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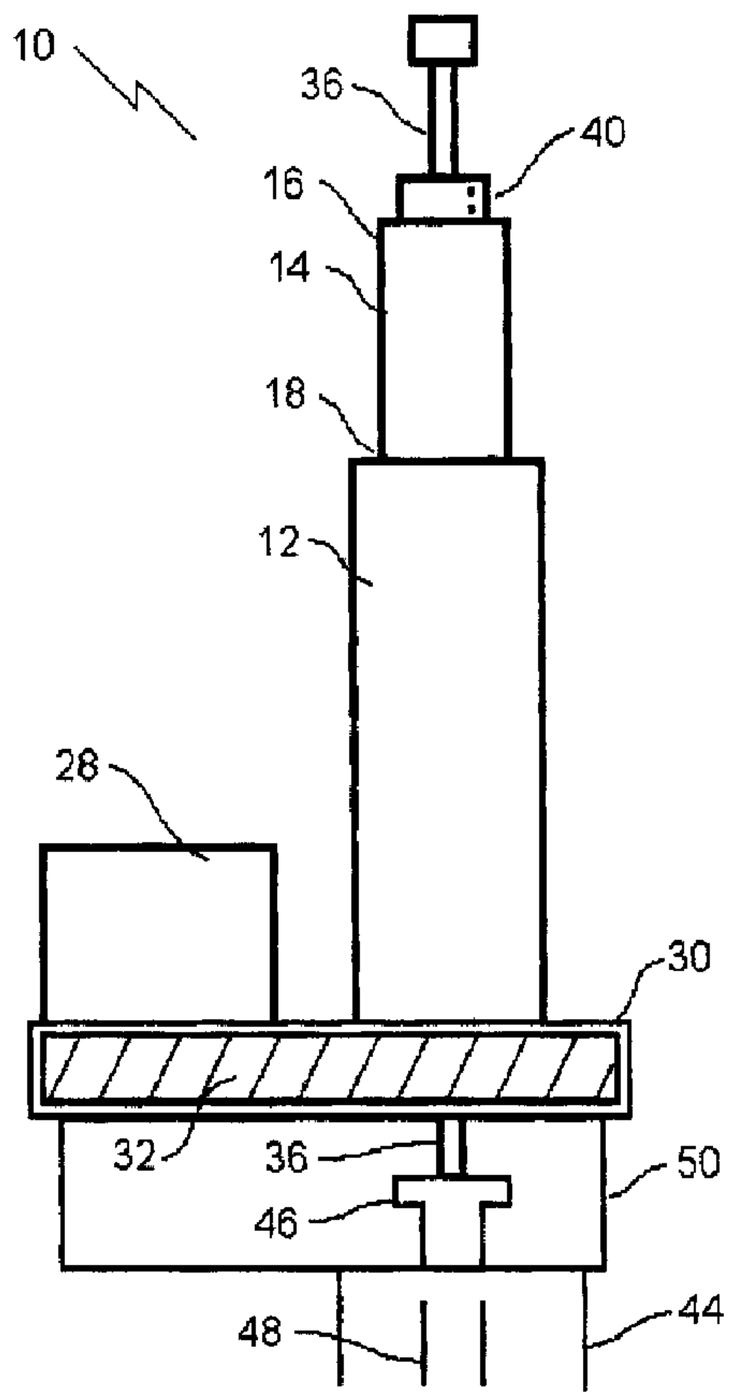
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(54) Titre : POMPE ALTERNATIVE AVEC VIS DE REGLAGE
(54) Title: RECIPROCATING PUMP WITH SCREW ACTUATOR



(57) Abrégé/Abstract:
A reciprocating pump includes a stationary housing and a travelling housing. The travelling housing is telescopically received within the stationary housing and is movable from a retracted position to an extended position. A screw is provided having a lower end

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(57) Abrégé(suite)/Abstract(continued):
and an upper end. The screw is housed within the stationary housing, with the upper end of the screw extending into the travelling housing. A nut is secured to a lower end of the travelling housing. The nut engages the screw. Upon rotation of the screw in a first direction, the nut travels toward the upper end of the screw lifting the travelling housing to the extended position. Upon rotation of the screw in a second direction, the nut travels toward the lower end of the screw lowering the travelling housing to the retracted position. The polish rod is coupled to the travelling housing.

ABSTRACT OF THE DISCLOSURE

A reciprocating pump includes a stationary housing and a travelling housing. The travelling housing is telescopically received within the stationary housing and is movable from a retracted position to an extended position. A screw is provided having a lower end and an upper end. The screw is housed within the stationary housing, with the upper end of the screw extending into the travelling housing. A nut is secured to a lower end of the travelling housing. The nut engages the screw. Upon rotation of the screw in a first direction, the nut travels toward the upper end of the screw lifting the travelling housing to the extended position. Upon rotation of the screw in a second direction, the nut travels toward the lower end of the screw lowering the travelling housing to the retracted position. The polish rod is coupled to the travelling housing.

TITLE OF THE INVENTION:

Reciprocating Pump With Screw Actuator

FIELD OF THE INVENTION

The present invention relates to reciprocating pump used to pump liquids from a well.

BACKGROUND OF THE INVENTION

Pumping installations which use a reciprocating pump, have a polish rod on surface which is attached to a string of sucker rods extending down into a well. A standing ball valve is positioned within the well. A travelling ball valve is positioned at a remote end of the string of sucker rods. The reciprocating pump raises and lowers the polish rod to move the travelling ball valve up and down. As the sucker rods travel upwardly, the ball on the standing ball valve is displaced and liquids are drawn up the well from below the standing ball valve. As the sucker rods travel downwardly, the ball on the standing ball valve falls back into position trapping liquid within the well. As the travelling ball valve descends, the ball on the travelling ball valve is displaced allowing the travelling ball valve to pass through the liquids trapped by the standing ball valve. As the travelling ball valve rises, the ball on the travelling ball valve falls back into position. Liquids trapped by the travelling ball valve are carried up the well with the string of sucker rods.

SUMMARY OF THE INVENTION

The present invention is a novel configuration of reciprocating pump.

According to the present invention there is provided a reciprocating pump which includes a stationary housing and a travelling housing. The travelling housing is telescopically received within the stationary housing and is movable from a retracted position to an extended position. A screw is provided having a lower end and an upper end. The screw is housed within the stationary housing, with the upper end of the screw extending into the travelling housing. The screw is mounted for rotation about its longitudinal axis. A motor is provided which is adapted to supply a rotational force to the screw. A nut is secured to a lower end of the travelling housing. The nut engages the screw. Upon rotation of the screw in a first direction, the nut travels toward the upper end of the screw lifting the travelling housing to the extended position. Upon rotation of the screw in a second direction, the nut travels toward the lower end of the screw lowering the travelling housing to the retracted position. Means are provided for coupling a polish rod to the travelling housing, such that the polish rod is raised and lowered with the travelling housing.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to in any way limit the scope of the invention to the particular embodiment or embodiments shown, wherein:

FIGURE 1 is a side elevation view of a reciprocating pump constructed in accordance with the teachings of the present invention.

FIGURE 2 is a side elevation view, in section, of the reciprocating pump illustrated in **FIGURE 1**, with the travelling housing in a retracted position.

FIGURE 3 is a side elevation view, in section, of the reciprocating pump illustrated in **FIGURE 1**, with the travelling housing in an extended position.

FIGURE 4 is a side elevation view, in section, of an alternative of the reciprocating pump.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment, a reciprocating pump generally identified by reference numeral 10, will now be described with reference to **FIGURES 1** through **3**.

Structure and Relationship of Parts:

Referring to **FIGURE 1,** reciprocating pump 10 includes a stationary housing 12 and a travelling housing 14. Travelling housing 14 has an upper end 16 and a lower end 18. Referring to **FIGURES 1** and **2,** travelling housing 14 is telescopically received within stationary housing 12 and is movable from a retracted position illustrated in **FIGURE 2** to an extended position illustrated in **FIGURE 3**. Referring to **FIGURES 2** and **3,** a screw 20 is provided having a lower end 22 and an upper end 24. The lower end 22 is machined without threads. Screw 20 is housed within stationary housing 12, with upper end 24 of screw 20 extending into travelling housing 14. Screw 20 is mounted for rotation about its longitudinal axis 26. A motor 28 is provided which is adapted through a gear box 30 having gears 32 to supply a rotational force to screw 20. Beneficial results have been obtained through the use of a bi-directional electric motor, although it will be appreciated that a hydraulic motor could also be used. A nut 34 is secured to lower end 18 of travelling housing 14 and engages screw 20, such that, as screw 20 rotates, the height of nut 34, and hence travelling housing 14, can be controlled. Tapered roller bearings 56 are located on the lower end 22 of the screw 20, while screw support bearings 41 are located at the top of screw 20. The bearings act to help

rotation and to keep screw 20 aligned. There is also a wiper seal 39 between the stationary housing 12 and the travelling housing 14 to help seal the inside of the stationary housing against weather, dust, and the like.

There are various means that can be provided for coupling a polish rod 36 to travelling housing 14, such that polish rod 36 is raised and lowered with travelling housing 14. In the illustrated embodiment, screw 20 is hollow having a central axial bore 38. Polish rod 36 extends up through bore 38 of screw 20 and is secured to travelling housing 14 by a clamp 40 positioned at upper end 16 of travelling housing 14.

As is common in the art, the pump is located on a pedestal stand 50, with stuffing box 46. The rod 36 passes through stuffing box 46, and through the well head 44 which is located over tubing 48 enclosed by casing 52.

Operation:

The operation of reciprocating pump 10 will now be described. Referring to **FIGURE 3,** upon rotation of screw 20 in a first direction, nut 34 travels toward upper end 24 of screw 20 lifting travelling housing 14 to the extended position. Referring to **FIGURE 2,** upon rotation of screw 20 in a second direction, nut 34 travels toward lower end 22 of screw 20, lowering travelling housing 14 to the retracted position. Clamp 40 secured polish rod 36 to travelling housing 14, so that polish rod 36 is raised and lowered with travelling housing 14.

Variations:

It will be appreciated that screw 20 does not have to be hollow. By inverting the reciprocating pump one could attach secure polish rod 36 to travelling housing 14 without passing through screw 20. One possible disadvantage of doing so, would be the height required. The inverted system would extend for a height of approximately 22 feet. It would be awkward to service the motor with such an inverted reciprocating pump.

The proto-type machine had a stroke of 86 inches and performed six strokes per minute. It will be appreciated that torque, speed and length of stroke can readily be adjusted by changing the motor used and the intervals at which the motor changes direction.

In another embodiment, the nut 34 is stationary, while the screw 20 reciprocates.

Referring now to **FIGURE 4**, the nut 34 receives a rotational force from the motor 28 through a gear box, or a drive belt 42 as depicted in **FIGURE 4**. The screw 20 will either extend or retract, depending on the direction of rotation of the nut 34. In this embodiment, the polish rod 36 may be inserted through the screw 20, and secured by clamp 40. It should be noted that the now-stationary nut 34 must be located near the top of the screw 20 in its rectracted position to make use of the full length of the now-reciprocating screw 20.

The pump may also be adapted for pumping at an angle, which is used in some circumstances.

In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment without departing from the spirit and scope of the invention as hereinafter defined in the Claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A reciprocating pump, comprising:

a stationary housing;

a traveling housing telescopically received within the stationary housing, the traveling housing being telescopically movable from a retracted position to an extended position;

a hollow screw having a first end and an second end, the hollow screw being housed within the stationary housing with the second end of the hollow screw extending into the traveling housing, the hollow screw being mounted for rotation about its longitudinal axis;

a motor adapted to supply rotational force to the hollow screw;

a nut secured to the traveling housing, the nut engaging the hollow screw, such that upon rotation of the hollow screw in a first direction the nut travels toward the second end of the hollow screw moving the traveling housing to the extended position extending past the hollow screw, and upon rotation of the hollow screw in a second direction the nut travels toward the first end of the hollow screw moving the traveling housing to the retracted position;

a polish rod extending axially through the hollow screw;

a clamp positioned at an upper end of the traveling housing for coupling the polish rod to the traveling housing, with the polish rod being raised and lowered by telescopic extension and retraction of the traveling housing, the polish rod extending below the traveling housing, the hollow screw, and the stationary housing; and

sucker rods connected to a downhole end of the polish rod.

2. A reciprocating pump, comprising:

a stationary housing;

a hollow screw having an upper end and a lower end, the hollow screw being vertically movable within the stationary housing, the hollow screw being secured against rotation about its longitudinal axis;

a nut secured to the stationary housing, the nut engaging the hollow screw such that upon rotation of the nut in a first direction the screw travels upward to an extended position, and upon rotation of the nut in a second direction the nut travels downward to a retracted

position; and

a motor supplying a rotational force to the nut;

a polish rod extending up through the hollow screw and being secured to the upper end of the hollow screw by a clamp positioned at an upper end of the traveling housing such that the polish rod is extended and retracted with the hollow screw.

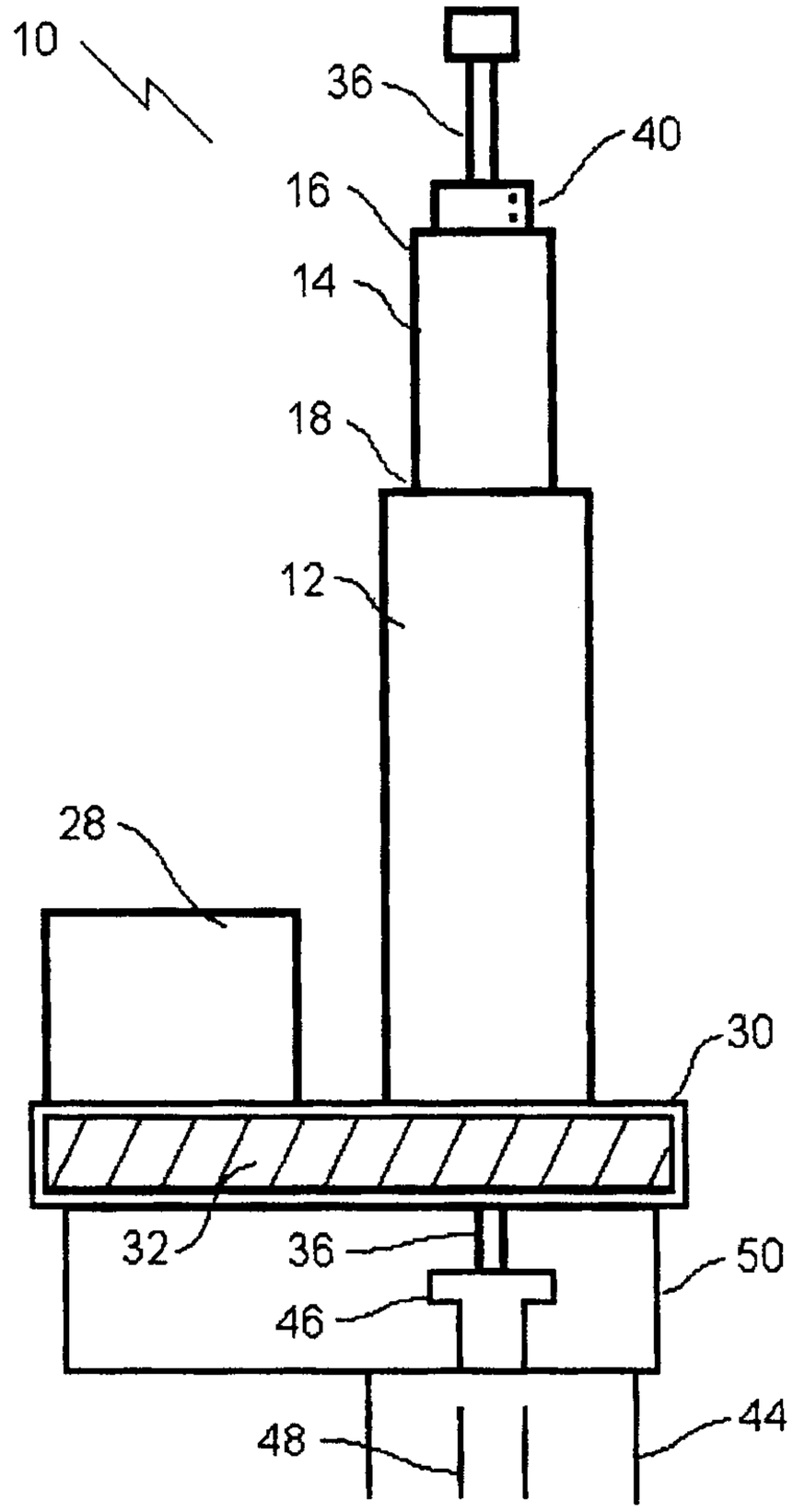


FIG. 1

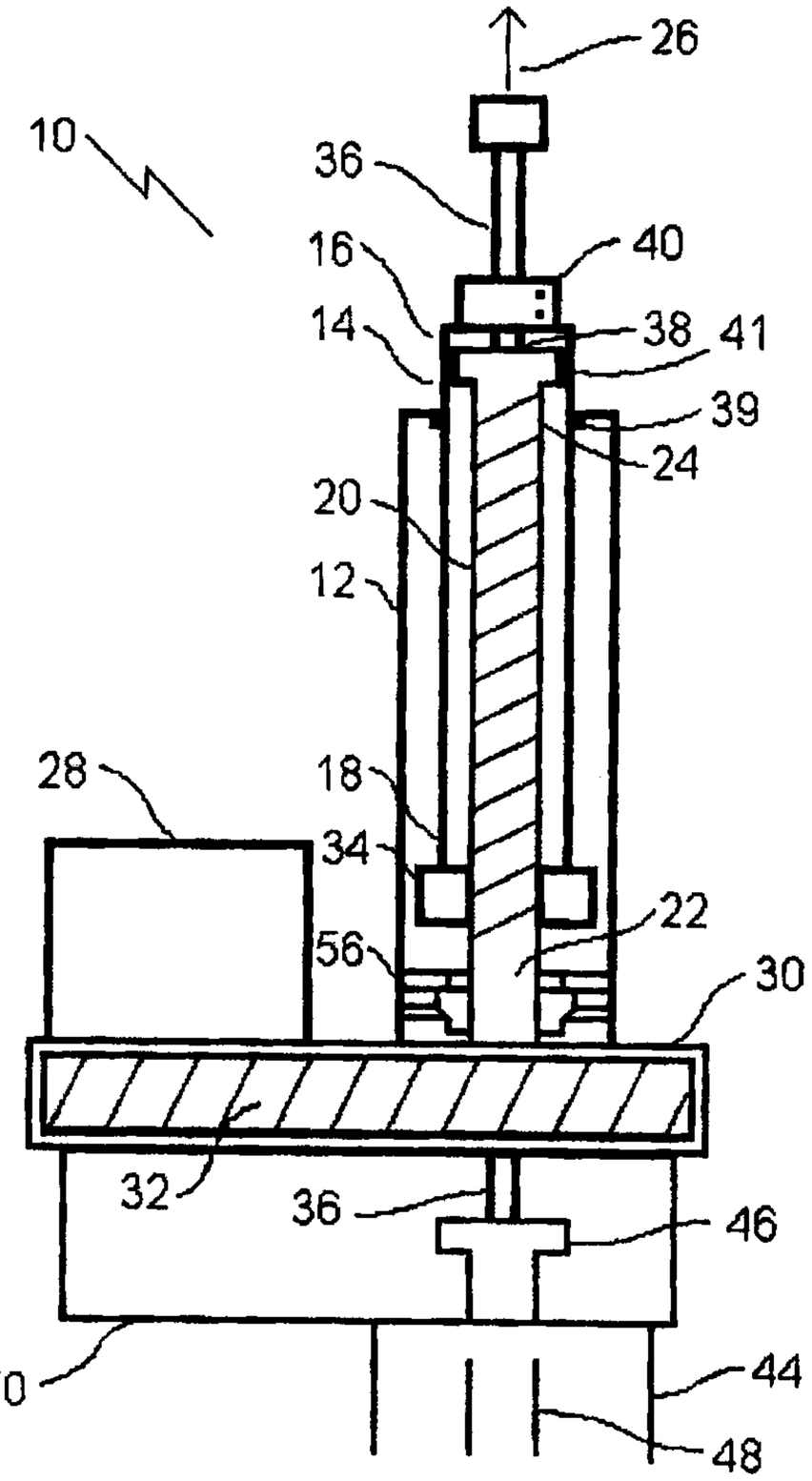


FIG. 2

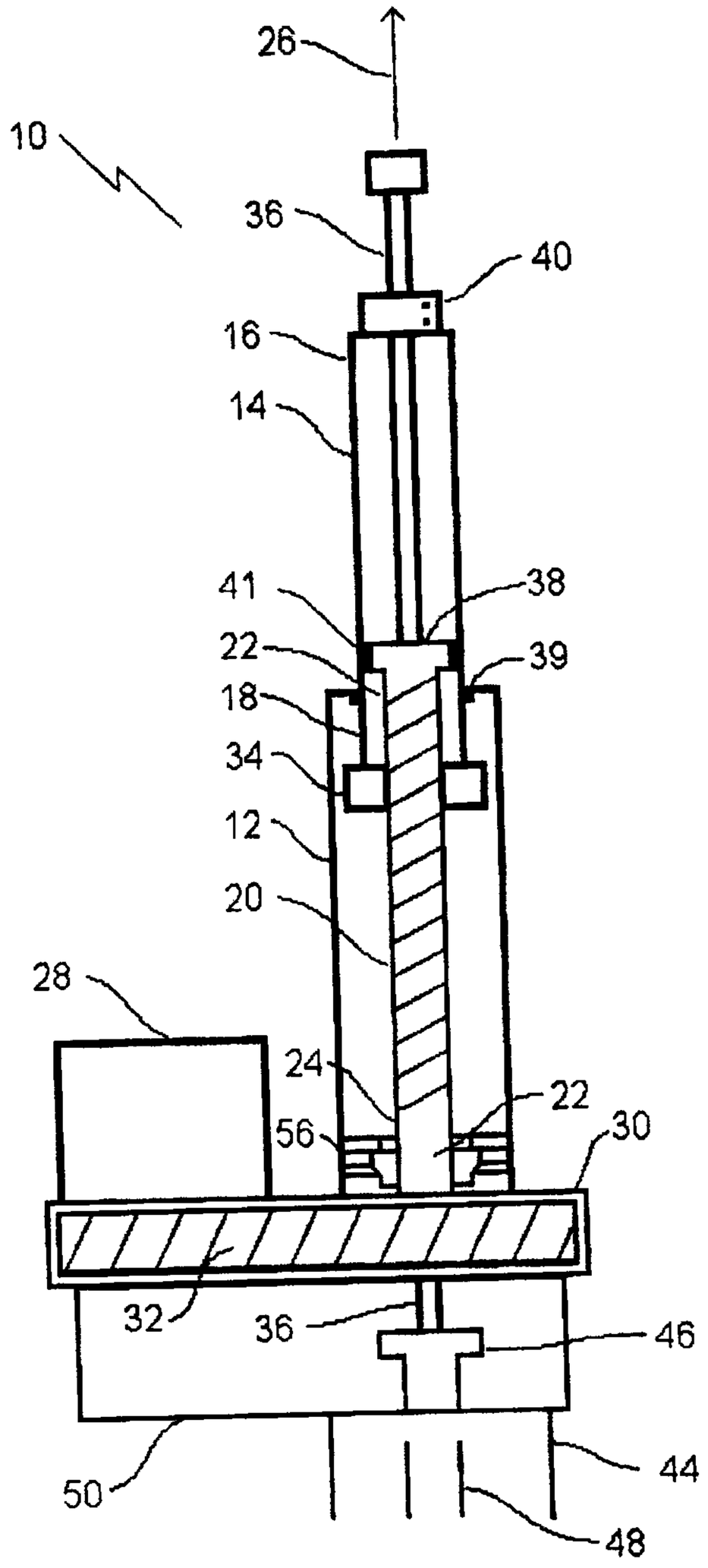

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FIG. 3

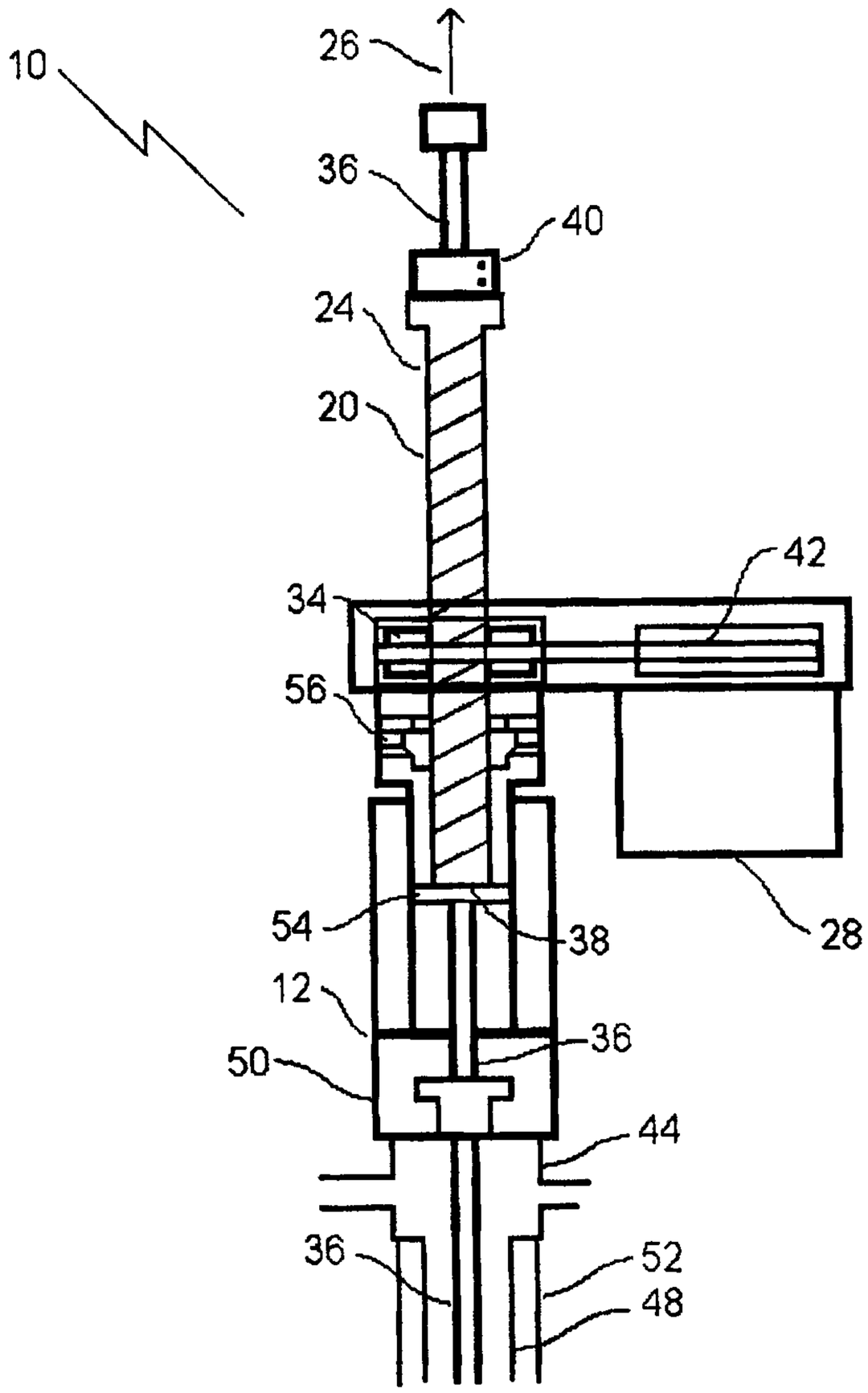
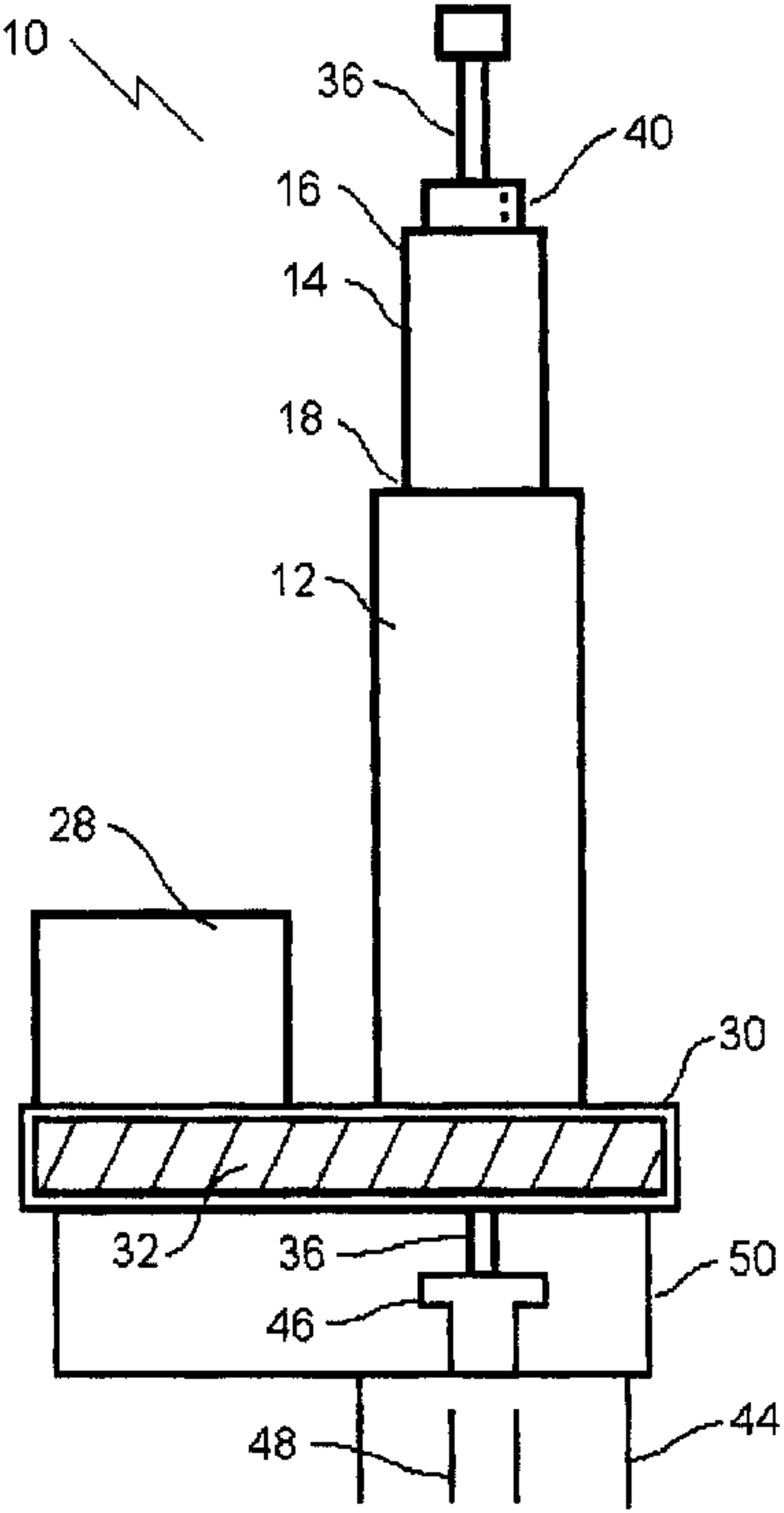


FIG. 4


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