel 10. At the same time, air is sucked in through the apertures 14 and is mixed with the broken up liquid within mixing chamber 42, and the mixture of water and air, the aerated water, then passes downwardly through the discharge end of the casing 10.

A screen-type support member 44 is located in the casing 10 downstream of the splash member 38 and extends across the open end of the casing. The support 44 is retained in position by being seated against an inwardly turned lip 46 formed at the lower terminal end of the casing 10. Preferably, a retainer ring 48 is press fit into the barrel to clamp the support 44 against the retaining lip 46.

The under side of the splash member 38 is recessed, or bored, at 50, providing a centrally disposed cylindrical recess, positioned within the recess 50 is an elongated coil spring 52, one end of which engages the plug member 20 at the innermost end of recess 50, and the other end of which seats against the screen-type support member 44. The spring 52 is of such a length and spring constant that when there is no water flowing through the aerator then the spring 52 operates to lift the plug member 20 upwardly toward the position shown in Figure 2. Thus, the spring 52 normally exerts a bias on the plug member 20 so as to urge the plug member 20 upstream relative to the annular ring 18 and against the force exerted on the plug member by the liquid passing through the aerator. It will be seen that when the plug member is moved to the position shown in Figure 2, then all the cooperating, or mating, portions of the plug member 20 and of the ring member 18, which cooperate to define the liquid flow passageways when the parts are in mating condition as shown in Figure 1, are then exposed, as seen in Figure 2 to the flushing or cleaning action of the water passing through the aerator.

The aerator is further provided with an anti-leak washer 54 the shape of which is more fully seen in Figure 3. This washer 54 is preferably formed of a plastic, such as polyethylene, which has rubberlike anti-leak properties and which also has some degree of rigidity. Preferably the outer diameter of the washer 54 is just slightly greater than the inward extent of the teeth 12, so that a slight press fit is required to force the washer 54 through the open end of the barrel, or casing, 10 into seating engagement on the upper rim of the annular guide ring 18. The washer 54 is also provided with a plurality of inwardly extending fingers, or tongues, 56 which are of a length to extend radially across the path of upward movement of the plug member 20. This arrangement is such that the tongues 56 engage the upper surface of the plug member 20 so as to limit upward movement of the plug member 20 relative to the guide ring 18. The property of rigidity of the material of washer 54 assists in restraining upward movement of plug member 20. The press fit of the washer 54 into the casing 10 provides that the washer 54 does not become unseated by the bias of the spring 52 exerted thereagainst through the plug member 20.

It will be seen that when the plug member 20 is in the fully raised position of Figure 2, there then is a wide open space 55 between the teeth on the disc portion 34 and the concave surface 28 of the guide ring. This insures that none of the dirt or debris which becomes accumulated against the various parts will remain lodged on any of the surfaces of either the plug member 20 or the guide ring 18.

The screen type support member 44 is principally for the purpose of providing a support for the lower end of coil spring 52, although there is some anti-splash effect achieved by the screen member 44 on the aerated liquid passing therethrough. Heretofore, the screens used at the outlet end of faucet aerators have been of a mesh in the range of 24 to 40 per inch. In the instant invention, it is important that the screen mesh be in the range of substantially 10 to 16 per inch. This provides for sufficiently large apertures in the screen support 44 so that none of the debris which passes through the jet forming means will become lodged on the screen support 44.

Because of the very small size of parts herein involved, it is important that some way be provided to maintain the spring 52 in its vertically erect position relative to the parts against which it must abut. Toward that end, a number of novel arrangements are herein suggested for assembly of the parts. In Figure 5 it will be seen that the end coils of the coil spring 52 are made slightly larger than the intermediate coils of the spring. For example, the dimension "A" may be equal to "B"+.020 inch. This permits selecting the size of recess 50 and the dimensions of spring 52 so that the enlarged end coil of spring 52 must be press fit into the recess 50, while the intermediate coils of the spring 52 remain free and resiliently effective. The press fit of the single coil is sufficient to retain the spring 52 in properly aligned relation with the plug member 20. After sub-assembly of the spring and the plug member 20, the sub-assembly may be handled as a unit and dropped into position in a casing which has the guide ring 18 assembled therein.

An alternate way of maintaining the spring in upright condition as shown in Figure 9 wherein the support screen 44' has mounted centrally thereon an upright pin 58 over which the coil spring 52' may be fitted. The pin 58 may be welded or brazed to support 44'. If desired, the end coil of spring 52' may be of smaller dimension than the intermediate coils so that said end coil may be press fit onto the pin 58. Still another alternate construction as shown in Figure 9*a* permits elimination of pin 58 and affords adequate connection of a coil spring to a support screen by means of a drop or two of solder interconnecting said parts.

Other variations between the size of cooperating parts, including the spring, will be readily evident as falling within the scope of this invention, such as providing recessed portions of different dimension for cooperating with springs of uniform coil size. In any event, it will be appreciated that one of the important features herein is the sub-assembly of the plug lifting spring with a firm connection established between said spring and only one of the two members against which the spring is to abut. This arrangement provides for simplicity of final assembly.

In Figure 6, there is shown an alternate construction wherein there is utilized a conical coil spring 60 as distinguished from the generally cylindrical coil spring 52 shown in Figures 1, 5 and 9. In Figure 6, the conical coil spring is arranged so that the uppermost and smallest coil enters a recess 50' formed in the underside of plug member 20' and engages plug 20', and the lowermost and widest diameter coil of spring 60 may be supported by an inwardly extending lip 46' formed at the discharge end of the casing. The conical spring 60 may be press fit either into the casing 10 or into the recess 50' in plug 20' so that the spring may be sub-assembled with one of said two parts comprising the plug member and the casing. Again, a screen 62 may be provided at the discharge end of the casing 10, if desired. As shown, the screen 62 is located between the lowermost coil of spring 60 and lip 46'. The latter arrangement avoids the necessity of using retainer ring 48 shown in Figure 1. It is to be noted that screen 62 is not essential for the aerator of Figure 6. The arrangement of coils of conical spring 60, located outwardly of plug 20' and extending to the inner wall of casing 10, in a way provides a certain amount of anti-splash feature. The additional anti-splash feature of spring 62 is merely cumulative. However, the provision of a conical spring for assisting in achieving anti-splash characteristics is novel in this type of structure.

In the modified form shown in Figure 7, the lower terminal end of the casing 10' is extended as shown at 64 to provide a necked down, or constricted, discharge aperture at the discharge terminus of the casing 10'. It has been found that with the wider mesh screen support 44 it is sometimes desirable to use a constricted discharge outlet to obtain better anti-splash characteristics and a more coherent or uniform column of discharging aerated water.

In the modified construction shown in Figure 8, a conical coil spring 60' of the type shown in Figure 6 is provided. In Figure 8 no outlet screen is provided. The lower coil of conical spring 50' may engage and seat against the inwardly extending portion 64 of casing 10', or may be press fit into the casing 10'. However, the discharge end of the casing 10' is constricted as in Figure 7 to provide better anti-splash characteristics and a more uniform discharging stream.

With respect to Figure 9, while said figure discloses a modified form of connection between the spring 52' and the screen-type support 44' it will be seen that Figure 9 also discloses a male threaded aerator wherein the casing is provided with male threads 12'. In the device shown in Figure 9, that is the male-threaded aerator, it is preferable to press fit the guide ring 18' into the casing 10 so that the parts will not become dis-assembled during manipulation.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is intended in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim as new, and desire to secure by Letters Patent of the United States is:

1. A liquid aerator comprising a barrel having its upstream end adapted for connection to a source of liquid, said barrel having air inlets therein, means within said barrel for breaking up the flow of liquid passing therethrough and for mixing the liquid with air ingested through said air inlets, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a pair of members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said members adapted to be moved apart from the other member, whereby the surfaces of said members which are adapted to mate to form said liquid flow passageways are exposed, to be flushed by liquid passing through the aerator, a screen-type support member carried by said barrel and extending across the barrel adjacent the downstream end thereof, an elongated coil spring having one end thereof engaging said screen-type member and the other end thereof engaging said one of the pair of members, said spring being of a length and spring constant to urge said one member upstream and apart from said other member, and said one member being movable downstream against the bias of said spring and into mating position with said other member by the force of the liquid entering said aerator.

2. A liquid aerator comprising a barrel having its upstream end adapted for connection to a source of liquid, said barrel having air inlets therein, means within said barrel for breaking up the flow of liquid passing therethrough and for mixing the liquid with air ingested through said air inlets, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a pair of members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said members adapted to be moved apart from the other member, whereby the surfaces of said members which are adapted to mate to form said liquid flow passageways are exposed, to be flushed by liquid passing through the aerator, a screen-type support member carried by said barrel and extending across the barrel adjacent the downstream end thereof, an elongated coil spring having one end thereof engaging said screen-type member and the other end thereof engaging said one of the pair of members, said spring being of a length and spring constant to urge said one member upstream and apart from said other member, said one member being movable downstream against the bias of said spring and into mating position with said other member by the force of the liquid entering said aerator, and means connecting said spring to one of the two members against which the spring abuts, to maintain said spring properly positioned relative thereto.

3. A device as set forth in claim 2 wherein said means for connecting the spring to one of the two members against which said spring abuts includes a solder connection between said spring and said screen-type support.

4. A device as set forth in claim 2 wherein said means for connecting the spring to one of the two members against which said spring abuts includes a peg carried by said screen-type support and extending upwardly therefrom and being of a dimension to have said coil spring press fit thereon.

5. A device as set forth in claim 2 wherein said means for connecting the spring to one of the two members against which said spring abuts includes a recess in said one movable member, and an end coil of said spring being slightly larger than the center coils of the spring to permit press fitting said end coil into said recess in said movable member while the remaining coils of the spring remain free and resiliently effective.

6. A device as set forth in claim 1 wherein said barrel defines a converging outlet terminus downstream of said screen-type support member.

7. A device as set forth in claim 1 wherein said screen-type support member is of a mesh in the range of substantially 10 to 16 per inch.

8. A liquid aerator comprising a barrel having its upstream end adapted for connection to a source of liquid, said barrel having air inlets therein, means within said barrel for breaking up the flow of liquid passing therethrough and for mixing the liquid with air ingested through said air inlets, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a pair of members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said members adapted to be moved apart from the other member whereby the surfaces of said members which are adapted to mate to form said liquid flow passageways are exposed, to be flushed by liquid passing through the aerator, a screen-type support member carried by said barrel and extending across the barrel adjacent the downstream end thereof, an elongated coil spring having one end thereof engaging said screen-type member and the other end thereof engaging said one of the pair of members, said spring being of a length and spring constant to urge said one member upstream and apart from said other member, said one member being movable downstream against the bias of said spring and into mating position with said other member by the force of the liquid entering said aerator, and a resilient sealing washer adjacent the upstream end of said barrel having a plurality of tongues extending inwardly therefrom across the path of movement of said one movable member for engaging said movable member to limit the upward movement thereof.

9. A liquid aerator comprising a barrel having its upstream end adapted for connection to a source of liquid, said barrel having air inlets therein, means within said barrel for breaking up the flow of liquid passing therethrough and for mixing the liquid with air ingested through said air inlets, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a pair of members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said members adapted to be moved apart from the other member, whereby the surfaces of said members which are adapted to mate to form said liquid flow passageways are exposed, to be flushed by liquid passing through the aerator, an annular support on the inner wall of said barrel located downstream of said members which define said liquid flow passageways, a conical coil spring supported on said annular support and engaging said one movable member, said spring being of a length and spring constant to urge said one member upstream and apart from said other member, and said movable member being movable downstream against the bias of said spring and into mating position with said other member by the force of the liquid entering said aerator.

10. A liquid aerator comprising a casing having its upstream end adapted for connection to a source of liquid under pressure, said casing having air inlets therein, means within the casing for sucking air into said casing through said air inlets and for breaking up the flow of liquid passing therethrough and for mixing the liquid with air sucked in through said air inlets, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a pair of flow control members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said flow control members being movable with respect to the other flow control member so as to expose the surfaces of said flow control members which are adapted to mate to form said trol member so as to expose the surfaces of said flow control members which are adapted to mate to form said liquid flow passageways to permit flushing of said surfaces by liquid passing through the aerator, a break-up member secured to said movable flow control member and extending downstream thereof, said break-up member being positioned to have the liquid which flows through said passageways impinge thereon to finely break up the liquid, a screen-type support member in said casing downstream of said break-up member and extending across the casing adjacent the downstream end thereof, an elongated coil spring, positioned between said screen support member and said break-up member and normally biasing said movable flow control member to a position where the flow passageways between said flow control members are open and said surfaces which are adapted for mating to form said flow passageways are exposed to permit flushing thereof, and the pressure of liquid flowing through said aerator being operative to overcome the bias of said resilient means to move said movable flow control member to a position where the flow passageways are re-formed and the apparatus functions to produce an aerated flow of liquid.

11. A liquid aerator comprising a casing having its upstream end adapted for connection to a source of liquid under pressure, said casing having air inlets therein, means within the casing for sucking air into said casing through said air inlets and for breaking up the flow of liquid passing therethrough and for mixing the liquid with air sucked in through said air inlets, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a pair of flow control members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said flow control members being movable with respect to the other flow control member so as to expose the surfaces of said flow control members which are adapted to mate to form said liquid flow passageways to permit flushing of said surfaces by liquid passing through the areator, a break-up member secured to said movable flow control member and extending downstream thereof, said break-up member being positioned to have the liquid which flows through said passageways impinge thereon to finely break up the liquid, a screen-type support member in said casing downstream of said break-up member and extending across the casing adjacent the downstream end thereof, an elongated coil spring, positioned between said screen support member and said break-up member and normally biasing said movable flow control member to a position where the flow passageways between said flow control members are open and said surfaces which are adapted for mating to form said flow passageways are exposed to permit flushing thereof, and the pressure of liquid flowing through said aerator being operative to overcome the bias of said resilient means to move said movable flow control member to a position where the flow passageways are re-formed and the apparatus functions to produce an aerated flow of liquid, and means connecting said spring to one of the two members against which the spring abuts, to maintain said spring properly positioned relative thereto.

12. A device as set forth in claim 11 wherein said means for connecting the spring to one of the two members against which the spring abuts includes a recess in said movable flow control member, and an end coil of said spring being slightly larger than the center coils of the spring to permit press fitting said end coil into the

recess in said flow control member while the remaining coils of the spring remain free and resiliently effective.

13. A liquid aerator comprising, in combination: a tubular barrel having its upstream end adapted for connection to a supply of liquid under pressure and having lateral air inlets therein; an annlar ring in said barrel extending inwardly from the inner wall of said barrel and providing an inner ring surface which includes an upstream cylindrical surface portion, and a flow-directing conical surface portion located downstream of said cylindrical surface portion and being sloped to converge downstream, and the greatest diameter of said conical surface portion being no greater than the diameter of said cylindrical surface portion; a plug member movably arranged relative to said annular ring and comprising a cylindrical liquid-dividing disc and a splash member downstream of said dividing disc, said cylindrical liquid-dividing disc having a plurality of axially extending grooves formed in the periphery thereof, the maximum diameter of said cylindrical disc being substantially the same as the diameter of said cylindrical surface portion, so that said ring and grooved disc are adapted to cooperate to define therebetween a plurality of axially extending flow passageways, said conical surface portion being positioned to receive and to turn and direct the flow of liquid issuing from said flow passageways for movement downstream along said conical surface portion, said splash member being positioned to have the liquid, which is directed by said converging conical surface portion, directed thereagainst to effect break-up of said liquid within said barrel and to cause aeration of said liquid within said barrel with air aspirated thereinto through said air inlets; a screen-type support member located in said barrel downstream of said splash member and extending across the barrel adjacent the downstream end thereof, and an elongated coil spring having one end thereof engaging said screen-type support member and the other end thereof engaging said splash member, said spring being of a length and spring constant to urge said plug member upstream relative to said annular ring, against the force exerted on said plug member by the liquid passing through the aerator, to expose the portions of said annular ring and liquid-dividing disc, which are adapted to cooperate to define said flow passageways, to flushing action by liquid passing through the aerator.

14. A liquid aerator comprising, in combination: a tubular barrel having its upstream end adapted for connection to a supply of liquid under pressure and having laterial air inlets therein; an annular ring in said barrel extending inwardly from the inner wall of said barrel and providing an inner ring surface which includes an upstream cylindrical surface portion, and a flow-directing conical surface portion located downstream of said cylindrical surface portion and being sloped to converge downstream, and the greatest diameter of said conical surface portion being no greater than the diameter of said cylindrical surface portion; a plug member movably arranged relative to said annular ring and comprising a cylindrical liquid-dividing disc and a splash member downstream of said dividing disc, said cylindrical liquid-dividing disc having a plurality of axially extending grooves formed in the periphery thereof, the maximum diameter of said cylindrical disc being substantially the same as the diameter of said cylindrical surface portion so that said ring and grooved disc are adapted to cooperate to define therebetween a plurality of axially extending flow passageways, said conical surface portion being positioned to receive and to turn and direct the flow of liquid issuing from said flow passageways for movement downstream along said conical surface portion, said splash member being positioned to have the liquid, which is directed by said converging conical surface portion, directed thereagainst to effect break-up of said liquid within said barrel and to cause aeration of said liquid within said barrel with air aspirated thereinto through said air inlets; a screen-type support member located in said barrel downstream of said splash member and extending across the barrel adjacent the downstream end thereof, an elongated coil spring having one end thereof engaging said screen-type support member and the other end thereof engaging said splash member, said spring being of a length and spring constant to urge said plug member upstream relative to said annular ring, against the force exerted on said plug member by the liquid passing through the aerator, to expose the portions of said annular ring and liquid-dividing disc, which are adapted to cooperate to define said flow passageways, to flushing action by liquid passing through the aerator, and means connecting said spring to only one of the two members against which the spring abuts, to maintain said spring properly positioned relative thereto.

15. A device as set forth in claim 14 wherein the means for connecting said spring to one of the two members against which the spring abuts includes a recess in the splash member portion of the plug member, and an end coil of said spring being slightly larger than the center coils of the spring to permit press fitting said end coil into the recess in said splash member while the remaining coils of the spring remain free and resiliently effective.

16. A liquid aerator comprising, in combination: a tubular barrel having its upstream end adapted for connection to a supply of liquid under pressure and having lateral air inlets therein; an annular ring in said barrel extending inwardly from the inner wall of said barrel and providing an inner ring surface which includes an upstream cylindrical surface portion, and a flow-directing conical surface portion located downstream of said cylindrical surface portion and being sloped to converge downstream, and the greatest diameter of said conical surface portion being no greater than the diameter of said cylindrical surface portion; a plug member movably arranged relative to said annular ring and comprising a cylindrical liquid-dividing disc and a splash member, said cylindrical liquid-dividing disc having a plurality of axially extending grooves formed in the periphery thereof, the maximum diameter of said cylindrical disc being substantially the same as the diameter of said cylindrical surface portion so that said ring and grooved disc are adapted to cooperate to define therebetween a plurality of axially extending flow passageways, said conical surface portion being positioned to receive and to turn and direct the flow of liquid issuing from said flow passageways for movement downstream along said conical surface portion, said splash member being located downstream of said conical surface portion and positioned to have the liquid, which is directed by said converging conical surface portion, directed thereagainst to effect break-up of said liquid within said barrel and to cause aeration of said liquid within said barrel with air aspirated thereinto through said air inlets; an annular support on the inner wall of said barrel located downstream of said annular ring and said plug member, and a conical coil spring supported on said annular support and engaging said splash member, said spring being of a length and constant to urge said plug member upstream relative to said annular ring, against the force exerted on said plug member by the liquid passing through the aerator, to expose the portions of said annular ring and liquid-dividing disc, which are adapted to cooperate to define said flow passageways, to flushing action by liquid passing through the aerator.

17. A liquid aerator comprising a barrel having its upstream end adapted for connection to a source of liquid, said barrel defining an air intake thereinto, means within said barrel for breaking up the flow of liquid passing therethrough and for mixing the liquid with air ingested through said air intake, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a pair of members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said members adapted to be moved apart from the other member,

whereby the surfaces of said members which are adapted to mate to form said liquid flow passageways are exposed, to be flushed by liquid passing through the aerator, a screen-type support member carried by said barrel and extending across the barrel and being located downstream of said pair of members, elongated resilient means having one end thereof engaging said screen-type support member and the other end thereof engaging said one of the pair of members, said resilient means being of the length and resilient constant to urge said one member apart from said other member, and said one member being movable against the bias of said resilient member, and into mating position with said other member under the force of the liquid entering said aerator.

18. A liquid aerator comprising a barrel having its upstream end adapted for connection to a source of liquid, said barrel defining an air intake thereinto, means within said barrel for breaking up the flow of liquid passing therethrough and for mixing the liquid with air ingested through said air intake, whereby the liquid issuing from the downstream end of the barrel has small bubbles disseminated throughout, said means including a plug member having jet-forming means defined therein and a ring member, said plug and ring members having complementary surfaces which are adapted to be disposed in adjacent mating relationship, one of said pair of complementary surfaced members being movable between a first position, wherein said complementary surfaces are in adjacent mating relation, and a second position, wherein said complementary surfaces are spaced apart to be exposed to flushing action by liquid passing through said aerator, a support member carried by said barrel and extending across the barrel and being located downstream of said pair of members, elongated resilient means having one end thereof engaging said support member and the other end thereof engaging said one of the pair of members, said resilient means being of a length and resilient constant to urge said one member apart from said other member, and said one member being movable against the bias of said resilient member, and into mating position with said other member under the force of the liquid entering said aerator.

19. A liquid aerator comprising a casing having its upstream end adapted for connection to a source of liquid under pressure, said casing having air inlets therein, means within the casing for sucking air into said casing through said air inlets and for breaking up the flow of liquid passing therethrough and for mixing the liquid with air sucked in through said air inlets, whereby the liquid issuing from the downstream end of the casing has small bubbles disseminated throughout, said means including a pair of flow control members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said flow control members being movable with respect to the other flow control member so as to expose the surfaces of said flow control members which are adapted to mate to form said liquid flow passageways to permit flushing of said surfaces by liquid passing through the aerator, a support member in the casing downstream of said flow control members, resilient means positioned between said support member and said movable flow control member and normally biasing said movable flow control member to a position where said flow passageways are open, and said surfaces which are adapted for mating to form said flow passageways are exposed to permit flushing thereof, and the pressure of liquid flowing through said aerator being operative to overcome the bias of said resilient means to move said movable flow control member to a position where the flow passageways are re-formed and the apparatus functions to produce an aerated flow of liquid.

20. A liquid aerator comprising a casing having its upstream end adapted for connection to a source of liquid under pressure, said casing having air inlets therein, means within the casing for sucking air into said casing through said air inlets and for breaking up the flow of liquid passing therethrough and for mixing the liquid with air sucked in through said air inlets, whereby the liquid issuing from the downstream end of the casing has small bubbles disseminated throughout, said means including a pair of flow control members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said flow control members being movable with respect to the other flow control member so as to expose the surfaces of said flow control members which are adapted to mate to form said liquid flow passageways to permit flushing of said surfaces by liquid passing through the aerator, and a break-up member secured to said movable flow control member and positioned downstream of said flow control members, said break-up member being positioned to have the liquid which flows through said passageways impinge thereon to finely break up the liquid, a support member downstream of said break-up member, resilient means, positioned between said support member and said break-up member, normally biasing said movable flow control member to a position where the flow passageways between said flow control members are open, and said surfaces which are adapted for mating to form said flow passageways are exposed to permit flushing thereof, and the pressure of liquid flowing through said aerator being operative to overcome the bias of said resilient means to move said movable flow control member to a position where the flow passageways are re-formed and the apparatus functions to produce an aerated flow of liquid.

21. A liquid aerator comprising a casing having its upstream end adapted for connection to a source of liquid under pressure, said casing having air inlets therein, means within the casing for sucking air into said casing through said air inlets and for breaking up the flow of liquid passing therethrough and for mixing the liquid with air sucked in through said air inlets, whereby the liquid issuing from the downstream end of the casing has small bubbles disseminated throughout, said means including a pair of flow control members having adjacent mating surfaces which form liquid flow passageways therebetween, one of said flow control members being movable with respect to the other flow control member so as to expose the surfaces of said flow control members which are adapted to mate to form said liquid flow passageways to permit flushing of said surfaces by liquid passing through the aerator, and a break-up member secured to said movable flow control member and positioned downstream of said flow control members, said break-up member being poistioned to have the liquid which flows through said passageways impinge thereon to finely break up the liquid, a support member downstream of said break-up member, a recess in the downstream side of said break-up member, a helical spring on said support member entering said recess in the break-up member and engaging the break-up member, said helical spring normally biasing said movable flow control member to a position where the flow passageways between said flow control members are open, and said surfaces which are adapted for mating to form said flow passageways are exposed to permit flushing thereof, and the pressure of liquid flowing through said aerator being operative to overcome the bias of said resilient means to move said movable flow control member to a position where the flow passageways are re-formed and the apparatus functions to produce an aerated flow of liquid.

22. A liquid aerator comprising, in combination: a tubular barrel having its upstream end adapted for connection to a supply of liquid under pressure and having lateral air inlets therein; an annular ring in said barrel extending inwardly from the inner wall of said barrel and providing an inner ring surface which includes an upstream cylindrical surface portion, and a flow-directing conical surface portion located downstream of said cylindrical surface portion and being sloped to converge downstream, and the greatest diameter of said conical surface portion being no greater than the diameter of said

cylindrical surface portion; a plug member movably arranged relative to said annular ring and comprising a cylindrical liquid-dividing disc and a splash member, said cylindrical liquid-dividing disc having a plurality of axially extending grooves formed in the periphery thereof, the maximum diameter of said cylindrical disc being substantially the same as the diameter of said cylindrical surface portion, so that said ring and grooved disc are adapted to cooperate to define therebetween a plurality of axially extending flow passageways, said conical surface portion being positioned to receive and to turn and direct the flow of liquid issuing from said flow passageways for movement downstream along said conical surface portion, said splash member being located downstream of said conical surface portion and positioned to have the liquid, which is directed by said converging conical surface portion, directed thereagainst to effect break-up of said liquid within said barrel and to cause aeration of said liquid within said barrel with air aspirated thereinto through said air inlets; and resilient means engaging said plug member and urging said plug member upstream, relative to said annular ring, against the force exerted on said plug member by the liquid passing through the aerator, to expose the portions of said annular ring and liquid-dividing disc, which are adapted to cooperate to define said flow passageways, to flushing action by liquid passing through the aerator, said resilient means including an upright helical spring the upper end of which engages said plug member, and apertured support means carried by said barrel against which the lower end of said helical spring abuts.

23. A liquid aerator comprising, in combination: a tubular barrel having its upstream end adapted for connection to a supply of liquid under pressure and having lateral air inlets therein; an annular ring in said barrel extending inwardly from the inner wall of said barrel and providing an inner ring surface which includes an upstream cylindrical surface portion, and a flow-directing conical surface portion located downstream of said cylindrical surface portion and being sloped to converge downstream, and the greatest diameter of said conical surface portion being no greater than the diameter of said cylindrical surface portion; a plug member movably arranged relative to said annular ring and comprising a cylindrical

liquid-dividing disc and a splash member, said cylindrical liquid-dividing disc having a plurality of axially extending grooves formed in the periphery thereof, the maximum diameter of said cylindrical disc being substantially the same as the diameter of said cylindrical surface portion, so that said ring and grooved disc are adapted to cooperate to define therebetween a plurality of axially extending flow passageways, said conical surface portion being positioned to receive and to turn and direct the flow of liquid issuing from said flow passageways for movement downstream along said conical surface portion, said splash member being located downstream of said conical surface portion and positioned to have the liquid which is directed by said converging conical surface portion, directed thereagainst to effect break-up of said liquid within said barrel and to cause aeration of said liquid within said barrel with air aspirated thereinto through said air inlets; and resilient means engaging said plug member and urging said plug member upstream, relative to said annular ring, against the force exerted on said plug member by the liquid passing through the aerator, to expose the portions of said annular ring and liquid-dividing disc, which are adapted to cooperate to define said flow passageways, to flushing action by liquid passing through the aerator, said resilient means including an upright helical spring the upper end of which engages said plug member, an apertured support means carried by said barrel against which the lower end of said helical spring abuts, said splash member defining a downwardly opening recess, and said helical spring being positioned to enter said downwardly opening recess in said splash member.

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