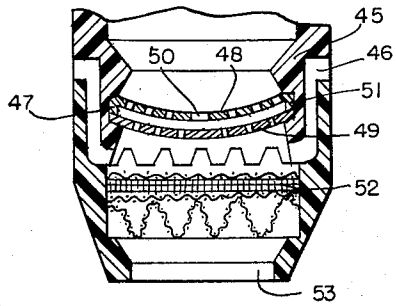
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WATER AERATOR DIAPHRAGMS

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WATER AERATOR DIAPHRAGMS

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The present invention relates to improved diaphragm structures particularly adapted for use in water aerators and fluid mixing devices; and is primarily concerned with diaphragm configurations which so produce and direct streamlets of water in the aerator that decreased downstream resistance (e.g. fewer mixing screens) are required than has been necessary heretofore.

The diaphragms of the present invention are particularly characterized by a pair of apertured discs or diaphragm members disposed in superposed relation to one another, with at least the downstream disc, being of curved configuration. The concept of curving the downstream disc is taught in my prior copending application Serial No. 333,773, filed January 28, 1953, for: "Gas and Liquid Mixing Device," now abandoned, which is a continuation-in-part of my prior application Serial No. 63,110, filed December 2, 1948, and now U.S. Patent No. 2,633,343. The instant application is a continuation-in-part of said prior application Serial No. 333,773 which is, in turn a continuation-in-part of said application Serial No. 63,110.

When both of the superposed discs or diaphragms are curved (the concavity of both being on the upstream side) and the space between the discs is flooded, there is a further improvement over and above that obtained when only the lower one of the two discs is curved. This feature of the invention is disclosed in my prior copending application Serial No. 673,017, filed July 19, 1957, for Water Aerators.

When reference is made herein to a curved disc, I intend to refer to one which is concave on its upstream side.

Located downstream of the two discs is suitable mixing means which may take the form of screens. The overall combination of the discs and screens cooperates to discharge a coherent jet of aerated water containing numerous small bubbles entrained therein as set forth in my U.S. Patent 2,210,846, issued August 6, 1940, for Fluid Mixing Device.

It is accordingly an object of the present invention to provide improved water aerators or fluid mixing devices requiring decreased downstream resistance producing means.

Another object of the present invention resides in the provision of improved diaphragm structures for use in water aerators.

A further object of the present invention resides in the provision of improved water aerators which are simpler in construction and which are more readily assembled, disassembled, and cleaned than has been possible heretofore.

The foregoing objects, advantages, construction and operation of the present invention will become more readily apparent from the following description and accompanying drawing.

The structure shown in the drawing by way of example only comprises a casing **45** which may again be formed of resilient material whereby it may be attached to a faucet, and the said casing **45** is provided with air inlets **46** and with an annular groove **47** adapted to receive and resiliently retain the two curved discs **48** and **49**. In one preferred embodiment constructed in accordance with the present invention, each of the superposed discs **48** and **49** has three circular rows of holes, with twenty holes in the outer row, fourteen holes in the middle row, and six holes in the center row. The uppermost disc **48** also has one additional hole **50**, preferably having a diameter of 0.120 inch, located directly in the middle of

said upper disc **48**. The forty holes in the lower disc **49** may each have a diameter of 0.040 inch, and the forty holes in the upper or upstream disc **48** may each have a diameter of 0.052 inch. In said preferred embodiment of the present invention, the discs **48** and **49** may, in addition, each have a diameter of 0.915 inch.

As has also been illustrated in the drawing, the uppermost disc **48** includes a downwardly extending integral annulus or rim **51** which serves to maintain an accurate spacing between the two superposed discs **48** and **49**; and in accordance with the present invention, the spacing between the two discs **48** and **49** is uniformly in the order of one millimeter. By reason of this structure, therefore, the two discs **48** and **49** are maintained in superposed relation to one another and are uniformly spaced from one another in such configuration that the several orifices in the upstream disc are displaced from, i.e. nonaligned with, the several orifices in the downstream disc. As a result, water entering through the orifices in the upstream disc **48** substantially fills the space between the two discs and then issues from the orifices in the lower curved disc **49** as a plurality of angularly disposed streamlets, whereafter such streamlets impinge upon the mixing screen means **52**, and then issue as a coherent whitish bubble-laden stream of water from the outlet **53**.

In view of the curving of the lower disc **49**, the streamlets emerging therefrom strike the upper screen means **52** in non-orthogonal relation and thus the impact is softer than in the case where the impact is orthogonal. This improves the mixing action.

In FIGURE 6 of my prior U.S. Patent 2,633,343, mentioned above, the invention herein claimed is broadly disclosed, the upstream one of the two discs being flat. One improvement effected by the specific structure disclosed herein and not disclosed in that patent is that both of discs **48** and **49** are similarly curved and are evenly spaced apart. This improvement gives particularly good results.

The casing itself preferably comprises a resiilent material such as rubber, and sealing is effected between the casing and one or both discs by providing a portion of the casing which surrounds and sealingly engages the peripheral edges of one or both of the superposed discs.

In the form illustrated the sealing engagement is accomplished by a recessed annular channel in the inner wall of the resilient material of the casing **45** which receives the peripheries of the curved discs **48** and **49** in a snap or press fit.

It will also be appreciated that the plurality of discs are so constructed, or at least one of the discs is so constructed, that in addition to the sealing function already described, means are provided as an integral portion of one or more of the discs which effects and maintains a desired spacing between the discs; and this particular feature of the invention obviates the necessity of separate spacing means, such as washers, considered necessary heretofore.

While I have thus described preferred embodiments of the present invention, many variations will be suggested to those skilled in the art. The foregoing description is therefore meant to be illustrative only and should not be considered limitative of my invention. All such variations and modifications as are in accord with the principles described are meant to fall within the scope of the appended claims.

Having thus described my invention, I claim:

1. A water aerator comprising a conduit having water and air inlet means, jet-forming means in said conduit comprising a pair of superposed apertured discs extending in spaced relation to one another across said conduit, a mixing screen downstream of said jet-forming means, at least the downstream one of said discs being curved to

form a concavity on its upstream side, said diaphragms having their respective apertures so arranged relative to each other as to effect a flooding of the space between said diaphragms, whereby water passing through the apertures in said curved downstream disc issues into said conduit as a plurality of diverging streamlets angularly disposed with respect to one another, said mixing screen being so positioned that said angularly disposed streamlets impinge on said screen in non-orthogonal relation thereto thereby to soften the impact of said streamlets on said screen, and means for sealing the peripheral edge of at least said curved downstream one of said discs to said conduit at a position downstream of said water inlet means and upstream of said air inlet means.

2. A water aerator comprising a conduit having a water inlet, jet forming means in said conduit comprising a pair of superposed adjacent apertured discs in spaced relation to one another and located across said conduit, each said disc extending from its periphery in a direction generally downstreamwardly and inwardly to its extreme downstream position at the axis of the conduit, mixing means spaced downstream from the downstream disc for finely breaking up the water from that disc and mixing the broken water with air to produce a coherent jet laden with numerous small bubbles, the space between the

downstream one of said discs and said mixing means being in communication with air outside the conduit, the downstream disc and the conduit cooperating with each other and including means blocking entry of air into the space between discs during operation of the aerator, the perforations in the downstream disc being small enough to flood the space between discs.

3. A water aerator as defined in claim 1 in which both apertured discs are curved in the same direction.

4. A water aerator as defined in claim 2 in which the mixing means includes a flat screen, the downstream disc projecting jets therefrom onto said screen in non-orthogonal relation.

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