Sept. 5, 1961 E. P. AGHNIDES 2,998,926

AERATOR WITH IMPROVED AIR SUPPLY

Filed Aug. 3, 1959

FIG. 1.

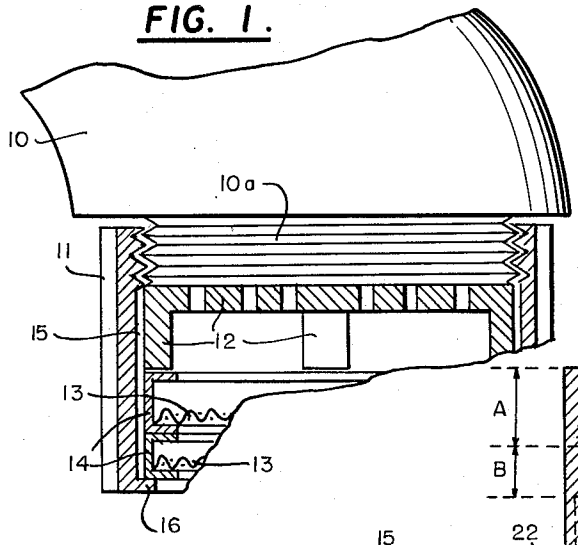


FIG. 5.

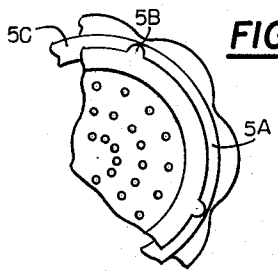


FIG. 6.

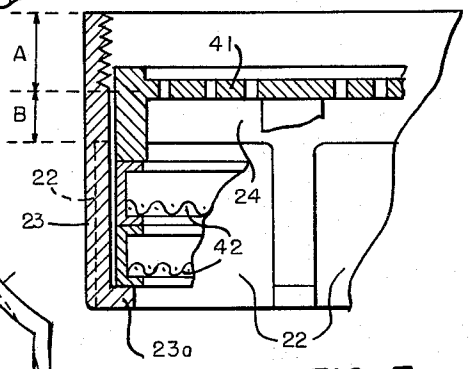


FIG. 2.

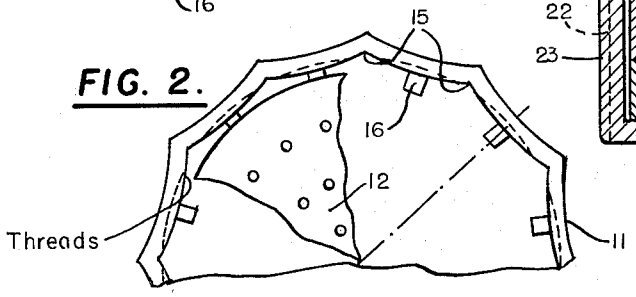


FIG. 7.

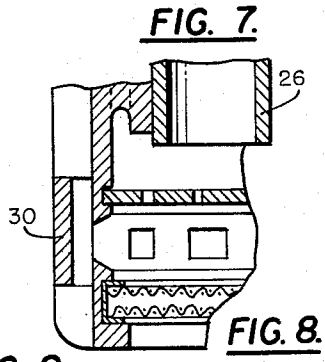


FIG. 8.

FIG. 3.

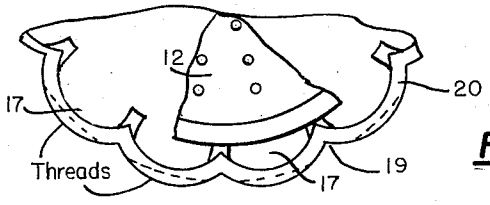


FIG. 9.

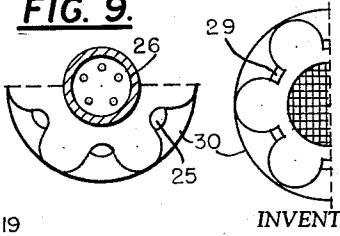
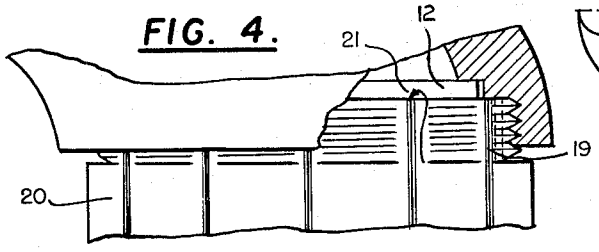


FIG. 4.



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AERATOR WITH IMPROVED AIR SUPPLY

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This invention relates to aerators and mainly to the type of aerator used on household water faucets.

I have pointed out the undesirability of having air enter through the side wall of the aerator in my earlier applications, Serial No. 135,645, filed December 29, 1949, Fluid Mixing Device (a portion of the disclosure of which appears in U.S. Patent No. 2,811,340 of October 29, 1957); Serial No. 337,501, filed February 18, 1953, Faucet Attachment (now abandoned); Serial No. 351,907, filed April 29, 1953, Fluid Mixing Device; and Serial No. 560,299, filed January 20, 1956, Fluid Mixing Devices. These applications teach that the air inlet may be at the extreme bottom of the aerator. Alternatively the air may enter at the top of the aerator as shown in FIGURE 1 of my prior copending application filed August 2, 1956, Serial No. 601,711, entitled Variable Outlet Fluid Mixing Devices, now abandoned. It is the main object of the present invention to provide air inlet means that is an improvement upon these prior arrangements.

A further and more specific object of the invention is to provide an air inlet means for a water aerator which provide ample air for complete aeration without decreasing the effective mixing area of the aerator.

Another object of the invention is to provide improved communication between the air passageways of an aerator and the outside atmospheric air.

In aerators for water faucets several basic requirements preferably should be met, for example, the aerator should be provided with standard threading, be of substantially the same outer diameter as present commercial aerators, provide an output stream as large in diameter as the present commercial aerators, and have as much aeration and water output as present commercial aerators. These desirable features are not only met but are surpassed in one or more respects by the present invention without any slots in the sidewall of the aerator.

In order to achieve the desirable results above named, I provide in one form of the invention, an aerator body having a vertical sidewall of substantially uniform thickness, though periodically departing from circular configuration whereby the aerator has an ornamental effect. The upper end of the housing is threaded but since the housing departs from a circle there are gaps in the threading which provide air entranceways at the top of the aerator. Each place that the aerator departs from a circular shape provides a vertical air passageway extending the length of the housing whereby air may enter from both the top and the bottom, thus effectively doubling the size of the air entranceway over and above what has been achieved in the case of the other aerators that do not have slots along the sidewall. Other forms of the invention will be specifically described hereinbelow.

In the drawings:

FIGURE 1 is a cross sectional view of the preferred form of the invention.

FIGURE 2 is a top view of the housing shown in FIGURE 1 with a portion of the upstream diaphragm also illustrated.

FIGURE 3 is a top view of a modified form of housing; a portion of the upstream diaphragm being shown.

FIGURE 4 is a partial cross sectional view of an aerator embodying the housing of FIGURE 3.

FIGURE 5 is a top view of another form of the invention.

FIGURE 6 is a cross sectional view of a further form of the invention.

FIGURE 7 is a cross sectional view of another form of the invention.

FIGURE 8 is a bottom view of the aerator shown in FIGURE 7.

FIGURE 9 is a top view of the aerator shown in FIGURE 7.

In FIGURE 1 the faucet **10** has a lower projecting tubular threaded portion **10***a* adapted to receive an aerator. The aerator includes a tubular body **11** of polygonal shape, the wall of the housing being of substantially uniform thickness. The upper inner surface of the housing **11** is threaded to mesh with threads complementary to those on the projection **10***a*. Since, however, the inner surface of housing **11** is not a true circle, the threads will appear as shown in the dotted line of FIGURE 2, that is at the places **15** where the polygonal housing is fluted outward there will be no threads. Moreover there will be a gap between the outer sidewall of projection **10***a* and the inner sidewall of housing **11** at projections **15**, when the housing **11** is screwed onto the faucet. As a result there are a series of vertical air passageways **15** along the inner wall of housing **11**. At the downstream end of the housing **11** there are a plurality of inwardly extending projections or lips **16** on which the frames **14**, which contain the screens **13**, rest. A polyethylene disc **12** having four legs resting on the upper frame **14** is also provided. This disc is perforated to increase the velocity of flow while decreasing its cross section. It thus projects a large number of high velocity streamlets onto the screens **13**, and/or additional upstream discs **12** may be added, if desired, to improve the quality of the aerated stream. The air enters the mixing space between disc **12** and screen **13** through the spaces between legs of disc **12**. The space between legs **12** in turn communicate with the vertical air passageways **15**.

It is noted that the vertical air passageways **15** receive air from both the upstream end of the aerator and from the extreme downstream end (between projections **16**) of the aerator. Since air is received from both ends of the aerator, the passageway may be much smaller than it was previously required thus reducing the overall size of the device.

From the foregoing it is apparent that the polygon shape of the housing **11** performs two functions. First it provides air passageways at its fluted points. Secondly it is ornamental in appearance.

This disc **12** is preferably made of suitable soft plastic material that will act as a washer. In this case it becomes jet forming and washer means. Since disc **12** acts as a washer it excludes water under pressure from the faucet from flowing laterally into the air entranceway **15**, and at the same time it directs the jets of water through its holes vertically downward. Hence, in effect, disc **12** maintains the air path and the water path spaced from each other, except of course it allows the air from passageway **15** to pass between the legs of disc **12** to the mixing space. If polyethylene is selected as the material for the disc, the disc **12** will act not only as the jet forming and washer means but will also tend to prevent accumulation of calcium deposits and many forms of dirt that frequently clog the upstream discs of conventional aerators.

In FIGURE 2 of my U.S. Patent No. 2,210,846, August 6, 1940, entitled Fluid Mixing Device, I show an aerator in which there is a vertical slot along the threads of the upstream end of the aerator to thereby provide an air passageway. The provision of these vertical slots causes mutilation of the threads and creates difficulty in placing the aerator on the faucet. In contrast the polygonal housing **11** does not result in threads that are difficult to mesh with those on the faucet.

A second form of invention is shown in FIGURES 3

and 4 where the faucet has female threads and the aerator has male threads around the outside of the housing **20**. Since the housing is not round, but has indented portions on its periphery, there are gaps **19** in the threads through which air may pass.

An upstream jet forming diaphragm **12** is provided but it has smaller diameter than the maximum internal width of member **20** and this leaves a small air space at the place designated by reference number **17** through which air may pass outside of the periphery of the upstream diaphragm **12** but inside the wall of the aerator body **20**. As a result air may enter along the path shown by arrow **21**. The diaphragm **12** may have an outer rim of polyethylene which will act as a washer.

The device of FIGURES 3 and 4 is the same in all respects, other than those shown, as any conventional aerator and may, for example, contain internal parts identical with those shown in FIGURE 1.

Another advantage of the construction of FIGURES 1 to 4 is that the aerator body may be stamped (an inexpensive manufacturing process) in contrast to prior aerator bodies which have been machined.

The form of invention shown in FIGURE 5 has the external corrugations the same as in FIGURE 3, but the inside wall of the aerator body is circular. The upstream diaphragm has several projections **5B** which center the diaphragm in the casing and provide air spaces **5A** outside the periphery of the diaphragm yet within the inside wall of the aerator body. Shoulder **5C** is a continuous ring at the downstream end of the aerator (in the same position as the inturned lips **16** of FIGURE 1; however, it extends continuously around the inside lower part of the aerator). Air may enter in much the same way as in FIGURES 3 and 4, namely it proceeds upward in the indent **19** between the vertical ribs or corrugations, then over the top of the aerator body, and finally through the air passageway **5A**. The internal parts of the aerator of FIGURE 5 may be the same as in the case of FIGURE 1, except as mentioned above in connection with projection **5C** and **16**.

In the form of invention shown in FIGURE 5, the tubular housing **23** has inwardly projecting lips **23***a* which support frames that in turn hold the screens **42**. The disc **41** has perforations for producing a large number of high velocity streamlets that bombard the screen **42**. The disc **41** is supported by four vertical legs which rest on the frames of the screens. Between the legs of the disc **41** is air space **24** which communicates with the air passageway **22** which is formed by a plurality of cutaway or thinned sections **22** of the housing **23**.

If it is desired to make a female aerator as shown in FIGURE 5 the upper part of the housing marked A has inside threads as shown. To make a male aerator the part marked A is cut off and external threads are placed on the part marked B.

It is possible to combine the features of FIGURES 5 and 6 into a further improved aerator. This can be done by having the upper part of the aerator built as shown in FIGURE 5 and the lower part built as shown in FIGURE 6. In other words, in addition to inverted cup **41** there would be the additional upstream disc of FIGURE 5 and everything else shown in FIGURE 5 except projection 5C. The lower part of the combined aerator would include member **41** and all parts below it built the same as in FIGURE 6.

FIGURES 7 to 9 show a rubber aerator adapted to fit on the metal faucet **26**. The main rubber aerator body **27** supports the usual discs and screens and has air inlet holes **28** that communicate with the vertical air passageway **25—29** (see FIGURE 9). A band of rubber material **30** extends around the aerator, enclosing the various air passageways **25—29** and defining them.

The internal parts of the aerators shown in this application, have the dimensions and proportions taught in my prior patents relating to faucet aerators whereby the device discharges a highly aerated coherent jet of water containing numerous small bubbles.

Reference is made to my prior copending application, Serial No. 624,846, filed November 28, 1956, now U.S. Patent No. 2,962,224, granted November 29, 1960, for Aerating Devices for Producing Streams of Large Cross-Section.

I claim to have invented:

1. In an aerator, body having a hollow housing adapted to be attached at its upstream end to a faucet, said housing having an air passageway immediately inside its inner wall and extending the length of the housing with an air extranceway from the outside atmospheric air at each end of the passageways, jet forming means adjacent the upstream end of the housing for increasing the velocity while decreasing the cross-section of flow, and mixing means spaced downstream the jet forming means for finely breaking up the water and mixing it with air and for discharging from the housing a coherent jet of aerated water containing numerous small bubbles, the space between the jet forming means and the mixing means communicating with said air passageway.

2. In an aerator, a hollow housing adapted to be attached at its upstream end to a faucet, said housing including means forming an air passageway along one wall of the housing and parallel to the axis of the housing, said air passageway at each end thereof being open to atmospheric air outside the faucet, jet forming and mixing means located at least partly in the housing for producing a coherent jet of aerated water at the output of the housing, said jet forming and mixing means communicating with said air passageway to thereby receive the air necessary for aeration.

3. In an aerator, a hollow housing the inner wall of which is of polygon shape, said wall being threaded at its upstream end with gaps in the threads at apexes of the polygon whereby when the housing is attached to a faucet the aforesaid gaps will provide air inlets between housing and the faucet, aerating means in the housing for converting the water under pressure in the faucet into a coherent aerated jet of water containing numerous small bubbles, said means having a mixing space communicating with said air inlets.

4. In an aerator as defined by claim 3, the wall of said housing having substantially uniform thickness whereby the outside surface thereof will have the ornamental effects of a polygon.

5. In an aerator adapted to be attached to a faucet, a hollow housing having outside threads, said housing having indents transverse to the direction of the threads in the threaded portion of the housing whereby when the housing is attached to a faucet there will be air passageways starting at the outlet end of the faucet which extend upward and over the upper edge of the housing and then downward into the housing, aerating means in the housing in communication with said air inlets for finely breaking up the water from the faucet and mixing it with air to form a coherent jet of aerated water containing numerous small bubbles.

6. In an aerator, a hollow housing of polygon cross-section adapted to engage and be held by a faucet, with gaps between the housing and faucet providing air entranceways, means in the housing for finely breaking up the water from the faucet and mixing it with air and discharging the aerated water from the housing, the last-named means being incommunication with at least one of said air entranceways.

7. In an aerator adapted to be attached to a threaded faucet, a housing having threads at its upstream end for attachment to the threads of a faucet, a diaphragm in the housing restrained against downward movement and positioned to engage and be pressed against the faucet when the housing is screwed onto the faucet, said diaphragm having smaller cross-section than the housing and having projections extending from its outer edge to center the

same in the housing and to also provide an air space between the outer edge of the diaphragm and the inner wall of the housing, mixing means for finely breaking up the water from the diaphragm and mixing it with air to produce a coherent stream laden with numerous small bubbles, the mixing means being spaced downstream the diaphragm to thereby form a mixing space, the threads which connect the housing and the faucet having at least one groove crossing the threads to thereby allow air to enter and then pass through said space between the diaphragm and the housing into the mixing space.

8. An aerator as defined in claim 7, said housing having its threads on the outside thereof with the grooves extending through the threads so that the air travels between the inner wall of the faucet and the outer wall of

the housing over the upper end of the wall of the housing and thence between the diaphragm and the housing to the mixing space.

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