Dec. 29, 1953 E. P. AGHNIDES 2,664,278

FLUID MIXING DEVICE

Filed April 21, 1949

Fig. 1

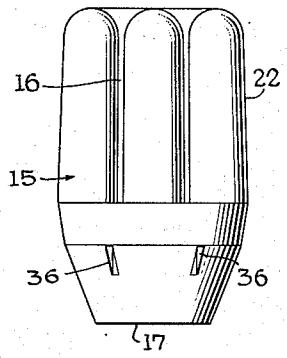


Fig. 4

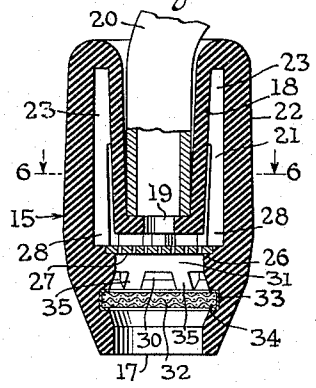


Fig. 5

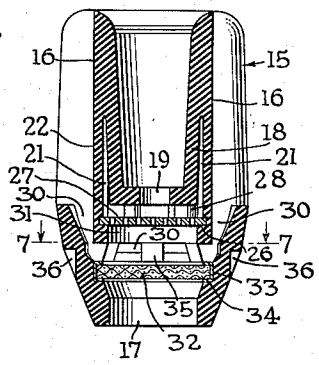


Fig. 2

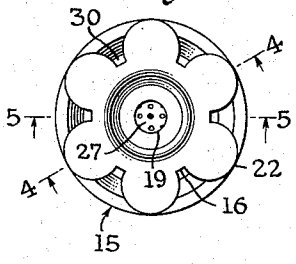


Fig. 6

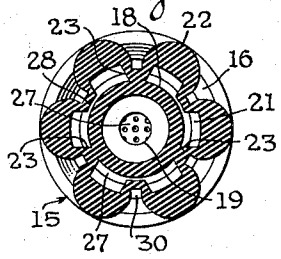


Fig. 7

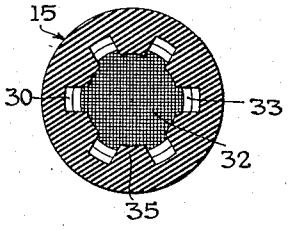


Fig. 3

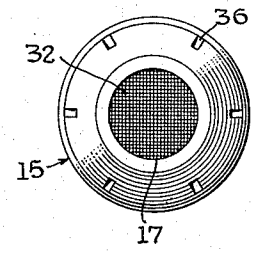


Fig. 8

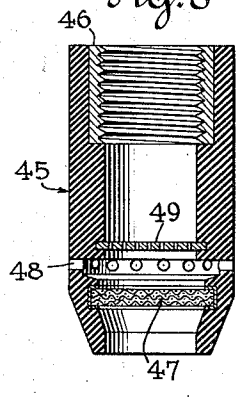
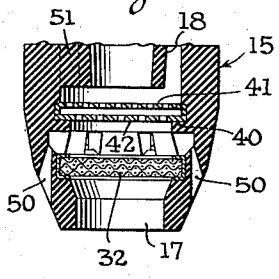


Fig. 9



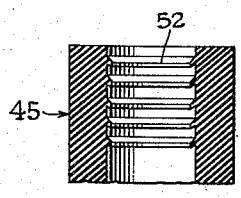


Fig. 8a

INVENTOR.

Elie P. Aghnides

BY

Attorney.

Patented Dec. 29, 1953 2,664,278

UNITED STATES PATENT OFFICE

2,664,278

FLUID MIXING DEVICE

Elie P. Aghnides, New York, N. Y.

Application April 21, 1949, Serial No. 88,797

1 Claim. (Cl. 261—76)

1

This invention relates to fluid mixing devices and more particularly to an improved device for producing a stream of liquid containing air bubbles throughout the stream. A device constructed in accordance with this invention, when applied to a conventional water faucet, provides a bubbly stream of water which is soft and light to the touch and which possesses numerous advantages not present in a plain water jet or in a sprayed water jet.

The present invention is an improvement on the devices shown in my Patent 2,210,846, dated August 6, 1940, Patent 2,316,832, dated April 20, 1943, and application Serial No. 63,110, filed December 2, 1948, now Patent No. 2,633,343 of March 31, 1953.

It is an important object of the present invention to provide an improved unit for mixing air with liquid to produce a bubbly stream.

It is another object of this invention to provide a simple and economical mixing device having a minimum number of parts and replaceable at low cost.

It is another object of this invention to provide a mixing device which consists of a single molded body member adapted to hold jet-forming and mixing members in proper position therein.

It is another object of this invention to provide a mixing device having a body member which may be molded from resilient material in a single molding operation.

Other objects and advantages of this invention will be readily apparent to those skilled in the art from the following description of the embodiments illustrated in the accompanying drawings, wherein:

Figure 1 is an elevational view of one embodiment of the fluid mixing device of this invention.

Figure 2 is a top plan view of the device shown in Figure 1.

Figure 3 is a bottom view of the device shown in Figure 1.

Figure 4 is an elevational view in section taken on line 4—4 of Figure 2, and showing the mixing device applied to the discharge end of a liquid supply conduit.

Figure 5 is an elevational view in section taken on line 5—5 of Figure 2.

Figure 6 is a sectional view taken on line 6—6 of Figure 4.

Figure 7 is a sectional view taken on line 7—7 of Figure 5.

Figure 8 is an elevational view in section of a modified form of fluid mixing device.

Figure 8a is an elevational view in section of a

2

modified form of the faucet engaging portion of a fluid mixing device.

Figure 9 is an elevational view of a part of a fluid mixing device showing a modified form of jet-forming means and air inlet orifices.

Referring now to the drawings for the purposes of illustration, the fluid mixing device includes a body member indicated by the numeral 15. The member 15 is generally tubular in shape and may be provided with longitudinally extending grooves 16 in an upper portion of the exterior surface. The lower end of the member 15 may be tapered to the discharge outlet 17. The upper end of member 15 is provided with an inturned flexible neck portion 18 which may be provided with a restricted orifice 19 at its inner end. As shown in Figure 4, the neck portion 18 is adapted to closely engage the outer surface of the end of a conduit 20. The conduit 20 may be the discharge end of a conventional water faucet or the like. Fluid pressure in the space 21 between the neck portion 18 and the outer portion 22 of the body member 15 serves to cause the neck 18 to firmly grip the conduit 20 to prevent the device from slipping off the conduit during operation. Integral webs 23 may be provided between the outer portion 22 and the upper portion of neck 18 as shown in Figure 4.

The inner chamber of the body member 15 is provided with an annular seat or shoulder 26 to receive the periphery of the perforated diaphragm or disc 27. The diaphragm 27 is held against the seat 26 by means of ribs 28 projecting from the inner surface of the upper portion of member 15, the lower ends of the ribs engaging portions of the periphery of the disc 27. The perforated diaphragm or disc 27 is spaced downstream from the orifice 19, and serves to divide the fluid flow into a plurality of relatively high velocity small diameter jets directed toward the mixing means hereinafter described. The longitudinal grooves 16 in the outer surface of member 15 open downwardly into passageways 30 which extend downwardly into central chamber 31 of the body member 15 downstream of the perforated diaphragm 27. These passageways 30 are best illustrated in Figure 5. The mixing means preferably includes three perforated diaphragms or screens 32 held in a rim 33, the latter being seated on and held against a shoulder or seat 34 formed in the member 15. The diaphragms or screens 32 may, for example, be formed of fine-mesh woven wire screens, such as disclosed in my copending application. The diaphragm assembly is held against the seat 34 by portions 35 of the mem-

ber 15 between the passageways 30. The perforated diaphragm 27 and the perforated diaphragms 32 may, however, be formed of any suitable metal or plastic material. As shown in Figures 1 and 3, the outer surface of the lower portion of body member 15 may be provided with grooves 36 in alinement with the grooves 16 to improve the external appearance of the device.

The provision of a longitudinally grooved body member as illustrated in Figures 1–7 inclusive is a preferred embodiment of this invention, but it is to be understood that similar advantages may be secured by forming the upper outer surface of body member 15 cylindrical and having longitudinal air passageways extending downward therethrough to the passageways 30. It is also to be understood that the upper outer portion of the body member may be of smaller diameter above the passageways 30 than the diameter of the body portion below the inlet of passageways 30, so that the air inlet passageways may be formed during the molding of the body member 15 without any grooves 16.

In the modified construction illustrated in Figure 9, body member 15 is provided with a seat or shoulder 40 to receive a pair of perforated upstream diaphragms 41 and 42 suitably spaced from each other. In this form of the device, the neck portion 18 need not be provided with a restricted orifice or orifices at its lower end. Air inlet passageways 50 are provided extending inward and upwards of the lower portion of body member 15 in lieu of the inlet grooves 16 and passageways 30 of the Figure 5 embodiment. Also illustrated is a web 51 connecting the outer part of body member 15 to the inturned neck 18 at one portion of the periphery of the neck 18. It is to be understood that the use of one connecting web is a modification of the construction shown in Figures 4 and 6 wherein three webs 23 are provided. Likewise, the passageways 50 may be formed as grooves in the surface of member 15 similar to the grooves shown in Figures 1–6 inclusive.

The construction shown in Figure 8 includes a one-piece molded body member 45 having a threaded insert 46 secured in the upper portion thereof for attachment to the end of a conduit or tap which is externally threaded. The body member 45 is provided with radial air inlet passageways 48. The member 45 is provided with at least one perforated diaphragm 49 upstream of the air inlets, and is provided with a plurality of perforated diaphragms 47 downstream of the air inlets. In this form of the device, the passageways 48 may be replaced by grooves and passageways as shown in Figures 1 to 6. The faucet engaging upper portion of the body member 45 may be provided with a threaded insert

46 as shown in Figure 8, or with a grooved gripping inner surface 52, the latter being illustrated in Figure 8a.

In the mixing devices shown and described herein, the body members 15 and 45 are preferably formed in one piece by molding material such as rubber. The provision of grooves 16 on the upper exterior surface of the body member or of passageways 50 facilitates the formation of the air inlet passageways by a simple and economical mold construction. The passageways 48 may be formed by a punching operation. Since the body of the device may be easily made in one piece, the devices may be discarded and replaced by new devices if the diaphragms become clogged or damaged by extensive use. The one-piece body also discourages a user from disassembling the device and reassembling the parts improperly. The one-piece body construction also avoids the falling or blowing apart of mxing devices having multi-part molded bodies. It is, therefore, obvious that mixing devices made in accordance with this invention, and properly assembled by the manufacturer, will remain in proper working order until replacement by a complete new unit is required.

This invention includes numerous variations and modifications in the embodiments shown and described which may be made without departing from the spirit and scope of the invention as defined in the following claim.

I claim:

A device for producing a stream of liquid containing bubbles therein comprising in combination: a resilient one-piece molded body member for attachment to the discharge end of a conduit adapted to deliver liquid under pressure, said body member defining a chamber having a discharge outlet at the end of said chamber, the outer surface of said body member having a plurality of longitudinal grooves extending along a portion thereof, a perforate diaphragm positioned in said chamber, and a perforate screen positioned in said chamber and held in spaced relationship downstream from said diaphragm, said body member having air inlet passageways extending from the ends of said surface grooves into said chamber between said diaphragm and said screen for conducting air into said chamber.

ELIE P. AGHNIDES.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,457,895	Campanella	June 5, 1923
2,210,846	Aghnides	Aug. 6, 1940
2,316,832	Aghnides	Apr. 20, 1943
2,510,395	Goodrie	June 6, 1950