Aug. 30, 1966 J. C. MARANTETTE ETAL 3,268,933

TANK CLEANING APPARATUS

Filed Jan. 4, 1965 2 Sheets-Sheet 1

FIG. 1

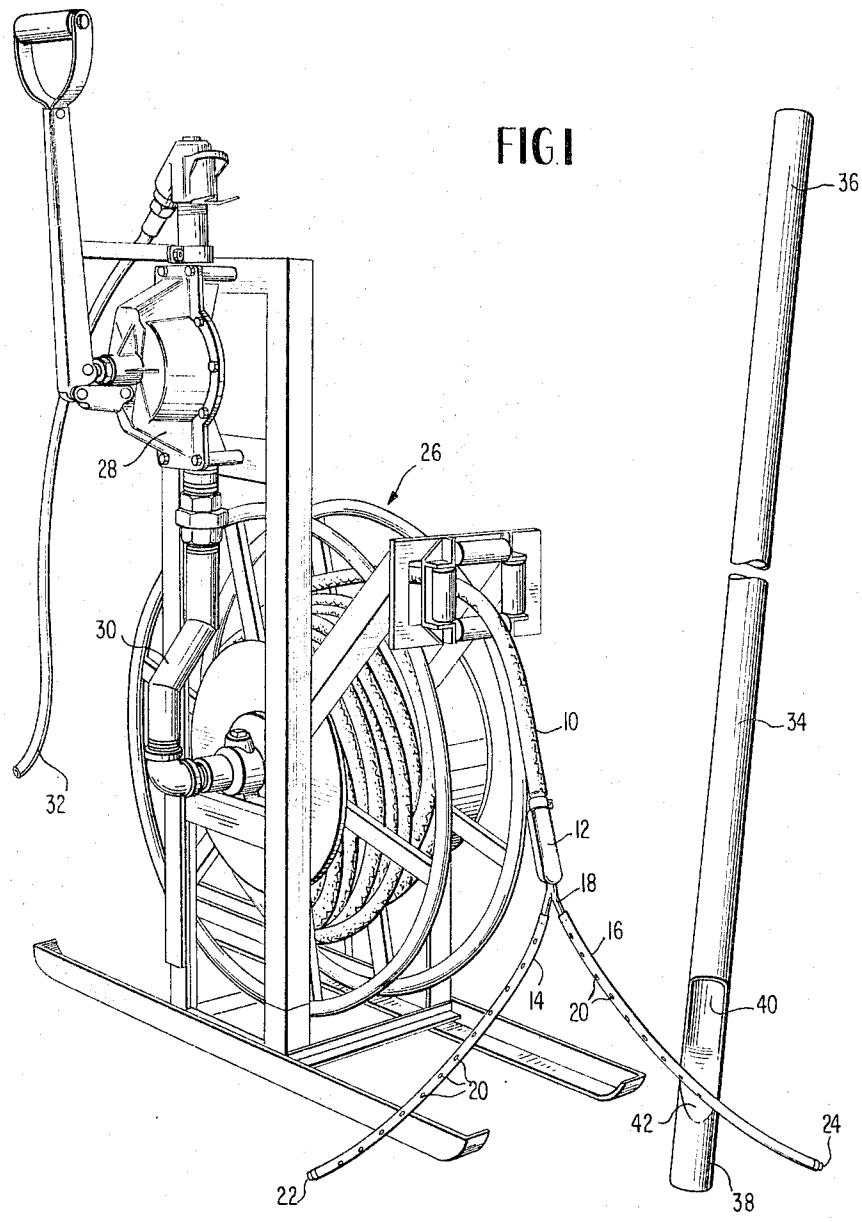
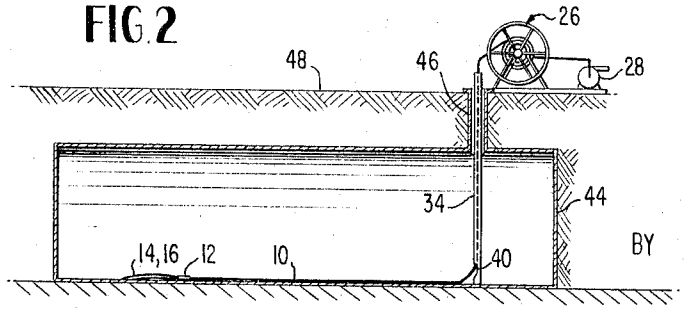


FIG. 2



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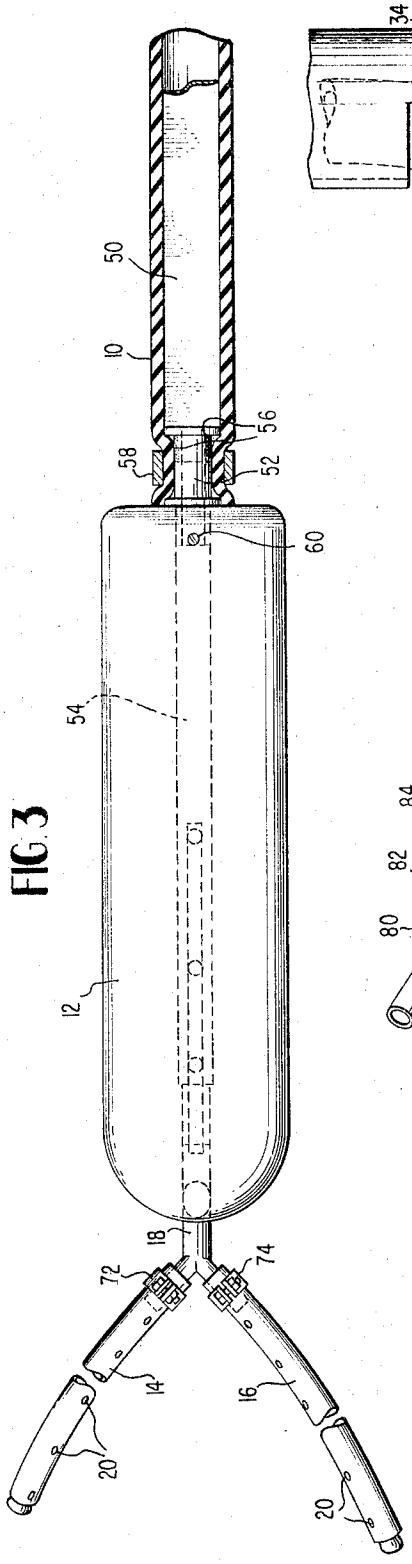


FIG. 3

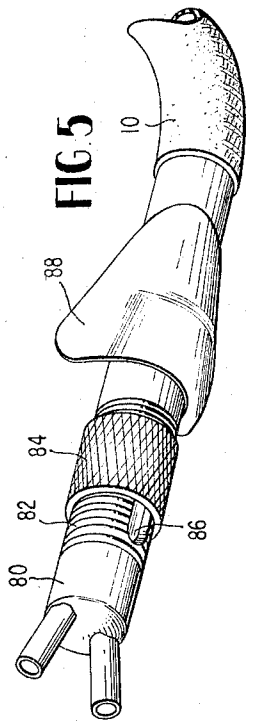


FIG. 5

FIG. 4

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TANK CLEANING APPARATUS

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8 Claims. (Cl. 15—1.7)

This invention relates generally to tank cleaning apparatus and, more particularly, to apparatus for removing extraneous liquid and sediment from underground storage tanks.

It is often desirable to store substances such as fuels, chemicals and other liquids in underground tanks. However, one disadvantage of this type of storage is the difficulty of removing water and sediment from the bottom of the tank.

At one time, the water and sediment could be removed only from the area of the tank immediately below the filler pipe which extends to ground level, however, there are now available devices for cleaning other areas of the tank bottom. However, these prior art devices have disadvantages which are overcome by the present invention. For example, one type of known apparatus incorporates a weighted probe head which is connected to the end of a flexible hose. In order to provide for manipulation of the probe head across the bottom of the tank, a chain is inserted in the hose and fixed thereto at the probe end. Other prior art devices utilize an external steel strap or a plurality of hinged smaller straps or links secured to the outside of the hose. However, all of these prior art attempts to provide the flexible hose with means which permits manipulation thereof across the bottom of the tank detract from the reelability of the hose. As a practical manner, it is very desirable to be able to wind the flexible hose on a reel during a cleaning operation.

Consequently, one of the objects of this invention is to provide a tank cleaning apparatus wherein the flexible hose connected to the probe head is provided with means which permits the probe head and hose to be directed along the bottom of the tank and also permits the hose easily to be wound upon a reel.

Another disadvantage of the prior art tank cleaning devices is the restriction on the size of the probe head which scavenges the bottom of the tank. In the past, the probe head has been limited in size by the diameter of the filler pipe which connects the tank to the surface of the ground. Since such a small probe head can clean only a very small area at one time, the tank cleaning operation was extremely time consuming and, furthermore, it was very possible to miss certain areas of the tank bottom.

Therefore, another object of this invention is to provide a tank cleaning probe head which may be inserted through the relatively restricted filler pipes of underground tanks but which will scavenge a much larger area of the tank bottom for each discrete position of the probe head.

Other objects and advantages of this invention will become apparent from the following written description and accompanying drawings which disclose in detail a preferred embodiment of this invention.

In the drawings:

FIGURE 1 shows a preferred embodiment of a complete tank cleaning apparatus embodying this invention and particularly illustrates the reelability of the flexible hose;

FIGURE 2 shows the manner in which this apparatus is utilized to scavenge or clean the bottom of an underground gasoline tank;

FIGURE 3 is a combined plan view and sectional view

of the probe head and adjacent flexible hose construction;

FIGURE 4 is partially cutaway side view of the apparatus shown in FIGURE 3; and

FIGURE 5 is a perspective view of another embodiment of the probe head.

FIGURE 1 shows the complete tank cleaning apparatus as actually used in practice. The apparatus comprises a flexible hose **10**, a probe head **12** and a pair of flexible plastic tubes **14**, **16** connected by a Y connector **18** to probe head **12**. These flexible tubes have a plurality of openings **20** for removing water and sediment from the bottom of an underground gasoline tank. The ends of these tubes are closed by any suitable means such as plugs **22** and **24**. As will be shown later, the underside of probe head **12** also has openings therein for withdrawing water and sediment from the bottom of the tank.

The hose is shown wound upon a reel generally designated by the reference numeral **26**. The water and sediment withdrawn from the tank passes through hose **10** and is drawn by a pump **28** through a pipe **30** and discharged through a clear plastic hose **32** which is purposely made transparent so that the operator of the cleaning apparatus can observe the nature of the material being withdrawn from the bottom of the tank.

Also shown in FIGURE 1 is a guide pipe **34** whose top end **36** projects above the ground level and whose bottom end **38** extends to the bottom of the tank. An opening **40** in pipe **34** near its bottom end provides an exit for the hose and probe assembly near the bottom of the tank. The extreme lower end of pipe **34** below opening **40** is blocked to provide an inclined surface **42** which directs the hose and probe head assembly along the tank bottom in the desired direction.

The diameter of probe head **12** must be smaller than the internal diameter of guide pipe **34**. However, flexible tubes **14** and **16** may be drawn together when the apparatus is inserted in the guide pipe. When tubes **14** and **16** exit from the opening **40** into the bottom of the tank they are once again free to spread open to the position illustrated in FIGURE 1 to cover a very large area of the tank bottom.

FIGURE 2 shows an underground cylindrical tank **44** having a filler pipe **46** which extends to the ground surface **48**. To clean the bottom of tank **44**, one first passes guide pipe **34** through filler pipe **46** into the tank in such a manner that the opening points in the direction that the operator desires the probe head to travel. Hose **10** carrying the probe head assembly is then unreeled from reel **26** and inserted into pipe **34**. As previously mentioned, during this stage of the operation, the flexible tubes **14**, **16** are drawn together so that they easily fit within pipe **34**. The probe head assembly and hose **10** exit from the opening **40** in the bottom of pipe **34**. As the hose is unwound from reel **26**, probe head **12** is pushed along the bottom of the tank and tubes **14**, **16**, now spread apart, travel across the bottom of the tank removing water and sediment by means of the suction applied by pump **28**. As will be discussed later, hose **10** is designed so that it will bend in only one direction to assure that probe head **12** and flexible tubes **14**, **16** lie flat on the bottom and travel in a predetermined direction. Since tank **44** is cylindrical, it is not generally necessary to sweep the probe angularly with respect to guide pipe **34** in order to remove all the water and sediment. However, if a flat-bottomed tank, for example, is being cleaned, pipe **34** may be rotated in order to change the position of opening **40** with respect to filler pipe **46**, thereby directing the probe head over all areas of the tank bottom.

FIGURES 3 and 4 show in greater detail the structure of hose **10**, probe head **12** and flexible tubes **14** and **16**. In order to render hose **10** bendable in only one direction

when it is inserted into underground tank 44, a spring steel strap 50 is placed in the hose and extends the length thereof. Strap 50 is rigidly fixed to probe head 12 by means of a fitting 52 which extends into the lower end of hose 10 and also into a bore 54 extending centrally through the length of probe head 12. Steel strap 50 is inserted in a slot in fitting 52 and welded thereto at points 56. Hose 10 is secured to fitting 52 by means of a hose clamp 58 and the fitting is fixed to probe head 12 by means of a set screw 60.

As shown in FIGURE 4, steel strap 50 permits hose 10 to bend only in one direction as it exits from opening 40 in guide pipe 34 and directs the hose along the bottom of the tank. For best results, it has been found that the width of strap 50 should be equal to, or slightly greater than, the inside diameter of hose 10. If the width of strap 50 is less than the internal diameter of hose 10, the hose will twist and deviate from the preferred straight course as the hose is lowered into the tank and guided along the bottom of the tank. On the other hand, if strap 50 is substantially wider than the inside diameter of hose 10, the hose will collapse when pump 28 applies suction thereto.

FIGURE 4 also shows an enlarged view of the bottom end 38 of the guide pipe 34. Opening 40 has an inclined lower surface 42 provided by a blocking member 59 to permit the hose and probe assembly easily to exit from the opening.

Also as shown in FIGURE 4, probe head 12 has an inclined front surface 62 which permits the head to slide over obstacles which may be encountered on the bottom of tank 44. A slot 64 is formed in the center of the bottom of probe head 12 and is connected to a bore 54 via three communicating countersunk passages 66. Consequently, when suction is applied to hose 10, water and sediment are drawn through slot 64 and passages 66 into bore 54 and then up hose 10. Another bore 68 is formed through the inclined surface 62 and joins bore 54. A Y connector 18 is inserted in bore 68, thereby permitting the two arms of the connector to extend forwardly from probe body 12. Flexible tubes 14 and 16 are fitted over the arms of connector 18 and secured by suitable hose clamps 72 and 74.

The desirablity of this apparatus for cleaning cylindrical underground tanks is quite obvious. The relatively heavy probe head 12 hugs the bottom of the tank. Water and sediment are sucked up through slot 64 and also through apertures 20 in the flexible tubes 14, 16 connected to the front end of probe 12. Since these tubes are flexible and connected to Y connector 18, they spread out along the bottom of the tank and cover a very large area, thereby removing water and sediment in a much more efficient and complete manner than can be accomplished by prior art devices.

In practice, the probe head 12 is constructed of stainless steel and is approximately five inches long, ½ inch thick and ⅞ inch wide. The bottom is slightly rounded to conform with the inside of guide pipe 34. The front surface 62 is sloped at a 45° angle. Bore 54 is 5/16 inch in diameter and extends from the hose end of the probe 12 to within one inch of the surface 62. Bore 68 has a diameter of approximately ¼ inch. Slot 64 is approximately three inches long, ¼ inch wide and 3/16 inch deep. Communicating passages 66 are ⅛ inch in diameter. The flexible hoses 14, 16 are approximately eighteen inches long.

FIGURE 5 shows another embodiment of the probe head assembly for use with hose 10. In this case, the probe body 80 is cylindrical and carries external threads 82 upon which is threaded an external sleeve 84. A slot 86 is formed in the bottom of probe body 12 to permit water to be drawn therethrough when suction is applied to hose 10. The total suction applied to the bottom of the tank via opening 76 may be controlled by adjusting the position of sleeve 84 along the length of the probe body 80.

Another feature of this embodiment is the provision of a flared plate 88 fixed to probe body 12 near hose 10. This flared plate prevents the probe from catching on guide pipe 34 as the hose and probe assembly are withdrawn from the tank after a cleaning operation.

A preferred embodiment and another embodiment of this invention have been described and illustrated in detail with reference to a gasoline tank. However, it is recognized that modifications of these embodiments will be obvious to those skilled in the art to which this invention appertains and that the present invention can be used for cleaning tanks used for storing liquids other than gasoline. Consequently, such modifications are considered to be within the scope of the invention which is intended to be limited only as defined in the appended claims.

What is claimed is:

1. An apparatus for removing extraneous liquid and sediment from the bottom of a liquid-filled tank comprising a length of flexible hose having one end adapted to be connected to a source of suction, an elongated spring metal strap in said hose to permit the hose to bend in only one direction, a probe head on the other end of said flexible hose and fixed to an end of said strap, said probe head having a fluid passage therein in fluid communication with said other end of said flexible hose, and elongated flexible tubular means connected to said head for fluid flow communication with said hose and having an opening therein for drawing said extraneous water and sediment therethrough.

2. An apparatus as defined in claim 1 wherein the flexible tubular means comprises a pair of elongated flexible tubes, each having its free end closed and a plurality of openings along its length, said tubes being adapted to diverge at their free ends when the probe head is moved along the bottom of said tank.

3. An apparatus as defined in claim 1 wherein the width of the steel strap is equal to or slightly greater than the inside diameter of said hose.

4. A probe head for use on the end of a flexible hose connected to a source of suction for removing extraneous water and sediment from a liquid-filled tank comprising a probe body having a bottom and front and rear ends, a first opening in said rear end for connecting said probe body in fluid flow communication with a flexible hose, a countersunk second opening in said bottom in flow communication with said first opening, a third opening in said front end in flow communication with said first opening, and flexible tubular means on said body in fluid flow communication with said third opening, said tubular means having an opening therein.

5. A probe head for use on the end of a flexible hose connected to a source of suction for removing extraneous water and sediment from a liquid-filled tank comprising a probe body having a bottom and front and rear ends, a first opening in said rear end for connecting said probe body in fluid flow communication with a flexible hose, means in said bottom for removing said extraneous water and sediment from the bottom of said tank, said bottom means being in flow communication with said first opening, a second opening in said front end in flow communication with said first opening, and means for adjusting the size of said bottom means.

6. A probe head as defined in claim 5 wherein said probe body is elongated and said bottom opening is shorter than the length of said body, said adjusting means comprising a sleeve mounted on said probe body for movement along the length thereof.

7. A probe head for the end of a flexible hose connected to a source of suction and used to remove extraneous liquid and sediment from a liquid filled tank comprising in combination:

a probe body having a passage therein for fluid flow communication with said flexible hose, said probe body having a countersunk opening in the bottom thereof in fluid flow communication with said passage, and

a pair of flexible tubes mounted on the end of said body in fluid flow communication with said passage, each of said tubes having aperture means therein for permitting removal of extraneous liquid and sediment therethrough.

8. A probe head for the end of a flexible hose connected to a source of suction and used to remove extraneous liquid and sediment from a liquid filled tank into and out of which said hose is guided through an opening in a guide pipe, comprising in combination:

a probe body having a passage therein for fluid flow communication with said flexible hose, and

flexible tubular means mounted on said body in fluid flow communication with said passage, said tubular means having an opening therein for permitting removal of said extraneous liquid and sediment therethrough, said probe body being elongated and having a flared guide plate thereon for guiding said probe head back into said guide pipe opening when said fleixble hose and probe head are withdrawn from the tank through said guide pipe opening.

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