May 1, 1956 J. P. BREEDLOVE 2,743,823

AUTOMATIC RACKING DEVICE

Filed April 8, 1953 2 Sheets-Sheet 1

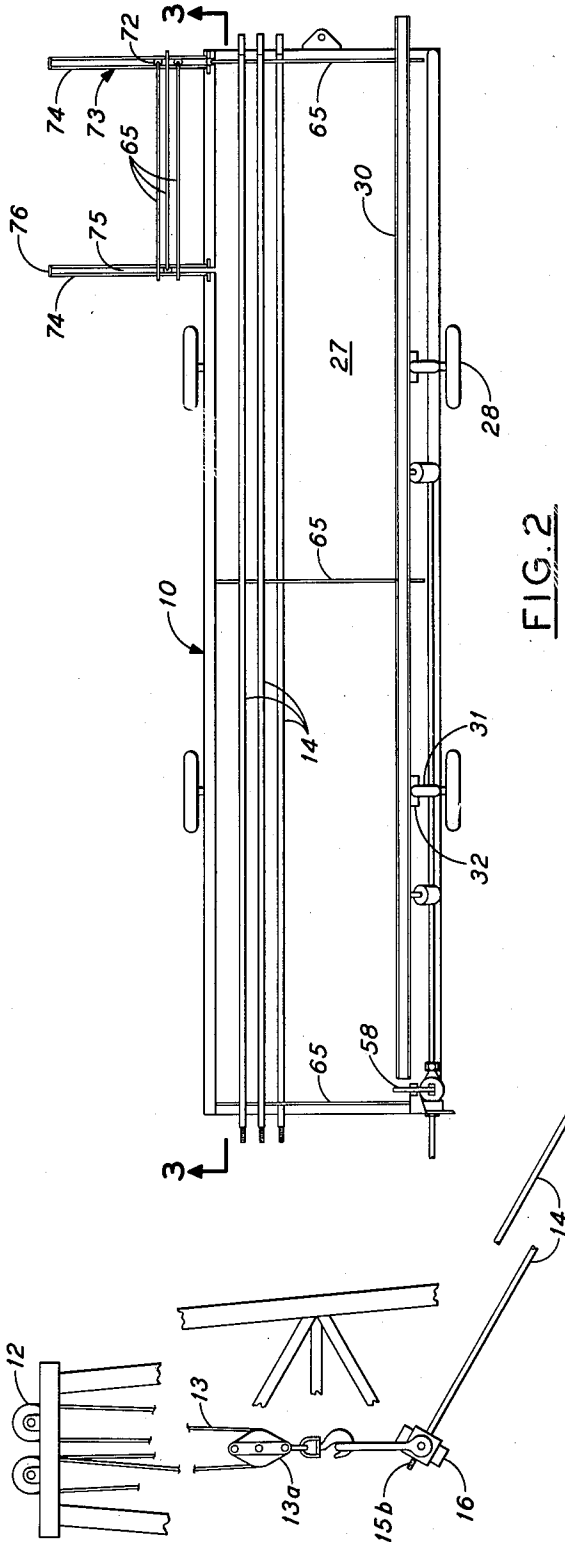


FIG. 2

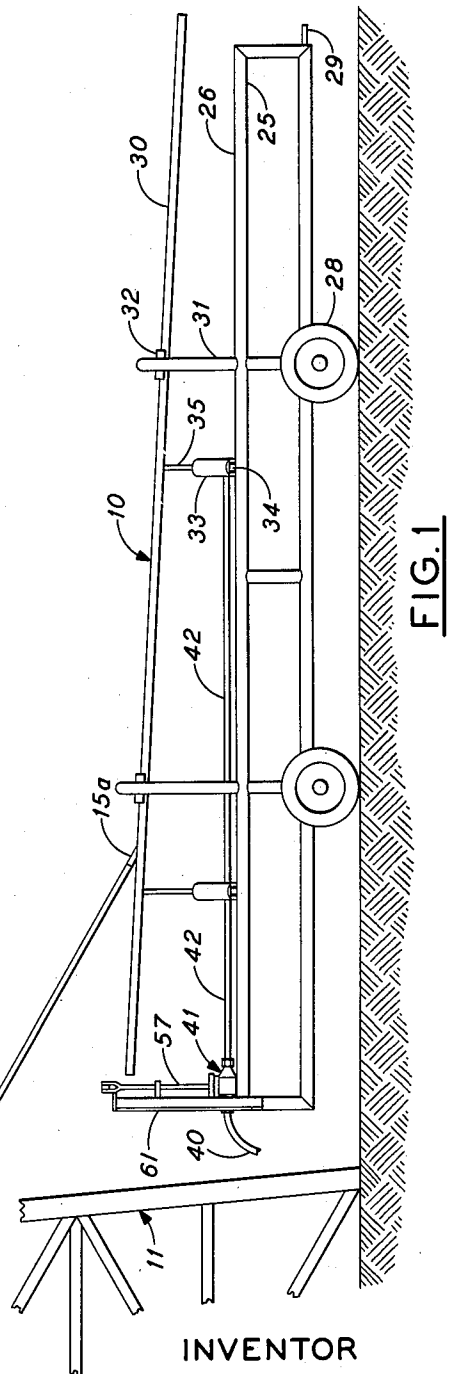


FIG. 1

INVENTOR
JAMES P. BREEDLOVE
BY A. L. Snow.
Walter L. Madden, Jr.
ATTORNEYS

May 1, 1956 J. P. BREEDLOVE 2,743,823

AUTOMATIC RACKING DEVICE

Filed April 8, 1953 2 Sheets-Sheet 2

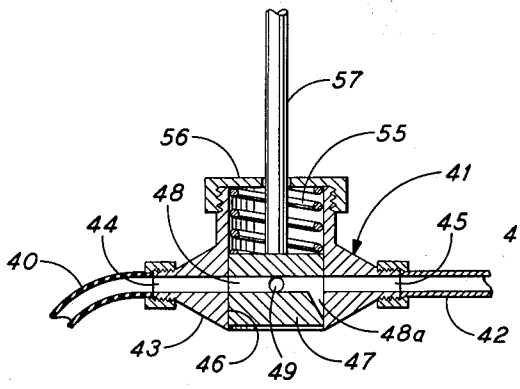


FIG.5

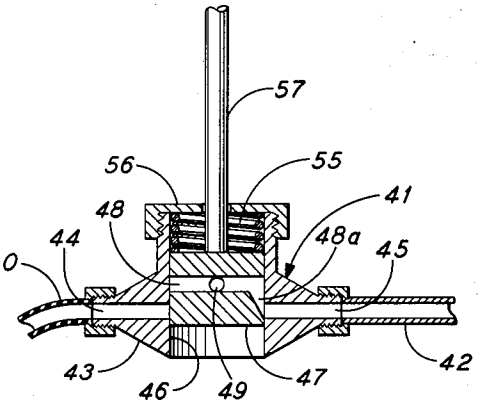


FIG.6

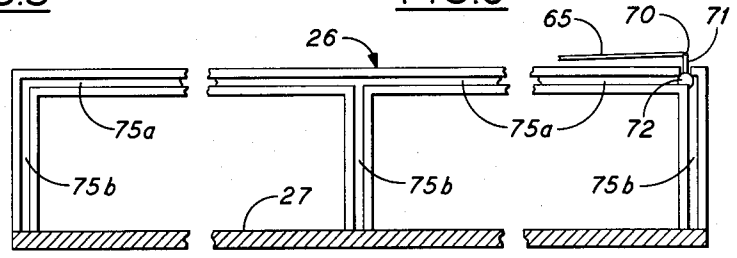


FIG. 3

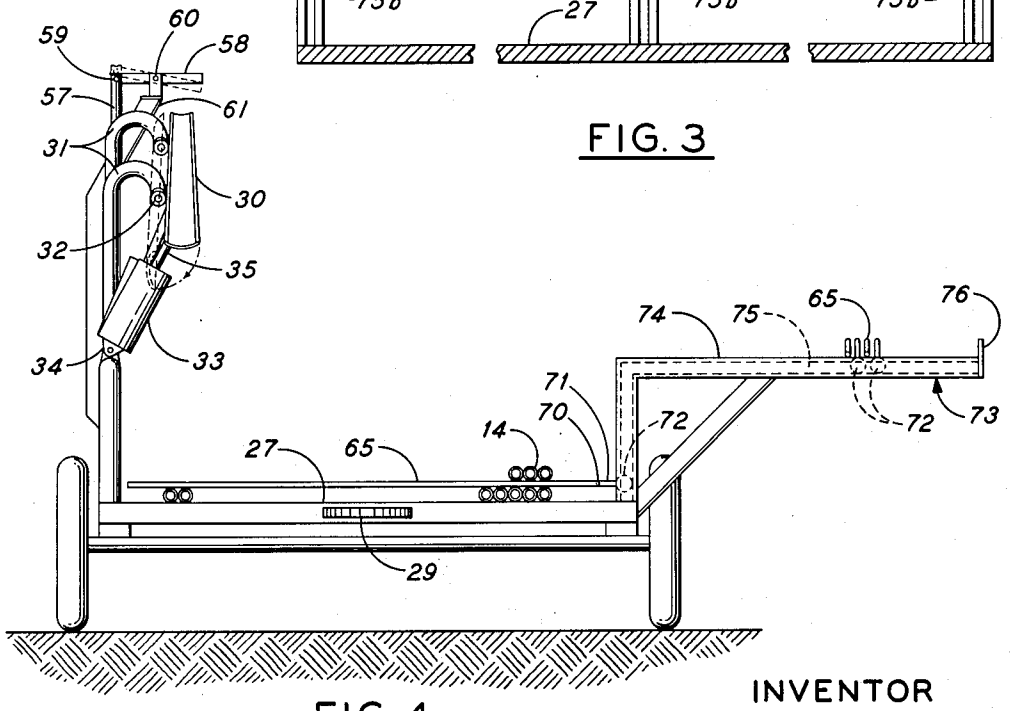


FIG.4

INVENTOR
JAMES P. BREEDLOVE
BY A. L. Snow
Walter L. Middleton Jr.
ATTORNEYS

United States Patent Office 2,743,823 Patented May 1, 1956

2,743,823

AUTOMATIC RACKING DEVICE

James P. Breedlove, Mentone, Tex.

Application April 8, 1953, Serial No. 347,461

2 Claims. (Cl. 214—2.5)

This invention relates to apparatus for racking sucker rods and other similar objects such as long lengths of pipe.

Sucker rods are employed in oil wells and other deep wells to operate pumps located at a considerable depth. A typical sucker rod is of steel construction, about ½ to 1 inch in diameter and about 25 to 30 feet long. An oil well of ordinary depth, e. g., 5,000 to 10,000 feet, will employ a very large number of sucker rods connected together end to end to form a string. A string of sucker rods extends down into the well and is connected at its lower end to a piston or plunger and at its upper end to mechanical means, such as the familiar walking beam, for reciprocating the sucker rod string and the plunger to effect the necessary pumping operation.

From time to time it is necessary to remove sucker rods from a well, e. g., when it becomes necessary to drill the well to a greater depth, to abandon the well or to remove the pump.

In such event the string of sucker rods is hoisted by any suitable means, such as the crown block of the derrick, a cable and a winch. As a length of rod is withdrawn it is uncoupled and hoisted clear of the well. It is then customary to place each rod on a stationary or mobile rack. Preferably a mobile rack is employed, which can be moved easily from well to well.

The handling and stacking of sucker rods presents a problem owing to the relatively great length of each rod, the great number of rods that require handling at an individual well, and the small diameter of each rod. Rods of such great length (25 to 30 feet) and small diameter (½ to 1 inch) have a tendency to become twisted together and/or bent out of shape. Not only is this tendency troublesome to workmen handling the rods, but twisting and bending of the rods weakens them, impair their usefulness and may require straightening bent rods or scrapping rods which are excessively damaged.

The means employed heretofore for the purpose of handling and stacking sucker rods and other like articles have been disadvantageous. In some instances the apparatus employed has been cumbersome or has required manual operation. In some instances such apparatus has resulted in damage to sucker rods.

It is an object of the present invention to provide improved apparatus of the character and for the purpose described.

It is another object of the invention to provide apparatus for handling sucker rods and other like articles, for the purpose of stacking the same, such apparatus being largely automatic in its operation.

Yet another object of the invention is to provide apparatus of the character and for the purpose described which is capable of rapid, efficient handling of sucker rods and the like and which will operate for the intended purpose without as much damage and tangling as has been experienced theretofore.

A further object of the invention is to provide a rod handling mechanism which, with a minimum of manual

control, will receive the lower end of a sucker rod after it has been hoisted from a well and has been detached from the string; which will guide such lower end as the rod is lowered so as to lay the rod in substantially a prone position; and which will automatically dump the rod to a prone position on a platform, rack or the like.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

One form of the invention is illustrated by way of example in the accompanying drawings, in which,

Figure 1 is a view in side elevation of the apparatus of the invention, which is shown adjacent an oil well derrick and in the course of operation.

Figure 2 is a top plan view of the apparatus of Figure 1.

Figure 3 is a fragmentary, vertical longitudinal section taken along the line 3—3 of Figure 2.

Figure 4 is an end elevation as seen from the right of Figure 1.

Figure 5 is a longitudinal, vertical section through the automatic control valve of the apparatus of Figure 1, which is shown in its normal, open position.

Figure 6 is a view similar to Figure 5 but showing the valve in closed position.

Referring now to the drawings, and more particularly to Figures 1, 2 and 4, the apparatus of the invention is shown as a mobile unit generally designated as 10 and it is also shown adjacent an oil well derrick which is designated as 11. The derrick is shown fragmentarily and it is provided with a crown block 12 to which a line 13 and a sheave 13*a* are attached. The other end of the line (not shown) is, of course, attached to a winch, and the necessary mechanical equipment and a prime mover are provided, none of which is shown.

A single sucker rod is shown at 14. At one end there is a female coupling 15*a* and at the other end a male coupling 15*b*, by means of which any number of individual rods are joined together in end-to-end relation to form a string of rods. A conventional elevator is shown at 16 which provides a detachable connection between the line 13 and the rod 14. The single rod 14 has, of course, been hoisted from a well and detached from the string. It is intended that the rod 14 be lowered onto the apparatus 10, detached from the elevator 16 and dumped to a prone position. It is also intended that successive lengths of rods 14, as they are pulled from the well and are detached from the string, be similarly handled.

The apparatus 10 comprises a frame 25 including an open siding 26 constructed of channels or any other suitable structural members, a bed 27 and wheels 28 which are suitably mounted on axles and secured to the frame. A coupling may be provided at 29 to connect the apparatus to an automotive vehicle.

A slide trough 30 is also provided which, as is best shown in Figure 4, is of U-shaped cross section to receive and hold a single length of rod such as shown at 14, but to allow dumping of the rod in the manner hereinafter described. The trough 30 is supported by a suitable number of posts 31, e. g., by two such posts, each of which is fixed rigidly at its lower end to the frame 25 and is connected at its upper end by means of a hinge 32 to the trough so that the trough is permanently supported at the level illustrated, but is capable of rotation about an inclined axis (i. e., the axes of the hinges 32) between a rod holding position shown in solid lines in Figure 4 and a dumping position shown in broken lines. It will be noted that hinges 32 are disposed at different levels such that the trough 30 is inclined, sloping downwardly from left to right as viewed in Figure 1.

For the purpose of rotating the trough 30, a suitable

number of air cylinders 33 are provided, e. g., two such cylinders, each of which is pivotally connected at its lower end, at 34, to the frame 25 and has a rod 35 whose upper end is pivotally connected to the trough 30. The pneumatic cylinders 33 are supplied with compressed air through a flexible hose 40, an automatic control valve 41 and a hose 42. The inlet hose 40 will, of course, be connected to a suitable source of compressed air (not shown). It will be apparent, of course, that other pressure means may be employed, e. g., hydraulic fluid. Compressed air is preferred, however, because of its general availability and because of its rapid response.

Referring now to Figures 5 and 6, the valve assembly 41 comprises a body 43 having an inlet passage 44 and an outlet passage 45 which are interconnected by a cylindrical chamber 46 in which a piston or plunger 47 is slidable. The plunger 47 is formed with a passage 48 for connecting the passages 44 and 45 and with an exhaust passage 49 which is intended to register with an opening (not shown) in the valve body 43. The right hand end of the passage 48 as viewed in Figures 5 and 6, i. e., the end adjacent the passage 45, diverges at 48*a* for a purpose which is explained hereinafter. The plunger 47 is normally held in the lower, open position illustrated in Figure 5 by means of an expansion spring 55 which is compressed between the top of the plunger and a cap 56. To the plunger 47 is attached a rod 57.

Referring to Figures 1 and 2, it will be seen that the rod 57 is adjacent but spaced somewhat from the upper left hand end of the trough 30 and that it extends to a point somewhat above the trough 30. As is most clearly shown in Figure 4, a lever 58 is provided the outer or left hand end of which (as viewed in Figure 4) is pivoted at 59 on the rod 57. The lever 58 is fulcrummed at 60 on the upper end of a post 61 which is fixed to the frame 25, and it extends inwardly or to the right as viewed in Figure 4 so that its inner end is in longitudinal alignment with the trough 30.

Normally, by reason of the spring 55, the valve 41 is in open position with respect to the passages 44 and 45 and is closed with respect to the exhaust passage 49; i. e., it is normally in the position illustrated in Figure 5. Hence, as long as adequate air pressure is supplied through the hose 40, the trough 30 will be held by the air cylinders 33 in its rod holding position, i. e., in readiness to receive and hold a rod such as that shown at 14 in Figure 1. Such a rod will be lowered by the hoisting equipment associated with the derrick 11, including the crown block 12 and the line 13. The lower end of the rod will be guided by a workman into the trough 30. Continued lowering of the rod, by reason of the downward pitch of the trough 30, will cause the lower end of the rod to slide downwardly and to the right as viewed in Figure 1. The cupped shape of trough 30 will not only guide the rod 14 longitudinally, but will also keep the upper end of the rod in alignment with the trough, hence also with the lever 58. Hence, as the upper end of the rod 14 is lowered into the trough, it will necessarily contact the lever 58. However, just before such contact is made, a workman will detach the upper end of the rod from the elevator 16 to allow it to drop freely into the trough. Upon contact with the lever 58, the rod will rotate the lever 58 clockwise as viewed in Figure 4. This will result in lifting the rod 57, and with it the plunger 47, to the position shown in Figure 6. The valve 41 will, therefore, be closed momentarily in relation to the inlet passage 44 and will be opened in relation to the exhaust passage 49.

It will be apparent that pressure will be momentarily released from the air cylinders 33. Hence, the trough 30 is free to rotate in clockwise direction as viewed in Figure 4 to the dumping position shown in broken lines, and it does so rotate under its own weight and the added weight of the rod 14. The rod will, therefore, be automatically dumped onto the bed 27 of the apparatus, and it will be dumped in the proper position for stacking, i. e., in a prone position parallel to the sides of the apparatus, so that an operator can easily roll the rod to one side.

This automatic dumping action is momentary only. As the rod is dumped, its pressure on the lever 58 is released. The spring 55 in valve 41 will return the plunger 47 to its normal, open position. Pressure will again be communicated from the passage 44 to the passage 45, thence through the hose 42 to the cylinders 33. The pressure in these cylinders will rotate the trough 30 back to its normal, rod holding position in readiness for the next rod.

In stacking rods which are thus dumped into the apparatus, it is preferable to arrange them in an orderly manner, parallel to one another and in layers or tiers. It will be noted that the automatic dumping mechanism is located at one side of the frame, hence will dump the rods on that side. An operator, or preferably two operators, one being located at each end of the frame, will roll successive rods across the bed until a layer of rods has been completed. Before stacking the next layer it is preferable to place transverse spacers atop the lower layer to space it from the next higher layer.

For this purpose an adequate supply of spacer rods 65 is provided together with means for storing these rods when not in use and for manipulating the rods. Each rod 65, as is best shown in Figures 3 and 4, is hinged at 70 to a shorter length of rod 71 which is connected to a rounded shoe 72. The storage means consists of a rack 73 comprising a pair of spaced, parallel cantilever members 74 which are fixed to and extend laterally from the side frame 26 opposite the trough 30. The rack 73 is shown in plan view in Figure 2. Each cantilever member 74 is formed with a longitudinal slot 75 which slidably and rotatably receives the shoes 72, and a detachable end closure 76 is provided for the outer end of each slot which can be detached to permit insertion and removal of spacer rods as desired. As shown in Figure 3, a continuation of the slots 75 is provided at 75*a* along the length and at the top of the adjacent side frame 26 which connect with vertical slots 75*b* which are located at the ends and at the middle of the side frame.

In use, when a layer of sucker rods 14 has been completed, spacer rods 65 are moved inwardly of the rack and are rotated to the extended position shown in Figure 4. One such rod is pushed along the longitudinal slot 75*a* and then down the vertical slot 75*b* at the left hand end of the apparatus as viewed in Figure 3. The next rod is similarly located in the slot 75*b* at the middle of the apparatus and a third rod is similarly located in the vertical slot at the right hand end. The apparatus is then in readiness to receive the next layer of sucker rods. It will, of course, be apparent that the spacer rods 65 are restored to the rack by carrying out the above operations in reverse.

When a full load of rods has been dumped and stacked in this manner, an automotive vehicle may be attached to the apparatus by means of the coupling 29 and the load hauled away.

It will, therefore, be apparent that apparatus has been provided which is preferably mobile as illustrated and which satisfies the several objects hereinabove mentioned. Sucker rods or the like can be stacked quickly, uniformly and without twisting, tangling or damage. The dumping operation is performed automatically and, when completed, the rod-receiving and dumping mechanism returns automatically to a state of readiness for the next rod. This mechanism guides each rod into proper position for dumping lengthwise of the apparatus, and it involves a minimum of manual operation. A means is provided for maintaining a supply of spacers at a convenient position and in compact position, and this means permits rapid, easy manipulation of the spacers.

I claim:

1. In rod racking apparatus and the like, the combination of an inclined trough having its longitudinal axis inclined to the horizontal so as to receive and guidingly support a rod suspended at its upper end and lowered onto

said trough, and to slide and guide the lower end of such rod from the upper end to the lower end of the trough; means hingedly supporting said trough for rotation between a receiving position to receive, guide and support a rod and a dumping position to dump such rod; fluid pressure means adapted to rotate said trough and to hold it in its receiving position; a normally open valve for admitting pressure to said fluid pressure means to so rotate and hold said trough; valve operating means including a lever disposed adjacent the upper end of said trough to lie athwart the path of travel of the upper end of a rod and to contact the same when such upper end is lowered into said trough, said valve operating means also including means connecting said lever with said valve to close the valve and relieve pressure momentarily from said fluid pressure means when the upper end of a rod has been deposited in said trough.

2. In a sucker rod racking device for receiving lengths of sucker rod in succession as they are pulled from a well, hoisted vertically, then lowered vertically onto a rack, the combination which comprises: a slide trough of cupped cross section to receive and support a length of sucker rod, means hingedly mounting such trough with its longitudinal axis inclined and for rotation about an axis parallel to such longitudinal axis between a first position for receiving and supporting a sucker rod and a second position for dumping such rod, the inclination of said trough being such that, as a suspended sucker rod is

lowered vertically from a derrick onto said trough, the trough will guide the lower end of the rod downwardly; said combination also comprising a fluid pressure member operable, when in pressurized condition, to rotate said trough to and hold it in said first position; said combination also comprising an automatic valve which normally assumes a position to communicate pressure to said fluid pressure member, and pressure release means operable upon application of a positive force to shift said valve to release pressure from said fluid pressure member, said pressure release means including a trigger member disposed athwart the path of travel of a sucker rod onto said trough to actuate said pressure release means momentarily as the upper end of a sucker rod is lowered into said trough.

References Cited in the file of this patent

UNITED STATES PATENTS

672,872	Dreyer	Apr. 23, 1901
1,423,856	Jupp et al.	July 25, 1922
2,335,719	Williams	Nov. 30, 1943
2,397,192	Meyerbach	Mar. 26, 1946
2,591,339	Davis	Apr. 1, 1952
2,593,472	McGinn	Apr. 22, 1952
2,611,495	Weaver	Sept. 23, 1952
2,631,741	Tucker	Mar. 17, 1953