

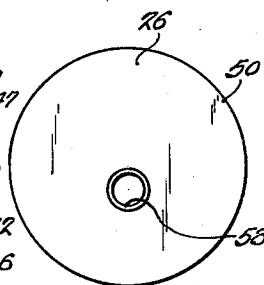
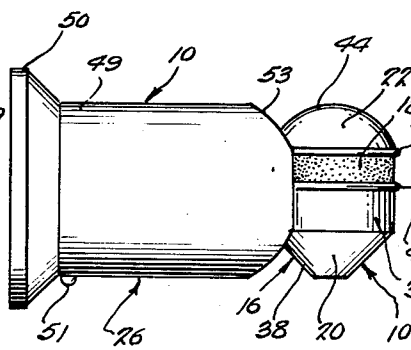
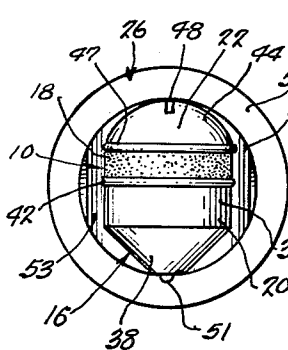
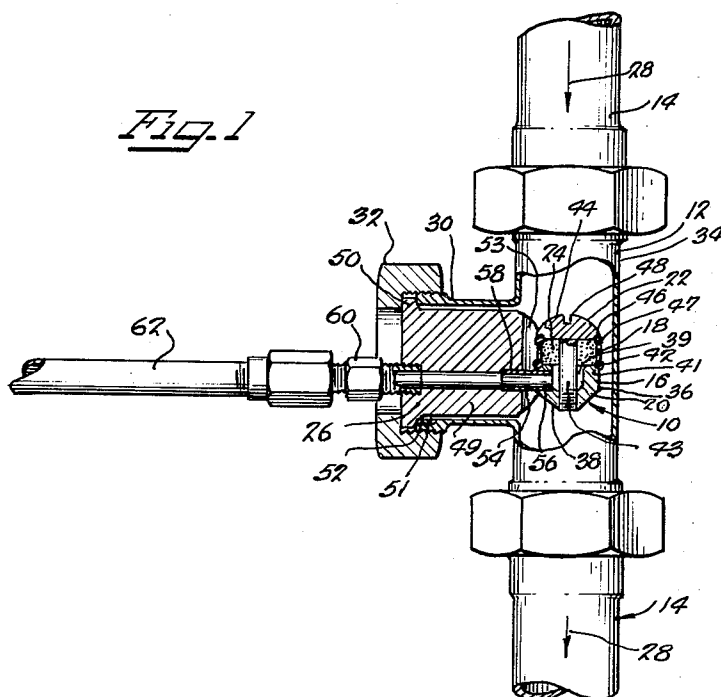
Jan. 12, 1965

L. W. YOUNG ET AL

3,165,562

DISPERSING DEVICE

Filed June 14, 1962



INVENTORS

LAWRENCE W. YOUNG

JIM M. VENETUCCI

BY

Loans, Anderson, Lueders & Fitch
ATTYS.

1

3,165,562

DISPERSING DEVICE

Lawrence W. Young, Oak Park, and Jim M. Venetucci, Forest Park, Ill., assignors to General Dynamics Corporation, New York, N.Y., a corporation of Delaware
Filed June 14, 1962, Ser. No. 282,507
2 Claims. (Cl. 261-122)

The present invention relates to gas dispersing devices and more particularly to an improved device for dispersing gas in a flowing liquid.

Devices presently available for dispersing a gas in a liquid commonly include a housing which, at least partially, is made of a porous material. These devices are known as spargers. Gas which is supplied to the sparger passes through the porous housing into the liquid and is thereby dispersed in the liquid.

Such spargers are normally difficult to incorporate in a continuous process and difficult to maintain. In this connection when the porous material becomes clogged, it is difficult to remove the sparger from the system. Moreover, once the sparger is removed, it is difficult to disassemble the sparger in order to either clean the porous material or replace the same.

Also previously available spargers unnecessarily interfere with the flow of liquid in the process and/or are relatively inefficient in dispersing the gas in the liquid. In this connection, the number of bubbles of gas transmitted into the liquid is limited and the bubbles are too large to efficiently infuse the gas into the liquid.

An object of the present invention is to provide an improved device for dispersing a gas in a liquid. Another object of the present invention is the provision of a device for dispersing a gas in a flowing liquid which device may be easily and quickly inserted in a continuous process. Still another object is the provision of a sparger which includes a porous element that is disposed so that liquid passes over the element in a direction parallel thereto. A further object is the provision of a dispersing device which can be easily maintained and which is relatively inexpensive in construction and relatively easy to manufacture.

Other objects and advantages of the present invention will become apparent by reference to the following description and accompanying drawings.

In the drawings:

FIGURE 1 is a plan view, partly in section, of a dispersing device embodying various features of the present invention, which device is disposed within a T pipe fitting connected in a pipe line.

FIGURE 2 is an enlarged plan view of the dispersing device shown in FIGURE 2; and

FIGURE 3 is an end view of the dispersing device shown in FIGURE 2; and

FIGURE 4 is a view of the other end of the dispersing device shown in FIGURE 2.

Generally, the dispersing device shown in the drawings, which is indicated by the reference numeral 10, is adapted to be disposed in a T pipe fitting 12 connected in a pipe line 14. The dispersing device 10 comprises a dispersing assembly 16 which includes a hollow cylinder 18 of porous material. The cylinder is supported within the cross member of the T pipe fitting 12 in coaxial relation thereto. End members 20 and 22 are provided at the ends of the porous cylinder 18 to close the same and thereby define a chamber 24 therebetween. Mounting means 26 which is connected to the end member 20, supports the tube 18 in the T pipe fitting 12 and also couples the chamber 24 to a source of gas (not shown).

More specifically, in the illustrated embodiment, the dispersing device or sparger 10 is disposed in the pipe line 14 which carries a liquid to be treated. The liquid

2

flows in the direction indicated by the arrows 28 and may, for example, be wine, oil, orange juice, mayonnaise, tomato paste, chemicals, etc. The pipe line 14 includes the T pipe fitting 12 which receives the sparger. The T pipe fitting 12 may be a conventional stainless steel sanitary type fitting.

The sparger 10 is inserted into a leg member 30 of the T pipe fitting 12 and is retained in position, as herein-after described, in the T pipe fitting 12 by an apertured cap 32 screwed on the end of the leg member 30. The illustrated sparger 10 includes the dispersing assembly 16 which transmits the gas to the flowing liquid. The dispersing assembly 16 includes the porous hollow cylinder 18 which may be made by bonding together carefully sized particles of carbon, ceramics or metal. As shown, the porous cylinder 18 is disposed in a cross member 34 of the T pipe fitting 12 in coaxial relation thereto.

The ends of the porous tube 18 are closed by the end members 20 and 22 which may be made of a material such as stainless steel, plastic, glass, etc. The end member 20 at the downstream end of the porous cylinder 18 includes a generally cylindrical portion 36 having an integral frusto-conical nose portion 38 which minimizes the effect of the dispersing assembly 16 on the flow of the liquid. The other or leading end of the downstream or trailing end member 20 is provided with a central recess 39 and an annular recess 41 having a V shaped cross section, the latter recess receiving a conventional O ring 42 for sealing against the trailing or downstream end of the porous cylinder 18.

The end member 22 at the upstream end of the porous cylinder 18 includes a bolt portion 43 which extends in coaxial relation to the porous tube 18 and is received within a threaded recess in the trailing end member 20. A generally spherical shaped head portion 44 is integrally connected to the leading end of the bolt portion 42. The trailing or downstream surface of the head portion 44 is provided with an annular, V shaped recess 46 which receives a conventional O ring 47 for sealing against the leading or upstream end of the porous cylinder 18. The leading or upstream surface of the head portion 44 is provided with a screw driver slot 48 so that the leading end member 22 may be easily unscrewed to disassemble the dispersing assembly 16 for cleaning.

In the illustrated embodiment, the dispersing assembly 16 is mounted in coaxial relation to the cross member 34 of the T pipe fitting 12 by the mounting means 26. The mounting means 26 includes a generally cylindrical body 49 which extends through the leg member 30 of the T pipe fitting 12, and generally transverse to the porous tube 18. The body 49 is made of a material such as stainless steel, plastic, glass, etc., and is made large enough in diameter to substantially fill the leg member 30 so as to thereby minimize flow of liquid into the leg member 30.

The end of the body 49 remote from the dispersing assembly 16 is provided with an outwardly tapered flange portion 50 which is gripped between the cap 32 and the end of the leg to mount the sparger 16 in position in the T pipe fitting 12. The flange portion 50 also serves as a gasket between the cap 32 and the leg member 30. The sparger 10 is indexed by means of a ball 51 suitably fastened to the body 49 adjacent the flange portion 50, which ball is received in a guide slot 52 in the inner surface of the leg member 30.

The other end of the body 49, that is, the end adjacent the dispersing assembly 16, is provided with a semi-cylindrical channel or groove 53, the axis of which is parallel to the axis of the dispersing assembly 16. The body 49 is made of sufficient length and the channel of a diameter such that the channel corresponds to the inner wall of

the cross member 34 of the T pipe fitting 12. In this way, turbulences in the flow of the liquid are minimized.

The dispersing assembly 16 is mounted in spaced relation to the channeled end of the body 49 by means of a conduit or pipe 54. The conduit 54 is suitably joined, as by press-fitting, with an opening 56 in the trailing end member 20 which extends transversely of the axis of the trailing end member 20 and communicates with the recess 39 therein. The other end of the conduit 54 is suitably joined, as by press fitting, with a passageway 58 which extends from the channeled end of the body 49 to the flanged end thereof.

The end of the passageway 58 at the flanged end of the body 49 is provided with threads for receiving a threaded end of a pipe fitting 60. The pipe fitting 60, in turn, is connected through a hose 62 to the source of gas, such as nitrogen, carbon dioxide, oxygen, argon, helium, air, nitrous oxide, etc.

As can be seen from the above the described sparger may be easily inserted into a pipe line and may be easily removed therefrom for maintenance purposes. Also, the sparger may be readily disassembled for cleaning and/or replacing the porous cylinder. Moreover, the sparger is designed so that when it is in the pipe line the flow of fluid through the pipe line passes over the cylinder generally parallel to the surface thereof. This results in a high shear rate on the bubbles of gas formed on the outer surface of the cylinder thereby removing the bubbles from the surface of the porous cylinder as soon as they are formed. This results in an efficient dispersion of the gas into the liquid.

Various changes and modifications may be made in the above described sparger without deviating from the spirit or scope of the present invention.

Various of the features of the invention are set forth in the accompanying claims.

What is claimed is:

1. A device for dispersing gas in a liquid flowing through a pipe line having a T pipe fitting connected therein with the liquid flowing through the cross member of the T pipe fitting, comprising a dispersing assembly including a cylindrical member of porous material, a first end member closing one end of said cylindrical member and having a spherical portion at the side thereof facing away from said cylindrical member, and a second end member having a recess therein and closing the opposite end of said cylindrical member, whereby a chamber is defined by said cylindrical member and said end members, means for mounting said dispersing assembly within the cross member of the T pipe fitting with the axis of said cylindrical member parallel to the direction of flow of liquid in said cross member and with said first end portion facing in an upstream direction, said mounting means including a body member located in the leg of the T and extending transversely of the axis of said cylindrical member and having an arcuate channel in the end thereof adjacent the dispersing assembly which channel extends parallel to the axis of said cross member, said arcuate chan-

nel being substantially a continuation of the surface of said cross member and having substantially the same curvature as said surface, the length of said body member and the curvature of the arcuate channel being such that when said body member is disposed within the leg of the T the channel corresponds to the inside surface of the cross member of the T pipe fitting, said body member having a passageway therein which extends from said channel to the opposite end of said body, and a conduit mounting said dispersing assembly in spaced relation to the wall of said channel and connected to said passageway and to the chamber to thereby provide fluid communication between said passageway and said chamber, and means for coupling a source of gas to said passageway.

2. A device for dispersing a gas in a liquid flowing through a pipe line, comprising a dispersing assembly including a cylindrical end member having a recess in one end thereof, having a passageway which extends between the exterior thereof and the recess, and having a frusto-conical portion at the other end thereof, the recessed end of said member being provided with a V-shaped annular groove, an O-ring disposed in said groove, a bolt end member having an elongated bolt portion threadedly engaged with said cylindrical end member in coaxial relation thereto, said bolt end member having a spherical-shaped head portion which is provided with a V-shaped annular groove, an O-ring disposed in said groove, and a hollow cylindrical member of porous material disposed between said rings and having an internal diameter which is larger than the diameter of the bolt portion, whereby a chamber is defined by said cylindrical member and said end members, means for mounting said dispersing assembly in said pipe line, said mounting means including a cylindrical body member extending transversely of the axis of said hollow cylindrical member, the end of said body member closer to said hollow cylindrical member being provided with a semi-cylindrical channel having an axis extending generally parallel to said cylindrical member, the other end of said cylindrical body member including an integral flange portion, said cylindrical body member being provided with a passageway which extends from said one end thereof to said other end thereof, a conduit mounting said dispersing assembly and mounting means in spaced relation and extending between said one end of said passageway in said body member and the passageway in said cylindrical end member which communicates with said recess, and means for coupling a source of gas to the passageway in said body member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,518,746	Blohm et al. -----	Aug. 15, 1950
2,946,519	Bellman -----	July 26, 1960

FOREIGN PATENTS

167,900	Great Britain -----	Aug. 25, 1921
694,918	Great Britain -----	July 29, 1953