Nov. 1, 1960 W. W. MORGAN 2,958,222

SAMPLE THIEF CONSTRUCTION

Filed May 23, 1957 2 Sheets-Sheet 1

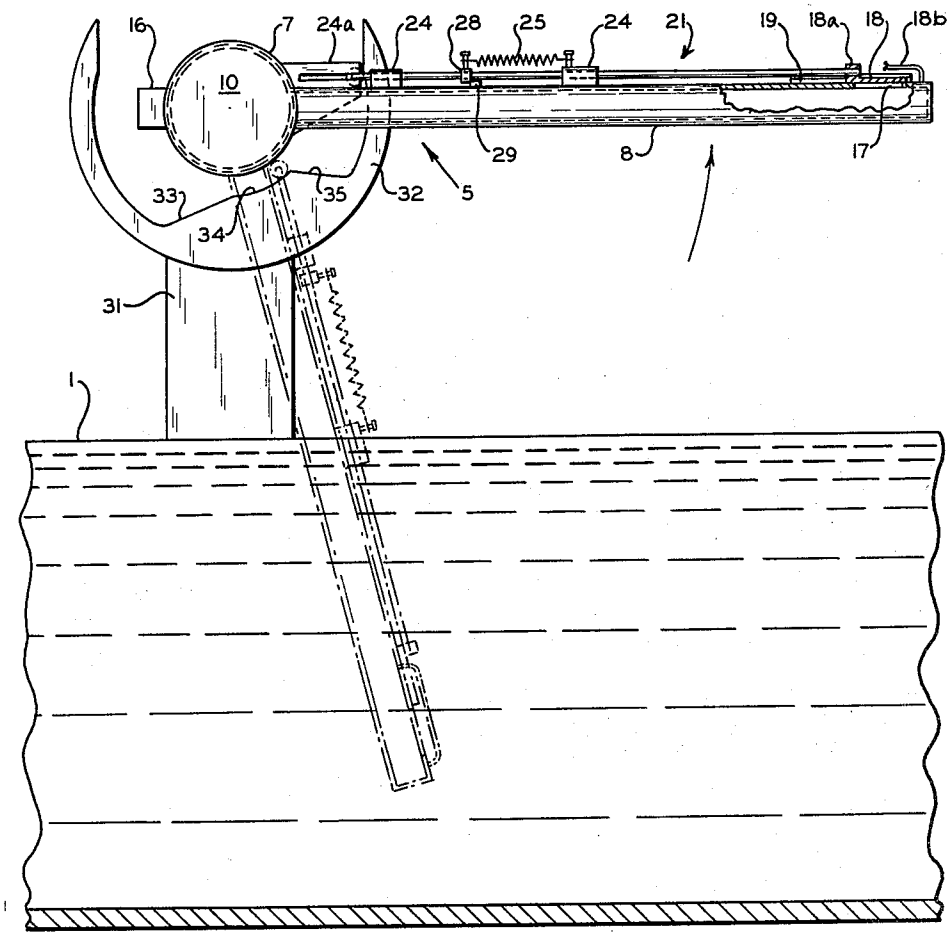


FIG. 1

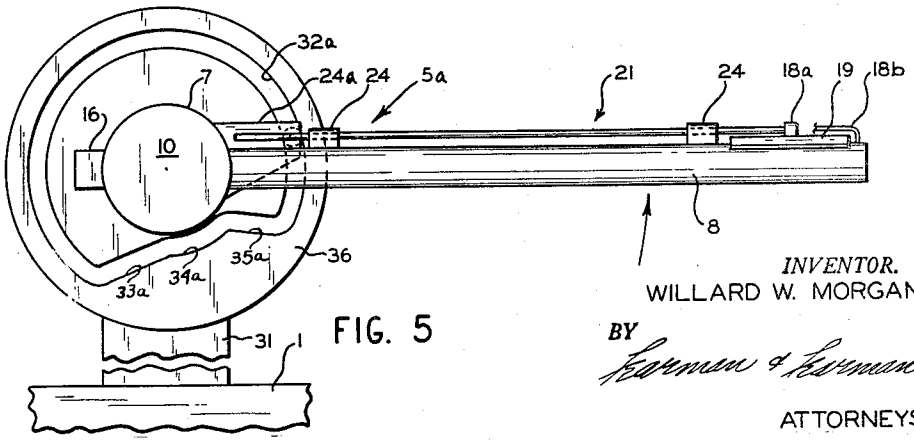


FIG. 5

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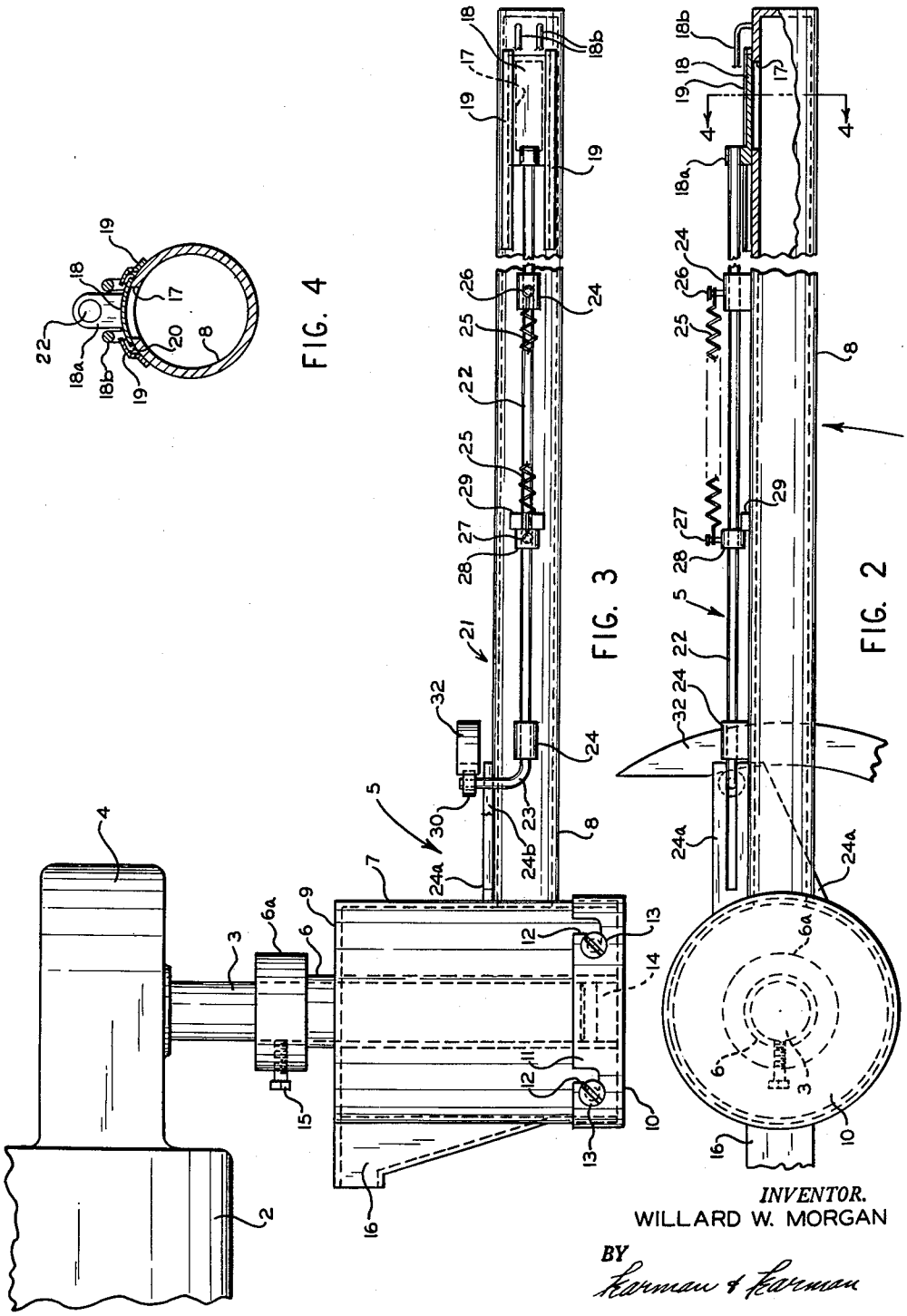


FIG. 4

FIG. 3

FIG. 2

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SAMPLE THIEF CONSTRUCTION

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This invention relates to fluid sampling apparatus and more particularly to automatically operable thief means for extracting fluid samples from below the surface of a fluid stream.

To sample fluids flowing through a fluid system, it is customary to immerse a tube or other receptacle in the fluid to collect in the receptacle a small portion of the fluid for analysis. In taking the sample it is preferable that fluid from substantially the middle third of the stream be collected in order that the sample will not be unduly influenced by heavy sedimentary material at the bottom of the stream or by lighter material suspended adjacent to or floating on the surface of the stream. Various kinds of devices have been proposed heretofore for use in taking so-called deep samples, but not all such devices have been entirely satisfactory inasmuch as they are operated manually and are complex and expensive to manufacture.

An object of this invention is to provide automatically operable sample taking apparatus of improved, simplified construction.

Another object of the invention is to provide sample taking apparatus of the kind referred to which is capable of taking a representative sample from a stream of flowing fluid at a point intermediate the surface and the bottom of the stream.

A further object of the invention is to provide a deep sample thief construction adapted to be power driven between sample taking and sample discharging positions, and which is so constructed as to be readily connected to and disconnected from its driver.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, in which:

Figure 1 is a view partly in front elevation and partly in section of thief means constructed in accordance with the invention and mounted for movement relative to a stream between sample taking and sample discharging positions, the driving means not being shown;

Figure 2 is an enlarged view of a portion of the apparatus shown in Figure 1;

Figure 3 is a top plan view of the apparatus shown in Figure 2 and also indicating the driving means;

Figure 4 is an enlarged sectional view taken on the line 4—4 of Figure 2; and

Figure 5 is a view similar to Figure 2, but on a reduced scale, of a modified embodiment of the invention.

Apparatus constructed in accordance with the invention is intended for use primarily, but not necessarily exclusively, in conjunction with a sewage disposal station in which a stream of sewage flows through a system including an open top channel indicated in Figure 1 of the drawings by the reference character 1. An electric or other suitable motor 2 (see Figure 3) is drivingly connected to a shaft 3 through a reduction gear assembly 4, the motor 2 and the assembly 4 being mounted on a support (not shown) of any suitable kind so that the shaft 3 projects above the stream of fluid in the channel 1.

Thief apparatus formed in accordance with one embodiment of the invention is represented in Figures 1–4 by the reference character 5 and includes a cylindrical sleeve 6 adapted for removable reception of the drive shaft 3 and being concentrically fixed within a substantially cylindrical receptacle 7 to one side of which is fixed

a radially extending, hollow tube member 8. One end of the receptacle 7 is closed by an integral wall 9 and the other end of the receptacle is closed by a removable cap 10 having a flange 11 in which is provided a number of bayonet slots 12, two of which are shown in Figure 3, for reception of studs 13 or the like. The inner surface of the cap 10 is provided with a centrally located sealing gasket 14 adapted to be received in the sleeve 6 to prevent the admission of fluid to the interior of the latter. The apparatus 5 is adapted to be rotated through 360° under the drive of the motor 2, and to prevent slippage of the thief apparatus the sleeve 6 may be equipped with an enlargement 6*a* in which a set screw 15 is mounted to bear against the shaft 3. At a point diametrically opposed to the connection of the tube 8 to the receptacle 7 the latter is provided with a discharge spout 16 by means of which fluid from the interior of the receptacle 7 may be drained.

Adjacent to the radially outer end of the tube 8 is an opening 17 in communication with the interior of the tube and through which fluid from the stream may be admitted. The opening 17 normally is closed or sealed by a closure or gate member 18 which is mounted for movement relative to the tube 8 by means of a pair of guides 19 located one on either side of the opening 17. If desired, the edges of the closure 18 may be equipped with sealing gaskets 20 (see Figure 4).

Apparatus constructed in accordance with the invention includes means generally designated by the numeral 21 operable in response to driving movement of the tube member 8 for effecting movement of the closure 18 from and to its closed position while the radially outer end of the tube is immersed in fluid so as to admit a sample of the flowing fluid to the thief. In the embodiment of the invention disclosed in Figures 1–4, the operating means 21 includes a rod 22 having one of its ends fixed in an upstanding projection 18*a* on the gate 18 and its other end bent laterally as at 23 to project beyond the tube 8. The arm 22 is mounted for sliding movements in a pair of tubular guides 24 fixed on the tube 8 and is prevented from rotating relatively to the tube 8 by means of a plate 24*a* fixed on the tube and having a slot 24*b* in which the projecting end of the rod may slide. A spring 25, anchored at one end to a post 26 on the radially outer guide 24 and at its other end to a post 27 mounted in a block 28 fixed on the arm 22, urges the arm and, consequently, the gate 18 to its opening covering position. A stop 29 is mounted on the tube 8 in a position to engage the block 28 when the opening 17 is covered by the gate 18. The spring 25 preferably is so located on the tube 8 that it will not be submerged in the fluid.

At the radially inner end of the rod 22, remote from the fluid to be sampled, is actuating means for controlling the operation of the gate 18. The actuating means comprises a cam follower or roller 30 journaled on the rod 22, and mounted on a suitable support 31 so as to be in the path of the cam follower 30 is a cam 32 having a riser surface 33 so located with respect to the orbit of the cam follower 30 as to exert a force on the latter when the radially outermost end of the tube 8 is submerged and effect movement of the gate 18 to uncover the opening 17. The riser surface 33 merges into a dwell surface 34 which maintains the gate 18 open, the dwell surface merging into a decline surface 35 which permits the spring 25 to return the gate 18 to its opening covering position. The construction and arrangement of the various cam surfaces are such that the sample admitting opening in the arm 8 is closed when the latter is first submerged in the fluid in the stream, is opened for a portion of the travel of the tube through the fluid, and is closed prior to the emergence of

the tube from the fluid. Preferably, the location of the opening **17** is such that it will be uncovered for at least a portion of its passage through the middle third of the stream of fluid. If desired, guard rails **18***b* may be fixed on the tube **8** to screen the opening **18** for the purpose of preventing the latter from being clogged by material in the stream.

In the operation of the apparatus described thus far, the thief apparatus is driven by the motor so as to cause the tube **8** to be cyclically immersed and withdrawn from the fluid in the channel **1**. During the revolution of the thief tube **8**, the gate **18** will cover the opening **17** until such time as the cam follower **30** engages the cam surface **33**, whereupon the gate will begin to move from its closed position to its open position. During the time the gate is in its open position, fluid from the stream will be admitted to the interior of the tube **8**. When the cam follower **30** reaches the cam surface **35**, the spring **25** will begin to return the gate to its closed position and the gate will be fully closed prior to the emergence of the tube from the stream. As the thief apparatus **5** continues to rotate, fluid in the tube **8** will drain by gravity into the receptacle **7** and, as the tube **8** approaches the vertical, fluid in the receptacle **7** will drain by gravity through the discharge spout **16** into any suitable receiver or trough (not shown). Thereafter, the cycle is repeated as often as desired. When the thief apparatus must be cleaned it is a simple matter to remove it from the shaft **3** merely by loosening the set screw **15**.

The thief apparatus **5***a* shown in Figure 5 is similar to that previously described, but differs from the latter in that the cam is provided by a track or groove **32***a* formed in a disc **36** which is mounted on the support **31**. In this embodiment the cam follower **30** is constrained by the walls of the track **32***a* to follow the contour of the latter which includes cam surfaces **33***a*, **34***a*, and **35***a*, corresponding to the cam surfaces **33**, **34**, and **35**, respectively. Inasmuch as the cam follower **30** must follow the contour of the track **32**, there is no necessity for providing the return spring **25**, the block **29**, or their associated parts. Instead, the action of the gate **18** will be controlled by pushing and pulling forces applied to it through the rod **22** under the influence of the cam follower **30**. The operation of the embodiment shown in Figure 5 is similar to that previously described.

The disclosed embodiments are representative of presently preferred forms of the invention but are intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

I claim:

1. Sampling thief apparatus comprising a hollow tube member having an opening adjacent to one end; driving means connected to said tube member for moving the latter to and from a position in which said one end is immersed in a fluid to be sampled to a depth such that said opening is below the surface of said fluid; a closure member mounted on said tube member for movements relative to the latter from and to a first position in which said opening is covered to and from a second position in which said opening is uncovered; operating means connected to said closure member operable in response to driving movement of said tube member for moving said closure member from and to its respective positions while said opening is below the surface of said fluid; and actuating means connected to said operating means remote from the fluid to be sampled for controlling said operating means.

2. Apparatus as set forth in claim 1 wherein said actuating means includes a cam follower connected to said closure member and a cam fixed with respect to said tube and located in the path of movement of said cam follower for moving said closure member via said operating means from its first position to its second position.

3. Apparatus as set forth in claim 2 wherein said operating means includes a spring reacting between said tube member and said closure member for moving the latter from its second position to its first position.

4. Apparatus as set forth in claim 1 including a receptacle connected to the other end of said tube member into which fluid in said tube member may drain when the latter has been moved from its immersed position.

5. Apparatus as set forth in claim 4 wherein said receptacle is provided with a discharge spout through which fluid in said receptacle may drain.

6. Sampling thief apparatus comprising a hollow tube member having an opening adjacent to one end; driving means; means connecting said tube member to said driving means for moving said tube member to and from a position in which said one end is immersed in fluid to be sampled to a depth such that said opening is below the surface of said fluid; a closure member mounted on said tube member for movements relative to the latter from a first position in which said opening is covered to a second position in which said opening is uncovered; a cam follower mounted on said tube member and connected to said closure member; and a cam located in the path of movement of said cam follower for effecting movements of said closure member from its first position to its second position and return while said opening of said tube member is below the surface of said fluid, said cam and cam follower being located remote from the fluid to be sampled.

7. Apparatus as set forth in claim 6 wherein said connecting means includes a receptacle connected to the other end of said tube member into which fluid in said tube member may drain when the latter has been moved from its immersed position.

8. Apparatus as set forth in claim 7 wherein said receptacle is provided with a discharge spout through which fluid in said receptacle may drain.

9. Sampling thief apparatus comprising a hollow tube member having an opening adjacent to one end; driving means; means connecting said tube member to said driving means for moving said tube member in an orbital path to and from a position in which said one end is immersed in a stream of fluid to be sampled to a depth such that said opening is below the surface of said fluid; a closure member mounted on said tube member for movements relative to the latter from a first position in which said opening is sealed to a second position in which said opening is unsealed; a rod mounted on said tube member and connected at one of its ends to said closure member and provided at its other end with a cam follower; a cam having camming surfaces thereon; and means mounting said cam in such position that said camming surfaces are in the path of movement of said cam follower, said camming surfaces being so located relatively to the orbit of said cam follower as to effect movement of said closure member from said first position to said second position after immersion of said opening below the surface of said stream.

10. Apparatus as set forth in claim 9 wherein one of said camming surfaces is so located as to effect movement of said closure member from said second position to said first position prior to emergence of said opening from below the surface of said stream.

11. Apparatus as set forth in claim 10 including spring means reacting between said closure member and said tube member to move said closure member to said first position upon movement of said cam follower across said one camming surface.

References Cited in the file of this patent

UNITED STATES PATENTS

2,245,519	Bailey	June 10, 1941
2,270,511	Crain	Jan. 20, 1942
2,486,639	Ferguson	Nov. 1, 1949
2,664,751	Johnson	Jan. 5, 1954