A sewer rodding machine is tiltable about its short transverse axis to lower its forward end toward or into the sewer manhole. Mounted on a pivotally adjustable apron at the forward end of the machine are a pair of opposed reels for winding up and storing a series of short section halves of a sectionalized rigid restraining tube through which the rod passes when the series of section halves are unwound from the reels and lowered into the manhole.

4 Claims, 2 Drawing Figures

ABSTRACT
INCLINED CARRIAGE FOR SEWER RODDING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to rodding equipment of the type used in the cleaning and maintenance of sewer pipes, water pipes, and other underground conduits and structures.

Sewer pipes, water pipes, and the like are customarily cleared of obstructions by feeding into the pipe a steel rod having at its foremost extremity a suitable tool for performing the particular cutting or clearing operation. The steel rod is ordinarily comprised of a string of individual rods of spring steel stock coupled together by suitable couplings. The coupled rod, when not in use or when being transported from one work location to another, is stored on the machine on a reel in coils or loops of large diameter. A power drive on the machine is used to pull the rod from the reel and push it into the sewer pipe. A second power drive on the machine is used to rotate the carriage in which the rod reel is mounted to rotate the rod about its own axis to rotate the cutting or other tool at the forward end of the rod. When the obstruction is encountered, rotation of the tool and of the rod will be slowed down and a torsional stress is imposed on the rod which tends to cause a twist to run back along the rod. To prevent such twist from getting all the way into the rod storage reel, the rod drive incorporates twist barrier means in the form of a drive-and-torsion taking wheel, such as is disclosed in my U.S. Pat. No. 3,673,627, granted July 4, 1972, entitled "Drive For Rodding Machine". When, during the forward drive of the rod, the obstruction is encountered and the forward movement of the rod is slowed down, a reaction force is set up in the rod which causes the rod to move rearwardly at the bottom of the manhole thereby to introduce a sharp bend into the rod and making it difficult to continue to drive the rod forwardly and difficult to rotate the rod axially.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an improved sewer rodding machine, for clearing obstructions in sewer pipes, water pipes, and other underground conduits and conduits, which is tiltable about its short transverse axis to elevate the rod storage reel and rod power drives to such position that the rod may be driven downwardly and forwardly along a relatively straight inclined path into the sewer manhole.

A further object of the invention is to incorporate into a tiltable rodding machine, at the forward end thereof, drums or reels for storing an extendible rigid guide tube which may be lowered into the manhole along the straight inclined path of the rod, thereby to provide restraining means for preventing the rod, when an obstruction is encountered, from developing sharp bends which inhibit continued forward drive of the rod into the obstruction.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a rodding machine incorporating the present invention.

FIG. 2 is a view looking along the line 1—2 of FIG. 1.

DESCRIPTION OF THE PREFERRED 2-

In FIGS. 1 and 2 of the application, the present invention is incorporated into a sewer rodding machine of the type shown in my aforesaid U.S. Pat. No. 3,673,627. It should be understood, however, that the invention may be incorporated into other forms of rodding machine.

In FIGS. 1 and 2, the rodding machine has a base frame 10 supported in a mobile carriage 40 for pivotal movement about a pair of trunnions 41 journaled in a pair of side frames 42 of the carriage 40. The carriage 40 is provided with a pair of wheels 43 on axle 45. Side frames 42 of carriage 40 are illustrated as A-frames but may have other shapes and forms of construction as far as the invention is concerned. The lower horizontal bars 46 of the side frames are supported by jacks 44, and have rearwardly extending projections 46a to the ends of which the ends of hydraulic cylinders 47 are pivotally connected, there being one cylinder 47 at each side of the machine.

The outer ends of the pistons 48 of hydraulic cylinders 47 are connected pivotally to the bulge portion 11 of the frame 10 rearwardly of the trunnions 41. Thus, by extension and retraction of the cylinder pistons 48, the frame 10 may be moved pivotally on the trunnions 41 to elevate the rearward end and to lower the forward end of the frame as, for example, to the sharply inclined position illustrated in FIG. 1.

Much of the rodding machine illustrated in FIGS. 1 and 2 is similar to that disclosed in my U.S. Pat. No. 3,673,627, and will be but briefly described herein.

Supported for rotation on the lengthwise axis of frame 10 is a rotatable carriage 20 having a cross axle 25 which supports and carries rod storage reel 30 and a drive-and-torsion-taking wheel 50. The carriage 20 is driven rotationally on trunnions 11 and 12 about the longitudinal axis of the frame 10 by a motor 14 and a chain-and-sprocket drive 15, supported on frame 10.

The cross axle 25 carried by the rotatable carriage 20 is bent or angled having a first portion 25a at right angles at the axis of rotation of carriage 20, and a second portion 25b at a slight angular relation relative to the first portion. The drive-and-torsion-taking wheel 50 is supported on the first portion 25a of the axle 25. The rod storage reel 30 is supported on the second portion 25b and is accordingly rotatable in a plane which is at a small angle relative to the axis of rotation of the carriage 20 and also relative to the plane of rotation of the drive-and-torsion-taking wheel 50. The forward trunnion 11, on which the carriage 20 is supported for rotation, is tubular to allow for passage therethrough of the coupled rod 70.

The drive-and-torsion-taking wheel 50 may be a disc wheel, the periphery of which is provided with radially-extending flanges forming therebetween a channel which continues about the periphery of the wheel. The coupled rod 70 is guided between the rod storage reel 30 and the peripheral channel of wheel 50 through a flared guide tube 121 supported by bracket 122 fixed to carriage 20. The rod 70 is guided between the peripheral channel of wheel 50 and the trunnion 11 through flared guide tube 116 supported on a bracket 126 fixed to the carriage 20.

The drive-and-torsion-taking wheel 50 may be driven by any suitable means. In FIG. 2, it is shown to be driven by a chain-and-sprocket drive comprising the driven sprocket 51, the drive chain 60, the drive sprocket 62, and the drive motor 64, all mounted on the rotatable carriage 20.
The rod storage reel 30 comprises a cage supported on a hub 31. The hub 31 is freely rotatable on the bent portion 25b of the fixed axle 25. The cage is formed by a plurality of radial spokes 33. Each spoke is of hook or J configuration, each fixed to the hub 31. The terminal ends 34 of the J shaped radial spokes 33 are connected together by a circular hoop 35. Within the cage, and secured thereto as by welding, is an annular band 180 which functions as a confining band. This confining band 180 has a smaller diameter than the cage 30 and also smaller diameter than the hoop 35, leaving between the band 180 and the hoop 35 an annular opening through which the coupled rod is passed as it is taken from or returned to the storage cage 30.

The storage reel 30 and the drive-and-torsion-taking wheel 50 are so located relative to each other, and the annular band 180 and the wheel 50 are in such relative sizes, that the band 180 embraces a substantial part of the periphery of the wheel. Preferably, band 180 may cover about one-half of the periphery of wheel 50.

When the drive sprocket 62 is driven in the clockwise direction, as indicated by the arrow in FIG. 1, the drive-and-torsion-taking wheel 50 is driven clockwise. Slots 57 in the channelled periphery of the wheel engage couplers 71 of the coupled rods 70 and push the rod in the direction of rotation of the wheel. This pulls rod 70 out of the reel 30 through the guide tube 121 and pushes the rod through the guide tube 116 into the tubular trunnion 11. In this action, the forces on rod 70 are such as to tend to cause the rod to move outwardly away from the periphery of the wheel on the right side thereof as viewed in FIG. 1. This outward movement is prevented by the annular band 180 which functions to keep rod 70 from leaving the peripheral channel as it is pulled about the wheel. Thus, the band 180 serves to confine the rod 70 in the channel.

When the drive-and-torsion-taking wheel 50 is driven in the counterclockwise direction to push against the coupler 71 in a direction to return the coupled rod 70 to the storage reel 30, the forces acting on the rod 70 as it moves around the rearward portion of the periphery of the wheel tend to cause the rod to move radially outwardly. This movement is prevented by the confining band 180.

The drive-and-torsion-taking wheel 50 functions, therefore, to pull the rod 70 from its storage reel and to drive it forwardly toward the sewer obstruction. After the obstruction has been cleared, the wheel functions to return the rod to the reel 30. When the rod 70 is driven toward the sewer obstruction, rotation of the carriage 20 causes the rod to rotate about its own axis, thereby rotating the cutter or other tool. When the cutter engages the obstruction, its rotational speed is slowed, but the resulting torsional twist on the rod is prevented by the wheel 50 from running back into the cage 30.

The problem which remains has to do with the sharp bend which tends to form in the rod 70 at the bottom of the manhole when the obstruction is encountered. This bend tends to form near the base of the manhole wall opposite the entrance to the sewer pipe in which the obstruction is located. The present invention provides means for taking care of this problem.

In accordance with the present invention, the forward part of the tiltable frame 10 is provided with a pair of depending legs 102 to which is secured, as by welding, a plate 103 having at its upper end a continuous hinge 101. Extending forwardly from hinge 101 is an apron or platform 100 whose position relative to the plane of the frame 10 is adjustable. Secured to the underside of platform 100, at each side, is a block 105 having a tapped hole for receiving a bolt 106 which passes through a slot 107 in a brace arm 108, one at each side of the platform. By the means just described, the angular position of platform 100 may be adjusted.

Supported on platform 100 are a pair of reels 141 and 142, each of which is adapted to receive one-half of a longitudinally-split sectionalized restraining tube 140. The function or purpose of the sectionalized tube 140 will become clear by referring to FIG. 1 wherein is depicted, in section, a manhole M having a sewer section S-1 extending toward the left and another sewer section S-2 extending toward the right. The rod 70, which is of coupled spring steel sections, extends from the cage 30, about the periphery of the drive wheel 50, out through the tubular trunnion 11, and down through the extending sectionalized split tube 140. At the forward end of the rod 70, a cutter tool 121 is shown to be connected.

To clear an obstruction in sewer section S-1, the rod 70 is driven forwardly and downwardly through the tube 140 and out through the sewer section S-1 toward the obstruction. The cutter tool 121 is rotated by rotating the rod 70 on its own axis. This is accomplished by rotating the rotatable carriage 20. It will be seen that when the cutter tool 121 encounters the tree root or other obstruction to be cleared, the forward movement of the forward end of rod 70 will be slowed down, while the drive wheel 50 continues to drive the rod forwardly at the same rate. As a result, a sharp bend will tend to be introduced into the rod at the base of the manhole just in front of the opposite sewer section S-2. Such a sharp bend would make it difficult for the rodding machine to continue to apply sufficient forward force against the obstruction to clear the obstruction.

To prevent the bend in the rod from happening, the rigid sectionalized longitudinally split tube 140 is used. The tube sections may preferably be cast iron or steel. When not in use, or when the rodding machine is being transported from one location to another, the split sectionalized tube 140 is stored on the two reels 141 and 142 with one longitudinal half of the split sectionalized tube being wound on the one reel 141 and the other half being wound on the other reel 142. These reels 141 and 142 are mounted for rotation on vertical shafts 143 and 144 supported on the platform 100.

A sectionalized restraining tube of the type contemplated by the present application is described in my co-pending U.S. Pat. application Ser. No. 334,673, filed Feb. 22, 1973, entitled RESTRAINING TUBE FOR SEWER ROD. As there shown, each split half may preferably consist of a series of semi-circular half sections of short length linked together. When withdrawn from the reels 141 and 142, these half-sections interfit and interlock together to form a continuous rigid tube. The end section, i.e., the first section, is not split. It is externally threaded for receiving a curved end piece of tubing, identified 145 in FIG. 1.

During transportation to the work site, the rodding machine would be in the horizontal or level position indicated in phantom in FIG. 1. When the machine arrives at the work location, for example, at the manhole M in FIG. 1, the jacks 44 are lowered and the machine
is tilted, as for example, to the steep inclined position indicated in solid line in FIG. 1. Jacks may also be provided at the forward end of the A-frame to raise the wheels 43 above ground and immobilize the carriage.

Following its placement at the edge of manhole M and tilting of the machine to the inclined position shown in FIG. 1, the platform 100 is adjusted to a suitable angle, preferably in line with, or parallel with, the plane of the frame 10. The reels 141 and 142, if locked, are then unlocked or released and the forward or tool end of the tube 140 is lowered into the manhole. As the half-sections of tube 140 leave their respective reels 141 and 142, they pass through a converging slide 146 which presses the opposing half-sections into interlocked engagement.

The rate at which the tube 140 is lowered is controlled by the rate at which the rod 70 is pulled from the storage cage 30 by the drive wheel 50. When the tube 140 reaches the bottom of the manhole, the reels 141 and/or 142 are locked to prevent further pay-out of the tube while the rod 70 continues its forward movement.

After the sewer obstruction has been cleared, and the rod 70 is being pulled back to the storage reel 30, when the tool 121 reaches the curved end piece 145, further return of the rod 70 causes the tube 140 to be pulled up and returned to the reels 141 and 142.

It will be seen that rodding machine disclosed herein has the feature of being placed in a sharply inclined position in combination with an adjustable forward platform 100 on which the wound-up sectionalized tube 140 is carried, thereby providing a machine having the highly desirable feature that the rod 70 may travel along a substantially straight inclined path from the bottom of the manhole all the way to the hollow truncation 11. The avoiding of bends in the rod between these two points greatly improves the capability of the machine to drive the rod forwardly into the sewer obstruction.

What is claimed is:

1. Rodding apparatus for clearing obstructions in sewers, water pipes, and the like, said apparatus including:
   a. a frame;
   b. a carriage mounted in said frame for rotation about the longitudinal axis of said frame;
   c. a storage reel for rod supported for rotation in said rotatable carriage;
   d. drive means mounted on said frame for driving said carriage rotationally;
   e. a drive and twist-barrier wheel supported in said carriage;
   f. drive means mounted on said carriage for driving said wheel rotationally to drive said rod;
   g. first guide means between said rod storage reel and the peripheral edges of said wheel for guiding said rod between said storage reel and the periphery of said wheel;
   h. second guide means between the periphery of said wheel and the forward end of said carriage for guiding said rod;
   i. a platform supported at the forward end of said frame;
   j. first and second opposed reels mounted on said platform for rotation about axes normal to the plane of said platform;
   k. a sectionalized restraining tube comprising first and second series of short hollow section halves on opposite side of the center axis of said restraining tube, said section halves being connected together by pivotal links, said first and second series of section halves being wound up for storage on said first and second reels;
   l. converging slide means mounted on said platform through which said first and second section halves pass for forcing said halves into abutting interlocking relation to form an elongated hollow restraining tube for said rod; and
   m. a chassis and means for pivotally mounting said frame on said chassis, for tilting said frame relative to said chassis, thereby to raise the rod storage reel and drive wheel and to lower said platform into working position.

2. Apparatus according to claim 1 wherein means are provided for adjusting the angular position of said platform relative to the plane of said frame.

3. Apparatus according to claim 1 wherein said chassis is mobile.

4. Apparatus according to claim 1 wherein said frame is tiltable to an angle relative to the horizontal sufficiently steep to allow said rod to pass along a straight downwardly inclined path between the forward end of said carriage and the bottom of a sewer or like manhole.

* * * * *
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3859687 Dated January 14, 1975

Inventor(s) Charles B. Caperton

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 64, "1-2" should read "2-2".

Col. 1, line 66, "PREFERRED 2-" should read "PREFERRED EMBODIMENTS".

Col. 2, line 56, "quided" should read "guided".

Col. 2, line 59, "quided" should read "guided".

Signed and sealed this 17th day of June 1975.

(SEAL)
Attest:

RUTH C. MASON Attesting Officer

C. MARSHALL DANN Commissioner of Patents and Trademarks