United States Patent

Caperton

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[54] DRIVE FOR RODDING MACHINE

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 75,568, Sept. 25, 1970.

[52] **U.S. Cl.** ..... **15/104.3 SN**

[51] **Int. Cl.** **B08b 9/02**

[58] **Field of Search** ..... 15/104.3 R, 104.3 SN; 242/54

[56] **References Cited**

UNITED STATES PATENTS

3,469,273	9/1969	Caperton	15/104.3 SN
3,480,983	12/1969	Caperton	15/104.3 SN

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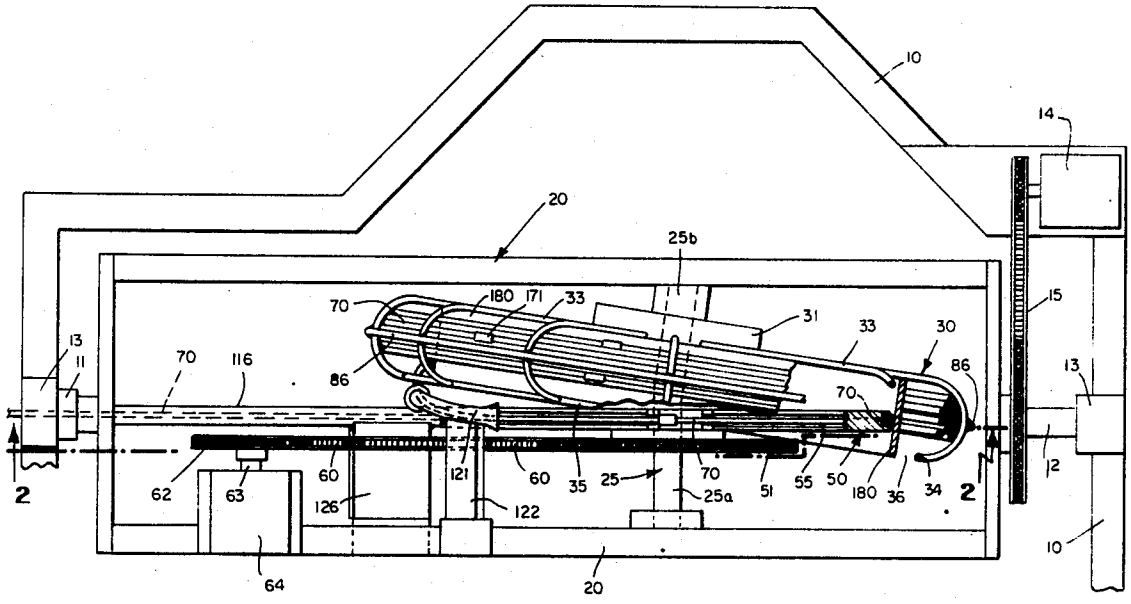
[57] **ABSTRACT**

A drive for a sewer rodding machine is disclosed which includes a circular arcuate channel surface, such as the channel periphery of a wheel, around which the rod is looped. The wheel functions both as a drive wheel and as a torsion-taking wheel for preventing the twist of the twisting rod from getting back into the storage reel. The storage reel, and the drive-and-torsion-taking wheel, are supported on a fixed axle for rotation in a rotatable carriage. The fixed axle is slightly bent or angled. The storage reel is mounted on the bent or angled part of the axle so that the storage reel is rotatable in a plane which is disposed at a slight angle with respect to the axis of rotation of the carriage. The drive-and-torsion-taking wheel is mounted on the straight part of the bent axle, so that the wheel is rotatable in a plane which is parallel to the axis of the carriage. The storage reel includes, as a fixed component part thereof, an inner annular confining band which embraces a substantial portion of the channel periphery of the drive-and-torsion-taking wheel. This band functions to confine the rod in the peripheral channel of the wheel against radially outward movement. Due to the angular disposition of the annual confining band relative to the drive-and-torsion-taking wheel, openings are available for entry and exit of the rod into and out of the wheel's peripheral channel.

3 Claims, 2 Drawing Figures



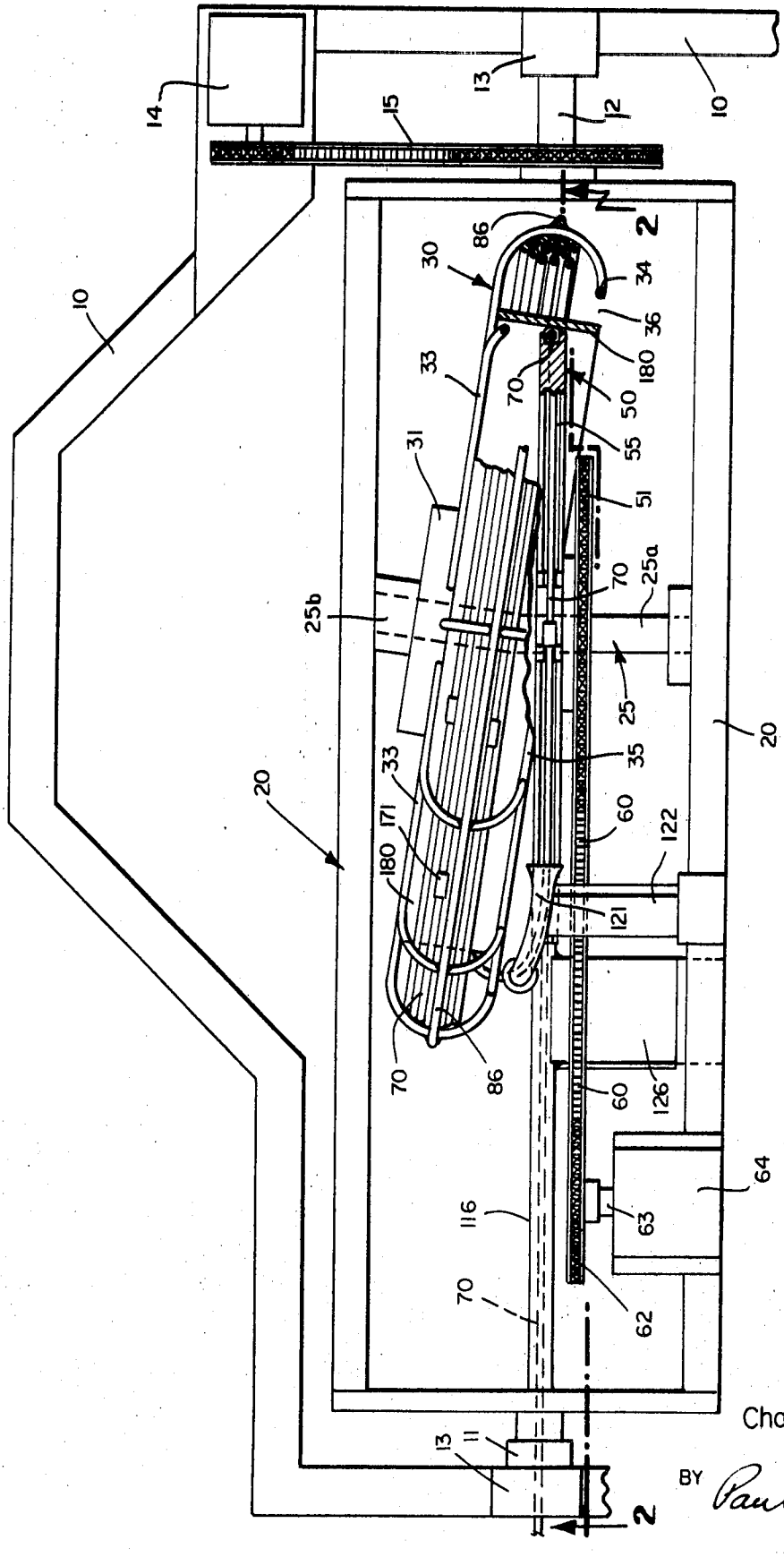


Fig. 1

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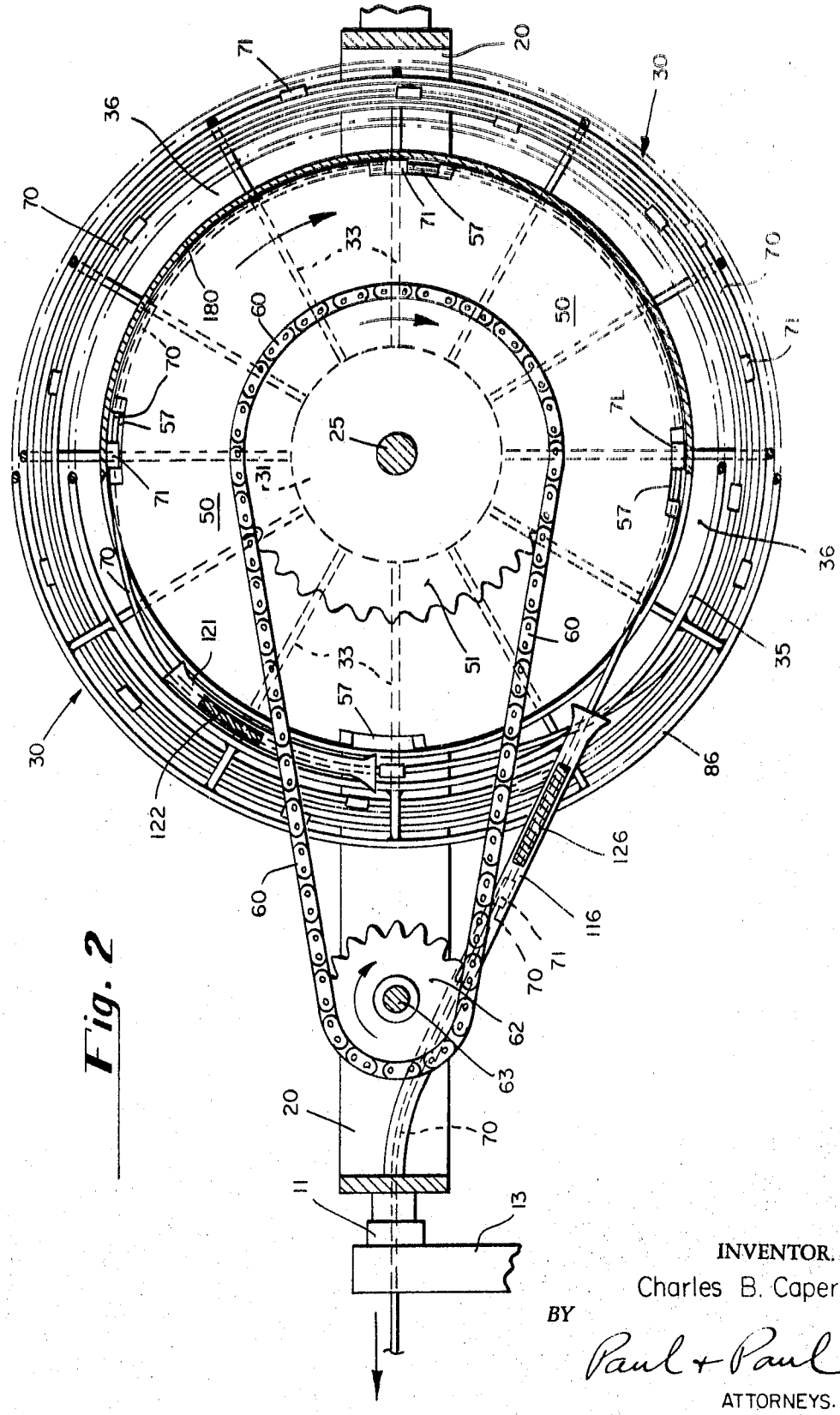

Fig. 2

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DRIVE FOR RODDING MACHINE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of my copending application Ser. No. 75,568, filed Sept. 25, 1970 and titled "-Drive for Rodding Machine."

The present application is also related to my U. S. Pat. No. 3,480,983, granted Dec. 2, 1969 entitled "Drive for Rodding Machine," and also to my U.S. Pat. No. 3,469,273 granted Sept. 30, 1969.

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. Such tool may, for example, be an auger bit, a root saw, a centrifugal cutter, a pick-up, 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 ¼ inch – ⅜ 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 900–1000 feet of rod. 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 the 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 rod 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 drive means and also 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 drive means and twist barrier or isolating means which are specially suitable for coupled rod.

The foregoing objects are achieved, in accordance with my present invention, by providing, in the rotatable carriage, a drive-and-torsion-taking annular surface, preferably a wheel, having a channel periphery which receives the rod to be driven. To prevent the rod from moving radially outwardly of the peripheral channel of the wheel, the storage reel is provided with an inner annular confining band. The wheel and reel are so positioned relative to each other that the inner annular confining band of the reel embraces a substantial portion of the channel periphery of the drive-and-torsion-taking wheel. Since the storage reel and confining band are disposed at an angle relative to the plane of rotation of the wheel, openings are available for entry and exit of the rod to and from the peripheral channel of the wheel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view, partly broken away and in section, of a rodding machine incorporating the present invention;

FIG. 2 is an elevational view, in section, looking along the line 2—2 of FIG. 1.

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 U. S. Pat. No. 3,469,273, granted Sept. 30, 1969.

In FIGS. 1 and 2 of the present application, there is illustrated a rodding machine having a fixed base frame **10** having at each end thereof a support standard **13**. Supported for rotation within the fixed frame **10** is a rotatable carriage **20** having a cross axle **25** which supports and carries a rotatable storage reel **30** and a rotatable drive-and-torsion-taking wheel **50**. The carriage **20** is driven rotationally about its longitudinal axis, as by a motor **14** and a chain and sprocket drive **15** supported on the frame **10**. The carriage **20** rotates on trunnions **11** and **12**.

The cross axle **25** carried by the rotatable carriage **20**, and rotatable therewith, is bent or angled, having a first portion **25***a* at right angles to the axis of rotation of carriage **20**, and a second portion **25***b* at a slight angular relation relative to the first portion. The drive-and-torsion-taking wheel **50** is supported on the first portion **25***a* of axle **25**, and according is rotatable in a plane parallel to the axis of rotation of carriage **20**. The storage reel **30** is supported on the second portion **25***b* 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 carriage **20** is supported for rotation on the trunnions **11** and **12**. Trunnion **11** is tubular to allow for passage therethrough of the coupled rod **70**.

The drive-and-torsion-taking wheel **50** is shown as a disc wheel similar to that shown in FIG. 5 of my U. S. Pat. No. 3,480,983. The periphery of wheel **50** is provided with radially extending flanges forming therebetween a channel **55** which continues about the periphery of the wheel. The coupled rod **70** is guided between the storage reel **30** and the peripheral channel **55** of wheel **50** through the flared guide tube **121** supported by bracket **122** fixed to carriage **20**. The rod **70** is guided between the peripheral channel **55** of wheel **50** and the trunnion **11** through the flared guide tube **116** supported on a bracket **126** fixed to the rotatable carriage **20**.

The drive-and-torsion-taking wheel **50** may be driven by any suitable means. It is shown in FIG. 2 to be driven by a chain and sprocket drive comprising the driven sprocket **51**, chain **60**, drive sprocket **62** mounted on shaft **62** and drive motor **64** mounted on and secured to the rotatable carriage **20**. The sprocket **51** and the wheel **50** are secured together for rotation on portion **25***a* of the fixed axle **25**.

The storage reel **30** comprises a cage supported on a hub **31**. The hub **31** is freely rotatable on the bent portion **25***b* of the fixed axle **25**. The cage is formed by a plurality of radial spokes **33**, each 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, as will be described. The annular band **180** has a smaller diameter than the cage, and also smaller than that of the hoop **35** leaving between the band **180** and the hoop **35** an annular opening **36** through which the coupled rod is passed as it is taken from, or returned to, the storage cage. A hoop **86** embraces the cage as a reinforcing element.

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 of such relative sizes that the band

180 embraces a substantial part of the channel periphery of the wheel. In the illustration, the band 180 covers about one-half of the periphery of the wheel 50.

In operation, when the drive sprocket 62 is driven in the clockwise direction, as indicated by the arrow in FIG. 2, the drive-and-torsion-taking wheel 50 is driven clockwise. Slots 57 in the channel 55 engage the couplers 71 of the coupled rod 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 rod through the guide tube 116 into the tubular trunnion 11. In this action, the forces on the 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. 2. This outward movement is prevented by the annular band 180 which functions to keep rod 70 from leaving the peripheral channel 55 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 counter-clockwise direction to push against the couplers 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 50 tend to cause the rod to move radially outwardly. This movement is prevented by the confining band 180.

When the coupled rod 70 is to be pulled from the storage reel 30 and fed into the underground conduit, it would be desirable to have a 1:1 coupling between the drive wheel 50 and the storage reel 30 so that, at start-up, as soon as the drive wheel 50 begins to rotate, the storage reel 30 will also begin to rotate. For if, due to inertia, the heavy storage reel 30 does not start to rotate as soon as the drive wheel 50 starts to rotate, the pull on the rod 70 in the cage tends to pull the rod into coils of smaller diameters. However, when the driven wheel 50 is up to speed, and is running at operating speed, it would be desirable to have the storage reel 30 rotate at a somewhat slower speed than the drive wheel 50. This because the diameter of the storage wheel 30 is larger than the diameter of the drive wheel 50. If the rotational speeds of the two are equal, more rod will be fed from the storage reel 30 to the wheel 50 than the channeled periphery of the wheel 50 can accept. It will be seen then that at full operating speed, it is desirable that the storage reel 30 rotate at a slightly slower speed than the drive wheel 50. The desired relative conditions just described with respect to start-up, and with respect to operating speed, may be taken care of by use of a friction connection between the drive wheel 50 and the storage reel 30. Such a friction connection device may be generally similar to that shown and described in my U.S. Pat. No. 3,039,715, granted June 19, 1962 entitled "Rod Reel Device." When the rod 70 is returned to the storage reel 30, the drive wheel 50 and the storage reel 30 should be allowed free rotation relative to each other. This condition is allowed by a one-way friction connection device similar to that shown in my aforesaid U.S. patent.

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 for rotation in said base frame about the longitudinal axis of said carriage;

c. a storage reel for coupled rods 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. drive means for driving said coupled rod in its lengthwise directions;

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 drive means and twist-barrier means comprising a drive-and-torsion-taking wheel supported in said rotatable carriage for rotation in a plane parallel to that of the axis of rotation of said carriage, with the rearward portion of said drive-and-torsion-taking wheel being within said storage reel;

g. the peripheral edge of said drive-and-torsion-taking wheel having a channel surface with slots therein at spaced intervals for receiving and engaging the couplers of said coupled rod;

h. said storage reel having an annular confining band fixed therewithin embracing the channel peripheral surface of the rearward portion of said drive-and-torsion-taking wheel for confining the coupled rod in the channel periphery of said wheel;

i. first guide means between said reel and the peripheral edge of said wheel for guiding said coupled rod between said storage reel and the channel periphery of said wheel; and

j. second guide means between the channel periphery of said wheel and the forward end of said carriage for guiding said rod.

2. Apparatus according to claim 1 characterized in that:

a. said storage reel is comprised of a plurality of radially disposed J-shaped spokes;

b. a circular hoop connects the terminal ends of the J portions of the spokes;

c. said annular confining band has a diameter smaller than the diameter of said hoop leaving an annular opening beyond said band for passage of coupled rod therethrough into and from said storage reel.

3. Apparatus according to claim 2 characterized in that said wheel and said storage reel are supported in said rotatable carriage on a bent cross axle having a first portion normal to the axis of rotation of said carriage and on which said drive wheel is mounted and having a second portion disposed at a slight angle relative to the axis of rotation of said carriage and on which said storage reel is mounted.

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