Jan. 9, 1951 A. L. STONE 2,537,607

APPARATUS FOR MOVING PIPE

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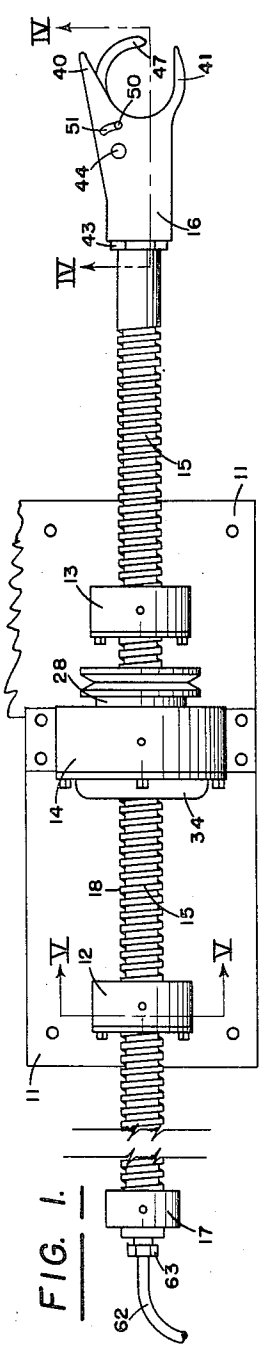


FIG. 1.

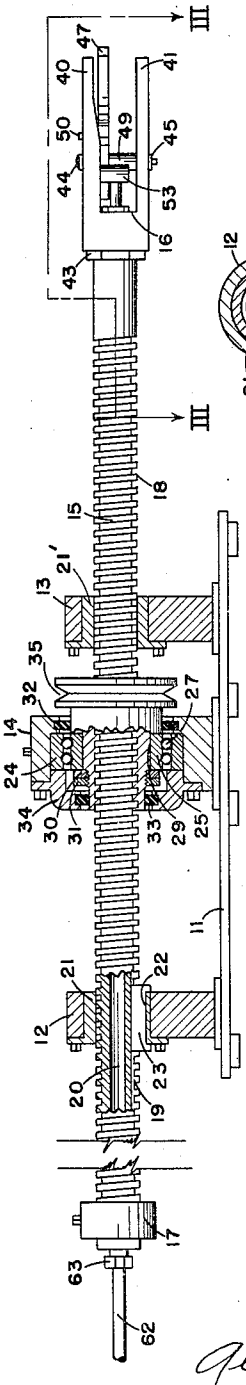


FIG. 2.

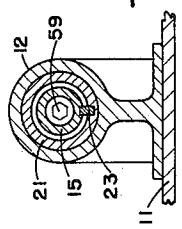


FIG. 5.

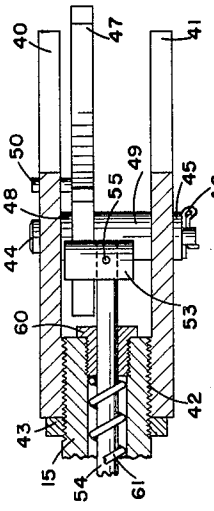


FIG. 4.

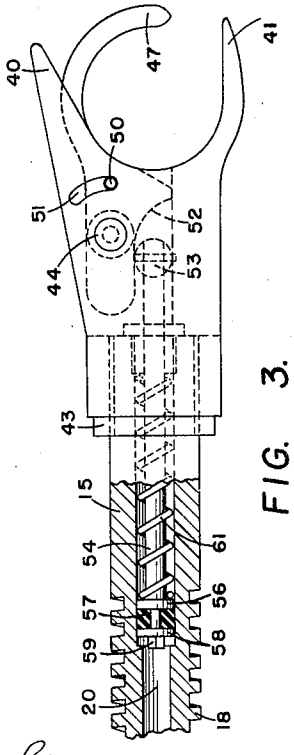


FIG. 3.

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APPARATUS FOR MOVING PIPE

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3 Claims. (Cl. 214—1)

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The present invention is directed to apparatus adapted for moving and handling pipe.

In many industrial operations, it is necessary to handle a great many lengths of tubing or pipe in a rapid, efficient manner. As an example of such an operation, in the drilling of wells by the rotary drilling method, it is frequently necessary to withdraw the entire length of drill stem from the borehole and subsequently replace the drill stem in the borehole. In deep boreholes, many lengths of pipe must be handled in the operation of withdrawing the drill stem from the hole and in the operation of returning the drill stem to the hole. In such conventional operations, it is common to raise the drill stem so that three joints of pipe, known as a stand, are above the surface of the earth, to unscrew the threaded connection joining the lower end of the stand to the remainder of the drill stem, then stack the disconnected stand in one side of the derrick. It has heretofore been the practice to station a man in the derrick, called the derrick man, who is assigned the task of grasping the upper end of each stand of pipe and controlling the movement of the upper end when a stand is being moved over into racking position. It has also been conventional for a member of the crew on the derrick floor to control the movement of the lower end of each stand as it is being placed in the rack.

The device of the present invention is particularly adapted for use in a derrick for controlling the movement of stands of pipe in the derrick. This device is adapted to be used for controlling the movement of either the upper or lower end of a stand of pipe having its axis substantially vertical as the stand is moved from the center of the derrick to one side of the derrick and from the rack to the center of the derrick.

The apparatus of the present invention may be described briefly as involving a hook adapted to engage with a stand of drill pipe having its axis substantially vertical when the stand is in the center of the derrick or when the stand has been racked in the derrick adjacent other stands of pipe. The apparatus further includes means for extending or restricting the hook along an axis at right angles with the axis of the stand of pipe grasped by the hook. In other words, the apparatus is adapted for handling a substantially vertical stand of pipe in a derrick and is arranged to engage with the stand and move it horizontally.

The device of the present invention will now be described in detail in conjunction with the drawing in which

Fig. 1 is a top elevation showing an embodiment of the present invention,

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Fig. 2 is an elevation, partly in section, taken at right angles to the view of Fig. 1;

Fig. 3 is a view taken along lines III—III of Fig. 2;

Fig. 4 is a view taken along line IV—IV of Fig. 1; and

Fig. 5 is a view taken along line V—V of Fig. 1.

Turning now specifically to the drawing, a base plate 11 has mounted thereon spaced upwardly projecting housings 12, 13 and 14. These housings are adapted to support a threaded tubular member 15. A hook member 16 is mounted on one end of member 15 and a stop member 17 is mounted on the other end.

It will be seen that the exterior surface of the major portion of member 15 defines a screw thread 18. A keyway 19 extends along the underside of member 15 parallel with the axis of the rod member and a central passage 20 extending the full length thereof.

Housing 12 is drilled to define a laterally extending opening in which is mounted a bushing 21 arranged for embracing the outside surface of square cut threads 18 thereby serving to support member 15. Housing 13 is similarly bored with an opening in which is mounted a bushing 21'. A keyway 22 is milled along the lower side of the interior of bushing 21 with a key 23 positioned therein which is arranged to engage with the keyway 19 defined by member 15. In other words, the assembly mounted in housing 12 is adapted to cooperate with the outer surfaces defined by thread 18 to support rod member 15 and with the keyway 19 to prevent rotation of member 15.

The housing 14 is positioned between housings 12 and 13 and serves as the mounting means for an assembly adapted to move rod member 15 longitudinally. Housing 14 is bored of a diameter such that it will receive a bearing assembly comprising ball races 24 and 25 and bearings 27. A member 28 of a generally tubular shape and having its interior threaded to mate with threads 18 is mounted for rotation in the housing 14. Member 28 defines a surface 29 which makes a sliding fit in retainer 25 and is provided with threads on which is screwed ring 30 which contacts with retainer 25 and a second ring 31 which acts as a lock ring. Entry of foreign materials into the bearing assembly is prevented by closure 32 which is positioned between housing 14 and member 28 and closure 33 which is positioned between member 28 and cover plate 34. The end of member 28 adjacent closure 32 extends outside the closure and has the configuration of a pulley with a groove 35 which provides the driving surface, for example, with a conventional V-shape belt.

It will be seen that by providing a suitable

rotating means for member 28, it may be rotated in one direction which will cause the hook 16 of the member 15 to be moved away from the base plate and in the opposite direction to withdraw hook 16 toward the base plate. The movement of member 15 is limited in one direction by contact of lock nut 43 with bushing 21' and in the opposite direction by contact of stop member 17 with bushing 21.

Hook member 16 comprises a body having a generally annular shape adapted to be secured to the end of tubular member 15 and having a bifurcated portion, said bifurcated portion defining hook portions 40 and 41. It will be understood that member 16 may be attached to member 15 in any suitable manner. In the drawing, member 16 is shown as attached to member 15 by screw threads 42 and is retained in the position by a lock nut 43. Portions 40 and 41 are bored to receive a headed pin 44 which is retained in position by washer 45 and cotter pin 46. Pin 44 serves as a mounting means for movable curved member 47 which is mounted on pin 44 between an upper washer 48 and a lower bushing 49. Angular movement of curved member 47 is limited by a dowel pin 50 which has an end pressed into a hole drilled in member 47 and its other end in a suitable slot 51 which is formed in member 40 to define the extreme angular movement of curve member 47.

Member 47 defines a cam surface 52 arranged to cooperate with vertically extending pin 53. Movement of pin 53 away from member 15 moves the free end of member 47 toward member 40, or opens the hook whereby members 40 and 41 may embrace a length of pipe, and movement of pin member 53 toward member 15 moves the free end of member 47 toward the free end of member 41 thereby retaining the pipe between members 41 and 47.

The movement of pin member 53 away from and toward member 15 to cause angular movement of member 47 for grasping and releasing pipe is controlled by rod 54 arranged in passage 20 of member 15. One end of rod 54 is secured to pin 53 and the other end defines a plunger. Rod member 54 may be secured to pin 53 by any suitable means; in the drawing, pin 53 is provided with a bore into which an end of member 54 extends and 54 and 53 are provided with suitable bores for receiving a small pin 55. The plunger assembly mounted on rod 54 comprises a washer 56, packing member 57, washer 58 and retaining nut 59. It will be seen that the end of rod 54 is of somewhat reduced diameter and defines a shoulder against which washer 56 fits snugly. At the end of passage 20 is arranged a bushing 60 having an interior diameter into which rod 54 fits slidably. Bushing 60 and washer 56 serve as a retainer for spring 61 which embraces the central portion of rod 54 and biases rod 54 to the left.

Passage 20 of rod 15 is adapted to receive a suitable fluid which may be forced into the passage by any suitable means, for example, through a flexible line 62 connected to a source of fluid at superatmospheric pressure, not shown, and fluidly connecting with an opening in nut 63 which closes the end of passage 20.

In the operation of the device, if it is desired to move the free end of member 47 away from member 41 it is necessary only to impose pressure in passage 20 great enough to overcome the tension of spring 61; such a pressure moves the free end of member 47 away from the free end of member 41 thereby allowing the hook member to be released from a stand of pipe if a stand of pipe has been embraced thereby or, alternatively, to place the hook in position for grasping a piece of pipe. When it is desired to move the free end of member 47 toward the free end of member 41 the pressure within passage 20 is released thereby allowing the spring 61 to move pin member 53 to the left which, in turn, engages with the cam surface 52 and moves the free end of member 47 toward the free end of member 41 thereby closing the hook.

Having fully described and illustrated a preferred embodiment of the present invention, what I desire to claim is:

1. A device adapted for grasping and releasing a vertical section of pipe in a drilling derrick comprising, in combination, a base member adapted to be mounted in a drilling derrick, a horizontally extending elongated member having a free end and mounted on said base member for movement along a horizontal axis coinciding with the axis of said elongated member, a hook assembly mounted on the free end of said elongated member comprising a first element fixed with respect to the elongated member defining a first end with vertical surfaces thereof substantially parallel with the axis of the elongated member and laterally displaced away from the outer surface of said elongated member, and a movable member mounted for arcuate movement about a vertical axis perpendicular to that of the elongated member and having a second end adapted to be moved toward and away from said first end.

2. A device adapted for grasping and releasing a vertical section of pipe in a drilling derrick comprising in combination a base plate adapted to be mounted in a drilling derrick, a horizontally extending rod member, a housing supported by a base plate and adapted to embrace the rod member to support the rod member for movement along a horizontal axis coinciding with the axis of said rod member, a hook member carried by one end of said rod member, said hook member defining a first prong having vertical surfaces substantially parallel with and spaced laterally away from the outer surface of the rod member and a movable member mounted for arcuate movement about a vertical axis perpendicular to the axis of the rod, said movable member defining a cam surface adjacent its mounting means and a curved end shaped to move toward and away from said first end as the movable member is given angular motion, and means adapted to cooperate with said cam surface for giving said movable member arcuate motion.

3. A device in accordance with claim 2 in which the means giving said movable member arcuate motion is a pin arranged to contact said cam surface, a rod secured to said pin, a spring member embracing said rod and a plunger mounted on said rod.

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