

[54] DRIVE FOR RODDING MACHINE

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Related U.S. Application Data

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[52] U.S. Cl.15/104.3 SN
[51] Int. Cl.B08b 1/04
[58] Field of Search15/104.3 R, 104.3 SN; 242/54

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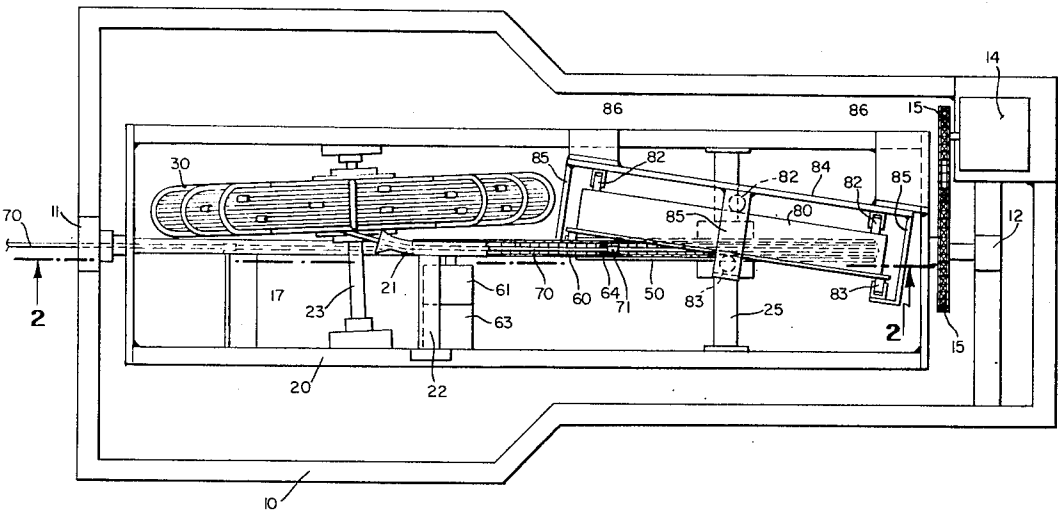
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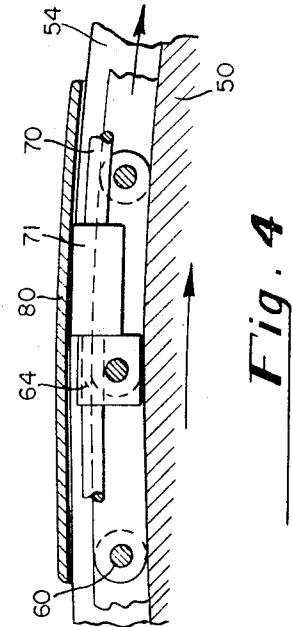
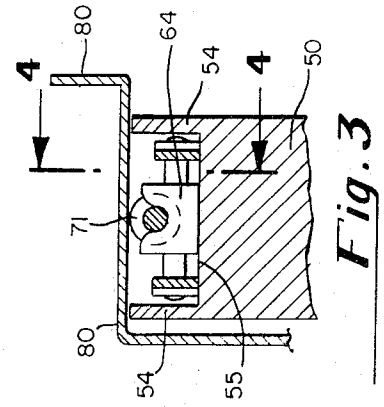
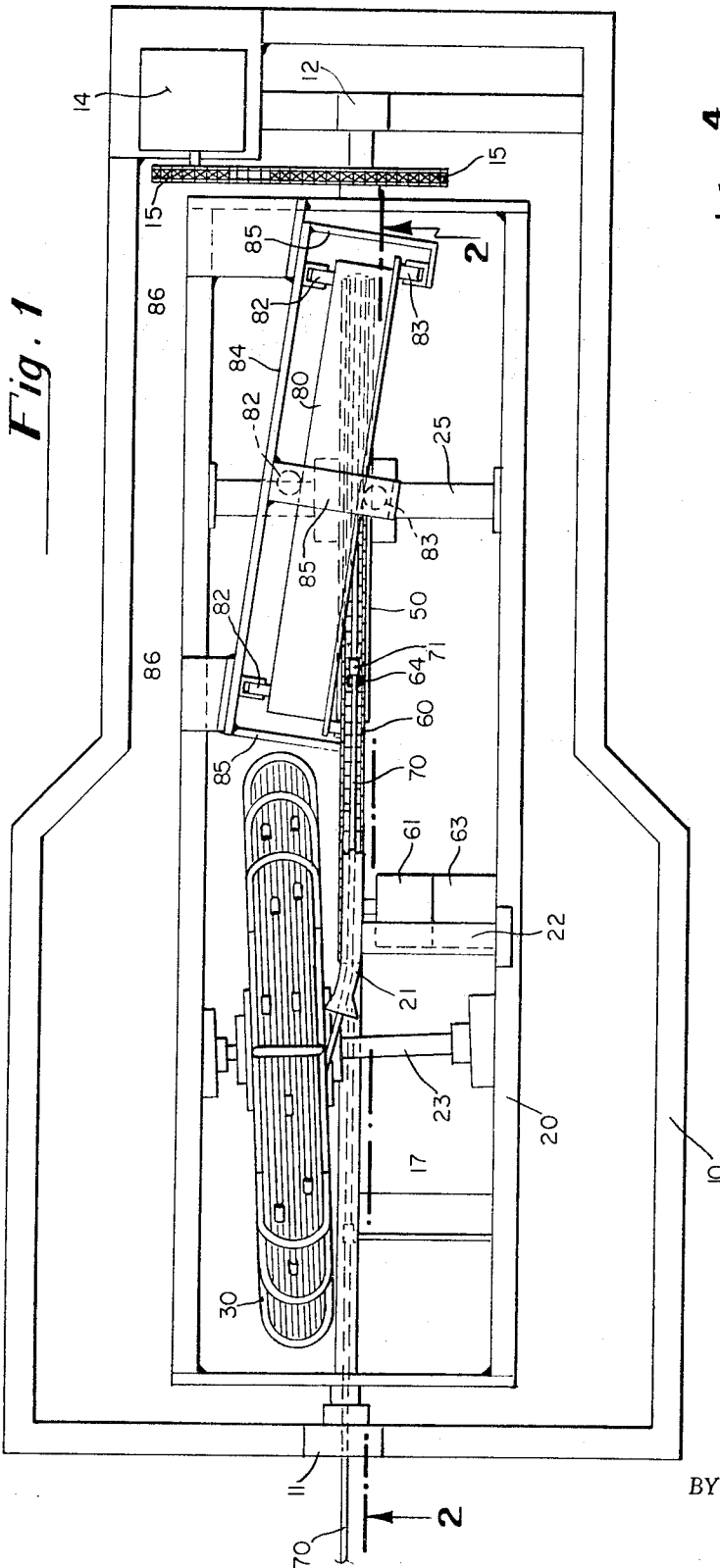
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[57] ABSTRACT

A drive for a sewer rodding machine is disclosed which includes twist barrier means in the form of a circular arcuate surface, such as the periphery of an idler wheel, around which the rod is looped to prevent the twist of the twisting rod from getting back into the storage reel. The storage reel and torsion-taking wheel are supported for rotation in the rotatable carriage on axes which are generally normal to the axis of rotation of the carriage. In one form, the axis of rotation of the carriage is inclined relative to ground. The periphery of the torsion wheel is flanged to provide a channel, and trained about the wheel in this channel, under the rod, is a drive chain having dogs thereon at spaced intervals for driving the coupled rod. An annular freely rotatable confining band surrounds the periphery of the wheel and confines the rod in the channel against radially outward movement. The confining band is canted slightly, relative to the wheel, to allow for entry and exit of the rod.

11 Claims, 7 Drawing Figures





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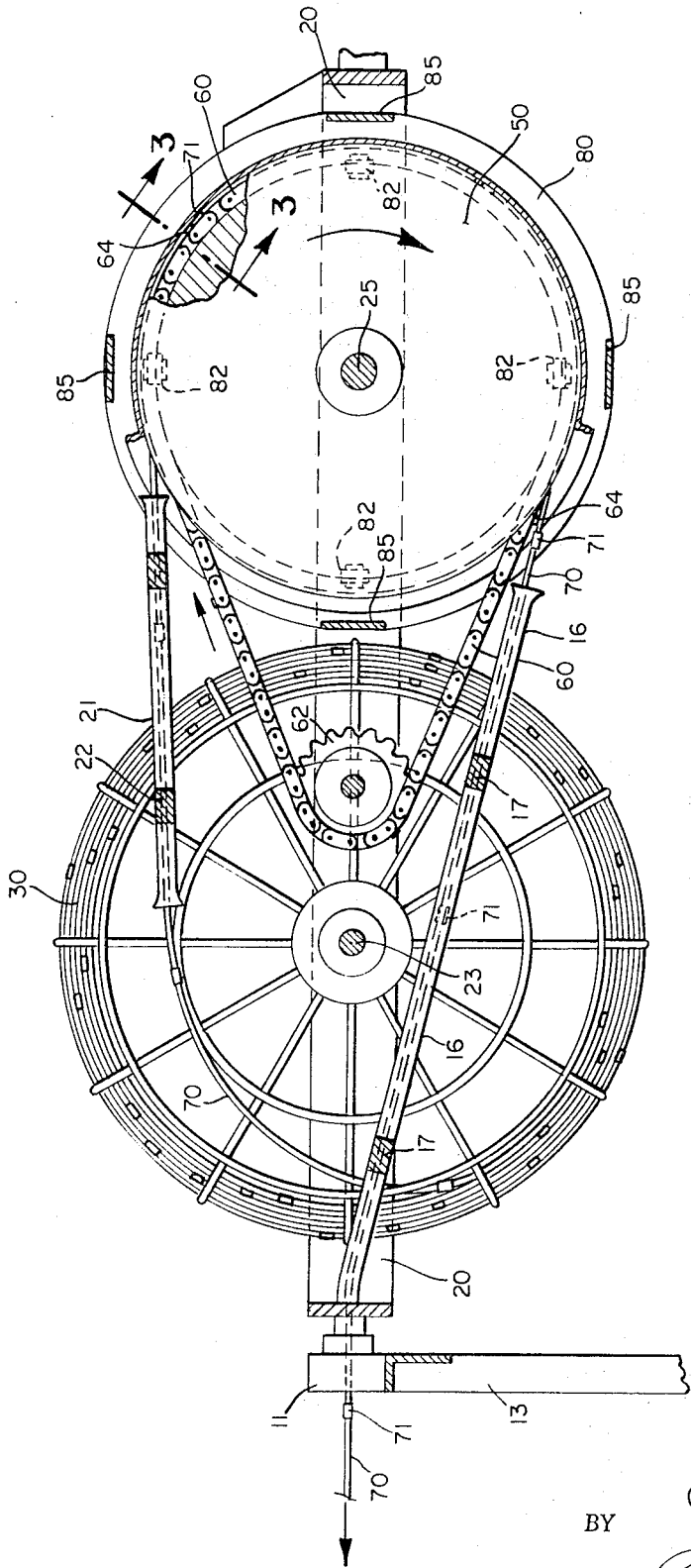


Fig. 2

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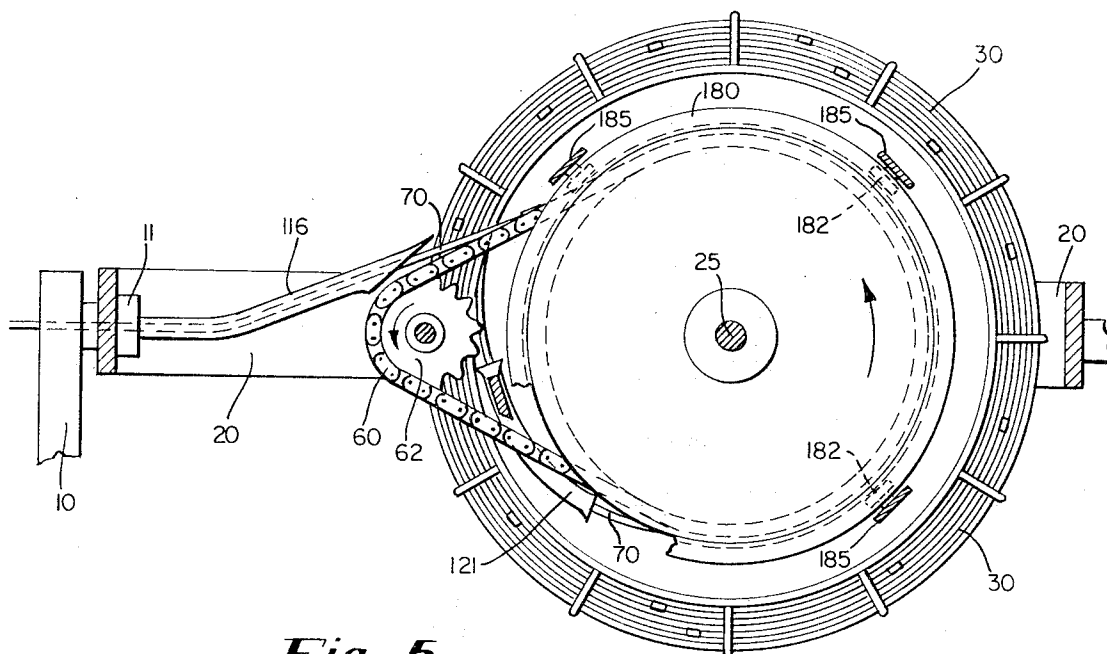


Fig. 5

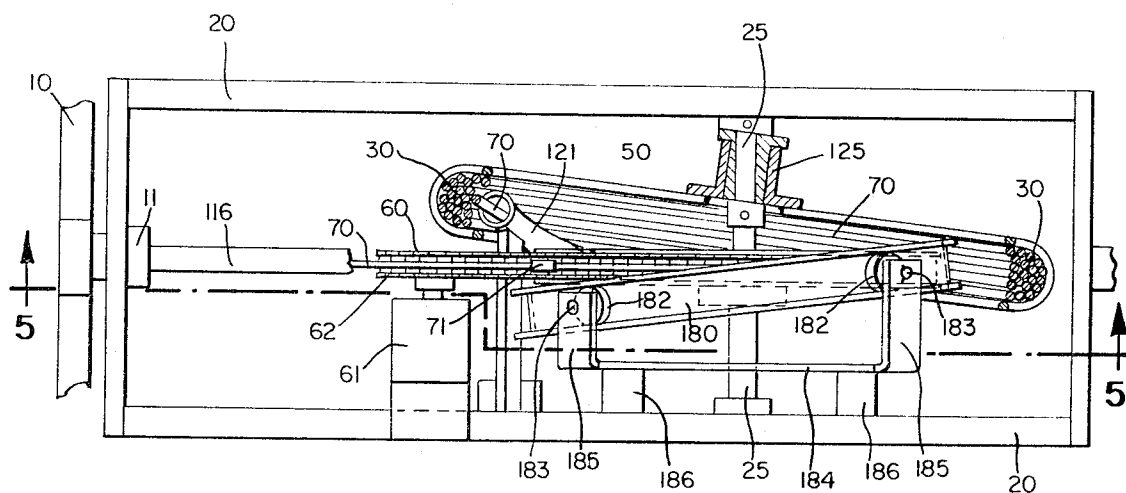


Fig. 6

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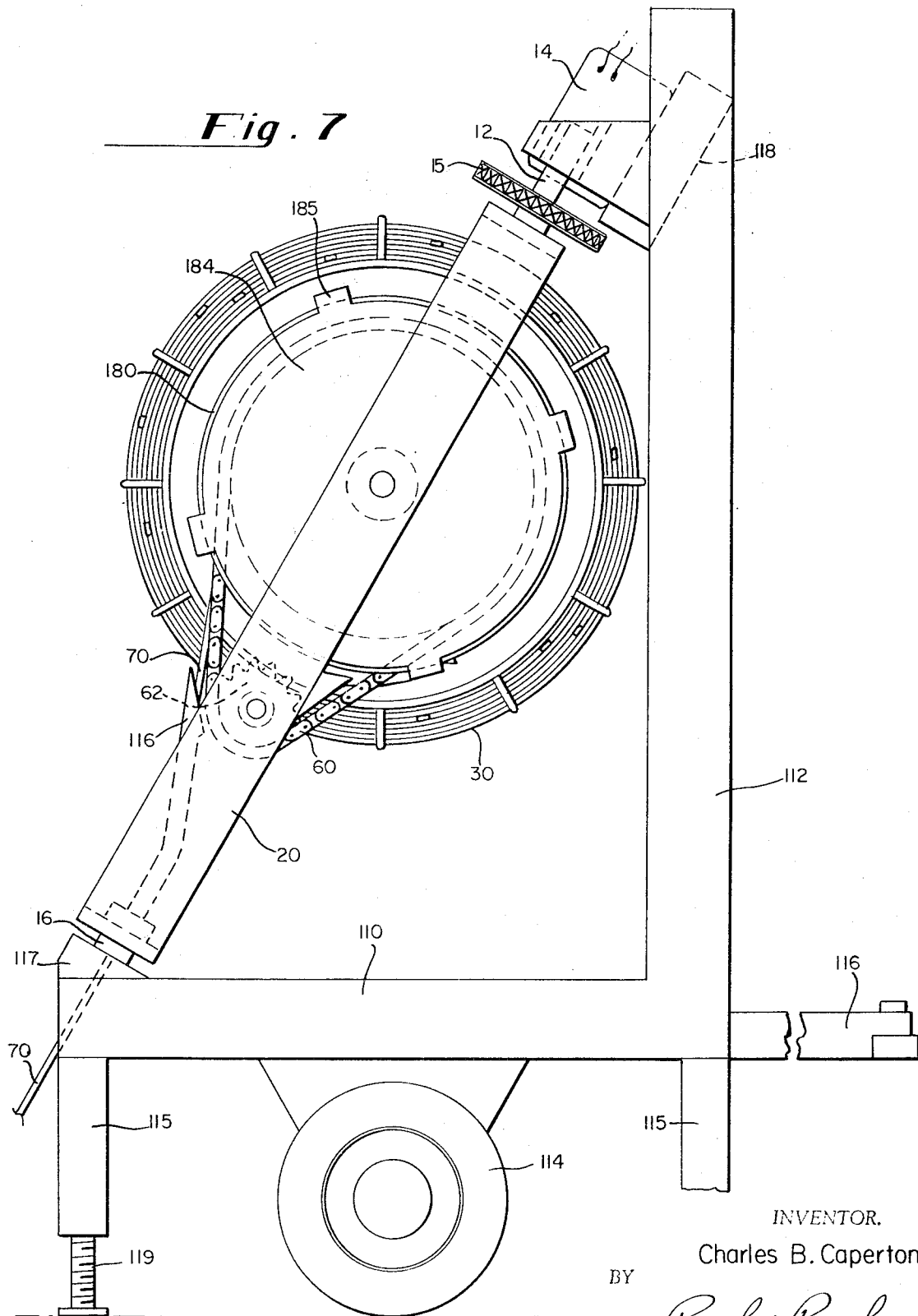
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Fig. 7



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DRIVE FOR RODDING MACHINE

CROSS REFERENCES TO RELATED APPLICATIONS

This application is a continuation-in-part of my copending application, Ser. No. 41,201, filed May 28, 1970 and now abandoned, entitled "Drive for Rodding Machine," which in turn was a continuation-in-part of my earlier application, Ser. No. 835,278, filed Apr. 4, 1969 and now U.S. Pat. No. 3,561,034, entitled "Sewer Rodding Machine," which was a division of my earlier application, Ser. No. 613,703, filed Dec. 30, 1966 and now U.S. Pat. No. 3,469,273 bearing the same title.

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 900-1,000 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 one-fourth-inch to three-eighth-inch spring steel stock, each rod being about 39 inches long, the rod 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 900-1,000 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 forward 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 which is especially suitable for coupled rod.

The foregoing objects are achieved, in accordance with my present invention, by providing, in the rotatable carriage, a torsion-taking annular surface, preferably an idler wheel, having a flanged periphery forming a peripheral channel which receives a drive chain having thereon at spaced-apart intervals dogs which face radially outwardly. The coupled rod is also received in the channel on top of, i.e., radially outwardly of, the drive chain. To prevent the rod from moving radially outwardly of the wheel, a freely rotatable annular confining band,

preferably steel, surrounds the flanged periphery of the wheel. The confining band is canted relative to the plane of the wheel to provide openings for entry and exit of the rod and drive chain.

IN THE DRAWINGS

FIG. 1 is a plan view of one form of rodding machine illustrating one embodiment of the present invention, and showing a torsion-taking idler wheel located rearwardly of the storage reel and having a peripheral channel for receiving the rod and for receiving a chain for driving the rod, and having about the wheel periphery a freely rotatable annular steel confining band;

FIG. 2 is a side view in vertical section taken along the line 2-2 of FIG. 1;

FIG. 3 is a view, in section, along the line 3-3 of FIG. 2;

FIG. 4 is a view, in section, along the line 4-4 of FIG. 3;

FIGS. 5 and 6 are vertical section and plan views, respectively, of an alternate arrangement wherein the wheel and reel are mounted on a common shaft;

FIG. 7 is an elevational view of an embodiment generally similar to that of FIGS. 5 and 6 but wherein the axis of rotation of the carriage 20 is inclined relative to ground.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a sewer rodding machine of the general type shown in FIGS. 1 and 2 of my copending application, Ser. No. 835,278, filed Apr. 4, 1969, which is a division of my earlier filed application, Ser. No. 613,703, filed Dec. 30, 1966, now U.S. Pat. No. 3,469,273.

In FIGS. 1 and 2 of the present application, there is illustrated a rodding machine having a base or frame 10 having at each end thereof a standard 13 for supporting therebetween a rotatable carriage 20 which supports and carries the storage reel 30 and the torsion-taking wheel 50.

The carriage 20 is driven, as by a motor 14 through a chain and sprocket drive 15, supported on the frame 10. The carriage 20 is rotatable, as on trunnions 11 and 12, about an axis which runs horizontally across the drawing in FIG. 1. Fixed to the rotatable carriage 20, and rotatable therewith, are two cross shafts 23 and 25 on which the storage reel 30 and torsion wheel 50 are respectively supported for free rotation. The storage reel 30 is mounted in suitable bearing for free rotation about the axis of the cross shaft 23 in a plane which may preferably be at a slight angle relative to the axis of rotation of the carriage 20. The torsion wheel 50 is mounted on shaft 25 and is rotatable in a plane which is parallel, or substantially parallel, to the axis of rotation of the carriage 20. The rod 70 leaves the carriage 20 at its forward end, the left end as viewed in FIGS. 1 and 2, being guided through a tubular trunnion 11 by an elongated guide tube 16 which is supported on carriage 20 as by a pair of brackets 17.

In the embodiment of FIGS. 1 and 2, the storage reel 30 is mounted at the forward end of the carriage, with the torsion wheel 50 being mounted rearwardly thereof. The rod 70 is guided between the storage reel 30 and the wheel 50 by a flared guide tube 21 supported in carriage 20 as by a bracket 22. In FIG. 1, the tube 21 is broken away to show the chain 60. The rod 70 is looped about the torsional wheel 50, and enters and leaves the periphery of the torsion wheel 50 at the forward end thereof. The rod is guided between the wheel 50 and the forward end of the carriage 20 by the guide tube 16.

The periphery of the torsion-taking wheel is provided with radially extending spaced-apart flanges 54, best seen in FIG. 3, forming a channel 55 about the periphery of the wheel 50.

A drive chain 60 is looped about the wheel 50 within the peripheral channel 55 of the wheel. The drive chain 60 may be driven by a drive motor 61 and sprocket 62, or any other suitable means. The drive motor 61 and the sprocket 62 are secured, as by a suitable bracket 63, to the rotatable carriage 20. The coupled rod 70 is looped about the wheel 50 within the peripheral channel 55 but on top of, i.e., radially out-

wardly of, the drive chain 60. Dogs 64 of hardened metal are provided on the drive chain 60 at spaced-apart intervals corresponding to the distance between the couplers 71 on the rod 70. These dogs 64 engage the couplers 71 and drive the rod 70 in its lengthwise direction about the wheel 50. When the drive chain is driven clockwise, as viewed in FIG. 2, the rod 70 is pulled out of the storage reel 30, through the guide tube 21, about the periphery of the wheel 50, or the rearward portion thereof, and out through the guide tube 16 and tubular trunnion 11 toward the sewer obstruction. When the drive chain 60 is driven in the opposite or counterclockwise direction, the rod 70 is returned to the storage reel 30.

To retain the rod 70 on the torsion wheel 50, an annular confining band 80 is provided which embraces the periphery of the wheel 50 in a plane having a slight angular relationship to the plane of the torsion-taking wheel 50. This angular or canted arrangement provides the necessary opening at the periphery of the wheel 50 to allow the rod 70 to enter and leave the peripheral channel 55. The confining band 80 is made sufficiently wider than the wheel 50 so that the forward portion of the channeled rim of the torsion-taking wheel 50 which is not needed for entry of the rod to, or exit of the rod from, the wheel is fully covered by the band 80.

As seen best in FIG. 3, the annular band 80 is supported by the peripheral flanges 54 of the wheel 50 and is free to move with the wheel. Guide means are provided for maintaining the band 80 at its intended angular position relative to the torsion-taking wheel 50. In FIGS. 1 and 2, such guide means are shown to be two sets of rollers 82 and 83, one set on each side of the band 80, each set consisting of four rollers spaced 90° apart and facing the band. The one set of guide rollers 82 are mounted on a plate 84 fixed to the carriage 20 as by brackets 86. Plate 84 has an opening for the shaft 25 which supports the torsion-taking wheel 50. The other set of guide rollers 83 are supported on L-shaped brackets 85 which extend outwardly from plate 84 beyond the periphery of the wheel.

FIGS. 3 and 4 are views, in section, along the lines 3—3 of FIG. 2 and 4—4 of FIG. 3, respectively, showing how the rod couplers 71 are engaged by the chain dogs 64 and pushed along the channel 55 of the torsion wheel 50. The wheel 50 is free to rotate, and does so in response to the frictional force imposed thereon by the chain 60. The canted annular band 80 confines the chain 60 and rod 70 in the wheel channel and prevents the rod from leaving the channel. The forces operating tending to cause the rod to leave the periphery of the wheel are especially great when, during a clearing operation, an obstruction is encountered in the sewer or other pipe, and the rod tries to form an enlarged loop. The confining band 80 is, however, of steel and has sufficient strength to resist deformity under the forces imposed thereagainst. The band 80 is free to rotate with the wheel 50, guided by the guide rollers 82 and 83.

The confining band 80 is generally similar to that disclosed in my application, Ser. No. 794,876, now U.S. Pat. No. 3,480,983, which was a continuation-in-part of my previously referred to application, Ser. No. 613,703, now U.S. Pat. No. 3,469,273.

The drive chain 60 is generally similar to that disclosed in my application, Ser. No. 613,703, now U.S. Pat. No. 3,469,273, but in the present application the drive chain 60 is beneath the rod in the peripheral channel of the wheel, making necessary the confining band 80, whereas in Pat. No. 3,469,273, the drive chain is above the rod and functions as its own confining means.

FIGS. 5 and 6 illustrate a modified arrangement in which the storage reel and torsion wheel are mounted on a common shaft. In FIGS. 5 and 6, component parts which are the same or similar to those of FIGS. 1 and 2 are identified by the same or similar reference numerals.

The arrangement shown in FIGS. 5 and 6 allows the carriage 20 to be substantially shorter in length than in the arrangement shown in FIGS. 1 and 2. This may be an advantage, at least in some cases.

In FIGS. 5 and 6, the torsion wheel 50, which is substantially smaller in diameter than the storage reel 30, is mounted on common shaft 25 for rotation in a plane which is parallel to the axis of rotation of rotatable carriage 20. Storage reel 30 is also mounted for rotation on shaft 25 but, by means of a bearing 125, the storage reel 30 is rotatable in a plane which is at a slight angle to the plane of rotation of wheel 50.

In FIGS. 5 and 6, the coupled rod 70 from storage reel 30 is guided by guide tube 121 into the peripheral channel 55 of wheel 50, at the lower front portion of the wheel. The rod 70, after passing around at least 180° of the wheel periphery, leaves the periphery of the wheel 50 at the upper front portion and is guided through guide tube 116 into the tubular trunnion 11.

As in the case of FIGS. 1 and 2, the coupled rod 70 in FIGS. 5 and 6 is driven about the wheel 50 by a drive chain 60 which is driven by a drive sprocket 62. Also, as in the case of FIGS. 1 and 2, the drive chain 60 in FIGS. 5 and 6 is beneath the coupled rod 70 in the peripheral channel 55 of the torsion wheel 50.

The rod 70 is confined on the wheel 50 by a freely rotatable annular band 180 which is canted or angularly disposed relative to the wheel 50 in the manner seen in FIG. 6. The band 180 is of U-shape cross section, forming a channel for receiving guide rollers 182 for guiding the band as it freely rotates. Guide rollers 182 are rotatable on pins 183 which are disposed radially relative to wheel 50. Pins 183 are supported in brackets 185 which are secured to a plate 184 which is fastened as by brackets 186 to the rotatable carriage 20.

As in the case of FIGS. 1 and 2, in the embodiment of FIGS. 5 and 6 dogs on chain 60 engage the couplers 71 of the coupled rod 70 and drive the chain about the freely rotatable torsion wheel 50 in one direction or the other, according to the direction of the drive sprocket 62.

In FIGS. 5 and 6, the rod 70 is shown entering the peripheral channel of wheel 50 at the forward bottom portion and leaving at the forward top portion, but the structure could be modified so that the rod would enter the wheel periphery at its forward upper portion and leave at its forward lower portion.

FIG. 7 illustrates a modification wherein the axis of rotation of the carriage 20 is inclined relative to ground. An important advantage of inclining the axis of rotation of the carriage 20 relative to ground is that it permits the spring steel rod 70 to be delivered into the manhole without having to bend the rod at the point of entry into the manhole. Repeated bending of the steel rod 70 tends to crystallize the metal and ultimately will cause the rod to break. It follows then that the life of the rod may be increased by reducing the number of times that the rod is flexed, i.e., bent and straightened.

While a rodding machine of the type shown in FIGS. 1 and 2 of the present application may also be mounted so that the axis of rotation of the carriage 20 is inclined relative to ground, it is more practical to incline the axis of rotation of the apparatus of FIGS. 5 and 6 since the carriage 20 of FIGS. 5 and 6 is substantially shorter in length than is the carriage 20 of FIGS. 1 and 2.

The machine shown in FIG. 7 is illustrated as supported in a two-wheel cart having a pair of side frame members 110 and a pair of vertical frame members 112. The wheels 114 of the cart are centered relative to the base members 110. A hitching bar 116 is provided to allow for hitching the cart to a truck or other mobile vehicle. The front and rear legs 115 of the cart are provided with adjustable jacks 119 for adjusting, within limits, the angle of inclination of the rotatable carriage 20 relative to ground. In FIG. 7, the rotatable carriage 20 is illustrated as inclined at an angle of approximately 60° relative to the side members 110 of the frame.

In FIG. 7, the carriage 20 is mounted for rotation on trunnions 11 and 12 supported in cross members 117 and 118. The exit or discharge trunnion 11 is hollow to allow for passage therethrough of the rod 70. The remainder of the machine of FIG. 7 may be similar to that of FIGS. 5 and 6, and parts

thereof are identified with similar reference numerals. The carriage 20 may be rotated by any suitable means. In FIG. 7, a motor 14 mounted on the cross member 118 drives a sprocket and chain drive 15. This drive 15 may be generally similar to that illustrated in FIG. 1.

What is claimed is:

1. Apparatus for clearing obstructions in sewers, water pipes, and the like, said apparatus including:

- a. a base frame;
- b. a rotatable carriage mounted in said base frame for rotation about the longitudinal axis of said carriage;
- c. a storage reel for coupled rod supported in said rotatable carriage for rotation in a plane generally parallel to that of the axis of rotation of said carriage but at a slight angle relative thereto;
- d. guide means at the forward end of said carriage on the axis of rotation thereof through which said rod is fed from and returned to said carriage;
- e. twist barrier means supported in said rotatable carriage for preventing the twisting of the rod from being transferred back into said storage reel;
- f. said twist barrier means comprising an annular surface of channel-like cross-section mounted for free rotation about an axis substantially normal to the axis of rotation of said carriage for receiving coupled rod looped about said annular surface;
- g. a drive chain having dogs at spaced-apart intervals for engaging and pushing the couplers of said coupled rod;
- h. means for driving said chain;
- i. an annular confining band surrounding said annular surface for confining said rod in said channel;
- j. said confining band being mounted for free rotation with said annular surface;
- k. said drive chain being trained about said annular surface and disposed within the channel thereof beneath said coupled rod.

2. Apparatus according to claim 1 characterized in that:

- a. said annular surface comprises the peripheral rim of an idler wheel,
- b. said idler wheel lies in a plane substantially parallel to that of the axis of rotation of said carriage,
- c. said confining band comprises an annular band occupying a plane disposed at an angle relative to the plane of said wheel thereby to provide for entry and exit of said rod to and from the peripheral rim of said wheel.

3. Apparatus according to claim 2 characterized in that said idler wheel and said storage wheel are supported in said rotatable carriage on separate cross shafts and in that the cross shaft which supports said idler wheel is rearward of the shaft which supports said reel.

4. Apparatus according to claim 2 characterized in that said idler wheel and storage reel are supported in said rotatable

carriage on a common cross shaft.

5. Apparatus according to claim 2 characterized in that guide means are provided for guiding said annular band as it rotates in its angular position.

6. Apparatus according to claim 5 characterized in that said guide means include roller means.

7. Apparatus for clearing obstructions in sewers, water pipes, and the like, said apparatus including:

- a. a frame;
- b. a carriage rotatable in said frame,
- c. a storage reel for coupled rod mounted in said carriage and rotatable on a shaft which is substantially normal to the axis of rotation of said carriage;
- d. a torsion wheel having a channel-shaped periphery mounted in said carriage and rotatable on a shaft which is substantially normal to the axis of rotation of said carriage;
- e. a drive chain trained about said wheel and within said channel;
- f. tubular means at the forward end of said carriage on the axis of rotation of said carriage allowing delivery of coupled rod from and to said carriage;
- g. said coupled rod being looped about said wheel within said channel on top of said drive chain;
- h. said storage reel being so disposed relative to said torsion wheel that said coupled rod from said reel is looped rearwardly about said torsion wheel;
- i. means for driving said chain;
- j. an annular confining band surrounding said wheel for confining said rod in said channel on top of said chain;
- k. said confining band being mounted for free rotation with said wheel.

8. Apparatus according to claim 7 characterized in that said torsion wheel and said storage reel are mounted for rotation in said carriage on a common shaft.

9. Apparatus according to claim 7 characterized in that said torsion wheel and storage reel are mounted for rotation in said carriage on separate shafts and in that the shaft on which said wheel is mounted is rearward of the shaft on which said reel is mounted.

10. Apparatus according to claim 8 characterized in that:

- a. said annular confining band is angularly disposed relative to the plane of said wheel;
- b. guide means are provided for guiding said annular confining band as it rotates;
- c. said band guide means include roller means.

11. Apparatus according to claim 9 characterized in that:

- a. said annular confining band is angularly disposed relative to the plane of said wheel;
- b. guide means are provided for guiding said annular confining band as it rotates;
- c. said band guide means include roller means.

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