

April 7, 1970

A. PALYNCHUK ET AL

3,504,866

TRANSPORT REEL

Filed May 6, 1968

2 Sheets-Sheet 1

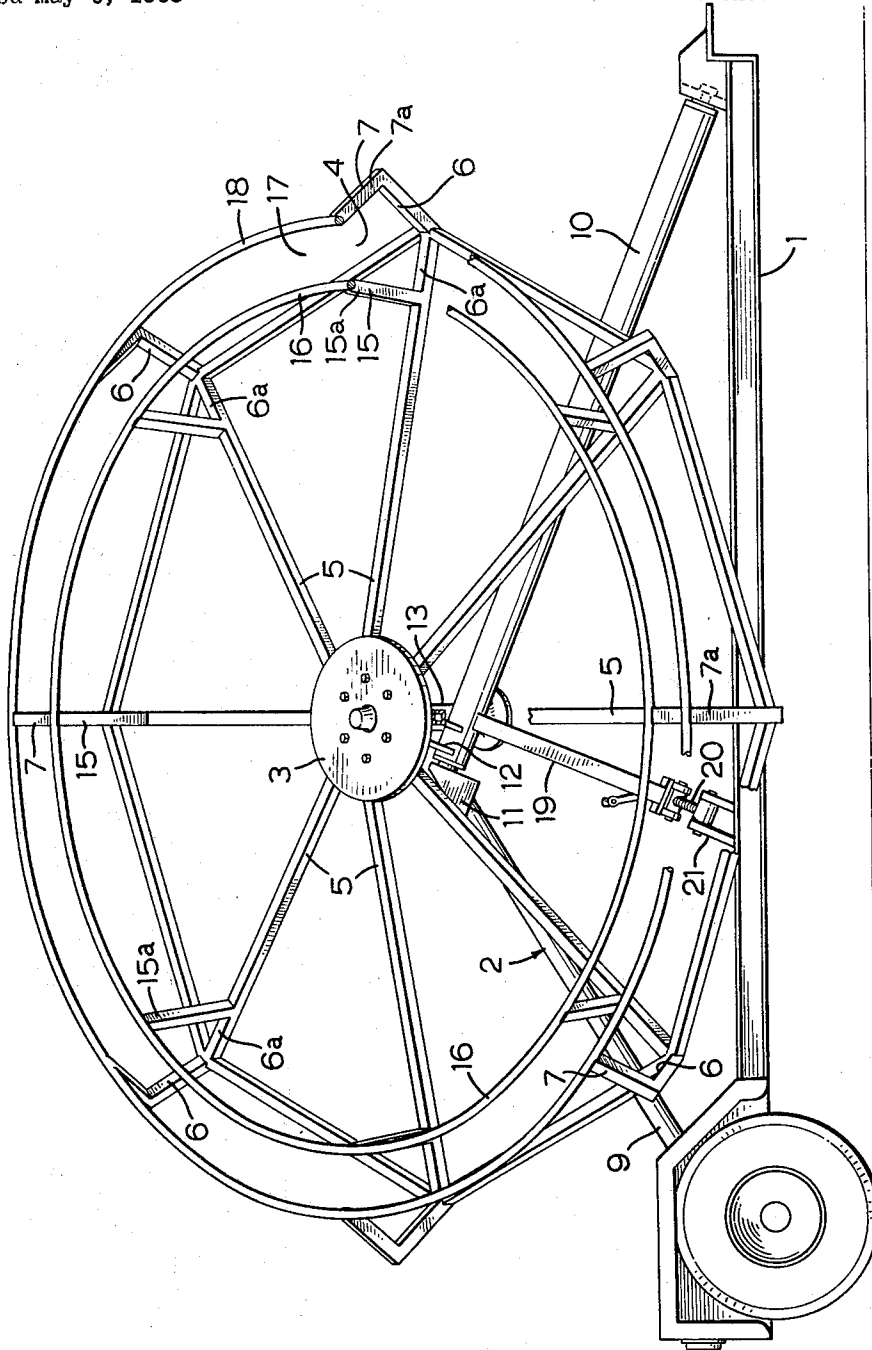


FIG. 1

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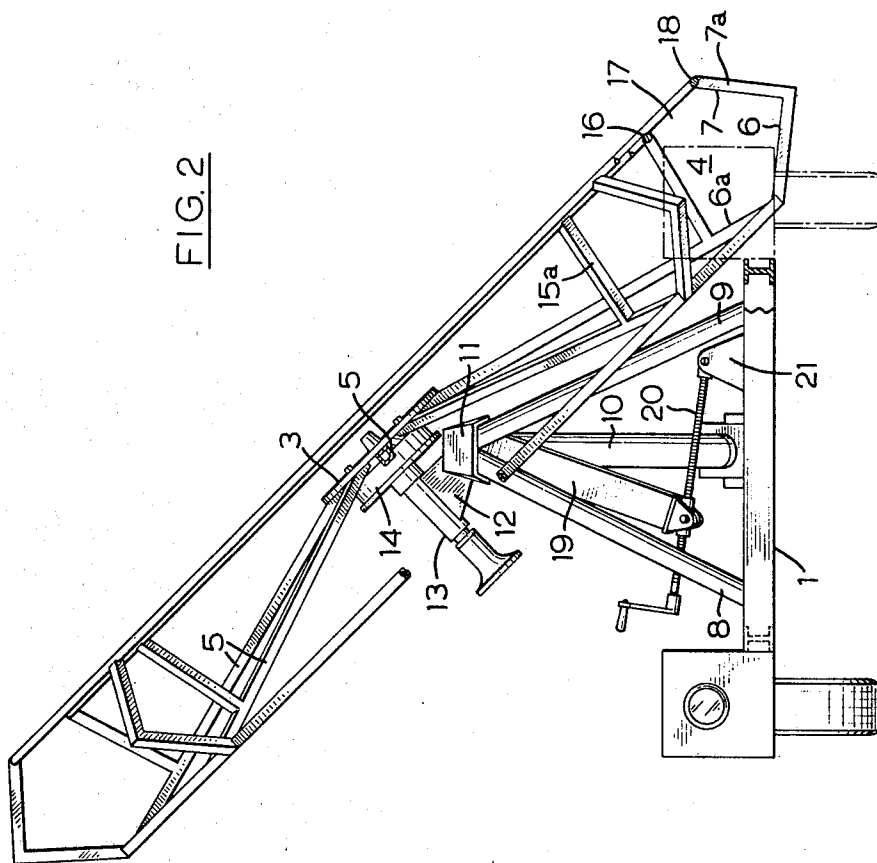
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TRANSPORT REEL

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FIG. 2



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TRANSPORT REEL

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5 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for the transportation of a coil such as a coiled, continuous sucker rod string. A ring-like, open-topped storage channel is rotatably mounted on a carrier, such as a truck bed, in a tilted position. Rod string may be fed into the moving channel and its outer upstanding side wall will form the string into an elastically deformed, coiled condition for transportation.

BACKGROUND OF THE INVENTION

This invention relates to a transport reel for the transportation, in a coiled form, of elongate articles such as continuous metal sucker rod strings.

A continuous sucker rod string is usually several thousand feet in length, particularly when it is to be used in an oil well. It is comprised of a single length of rod or several lengths welded together end to end. These lengths, upon being manufactured in the rolling mill, are usually individually coiled on a small drum for shipping. When so coiled, each length is usually permanently deformed or bent as a result of being stressed beyond its elastic limit. The coils are shipped in this condition to a servicing point, such as a city located in an oil producing region. There they are straightened and heat-treated, to reduce residual stresses, so as to put them into condition for use in a well. They are also usually joined together at the servicing point to form the complete string.

The servicing point is, of course, somewhat removed from the well. At the present state of the art, there is no practical means available for transporting the rod string to the well using public highways.

In order for such transportation means to be practical, the rod string would have to arrive at the well in a condition wherein it is not permanently deformed; or, if it is permanently deformed, the degree of deformation should be so small that simple field equipment, such as a set of straightening rolls, could be used to treat the string to put it into usable form. The lack of such a transportation means is largely a result of highway restrictions as to load height and width, which are commonly in force. For example, in the Province of Alberta, the use of the highways for the movement of loads which are more than 14 feet high or 12 feet wide is prohibited. If one were to coil a 5/8 inch or 3/4 inch diameter rod string on an upright drum, sized so that the drum and its carrier would be within the highway regulations, one would severely and permanently deform the string. It would then be necessary to subject the string, at the wellsite, to the same elaborate treating steps which it underwent at the servicing point.

In addition to the foregoing, it would be desirable if the transportation means could be easily loaded and unloaded. Finally, the design of the transportation means should ensure that the coiled load would not become free

during transit. The undesirability of having several thousand feet of metal sucker rod uncoiling on a public highway is self-evident.

SUMMARY OF THE INVENTION

It is therefore the object of the invention to provide a transport apparatus which acts to form an elongate article into a coil and maintains it in that form during transportation.

It is a further object to provide such an apparatus which is adapted to fit the coil into a compact space. It is still a further object to provide such an apparatus which can be easily loaded and unloaded.

The invention provides an apparatus which is characterized by the aforementioned desirable features. It comprises a transportable reel which is adapted to travel in a tilted condition. As a result, the reel will meet the highway width and height regulations of most areas while still having a sufficiently large stress diameter whereby a rod string, up to 3/4 inch in diameter, will not be permanently deformed or will only be permanently deformed to a small degree when coiled thereon. The reel is constructed having a substantially ring-shaped support surface, upon which the coiled rod string rests. The reel is movable about its centre point. An upstanding restraining element rises from the support surface and defines its outer boundary. The restraining element may comprise a circle of spaced posts distributed around the outer edge of the support surface. When the rod string is fed onto the support surface, it is formed into a plastically deformed coil and is maintained in that condition by the restraining element. By providing a rotatable support surface, the string may be easily loaded thereon or removed therefrom.

Up to this point, and following this paragraph, the invention has been discussed in terms of its use with continuous metal sucker rod strings. It will be understood that the device is not restricted to such use. Other elongate articles, such as plastic pipe of diameters in the order of 2 inches, may also benefit from its advantages.

Furthermore, the expression "support surface" has been used to describe the portion of the reel device which carries the rod string. It is to be understood that, for the purposes of this specification, the expression is intended to cover both a continuous surface and a discontinuous surface, such as would be provided by a series of spaced, coplanar, cross pieces.

DESCRIPTION OF THE DRAWINGS

The invention is illustrated in the drawings in which: FIGURE 1 is a side view of one embodiment of the device; and

FIGURE 2 is a rear view of the embodiment of FIGURE 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The specific embodiment illustrated in the drawings will first be described in general terms: A wheeled carrier 1 is provided having an upwardly extending framework 2 mounted thereon. A central hub 3 is rotatably carried by framework 2. Hub 3 is so arranged as to be disposed at an angle from horizontal when travelling. A trough-shaped circular channel 4, concentric with and outwardly spaced from hub 3, is rigidly connected therewith by radial struts 5. Hub 3, channel 4 and struts 5 together make up a structure herein referred to as the reel assem-

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ably. As a result of the angling of hub 3, the reel assembly is maintained in a plane angled from horizontal. The plane extends in substantially the same direction as the longitudinal axis of the carrier 1. Channel 4 comprises the coiling region for the rod string; it includes a ring-shaped support surface 6 whose outer boundary is defined by upstanding restraining element 7. In operation, the rod string is fed into rotating channel 4 where it is formed into a coil by restraining element 7 and is supported by support surface 6.

In greater detail, wheeled carrier 1 is illustrated comprising a trailer. A truck bed will do just as well. The carrier will usually be of the type suitable for highway transportation; however, other carriers, such as barges used in off-shore oil well operations may be used.

The supporting framework 2 consists of three upwardly inclined legs 8, 9 and 10. Coplanar legs 8, 9 are attached (at their lower ends) to the rear end of the deck of carrier 1. They are secured together at their upper ends by gusset plate 11. Leg 10 is attached to the carrier deck at its lower end and extends rearwardly for connection with gusset plate 11. It is pin-mounted at both ends so that it may be rotated about its longitudinal axis.

A gusset plate 12 is mounted on the upper end of leg 10. It is attached, at its upper end, to the stationary shaft 13 of a conventional truck half shaft.

Hub 3 is bolted onto the rotatable wheel assembly 14 of the truck half shaft. Secured to and extending outwardly from hub 3 are rigid radial struts 5. At their outer ends, struts 5 carry channel 4.

The particular channel 4 which is illustrated comprises a support surface 6 bounded on each side by inner and outer restraining elements 15, 7. Support surface 6 is shown as a discontinuous surface comprised of a plurality of coplanar, spaced cross pieces 6A which are extensions of radial struts 5. It will be understood that the phrase "support surface" as used herein, is intended to cover any support element which will serve to support the coiled rod string. For example, it may comprise a discontinuous surface, as shown, or a continuous solid sheet. Returning to the version shown, channel 4 is generally trough-shaped. Upstanding, inner restraining element 15, comprised of a series of spaced posts 15A reinforced by a bar 16, is outwardly inclined so as to narrow the mouth 17 of channel 4. By virtue of this arrangement, any spilling over of the rod string during unloading is substantially avoided. The outer restraining element 7, comprising a series of upstanding, spaced posts 7A, reinforced by bar 18, acts to form the rod string into a coil when loading and maintains the elastically deformed string in that condition. Although not shown, a continuous length of sheet metal may advantageously be provided to form the interior surface of outer restraining element 7.

The reel assembly may be adjustably tilted. The upper end of a lever 19 is connected to rotatable leg 10. At its lower end, lever 19 is threadably mounted on threaded member 20. Member 20, in turn, is rotatably and pivotally mounted at 21 on the deck of carrier 1. Rotation of member 20 will cause lever 19 to pivot, thereby rotating leg 10 and tilting the reel assembly.

It is a key feature of the invention that the substantially circular support surface 6 must be movable about its centre point in order to facilitate loading and unloading. In the version illustrated, the support surface forms a segment of a rigid reel assembly and the entire assembly is rotatable. Alternatively, a continuous support surface could be adapted to travel in a rigid, stationary framework so as to accomplish the same result.

While not shown in the drawings, it will be desirable to provide suitable means for braking the rotation of the reel assembly. We have used a conventional brake shoe on the wheel assembly 14 with success.

In operation, the rod string is fed to channel 4, as by a set of feed rollers, through mouth 16. The leading end of the string will have been secured to one of the posts

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14A. As the string is fed to the channel 4, the free-wheeling reel assembly will rotate. Outer restraining element 7 will reel the string to be formed into a coil. This coil, being elastically deformed, will press itself against restraining element 7. In other words, it will comprise a self-sustaining coil. To unload the string, the reel assembly can be turned by hand to pay it out.

By using a device as described, we have moved rod strings on Alberta highways on reels having an inner, or stress, diameter of up to 17 feet. As a result, strings up to $\frac{3}{4}$ inch in diameter have been delivered at the wellsite requiring only minor straightening to put them into condition for use.

What I claim as my invention is:

1. A transport device for carrying coiled, elongate articles comprising:

- (A) a carrier; and
- (B) a reel assembly, mounted on the carrier, comprising:

- (a) a substantially ring-shaped, rotatable supporting surface, maintained in a plane at an angle to horizontal, said plane extending in substantially the same direction as the longitudinal axis of the carrier, for carrying an elongate article coiled thereon; and

- (b) a restraining element, upstanding from and defining the outer boundary of the said surface, for maintaining the coiled condition of the elongate article.

2. A transport device for carrying coiled, elongate articles comprising:

- (A) a carrier; and
- (B) a reel assembly, mounted on the carrier in a plane at an angle to horizontal, said plane extending in substantially the same direction as the longitudinal axis of the carrier, comprising:

- (a) a central hub, rotatably carried by the carrier;
- (b) a substantially ring-shaped supporting surface, concentric with the hub and spaced therearound, for carrying an elongate article;

- (c) rigid means connecting the hub and supporting surface; and

- (d) a restraining element, upstanding from and defining the outer boundary of the said surface, for maintaining the coiled condition of the elongate article.

3. The device as claimed in claim 2 wherein:

- (A) a framework is carried by the carrier and the central hub is rotatably mounted on the framework, said framework adapted to bias the hub to alter the angle at which the reel assembly is disposed.

4. The device as claimed in claim 3 wherein: the inner boundary of the supporting surface is defined by a second upstanding element.

5. A transport device for carrying coiled sucker rod string, comprising:

- (A) a carrier;
- (B) a framework extending upwardly from the carrier; and

- (C) a reel assembly comprising:

- (a) a central hub, rotatably carried by the framework in a plane at an angle to horizontal, said plane extending in substantially the same direction as the longitudinal axis of the carrier;

- (b) a trough-shaped, substantially circular channel, concentric with the hub and spaced therearound, comprising:

- a support surface, an outer restraining element, upstanding from and defining the outer boundary of the said surface, for maintaining the coiled condition of the elongate article, and an inner restraining element, upstanding from and defining the inner boundary of the said surface, sized to prevent permanent deformation of the suck-

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er rod string coiled on the support surface;
and
(c) rigid means connecting the hub and channel.

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U.S. Cl. X.R.