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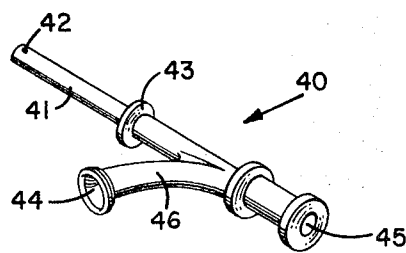
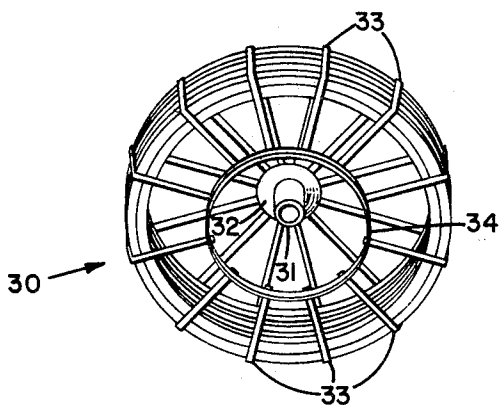
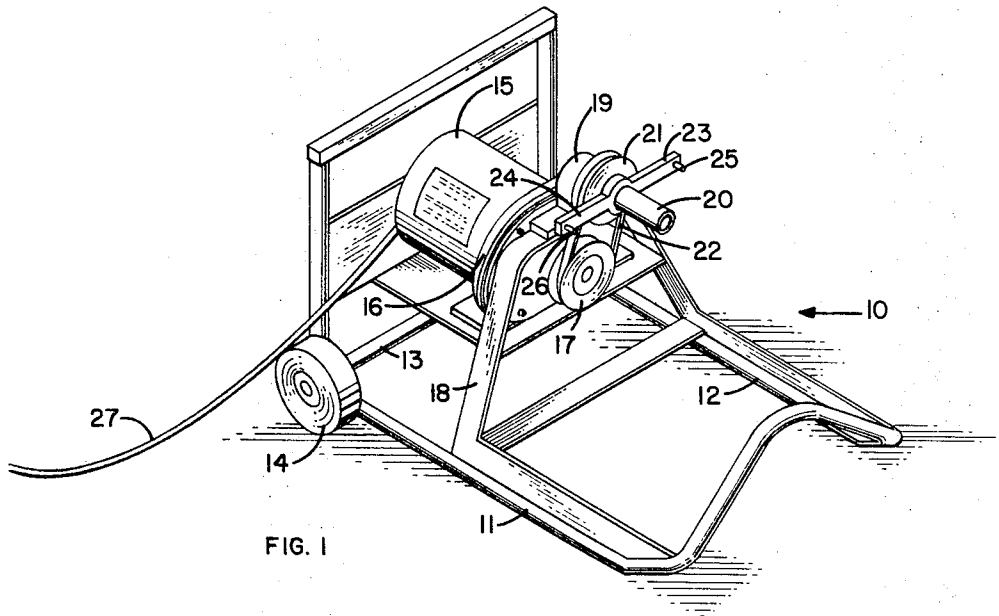
T. L. RATLIFF

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CONDUIT CLEANING APPARATUS

Filed Sept. 24, 1968

2 Sheets-Sheet 1



INVENTOR
TROY L. RATLIFF

BY

Hinderstein & Siller

ATTORNEYS

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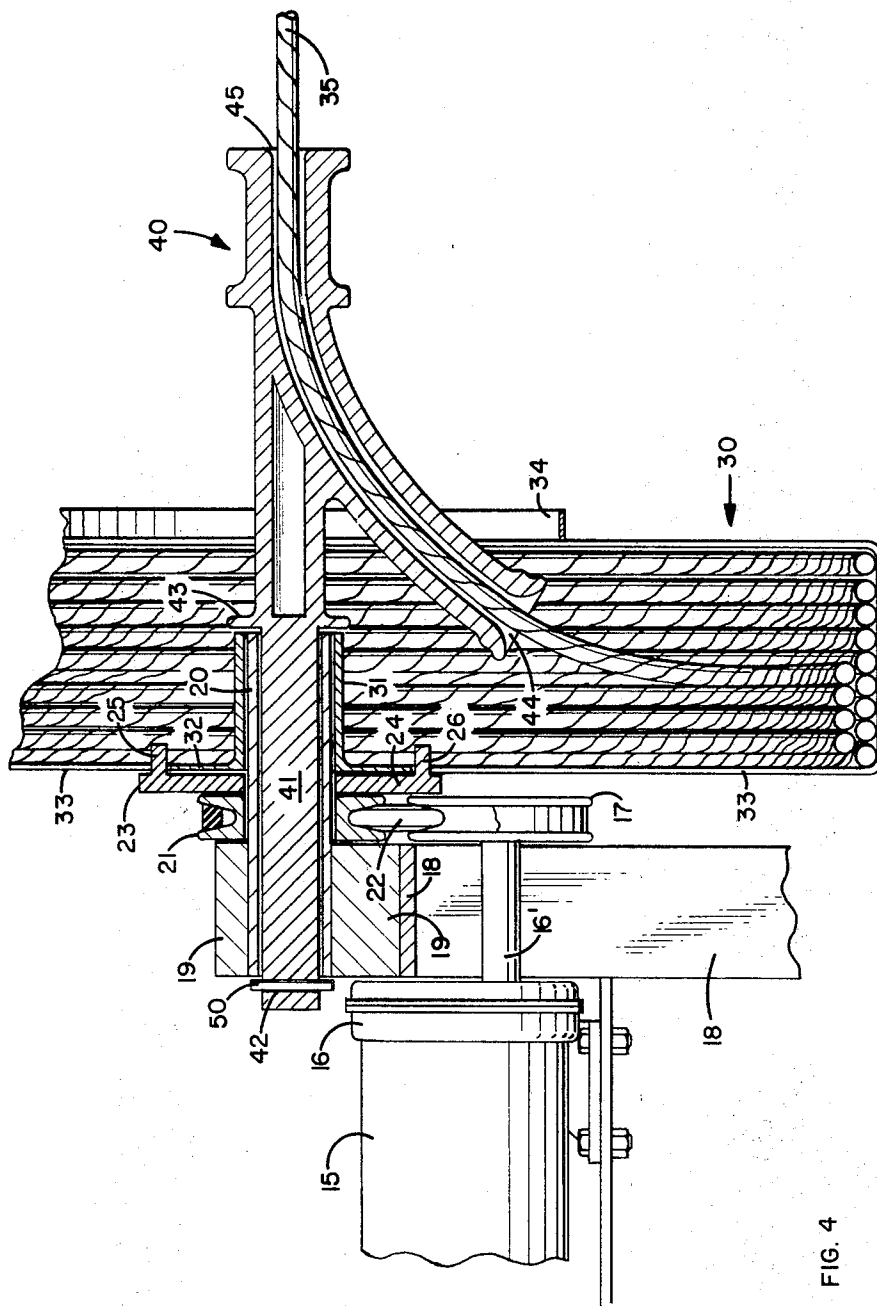
T. L. RATLIFF

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INVENTOR.

TROY L. RATLIFF

BY

Hinderstein & Silber

ATTORNEYS

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CONDUIT CLEANING APPARATUS

Troy L. Ratliff, Santa Ana, Calif., assignor to U.S. Rooter Corporation, Santa Ana, Calif., a corporation of California

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ABSTRACT OF THE DISCLOSURE

Conduit cleaning apparatus comprising: a supporting frame; a stationary, hollow, stub shaft mounted on the frame; a first pulley rotatably mounted on the stub shaft, the pulley including a pair of driver arms; a motor second pulley and belt for driving the first pulley and driver arms; a reel adapted for carrying cable rotatably mounted on the stub shaft and rotated by the driver arms; and a guide tube extending through the stub shaft for restraining axial movement of the reel relative to the stub shaft.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to conduit cleaning apparatus and, more particularly, to a simplified mechanism for supporting and driving a rotary cable-carrying reel which contains a flexible cable of the type used for cleaning sewer and drain pipes.

Description of the prior art

Various types of conduits, such as sewer and drain lines, often become clogged with waste materials or tree roots which grow through the joints in the lines. When this occurs, the usual procedure for unclogging the line is to open a clean-out tap at some accessible point and insert a suitable tool for removing the obstruction. Most conduit cleaning machines used for this purpose comprise a plurality of spring cutters or knives affixed to the end of a flexible cable which is fed into the conduit and rotated in order to rotate the cutters. The rotating cutters effectively cut away the obstruction in the conduit, whereupon liquid flowing through the line washes the obstruction away.

Typical conduit cleaning machines include a cage-type reel with the flexible cable wound on the inside thereof in position to be fed in and out of the line to be cleaned. The reel is operatively connected to a motor which turns the reel and cable wound therein so that the cutters will sweep the interior of the pipe removing any obstructions therein. Since the rotation of the reel merely turns the cable, the cable itself is generally fed into and out of the conduit by hand.

Although many types of conduit cleaning machines are presently in existence and operative, many problems are associated therewith. Most existing machines are complicated, with many moving parts. For this reason, the assembly and disassembly of the machine is generally a time-consuming process, making it infeasible to store and transport the apparatus in more than one piece. As a result, the user is forced to constantly deal with a heavy, cumbersome machine. Since these machines are most often used in the home, this presents a serious problem for the user who is often required to manipulate the machine down or up narrow staircases to the basement or other parts of the home.

The inability to rapidly assemble and disassemble the machine also prohibits the ready changing of reels. Such a feature is desirable for many reasons. For example, in one situation a reel of 50 feet may be adequate to perform a particular job, whereas in another situation a cable

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length of 150 feet may be required. Since it stands to reason that the reel supporting 150 feet of cable is substantially heavier than the reel containing 50 feet of cable, it is desirable to be able to rapidly change reels to use the minimum amount of cable necessary for each situation. Furthermore, it is often necessary to clean very long lengths of conduits which are longer than the amount of cable which is stored on a single reel. In a situation such as this, it may be necessary to use many reels of cable, continually changing reels during the operation of cleaning the obstructed conduit. In such a situation, apparatus for the convenient, rapid changing of reels, so as to materially shorten the time required to clean an obstructed sewer, would be extremely advantageous.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a light-weight, maneuverable, conduit cleaning machine with a minimum number of moving parts which may be rapidly assembled and disassembled. This permits the machine and cable-carrying reels to be stored and transported separately to permit the ready manipulation thereof. Furthermore, the present invention permits the convenient and rapid changing of reels in a matter of seconds so as to materially shorten the time required to clean an obstructed conduit.

Broadly, the present invention consists of a portable frame which supports a motor which drives a first pulley via a reduction gear box. A second pulley is rotatably mounted on a stationary, hollow, stub shaft and is driven by the first pulley via a flexible belt, the second pulley supporting a pair of radially extending driver arms. A rotary cage reel includes a hub which is adapted to be positioned over the stub shaft. Extending from the hub are a plurality of radially extending spokes which make up the body of the reel. Each driver arm includes a pin adapted to extend between adjacent spokes so as to rotate the reel with the second pulley. A guide tube extends through the center of the stationary hollow stub shaft and is secured in place with a removable pin. The guide tube serves the dual function of locking the rotary cage reel in place and feeding the flexible cable axially out of the cage reel into the conduit to be cleaned.

It is, therefore, an object of the present invention to provide a novel conduit cleaning apparatus.

It is a further object of the present invention to provide a conduit cleaning machine which has a minimum number of moving parts.

It is a still further object of the present invention to provide a conduit cleaning machine which may be rapidly assembled and disassembled for storage and changing of reels.

It is another object of the present invention to provide a conduit cleaning machine in which the removal of a single pin permits the disassembly of the machine in a matter of seconds.

Still other objects, features and attendant advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of the preferred embodiment constructed in accordance therewith, taken in conjunction with the accompanying drawings wherein like numerals designate like parts in the several figures and wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a portion of the present conduit cleaning apparatus showing the portable support frame, the motor, and the remaining drive apparatus;

FIG. 2 is a perspective view of a rotary, cable-carrying, storage reel for use with the driver apparatus of FIG. 1;

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FIG. 3 is a perspective view of a guide tube for use with the apparatus of FIGS. 1 and 2; and

FIG. 4 is a view, partly in section, of the assembled conduit cleaning apparatus showing the relationship of the components of FIGS. 1 to 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and, more particularly, to FIGS. 1 and 4 thereof, the present conduit cleaning apparatus comprises a portable support frame, generally designated 10, having a pair of parallel legs 11 and 12 which provide a stable support for frame 10. An axle 13 extends between legs 11 and 12 at one end thereof and supports a pair of wheels 14, one of which is not shown in FIG. 1, so that the present apparatus may be readily rolled from one location to another. Frame 10 supports a motor 15 which drives, through a gear box 16 and a shaft 16', a first pulley 17. Frame 10 further includes a substantially U-shaped support member 18 which extends from legs 11 and 12 over shaft 16'. Member 18 supports a stationary member 19 which is a horizontally positioned bore therein. Extending through bore 19 and connected thereto is a stationary, hollow, stub shaft 20 which extends from the front of member 19 for reasons which will become clearer hereinafter. Positioned on stub shaft 20 so as to be rotatable with respect thereto, is a second pulley 21 which is driven by pulley 17 via a flexible belt 22. Connected to pulley 21 are a pair of radially extending driver arms 23 and 24 which are attached to pulley 21 and are adapted to rotate therewith around stationary stub shaft 20. A pair of pins 25 and 26 extend in an axial direction from the ends of driver arms 23 and 24, respectively.

Referring now to FIGS. 2 and 4, there is shown a rotary, cable-carrying, storage reel, generally designated 30, for use with the apparatus of FIG. 1. Reel 30 includes a hollow hub 31, the inside diameter of which is slightly greater than the outside diameter of stub shaft 20. Extending radially from one end of hub 31 is a rim 32 which supports one end of a plurality of radially extending spokes 33. Spokes 33 are substantially U-shaped members which terminate at their other ends in a cylindrical support member 34 to form an open sided, cage-type structure for supporting a flexible cable 35.

Referring now to FIGS. 3 and 4, there is shown a guide tube, generally designated 40, for use with the apparatus of FIGS. 1 and 2. Guide tube 40 includes a straight, cylindrical sleeve shaft 41, the diameter of which is slightly less than the inside diameter of stub shaft 20. Sleeve shaft 41 has a radially extending hole 42 at one end thereof and a disc-shaped flange 43 at the other end thereof. Guide tube 40 further includes a hollow, arcuate section 46 having a guide tube mouth 44 at one end thereof and a guide tube exit 45 at the other end thereof for conducting cable 35 from reel 30, as will appear more fully hereinafter.

Referring now to FIG. 4, motor 15, gear box 16 and members 18 and 19 are all fixedly mounted on portable support frame 10. Member 19 supports stationary hollow stub shaft 20, one end of which is flush with the back of member 19 and the other end of which extends from the front thereof. Pulley 21 is adapted to be rotated around stationary stub shaft 20 by motor 15 and pulley 17 via flexible belt 22. Pulley 21 rotates driver arms 23 and 24 which are connected to pulley 21 and rotatably mounted on stub shaft 20.

Hub 31 of rotary, cable-carrying, storage reel 30 is adapted to fit over stub shaft 20. The length of hub 31 is approximately equal to the length of that portion of stub shaft 20 which extends beyond driver arms 23 and 24. Furthermore, the diameter of rim 32 is slightly less than the spacing between driver arm pins 25 and 26. In this manner, and as shown in FIG. 4, driver arm pins 25 and 26 extend over rim 32 between radially extending

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spokes 33. Therefore, as driver arms 23 and 24 rotate with pulley 21, reel 30 is caused to rotate therewith.

Sleeve shaft 41 of guide tube 40 is adapted to extend through the hollow portion of stub shaft 20, the length of sleeve shaft 41, from hole 42 to flange 43, being approximately equal to the length of stub shaft 20.

In addition, the diameter of flange 43 is slightly greater than the diameter of hub 31. In this manner, and as shown in FIG. 4, with sleeve shaft 41 extending through the center of stub shaft 20, flange 43 prevents hub 31 from slipping off stub shaft 20 so that driver arm pins 25 and 26 are kept in driving engagement with spokes 33. To prevent guide tube 40 from being withdrawn from stub shaft 20, a pin 50 may be extended into hole 42.

The remainder of guide tube 40 operates in a conventional manner. Cable 35 is adapted to be extended into guide tube mouth 40 and to extend from guide tube exit 45 so that cable 35 may be fed axially out of the present apparatus.

In operation, the present apparatus may be conveniently stored in three parts corresponding to the three parts shown in FIGS. 1 to 3. Thereafter, once the apparatus is positioned adjacent the conduit to be cleaned, the apparatus may be readily assembled in a rapid and efficient manner by simply positioning reel 30 onto support frame 10 with stub shaft 20 extending through hub 31 and with driver arm pins 25 and 26 extending between spokes 33. The apparatus is then locked in place by extending sleeve shaft 41 of guide tube 40 through stub shaft 20 and positioning pin 50 in hole 42. The end of cable 35 is then positioned into guide tube mouth 44 where it exits from guide tube exit 45. After a set of cutter blades are attached to the end of cable 35 and cable 35 is inserted into the conduit to be cleaned, motor 15 may be started by connecting electrical line 27 to any suitable source of AC voltage. Motor 15 drives pulley 17 via gear box 16, whereupon pulley 17 drives pulley 21 via flexible belt 22. Pulley 21 drives reel 30 via driver arms 23 and 24 and pins 25 and 26.

As long as cable 35 is not pulled out of or pushed into cage 30, the rotation of cage 30 forces guide tube 40 to rotate therewith, thereby rotating cable 35. However, it should be noted that guide tube 40 is freely rotatable within stub shaft 20. Therefore, guide tube 40 is free to rotate independently of cage 30. Thus, while cable 35 is being withdrawn from reel 30, guide tube 40 rotates faster than reel 30. Conversely, when cable 35 is being fed back into reel 30, guide tube 40 rotates slower than reel 30 or may be stationary or even rotate in the opposite direction, depending upon the speed of rotation of cage 30 and the speed with which the cable is fed into cage 30.

When it is desired to change reels, pin 50 is removed from hole 42 thereby permitting guide tube 40 to be pulled out of stub shaft 20. This simple action completely frees cage 30 and permits it to be removed from stub shaft 20. Alternatively, once pin 50 is removed, cage 30 may be pulled from stub shaft 20 without first removing guide tube 40, since the removal of cage 30 automatically removes guide tube 40. Another reel may then be placed with its hub 31 on stub shaft 20 whereupon sleeve shaft 41 of guide tube 40 is extended back into stub shaft 20 and pin 50 is replaced.

It can, therefore, be seen that in accordance with the present invention there is provided a simple and efficient apparatus for cleaning sewer and drain lines and other conduits. The present apparatus serves to completely replace the complicated structures of prior art conduit cleaning machines. Not only is the present machine simpler and more trouble-free in construction, but it has the added advantage of permitting the rapid assembly and disassembly of the machine for changing reels or for storage and transportation.

While the invention has been described with respect to a preferred physical embodiment constructed in accordance therewith, it will be apparent to those skilled in the art that various modifications and improvements

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may be made without departing from the scope and spirit of the invention. Accordingly, it is to be understood that the invention is not to be limited by the specific illustrative embodiments, but only by the scope of the appended claims.

I claim:

1. Conduit cleaning apparatus comprising:
 - a supporting frame;
 - a stationary, hollow, stub shaft mounted on said supporting frame;
 - at least one radially extending driver arm rotatably mounted at one end thereof on said stub shaft, the other end thereof supporting an axially extending pin;
 - means for rotating said driver arm relative to said stub shaft;
 - a reel adapted for carrying cable, said reel comprising:
 - a cylindrical, hollow hub adapted to be positioned on said stub shaft; and
 - a plurality of radially extending spokes, said driver arm pin adapted to extend between said spokes to rotate said reel therewith; and
 - a guide tube extending through said stub shaft and being rotatably mounted therein, said guide tube restraining axial movement of said reel relative to said stub shaft, said guide tube being releasably restrained from axial movement through said stub shaft.
2. Conduit cleaning apparatus according to claim 1 wherein said means for rotating said driver arm comprises:
 - a pulley rotatably mounted on said stub shaft, said driver arm connected to said pulley; and
 - means for rotating said pulley.
3. Conduit cleaning apparatus according to claim 2 wherein said means for rotating said pulley comprises:
 - a motor mounted on said supporting frame;
 - a second pulley;
 - means including a gear box for connecting said motor to said second pulley whereby said motor drives said second pulley; and
 - a flexible belt connecting said first-mentioned pulley and said second pulley.
4. Conduit cleaning apparatus according to claim 2 wherein said at least one driver arm comprises:
 - a pair of radially extending driver arms extending in opposite directions from said stub shaft, each of said driver arms supporting an axially extending pin, said pins adapted to extend between opposite pairs of spokes in said reel, said driver arms fixedly connected to said pulley.
5. Conduit cleaning apparatus according to claim 1 wherein said spokes are substantially U-shaped members, one end of which is connected to one end of said hub, the other ends of which are connected together to form an open ended cage for carrying said cable.
6. Conduit cleaning apparatus according to claim 1 wherein said guide tube comprises:
 - a substantially straight portion adapted to extend through said stub shaft and to be releasably restrained therein; and

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- a hollow, arcuate portion for guiding said cable out of said reel, said cable adapted to extend through said arcuate portion of said guide tube.
- 7. Conduit cleaning apparatus according to claim 6 wherein said guide tube further comprises:
 - a flange extending from one end of said straight portion, said flange preventing axial movement of said hub relative to said stub shaft.
- 8. Conduit cleaning apparatus according to claim 7 wherein said guide tube further comprises:
 - a radially extending bore in the other end of said straight portion; and further comprising:
 - a pin extending through said bore, said pin releasably restraining said guide tube from axial movement relative to said stub shaft.
- 9. Conduit cleaning apparatus according to claim 8 wherein the length of said straight portion of said guide tube, from said bore to said flange, is approximately equal to the length of said stub shaft.
- 10. Conduit cleaning apparatus according to claim 6 wherein said guide tube further comprises:
 - a disc-shaped flange extending from one end of said straight portion, the diameter of said flange being greater than the diameter of said hub whereby said flange prevents axial movement of said hub relative to said stub shaft.
- 11. Conduit cleaning apparatus comprising:
 - a supporting frame;
 - a stationary, hollow, stub shaft mounted on said supporting frame;
 - at least one radially, extending driver arm rotatably mounted at one end thereof on said stub shaft, the other end thereof supporting an axially extending pin;
 - means for rotating said driver arm relative to said stub shaft;
 - a reel adapted for carrying cable, said reel comprising:
 - a cylindrical, hollow hub adapted to be positioned on said stub shaft; and
 - a plurality of radially extending spokes, said driver arm pin adapted to extend between said spokes to rotate said reel therewith; and
 - a guide tube extending into said stub shaft and being rotatably mounted therein, said guide tube restraining axial movement of said reel relative to said stub shaft, said guide tube being releasably restrained from axial movement in said stub shaft.

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EDWARD L. ROBERTS, Primary Examiner

U.S. Cl. X.R.

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