May 18, 1965 H. E. ALQUIST ETAL 3,183,940

FLUID HANDLING APPARATUS

Filed Aug. 17, 1962

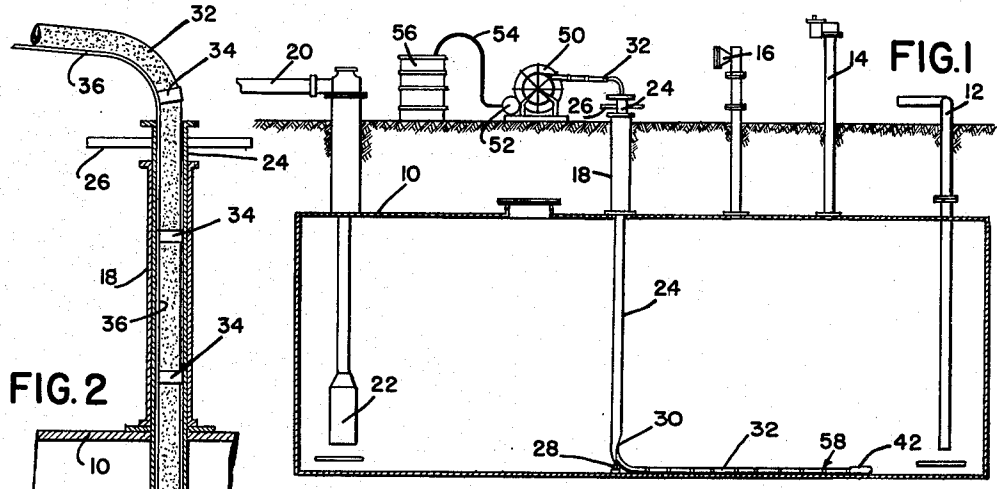


FIG. 1

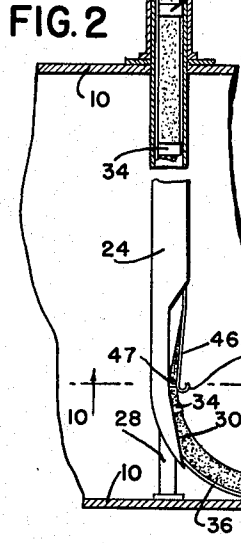


FIG. 2

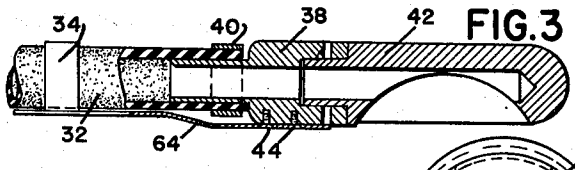


FIG. 3

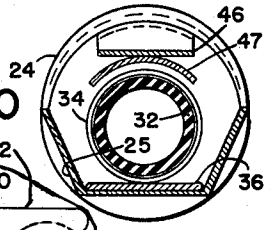


FIG. 10

FIG. 4

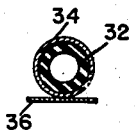


FIG. 5

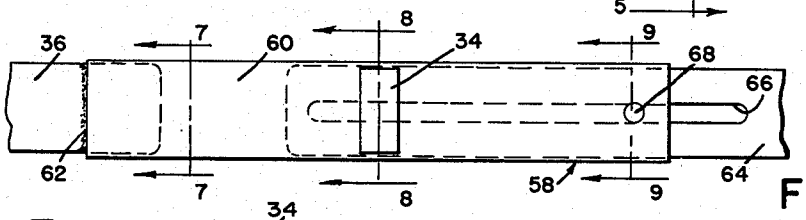


FIG. 6

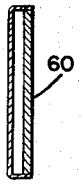


FIG. 7

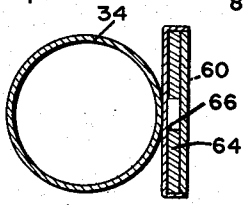


FIG. 8

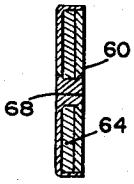


FIG. 9

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FLUID HANDLING APPARATUS

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8 Claims. (Cl. 138—106)

This invention relates to fluid handling apparatus especially adapted for use with liquid storage tanks into which or from which liquid is to be conveyed.

Whereas the invention partakes of some of the objects and arrangements disclosed in the patents to Senke, 2,332,940, dated October 26, 1943, Smith, 2,612,998, dated October 7, 1952, and Neer, 2,845,091, dated July 29, 1958, it is with a view towards obviating the shortcomings inherent to the structures of these patents that the present invention has been evolved.

It is among the objects of the present invention to provide fluid handling apparatus comprising a flexible hose having a substantially uniform unobstructed longitudinal passage, and restraining means attached externally to the hose along a substantial length thereof and slidable relative thereto in a direction parallel to the passage, the restraining means being flexibly movable with the hose in the direction of a first plane disposed radially of the passage and substantially rigid in the direction of a second plane disposed radially of the passage and normal to the first plane. The restraining means is preferably resilient and preferably comprises a longitudinally expansible portion. The restraining means is preferably secured to the hose adjacent one end thereof and assumes the form of an elongated leaf spring. The restraining means is preferably attached to the hose by spaced elements embracing the hose and in a preferred form such elements are annular and completely surround the hose. The apparatus preferably includes a deflecting member having a bore receiving the hose and restraining member and terminating in a transversely directed outlet port intermediate the length of the deflecting member and the bore preferably extends arcuately adjacent the outlet port.

The apparatus may be used for sampling the contents of a tank at any position along the bottom and may serve for filling, scavenging, spraying, cleaning, and introducing various materials such as bactericides, fungicides and corrosion inhibitors. It is contemplated that the parts of the apparatus coming in contact with the contents of the tank will be impervious to such materials. The apparatus is dirigible so that it can be employed in any desired position along the bottom of the tank. Various types of interchangeable nozzles can be used, depending upon the desired function to be achieved.

It is frequently desirable to ascertain the presence and location of rust, water, bacteria, sludge, and sediment of various types within a tank, and for any of these purposes, the present invention is eminently suited. The apparatus finds wide application in conjunction with liquids such as fuels, solvents and food materials, volatile liquids, and toxic materials.

A more complete understanding of the invention will follow from a description of the accompanying drawings wherein:

FIG. 1 is an elevation, partially in section, illustrating the use of the present invention in conjunction with an underground tank;

FIG. 2 is a fragmentary elevation, partially in section, depicting the present invention on a somewhat enlarged scale;

FIG. 3 is a fragmentary elevation, partially in section, depicting a nozzle attached to one end of the hose and restraining means employed in the present invention;

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FIG. 4 is a fragmentary elevation depicting a section of hose and restraining means on a somewhat enlarged scale;

FIG. 5 is a sectional elevation taken along line 5—5 of FIG. 4;

FIG. 6 is a fragmentary plan view of an expansion joint provided for the restraining means;

FIG. 7 is a section taken along line 7—7 of FIG. 6 on an enlarged scale;

FIG. 8 is a section taken along line 8—8 of FIG. 6 on an enlarged scale;

FIG. 9 is a section taken along line 9—9 of FIG. 6 on an enlarged scale; and

FIG. 10 is a section taken along line 10—10 of FIG. 2 on an enlarged scale.

The drawings depict an underground tank 10 provided with the usual filling tube 12, vent tube 14, indicating gauge 16, stick gauge connection 18 and delivery pipe 20 communicating with the discharge side of a submersible pump 22.

A guide tube 24 extends through the stick gauge connection 18 and carries at its upper end a handle 26 permitting rotation of the guide tube to any desired degree. The guide tube 24 has at its lower end a supporting foot 28 for engagement with the bottom wall of the tank, and intermediate its length, the guide tube terminates in a transversely directed outlet port 30, at which the guide tube has been formed to a channel shape as shown in FIG. 10 to provide convergent guide walls 25, through which a hose and restraining member can be directed precisely to any portion of the lower wall of the tank.

The hose 32 is of standard manufacture and slidably receives spaced annuli 34 which are suitably secured by means of rivets or welding to a restraining member 36 assuming the form of an elongated flat or leaf spring, uniformly flexible throughout for movement parallel to one transverse plane of the hose and substantially rigid in a direction parallel to a second radial plane through the hose at right angles to the first. Thus, it will follow, that when the guide tube is oriented by means of its handles 26 to direct the outlet port 30 to a given position, the path of the hose and its restraining member along the bottom of the tank will be determined.

The leading end of the hose 32 is secured to a terminal member 38 by means of a hose clamp 40, the terminal 38 serving to receive any of a number of interchangeable nozzles 42, designed for specific uses. The end section 64 of the restraining member 36 is also secured to the terminal 38 by means of screws 44 or in any other suitable fashion. Otherwise, the restraining member 36 and the hose 32 are relatively slidable throughout their lengths to avoid binding. In this manner, the bore of the hose is substantially unobstructed throughout its length so as to reduce stoppage and cleaning to a minimum and maintain substantially uniform flow characteristics. The annuli 34 have internal diameters slightly exceeding the external diameter of the hose 32, but the external diameters of the annuli do not project appreciably beyond the hose surface since it is desirable to avoid undue projections that would be apt to become snagged during use.

Adjacent its outlet port 30, the guide tube 24 carries a leaf spring 46 having at its free end a loop 48, and adjacent the loop, an arcuate shoe 47 to bias the hose and restraining member against the curved wall of the guide tube while at the same time permitting flexure of the hose and restraining member in this area.

The hose and restraining member are stored on a reel 50, the end of the hose remote from the nozzle 42 being connected to one side of a reversible pump 52 which can be used to introduce fluid into the tank or remove

material from it. The other port of the pump is connected by a hose 54 to a suitable container, depicted as a drum 56.

As illustrated in FIGS. 6, 7, 8 and 9, the restraining member 36 contains an expansion joint 58 comprising a socket member 60 one end of which receives an end of the restraining member 36 to which it is secured by a weld 62, the other end of which receives the slotted end of a section 64 of the restraining member for relative telescopic movement. The slot 66 receives a pin 68 welded to the walls of the socket member 60 so as to limit the relative movement of the elements in both directions.

It has been found to be convenient to sequentially number the annuli 34 so that by observing the number at a convenient point externally of the guide tube and knowing the orientation of the guide tube from the position of its handle 26, the precise portion of a tank undergoing inspection or treatment can be ascertained precisely. The substantially uniform flexibility of the hose and restraining member throughout their lengths prevents undesired jamming when obstacles are encountered.

To facilitate operation, it is desirable that the clearance between the sampling device comprising the hose and restraining means, on the one hand, and the sleeve or guide tube 24, on the other, be as close as possible consistent with the assurance of complete freedom of movement. The outlet port 30 is preferably disposed at an angle exceeding a right angle with respect to the axis of the guide tube so as to assure the relative freedom of movement as the hose and restraining member are projected from and retracted within the guide tube.

Whereas only one form of the invention has been illustrated and described, those skilled in the art will recognize a number of variations as coming within the scope of the appended claims.

We claim:

1. Fluid handling apparatus comprising a flexible hose having a substantially uniform unobstructed longitudinal passage, restraining means having an end fixed to an end of said hose and its remaining portion loosely attached externally to said hose at a series of relatively closely spaced points along a substantial length thereof and freely slidable relative thereto in a direction parallel to said passage, said restraining means being flexibly movable with said hose in the direction of a first plane disposed radially of said passage and substantially rigid in the direction of a second plane disposed radially of said passage and normal to said first plane, and a guide member providing an abutment slidably engaging said restraining means to control the direction of longitudinal movement of said hose.

2. Fluid handling apparatus according to claim 1 wherein said restraining means is resilient.

3. Fluid handling apparatus according to claim 1 wherein said restraining means is longitudinally expansible.

4. Fluid handling apparatus according to claim 1 wherein said restraining means comprises an elongated leaf spring.

5. Fluid handling apparatus according to claim 1 wherein said elements surround said hose.

6. Fluid handling apparatus according to claim 1 wherein said guide member provides a bore receiving said hose and restraining member and a laterally opening outlet port through which said hose and restraining member can be projected.

7. Fluid handling apparatus according to claim 6 wherein said bore has a cross section changing from curvilinear to angular at said outlet port.

8. Fluid handling apparatus according to claim 6 including biasing means carried by said guide member adjacent said outlet port for urging said hose towards said guide member.

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