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C. W. HAYNES

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PIPE ELEVATOR

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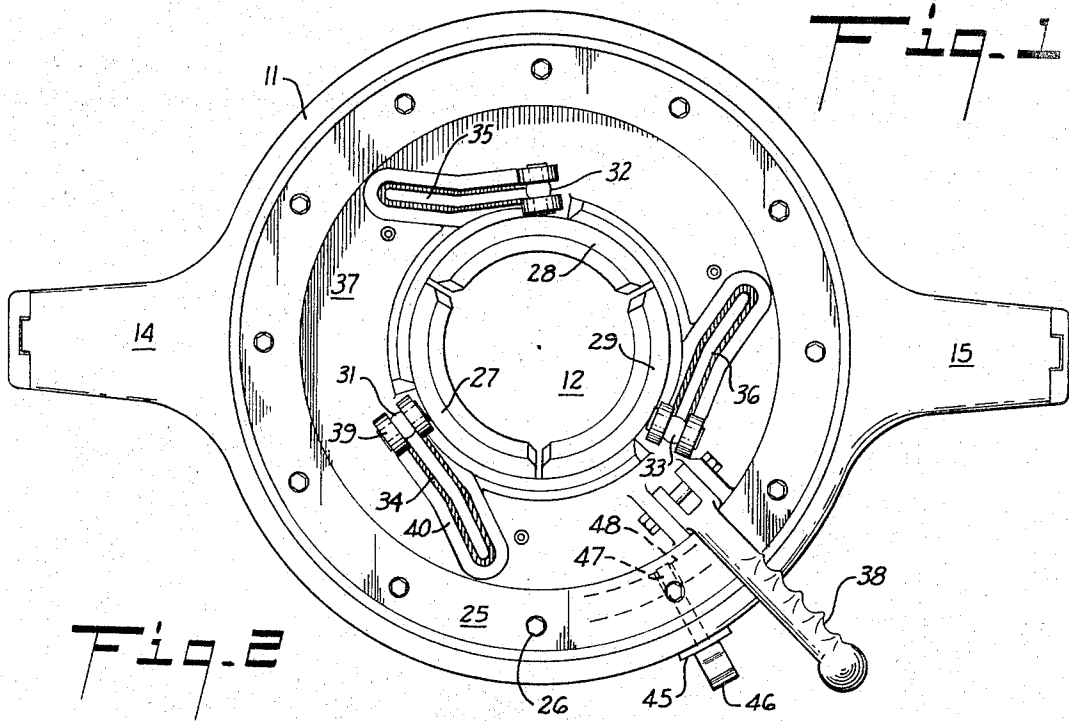


Fig. 2

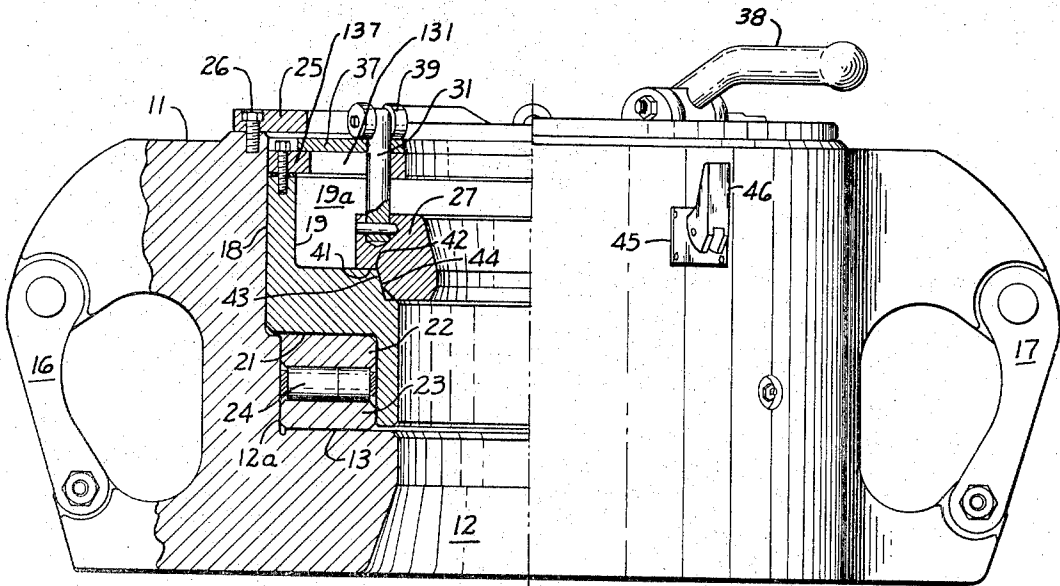
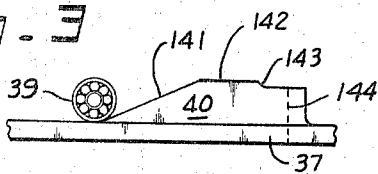


Fig. 3



CHARLES W. HAYNES
INVENTOR.
BY *Browning, Simms
Hyer & Eisenrodt*
ATTORNEYS

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PIPE ELEVATOR

Charles W. Haynes, Houston, Tex., assignor to Dresser Industries, Inc., Dallas, Tex.
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This invention relates to improvements in elevators useful for handling pipe during well operations, as for example, in handling stands of drill pipe or drill collars in the drilling or workover of oil and gas wells.

Elevators used in running or pulling of pipe in wells can be classified in two categories. The first category is the side-opening elevator. In this type, the elevator body is divided into two halves which are hinged together on one side so that the two halves can be swung open and the elevator moved laterally about the pipe after which the halves are swung back together and latched in position. In this type of elevator, the vertical opening through the elevator is made just large enough to receive the pipe and does not need to be large enough to pass over the larger tool joints. Therefore, any pipe engaging slips carried by the elevator need be movable radially only far enough to adequately grip the pipe.

Another type of elevator has a unitary body and instead of being moved laterally to pipe gripping position as in the side-opening elevator, it is lowered down over the upper end of the pipe so that the latter moves through an opening in the elevator after which suitable slips are moved into position to grip the pipe. For this type of elevator, the vertical opening through it must be large enough to pass over the tool joint. Since this joint is usually considerably larger than the pipe, an arrangement must be provided where the slips can be moved out of the way while the elevator is passing over the tool joint and then moved into pipe engaging position. Desirably, the means for so actuating the slips should not only be simple and reliable, but relatively easy to manipulate since they must be operated by a man standing on the monkey board. This ease of operation becomes particularly desirable in the larger sizes of elevators where the slips may be quite heavy.

It is therefore an object of this invention to provide an improved pipe elevator in which the slips can be moved to and from pipe engaging position by a relatively simple manipulation which does not require a great deal of effort even though the slips and elevator may be quite large.

Another object is to provide such an elevator in which the slips, when in pipe engaging position, transmit the force due to the weight of the pipe directly to the elevator body so that the means for manipulating the slips remains substantially unstressed.

Another object is to provide such an elevator in which the slips are moved upwardly from pipe engaging position and outwardly by a simple camming action which does not require a great deal of force even though the slips may be quite heavy.

Other objects, advantages and features of the invention will be apparent to one skilled in the art from a consideration of the written description, the claims and the drawings wherein:

FIG. 1 is a plan view of a preferred embodiment of the elevator of this invention;

FIG. 2 is a vertical view, partially in vertical section, of the elevator of FIG. 1; and

FIG. 3 is an elevational view of the cam means and follower shown in FIG. 1.

The elevator illustrated in the drawings has a one-piece substantially circular body 11 having a vertical central opening 12 therethrough whose axis coincides with the vertical axis of body 11. The body is counterbored at 12a to provide an upward facing shoulder 13, shown only in

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FIG. 2, which is annular and surrounds the circular opening 12. Body 11 also has portions shaped to receive bails or the like for suspending the elevator from a travelling block or other lifting means. Thus, a pair of laterally extending lifting ears 14 and 15 are provided on the body and are adapted to engage a pair of conventional elevator bails (not shown) and are provided with pivoted locking members 16 and 17 adapted to retain such bails in engagement with the lifting ears.

The opening 12 is counterbored at 18 to provide room for a slip carrier 19 which is annular in plan and surrounds the opening 12. Carrier 19 has a downward facing shoulder 21 opposing the upward facing shoulder 13 on the body. An antifriction bearing, illustrated as upper and lower faces 22 and 23 and rollers 24 disposed between the faces, is carried by shoulder 13 and support slip carrier 19 by contact with shoulder 21. Carrier 19 is retained within the counterbore 18 by an annular retaining plate 25 detachably connected to the body by suitable members illustrated as screws 26.

A plurality of pipe engaging slips illustrated as slips 27, 28 and 29, each extending through an arc of a circle and in total extent comprising substantially a complete circle, are movable to and from pipe engaging position, and are carried by lift pins 31, 32 and 33 extending through slots 34, 35 and 36, respectively, in a rotatable member such as an annular plate 37. The latter is rotatable through an arc by handle 38. Plate 37 is retained on slip carrier 19 by overlap of retaining plate 25.

The slip carrier 19 has an upwardly facing shoulder or surface 41 opposed to a downward facing shoulder 42 on each of the slips and also has a downwardly and inwardly inclined surface 43 which matches a complementary surface 44 on each of the slips. This arrangement of surfaces provides for transfer of substantially all weight supported by the slips to the slip carrier, so that there is substantially no stress upon any part of the slip manipulating assembly. Also, the amount of movement of the slips along inclined surface 43 is limited by engagement of shoulders 41 and 42 to thereby limit the force with which the slips engage the pipe.

The slips 27, 28 and 29 are carried by cam followers shown here as pins 31, 32 and 33 and rollers 39. The rotatable member 37 carries cam means designated generally at 40. The cam means are shown as a pair of tracks disposed on opposite sides of the respective slots 34, 35 and 36 and each provide an upwardly sloping cam surface 141 (FIG. 3), a substantially horizontal surface 142 and a locking shoulder 143. A guide plate 137 is fastened to slip carrier 19 and has radial slots for each of pins 31, 32, 33, only one slot 131 being shown. These radial slots guide the lifting pin's movement to be in a radial direction and, together with the respective ones of slots 34, 35 and 36, determine the radial position of the pins.

Thus, rotation of plate 37 by handle 38 results in rollers 39 rolling up the inclined section 141 which is substantially parallel to a tangent to a circle defined by the slips' outer seating surfaces so that the slips are lifted upwardly by the lifting pins until they are sufficiently far above shoulder 41 to clear slip carrier 19. The horizontal section 142 of cam means 40 and the associated slot extend outwardly away from the axis of the elevator so that the lift pins engage the side of the tracks or the slot in member 37, as the case may be, and a side of one of the radial slots (e.g. slot 131) to move the slips outwardly into a slip receiving space formed by a counterbore 19a within slip carrier 19 for a distance sufficient to permit free passage over tool joints on the pipe. In this position, the rollers 39 rest behind a shoulder 143 which prevents accidental setting of the slips. The slot 34 ends at the dotted line indicated as 144 in FIG. 3 so that the roller cannot pass off the outer end of the tracks.

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A latch for locking the slip carrier 19 in place is illustrated generally as 45. This latch comprises a pivoted cam member 46 and a rod 47 attached thereto, shown in dotted lines in FIG. 1, and a socket 48 in member 19. When in locked position, the latch prevents slip carrier 19, and hence guide plate 137, from rotating with rotatable member 37. This permits the slips to be moved as above described. When the latch is in unlocked position, the slip carrier, slips, guide plate, etc. are free to rotate with respect to the outer body 11. The latch is preferably located adjacent to the handle as shown in FIG. 2 so that it can be quickly released when desired.

The operation of the device is believed to be clear from the above description. When the elevator is to be placed upon an end of the pipe, the plate 37 is rotated by handle 38. Rotation of the plate results in lifting slips 27, 28 and 29 vertically upward until they clear the corresponding portion of upward facing shoulder 41 and then moving them outwardly until the slips are located on the slip receiving space 19a. In this position the slips cannot engage the pipe. The elevator is then lowered down over the upper end of the pipe so that the pipe extends through opening 12, and the slips are below the level of a sloping shoulder on the tool joint end of the pipe. The plate 37 is then rotated by handle 38 which results in movement of rollers 39 on the cam surfaces and along the radial slots in plate 137 to move the slips inward to bring the shoulders 41 and 42 into vertically spaced position, and then to move the slips downwardly to engage the pipe. Raising the elevator will then bring the slips into seated position as shown in FIG. 2.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

The invention having been described, what is claimed is:

1. A pipe elevator comprising, in combination, body means having portions thereof shaped to receive bails or the like for suspending the elevator from a lifting means, said body means including a slip carrier portion having an inner surface and providing a slip receiving space upwardly and outwardly of said inner surface, at least one pipe engaging slip within the slip carrier portion and having an outer surface complementary to said inner surface so as to mate therewith when the slips are in pipe engaging position, a rotatable member carried by said body means above the slip, a cam and cam follower for the slip, one of the cam and cam follower being carried by the rotatable member and the other being attached to the slip, the cam having a cam surface engaged by the follower such that as the rotatable member is rotated in one direction, the cam's surface causes the slip to be raised vertically out of engagement with said inner surface and then moved laterally outwardly into said slip receiving space.

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2. The elevator of claim 1 wherein said cam surface is carried on the upper surface of said rotatable member and said cam follower extends through a slot in said rotatable member, the slot and cam surface extending from a point over the slip when in pipe engaging position to a point over said slip receiving space and means carried by the body means restraining movement of the cam follower to be laterally outwardly of and inwardly toward said inner surface.

3. The elevator of claim 2 wherein said follower is a pin connected to a slip and carrying a member engaging said cam surface.

4. The elevator of claim 1 wherein said body means includes an outer body and wherein means are provided rotatably mounting said slip carrier on said outer body.

5. A pipe elevator comprising, in combination, body means having portions thereof shaped to receive bails or the like for suspending the elevator from a travelling block, said body means including a slip carrier having an upwardly facing surface and a downwardly and inwardly inclined surface and providing a slip receiving space upwardly and outwardly of said inclined surface, a plurality of pipe engaging slips within the slip carrier and having outer surfaces complementary to and engageable with said upwardly facing surface and said inclined surface on the slip carrier so that the weight of the pipe engaged by the slips causes them to move downwardly and inwardly along said inclined surface until they engage said upwardly facing surface to thereby limit the force with which the slips engage the pipe, a rotatable member carried by the body means above the slips, cam means carried by one of the slips and rotatable member and providing cam surfaces at least a portion of which slopes with respect to the slips and having at least a portion extending outwardly with respect to said inclined surface, a cam follower carried by the other one of the slips and rotatable member and engageable with said cam surfaces upon rotation of said rotatable member to move the slips in a vertical direction during at least an initial portion of said rotation and outwardly into said slip receiving space during at least another portion of said rotation whereby such rotation of the rotatable member disengages said slips from said inclined surface, lifts them and moves them outwardly into said slip receiving space.

6. The elevator of claim 5 wherein said cam means includes a part carried on the upper surface of said rotatable member and having said sloping surfaces thereon and a member fixed to said body means having a slot therein providing the surfaces which extend outwardly with respect to the inclined surface, said cam follower including a pin extending through said slot.

7. The elevator of claim 5 wherein said body means includes an outer body and wherein means are provided rotatably mounting said slip carrier in said outer body.

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GERALD M. FORLENZA, *Primary Examiner.*

G. F. ABRAHAM, *Assistant Examiner.*

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