DRIVE FOR ROEDDING MACHINE

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ABSTRACT OF THE DISCLOSURE

A drive for a sewer rodding machine is disclosed which includes a torsion-taking arcuate surface, such as the periphery of a driven wheel, around which the rod is passed to drive the rod and also to prevent the twist of the twisting rod from getting back into the storage reel. An annular freely-rotatable band surrounds the wheel and embraces the rod on the wheel periphery. Two embodiments are disclosed in which the wheel and annular band occupy the same plane, and in the other of which the wheel and band are located in planes disposed at a small angle relative to each other.

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my co-pending application, Ser. No. 613,703, filed Dec. 30, 1966, entitled "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 steel rod having at its foremost extremity a suitable tool for performing the particular cutting or clearing operation. Such tool may, for example, be an auger bit, a root saw, a centrifugal cutter, a pickup, or any other of a large variety of tools especially adapted for the purpose.

The point of obstruction in the pipe may, of course, be far removed from the point of entry into the pipe and, accordingly, the tool may be at the foremost end of a rod whose length may be of the order of 900—1000 feet. In some cases, such long length of rod is a continuous piece, but in other cases the rod is comprised of a string of individual solid rods of ¾—3/4" spring steel stock, each rod being about 59' long, the rods being coupled together by suitable couplings. For storing such long length of steel rod, either continuous or coupled, when not in use, or for transporting such rod to another work location, reels have been developed capable of holding 900—1000 feet of rodding. Such reels are designed to confine the rod in coils or loops of large diameter in order to avoid bending the rod into a permanent set.

It is, of course, necessary to push the tool into the pipe and to withdraw the tool from the pipe, and for these purposes a power drive is provided to move the rod in its lengthwise direction. In order for the tool, particularly a cutting tool, to be effective, it is necessary for the rod to be rotated axially, and a power drive for this purpose is also provided. If, as the rotating tool progresses forwardly into the pipe an obstruction is encountered, such obstruction will oppose rotation of the tool and the speed of rotation of the tool will be slowed down. A torsional stress is then imposed on the rod and a twist will run back along the rod which, unless prevented, will run all the way into the coiled rodding in the storage reel. This tends to distort the loops of stored rod and to cause entanglement thereof.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a sewer rodding machine having twist barrier means for isolating, or substantially isolating, the storage reel from the torsional stress and twisting forces which tend to be set up in the rod as the rod is driven rotationally into the obstruction in the sewer or other pipe.

It is a further object to provide twist barrier or isolating means as aforesaid for either continuous or coupled rod.

The foregoing objects are achieved in accordance with my present invention by providing a torsion-taking annular surface such as a driven wheel near the storage reel, together with means for confining the rod on the wheel periphery or other annular surface as the rod passes out from or back into the storage reel. In the specific form disclosed in the present application, the confining means is a freely-rotatable annular band, preferably steel, which surrounds the wheel and is of sufficiently larger diameter than the wheel to provide an annular space for the rod between the inner surface of the annular band and the peripheral surface of the wheel. In each embodiment, the band and wheel occupy the same plane. In another embodiment, the band and the wheel occupy planes which are slightly angularly disposed relative to each other.

IN THE DRAWING

FIG. 1 is a plan view of a portion of a rodding machine having, in accordance with the present invention, a torsion-taking wheel driven to drive the rod and having a freely rotatable annular steel band which embraces and confines the rod on the wheel periphery;

FIG. 2 is a side elevational view taken along the line II—II of FIG. 1;

FIG. 3 is a view in section along the line III—III of FIG. 2;

FIG. 4 is a plan view of a portion of a rodding machine showing an alternate form in which the confining band lies in a plane disposed at a small angle relative to the plane of the wheel;

FIG. 5 is the side elevational view taken along the line V—V of FIG. 4;

FIG. 6 is a plan view showing the pusher dog pushing the rod coupler;

FIG. 7 is a perspective view of one of the pusher dogs at the periphery of the wheel.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1—3 illustrate a form of rodding machine incorporating the present invention and suitable for use with continuous rod. FIGS. 4—7 illustrate a form suitable for coupled rod.

FIG. 1 shows a fragmentary portion of a rodding machine of the type shown in FIG. 12 of my co-pending patent application Ser. No. 613,703. In this form of rodding machine, a frame 12 carrying a storage reel 14 is mounted for rotation in a base structure 15. The frame 12 is rotatable on trunnions, one of which is shown at 17, about an axis which runs horizontally across the drawing in FIG. 1. Fixed in the frame 12 is a cross shaft 16 which carries a first sleeve 21 and a second sleeve 22. Keyed to sleeve 21 is a bevel gear 23 which meshes with a second bevel gear 24 which is keyed to a drive shaft 25. The inward end of sleeve 21 is secured, as by bolts or welding, to the hub portion of a circular drive wheel 30, so that when drive shaft 25 drives the sleeve 21 rotationally, the drive wheel 30 is driven rotationally about the axis of the cross shaft 16.
The inward end of sleeve 22 is connected to a plate 35 which is connected as by welding to the storage reel 14. Thus, storage reel 14 is mounted for free rotation about the axis of the cross shaft 16 in a plane parallel and adjacent the plane of rotation of the drive wheel 30. To a rotatable frame 15, the inward end of which is secured, as by welding or by bolts, an annular guard 27 of L-shaped cross section, as best seen in FIG. 3, the flange portion of which is identified as 27a. Secured, as by welding, to the flange portion 27a of guard 27 are guard members 38, also of L-shaped cross section, as seen in FIG. 3. The guard 27 is shown as, and preferably is, a continuous annular band. The guard member 38 may likewise be a continuous annular band, but for the purpose of conserving material, may be segmented, and is so illustrated, four separate segments being shown.

The diameter of the annular guard 27 is substantially larger than the diameter of the drive wheel 30, thereby providing a space for receiving the annular confining band 31 and for receiving rollers 29 which bear against the outer surface of the annular confining band. The confining band, while of lesser diameter than the guard 27 is capable of a slightly greater diameter than the drive wheel 30 to leave an annular space 33 for receiving the continuous rod 20.

The rod 20 in the storage reel 14 is introduced to the periphery of the drive wheel 30 through a tubular guide eye 32 formed in segment 38a of the guard 38. As indicated in FIG. 3, the continuous rod 20 may be wound about the periphery of the drive wheel 30 more than one time, if desired or necessary. The rod leaves the wheel 30, when being driven forward toward the work (such as the sewer obstruction) by passing through a guide 32 formed in the guard member 38. In operation, when the drive wheel 30 is driven rotationally in the clockwise direction, as viewed in FIG. 2, the rod 20 in the storage reel 14 (which has previously been threaded through the guide eye 32 on to the periphery 30a of the drive wheel 30 in the space 33 under the annular band 31, and out through the guide eye 34) is pulled by frictional engagement with the peripheral surface of the drive wheel and is delivered from the drive wheel through a guide tube 34, the rod moving toward the left as viewed in FIG. 2. It will be appreciated that in pulling the rod 20 from the reel, the rod tends to form a smaller diameter circle and, accordingly, tends to maintain tight frictional engagement with the periphery 30a of the drive wheel, and the rod may or may not engage the surface of the band 31 sufficiently to cause substantial rotational movement of the band. This is not important. When, however, the rotating tool at the forward end of the rod 20 meets an obstruction, resistance to forward progress of rod 20 is encountered and the rod tends to form a larger diameter circle, and in this case bears heavily and frictionally against the inner surface of the annular band 31. Band 31 then moves with the rod and operates to confine the rod within the space 32. The rollers 29 function to maintain the circular configuration of the band 31, and at the same time allow for the rotational movement of the band 31 without introducing any opposing friction force.

A modified form of the present invention is illustrated in FIGS. 4–7. In FIGS. 4–7, the storage reel which is not shown may be assumed to be located to the left of the drive wheel 130, or alternatively the storage reel may be mounted for free rotation on the shaft 138 of the drive wheel, generally similar to the arrangement shown in FIG. 1.

In FIGS. 4–7, instead of having the band and drive wheel occupy the same vertical plane, the confining band 131 is cantilevered, that is, it occupies a plane which has a slight angular relationship to the plane of the drive wheel 130. This arrangement provides the necessary opening to allow the rod 120 to enter and leave the peripheral surface of the wheel 130.

In FIGS. 4–7, the rod 120 is coupled rod, and to drive the coupled rod dogs 121 of hardened metal are provided as spaced-apart intervals on the periphery of the wheel. To allow for driving the rod 120 in both directions, the dogs 121 are provided in pairs, identified as 121a and 121b, with the dogs of the pair facing each other with a spacing therebetween longer in length than the length of the coupler 122, preferably one and a half or two times as long. Between the pairs of dogs 121a, 121b, the peripheral rim of the drive wheel 130 is provided with outward flanges 123 forming therebetween a channel 124 for receiving the rod 120.

Embracing the wheel 130 and substantially concentric therewith is the cantilevered band 131 occupying a plane slightly angularly disposed relative to the plane of the wheel 130 forming an open peripheral area 139 where the rim of the wheel 130 is uncovered and available to receive or discharge the rod 120.

The annular band 131 is made sufficiently wider than the wheel 130 so that that portion of the rim of the wheel which is not employed for entry or discharge of the rod 120 is fully covered by the band 131.

The annular band is supported by the flanges 123 and is free to move with the wheel 130. Means are provided for maintaining the band 131 at its intended angular position relative to the wheel 130. In FIGS. 4–5, such means are shown to be two sets of rollers 132 and 133, one set on each side of the band 131, each set consisting of four rollers spaced 90° apart and facing the band 131. The rollers are mounted on plates 134 and 135 fixed to the frame of the machine, and the nuts 136 and 137 of the plates support the drive shaft 138 which drives the wheels 130 and 131. The roller position, for example, be supported on spindles fixed to the frame in a manner generally similar to spider 26 and frame 12 of FIG. 1. Where the storage cage is adjacent to and co-axial with the wheel 130, as in FIG. 1, only one plate 135, and only one spider, would be employed, and in lieu of a plate on the cage side, an annular ring would be employed supported as by brackets from plate 135 which overhang the periphery of the wheel 130 and overhang the band 131, and the rollers 132 on the cage side would be supported on the ring.

Referring again to FIGS. 4–7, in operation, the shaft 138 is driven to drive the wheel 130. If the wheel 130 is driven in a clockwise direction as viewed in FIG. 5, the dog 121a will engage the coupler 122. The rod 120 and the roller will be pulled clockwise around the drive wheel 130. Thus, the rod 120 will enter and leave the wheel 130 in the directions indicated by the arrows in FIG. 5.

Assume that the rod 120 is being fed by the rotating wheel 130 into an obstructed sewer line, and that, to turn the tool at the forward end of the rod, the wheel 130 is being rotated about the horizontal axis A (FIG. 5) perpendicular to the axis of shaft 138, as by a rotatable frame corresponding to frame 12 of FIG. 1. It will be seen that when the tool meets the obstruction, the rod 120 on the wheel 130 will tend to form an enlarged loop and will tend to leave the peripheral surface of the wheel. This is prevented, however, by the annular band 131 which functions to confine the rod 120 to the wheel 130. Since the band 131 is free to rotate with the wheel, frictional impedance to movement of the rod in its axial direction on the shaft 138 is avoided.

When the rod is to be withdrawn from the sewer or other conduit, the wheel 130, in the present illustration, is driven in the opposite or counterclockwise direction, and the couplers 122 are engaged by the dogs 1225, which face in the opposite direction and which are spaced from dogs 121a by a distance equal to 1 ½ to 2 times the length of a coupler.
What is claimed is:

1. Apparatus for clearing obstructions in sewers and the like, including:
   (a) a base structure,
   (b) a rotatable frame mounted for rotation in said base structure,
   (c) a storage reel for rod,
   (d) combined drive and twist barrier means mounted on said rotatable frame near to said storage reel for driving the rod in its axial direction, for rotating the rod axially, and for preventing the twisting of the rod from being transferred back into said storage reel,
   (e) said combined drive and twist barrier means including a driven annular surface for driving said rod axially and an annular confining band surrounding said annular surface for confining said rod on said annular surface and free to rotate therewith.

2. Apparatus according to claim 1 characterized in that said annular surface comprises the peripheral rim of a driving wheel and in that said confining band comprises an annular band concentric with said wheel of slightly larger diameter than said wheel and occupying the same plane as said wheel.

3. Apparatus according to claim 2 characterized in that retaining means are provided for retaining said annular band in substantially concentric position.

4. Apparatus according to claim 3 characterized in that said retaining means includes roller means disposed in a concentric circle outside said annular band.

5. Apparatus according to claim 1 characterized in that said annular surface comprises the rim of a driving wheel and in that said confining band comprises an annular band concentric with said driving wheel and of slightly larger diameter than said driving wheel and occupying a plane angularly disposed relative to the plane of said driving wheel.

6. Apparatus according to claim 5 characterized in that retaining means are provided for retaining said annular band in its angular position.

7. Apparatus according to claim 6 characterized in that said retaining means include roller means.

References Cited

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