Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2525338 C 2008/10/21

(11)(21) 2 525 338

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 2005/11/03

(41) Mise à la disp. pub./Open to Public Insp.: 2007/05/03

(45) Date de délivrance/Issue Date: 2008/10/21

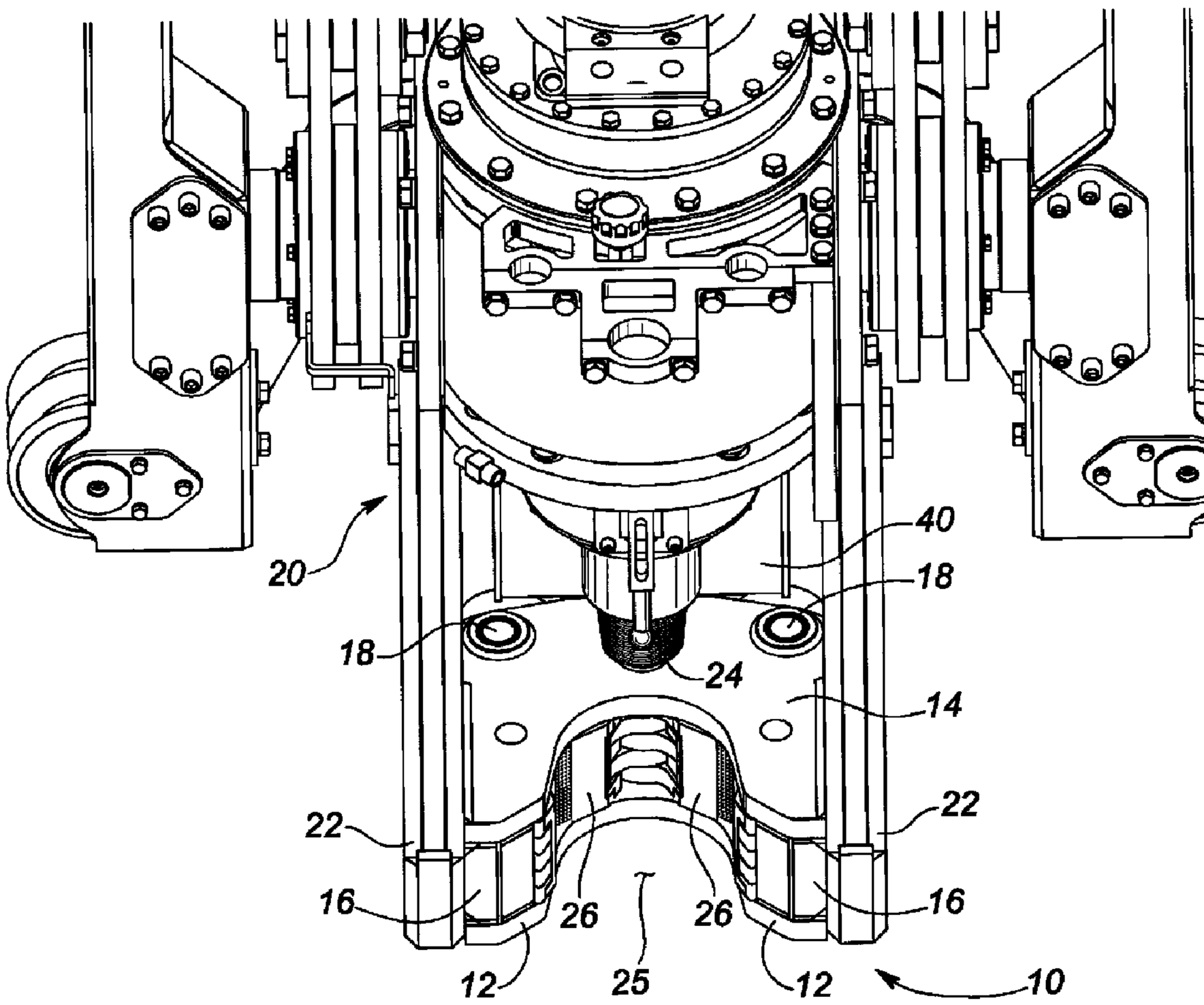
(51) Cl.Int./Int.Cl. *B25B 5/14* (2006.01),
B25B 13/50 (2006.01)

(72) Inventeur/Inventor:
LESKO, GERALD, CA

(73) Propriétaire/Owner:
LESKO, GERALD, CA

(74) Agent: HAUGEN, J. JAY

(54) Titre : PINCE DE PREHENSION DE TUYAU
(54) Title: PIPE GRIPPING CLAMP



(57) Abrégé/Abstract:
The present invention is a pipe-gripping clamp assembly that is attached to a top drive unit by a pair of guide rails and a telescoping boom. The clamp assembly consists of a pair of hinge scissor jaws that are opened and closed by a pair of rams attached to the

CA 2525338 C 2008/10/21

(11)(21) 2 525 338

(13) C

(57) Abrégé(suite)/Abstract(continued):
jaws and the frame members that make up the assembly. Each jaw has a jaw insert that is surfaced to firmly grip a pipe and can be easily replaced once worn beyond service. The rams are either hydraulically or pneumatically operated.

ABSTRACT

The present invention is a pipe-gripping clamp assembly that is attached to a top drive unit by a pair of guide rails and a telescoping boom. The clamp assembly consists of a pair of hinge scissor jaws that are opened and closed by a pair of rams attached to the jaws and the frame members that make up the assembly. Each jaw has a jaw insert that is surfaced to firmly grip a pipe and can be easily replaced once worn beyond service. The rams are either hydraulically or pneumatically operated.

"PIPE GRIPPING CLAMP"

Inventor: Gerald Lesko

FIELD OF THE INVENTION

The present invention relates to the field of clamps used to grip sections of drilling pipe used on a drilling rig. Specifically, the present invention relates to the field of clamps on top drive units used to grasp sections of pipe that are connected to or disconnected from the top drive unit.

BACKGROUND OF THE INVENTION

In addition to rotary tables used to rotate drilling pipe in well drilling operations, top drive motor units are also used to rotate drilling pipe. As sections of pipe are tripped into or out of the drill string on drilling rigs having top drive units, it is desirable to have a pipe clamp sub assembly on the top drive unit that is capable of gripping a section of pipe and drawing it towards or away from the quill of the top drive unit when making or breaking connections between the pipe and the top drive unit.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a pipe gripping clamp that is compact in its physical configuration yet powerful enough to grip sections of pipe.

It is another object of the present invention to provide a pipe gripping sub assembly to a top drive unit that is capable of gripping a section of pipe and drawing it towards the top drive unit to make a connection with the top drive unit quill.

The present invention is a pipe gripping clamp. It comprises a frame consisting of a planar bottom plate having a pair of scissor jaws pivotally attached thereon. The jaws are hinged at one point and are capable of gripping a section of

pipe. Specifically, the jaws are hinged about a pivot rod projecting upwardly from the bottom plate, the rod having a longitudinal axis that is substantially perpendicular to the surface of the bottom plate. In addition, two rams are pivotally attached to the bottom plate, one for each of the pair of jaws. Each ram is operatively coupled to a jaw whereby the jaw is closed together to grip a section of pipe when the rams are extended and open up when the rams retract. The rams can be operated using hydraulic or pneumatic control systems as well known to those skilled in the art.

A planar top plate operatively attached to the frame covers the rams and the scissor jaws and provides second pivot support point for each of the rams and the scissor jaws. Furthermore, each jaw has a replaceable jaw insert for gripping a pipe. As the insert wears out, it can be replaced without replacing the jaws themselves.

Broadly stated, an aspect of the present invention is a pipe gripping clamp, comprising: a bottom plate; a pair of scissor jaws capable of gripping a pipe pivotally attached to said bottom plate, said jaws capable of pivoting about a pivot axis that is substantially perpendicular to said bottom plate; and a ram operatively coupled to each of said pair of scissor jaws, each ram pivotally attached to said bottom plate and capable of pivoting about an axis that is substantially parallel to said pivot axis, whereby said jaws close to grip said pipe when said rams are extended and said jaws open to release said pipe when said rams are retracted.

Broadly stated, another aspect of the present invention is A pipe gripping assembly for a top drive unit, comprising: a pipe gripping clamp sub assembly, comprising: a bottom plate, a pair of scissor jaws capable of gripping a pipe pivotally attached to said bottom plate, said jaws capable of pivoting about a pivot axis that is substantially perpendicular to said bottom plate; and a ram operatively coupled to

each of said pair of scissor jaws, each ram pivotally attached to said bottom plate and capable of pivoting about an axis that is substantially parallel to said pivot axis, whereby said jaws close to grip said pipe when said rams are extended and said jaws open to release said pipe when said rams are retracted; a pair of guide rails operatively coupling said clamp sub assembly to said top drive unit whereby said clamp sub assembly is capable of moving towards and away from a quill operatively mounted on said top drive unit along an axis that is substantially parallel to the longitudinal axis of said quill; and means for moving said clamp sub assembly along said guide rails.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front perspective view of a representative embodiment of the present invention with the scissor jaws open.

Figure 2 is a front perspective view of a representative embodiment of the present invention with the top plate removed and the scissor jaws open.

Figure 3 is a front perspective view of a representative embodiment of the present invention with the top plate removed and the scissor jaws closed.

Figure 4 is a front perspective view of a representative embodiment of the present invention with the scissor jaws closed about a valve sub-assembly.

Figure 5 is a perspective view of a top drive unit comprising a representative embodiment of the present invention shown in a raised position prior to gripping a section of pipe.

Figure 6 is a perspective view of a top drive unit comprising a representative embodiment of the present invention shown in a descended position to grip a section of pipe.

Figure 7 is a perspective view of a top drive unit comprising a representative embodiment of the present invention shown raising a section of pipe to be coupled to the top drive unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is a pipe-gripping clamp for use on a top drive motor unit used on a drilling rig. The clamp comprises a pair of scissor jaws that provides the clamping mechanism to grip a pipe. The present invention is mounted on a telescoping boom such that it forms an assembly. When not in use, the clamp assembly is in a raised position with respect to the top drive unit. When a pipe is to be connected to the top drive unit, the clamp mechanism is lowered when the telescoping boom is extended until the clamp jaws straddle the pipe. The jaws are firmly closed about the pipe and the boom is retracted thereby raising the pipe to be connected to the top drive unit.

Referring to Figure 1, clamp assembly 10 is shown. Assembly 10 comprises bottom plate 12 (which is attached to guide rails 22), telescoping boom 40, top plate 14 and front covers 16. Disposed between top and bottom plates 14 and 12, and behind front covers 16, are jaws 26 hinged together to form scissor jaws 25. Guide rails 22 and boom 40 connect assembly 10 to top drive unit 20.

Referring to Figure 2, assembly 10 is shown with top plate 14 removed to better illustrate the present invention. Scissor jaws 25 are pivotally attached to bottom plate 12 at jaw pivot 32. When top plate 14 is attached to assembly 10, jaw pivot 32 extends through top plate 14. Also shown in Figure 2 is a pair of rams 30. Rams 30 are pivotally attached to bottom plate 12 at ram pivots 18. One end of each ram 30 is pivotally connected to a jaw 26. Each jaw 26 further comprises a jaw insert 28 that is

the portion of jaw 26 part that contacts the pipe being gripped by assembly 10. Insert 28 comprises a surface that easily grips a pipe and can be easily replaced when it becomes worn. Rams 30 may be hydraulically or pneumatically operated by control systems that are well known to those skilled in the art.

Referring to Figure 3, rams 30 are shown in an extended position such that each jaw 26 are pushed towards each and jaws 25 are in a closed position. In Figure 4, ball valve sub-assembly 36 is shown attached to quill 24 and secured by thread lock 34 to illustrate the gripping action of jaws 25 when in the closed position.

In Figures 5 to 7, a representative embodiment of the present invention is shown in the process of grasping and raising a section of pipe 42 to be coupled to top drive unit 20. In Figure 5, top drive unit 20 is shown in a descended and tilted position so as to receive and threadably couple to pipe 42. Telescoping boom 40 is shown in its raised and retracted position whereby assembly 10 is raised and jaws 25 are open.

In Figure 6, telescoping boom 40 is shown in a lowered and extended position such that jaws 25 are straddling and clamped on pipe 42. In Figure 7, telescoping boom 40 is shown partially retracted having raised pipe 42 towards valve sub 36 to be threadably coupled. One pipe 42 has been securely coupled to valve sub 36, jaws 25 are opened and telescoping boom 40 is further retracted to its fully raised position. Top drive unit 20 can then be raised in rig 38 thereby raising pipe 42 with it. Once top drive unit 20 is fully raised in rig 38 so that pipe 42 can be coupled to the drill string. When sections of pipe 42 are to be removed from the drill string, the process is removed.

Although a few preferred embodiments have been shown and described, it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention. The terms and expressions used in the preceding specification have been used herein as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims that follow.

WE CLAIM:

1. A pipe gripping clamp, comprising:

(a) a bottom plate;

(b) a pair of scissor jaws capable of gripping a pipe pivotally attached to said bottom plate, said jaws capable of pivoting about a pivot axis that is substantially perpendicular to said bottom plate; and

(c) a ram operatively coupled to each jaw of said pair of scissor jaws, each ram having two ends wherein one end is pivotally attached to said bottom plate and capable of pivoting about an axis that is substantially parallel to said pivot axis and the other end is pivotally attached to said jaw, whereby said pair of jaws closes to grip said pipe when said rams are extended and said pair of jaws opens to release said pipe when said rams are retracted.

2. The clamp as set forth in claim 1 further comprising a top plate wherein said pair of jaws and said rams are disposed between said top and bottom plates and pivotally attached to said top plate.

3. The clamp as set forth in claim 1 wherein each jaw of said pair of jaws further comprises a detachable pipe gripping jaw insert.

4. The clamp as set forth in claim 1 wherein said rams are hydraulically or pneumatically operated.

5. A pipe gripping assembly for a top drive unit, comprising:

(a) a pipe gripping clamp sub-assembly, comprising:

(i) a bottom plate,

(ii) a pair of scissor jaws capable of gripping a pipe pivotally attached to said bottom plate, said jaws capable of pivoting about a pivot axis that is substantially perpendicular to said bottom plate, and

(iii) a ram operatively coupled to each jaw of said pair of scissor jaws, each ram having two ends wherein one end is pivotally attached to said bottom plate and capable of pivoting about an axis that is substantially parallel to said pivot axis and the other end is pivotally attached to said jaw, whereby said pair of jaws closes to grip said pipe when said rams are extended and said pair of jaws opens to release said pipe when said rams are retracted;

(b) a pair of guide rails operatively coupling said clamp sub-assembly to said top drive unit whereby said clamp sub-assembly is capable of moving towards and away from a quill operatively mounted on said top drive unit along said guide rails, said guide rails having an axis that is substantially parallel to the longitudinal axis of said quill; and

(c) means for moving said clamp sub-assembly along said guide rails.

6. The assembly as set forth in claim 5 wherein said means for moving said clamp sub-assembly is a second ram operatively coupling said clamp sub-assembly to said top drive unit, said second ram being hydraulically or pneumatically operated.

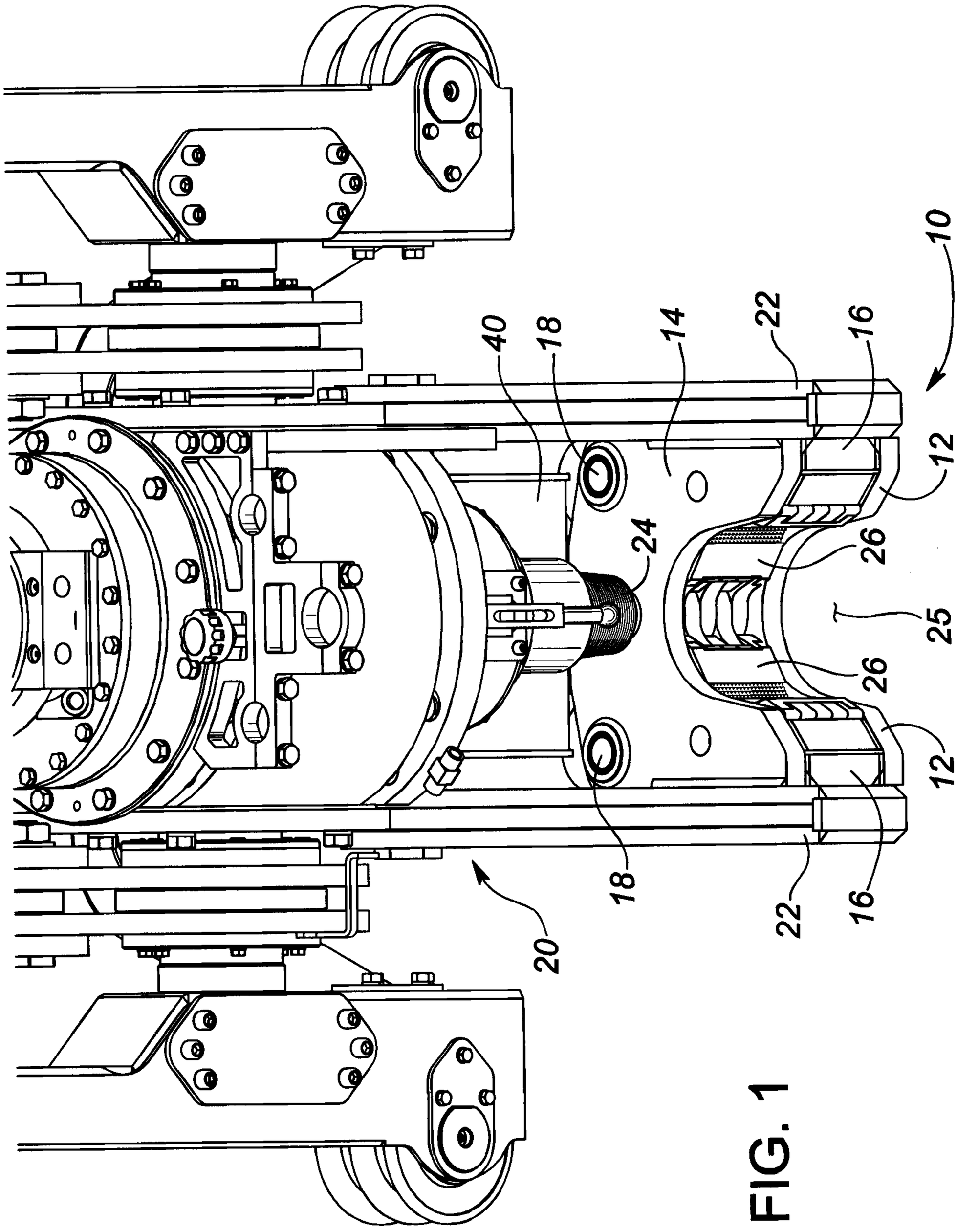


FIG. 1

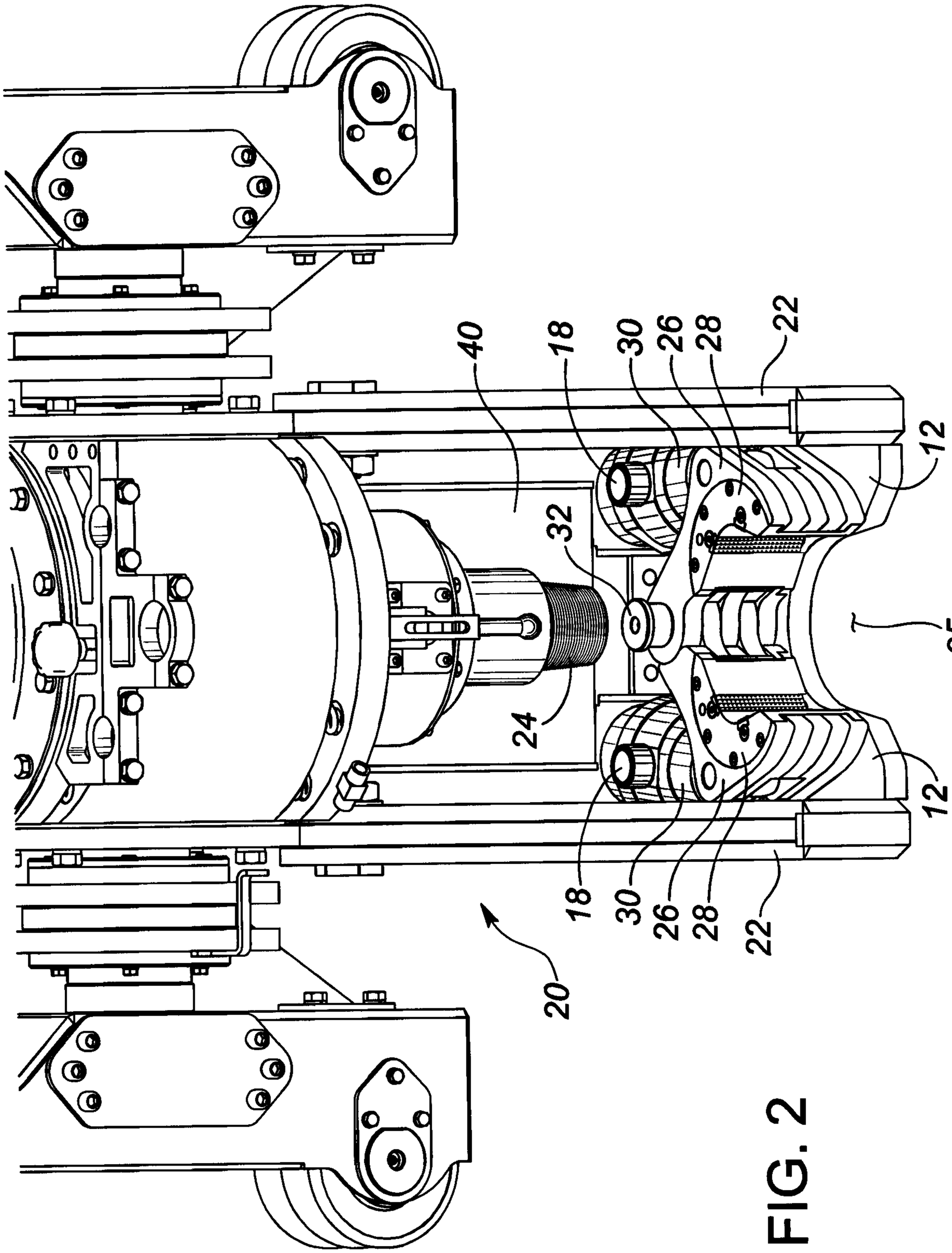


FIG. 2

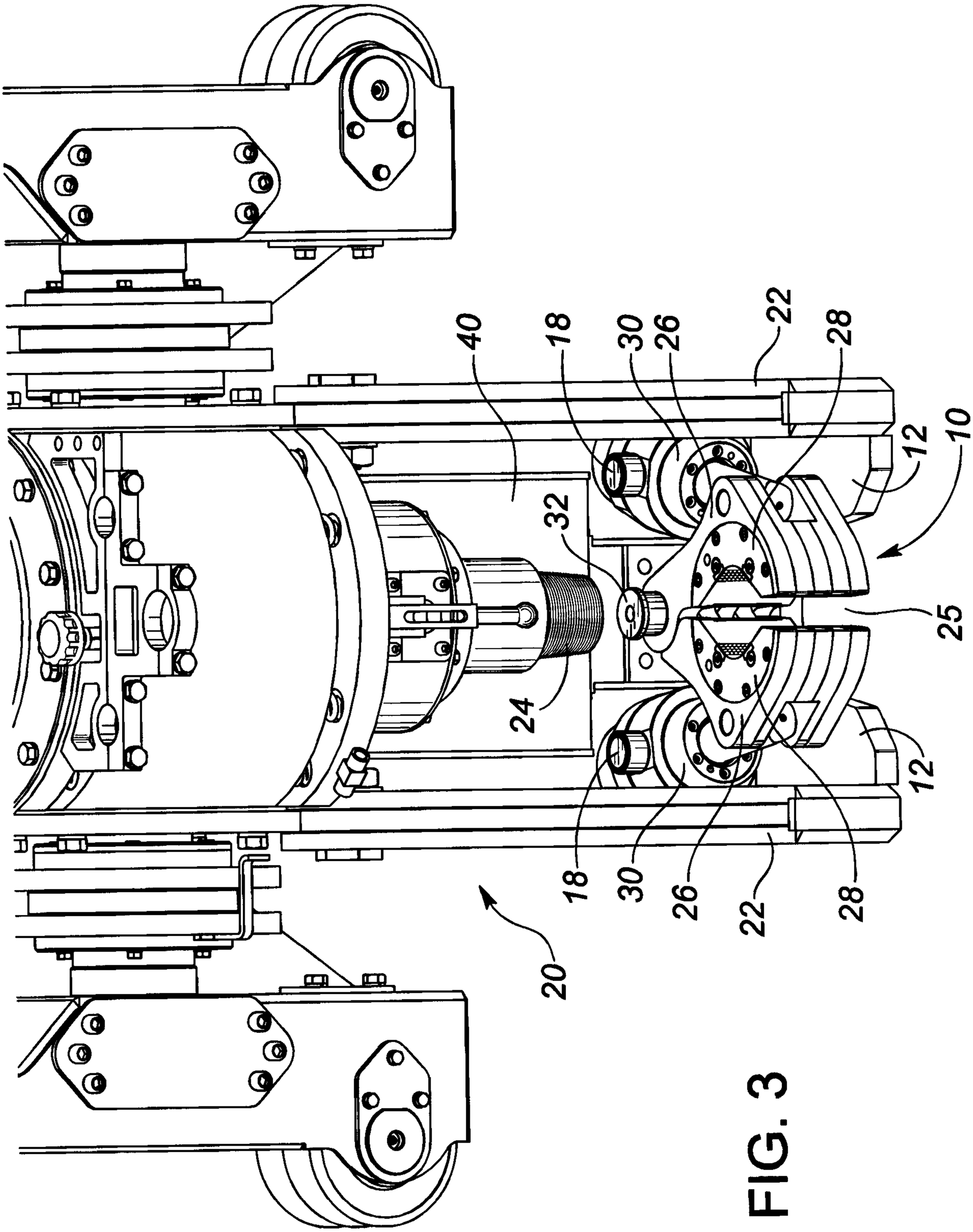


FIG. 3

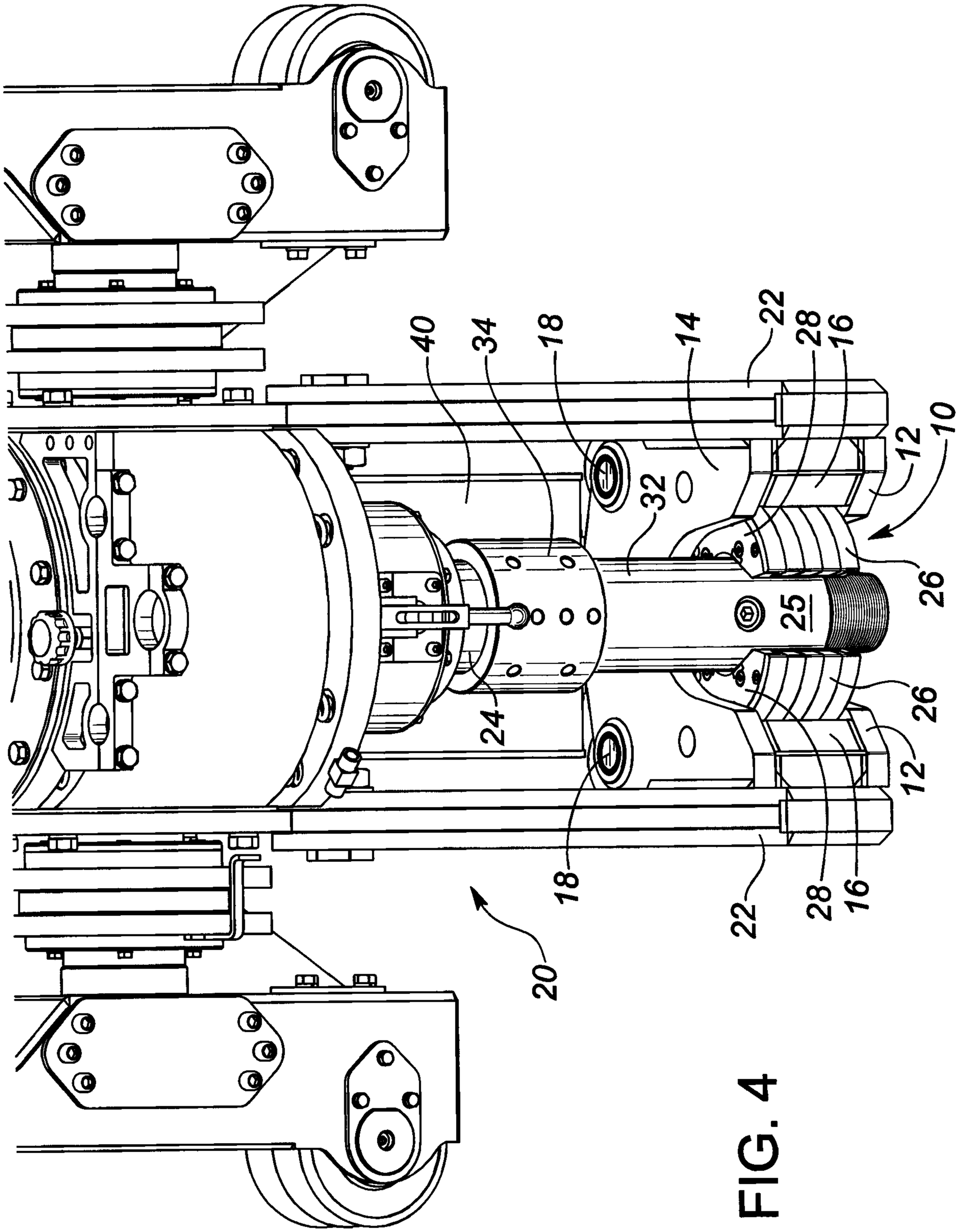


FIG. 4

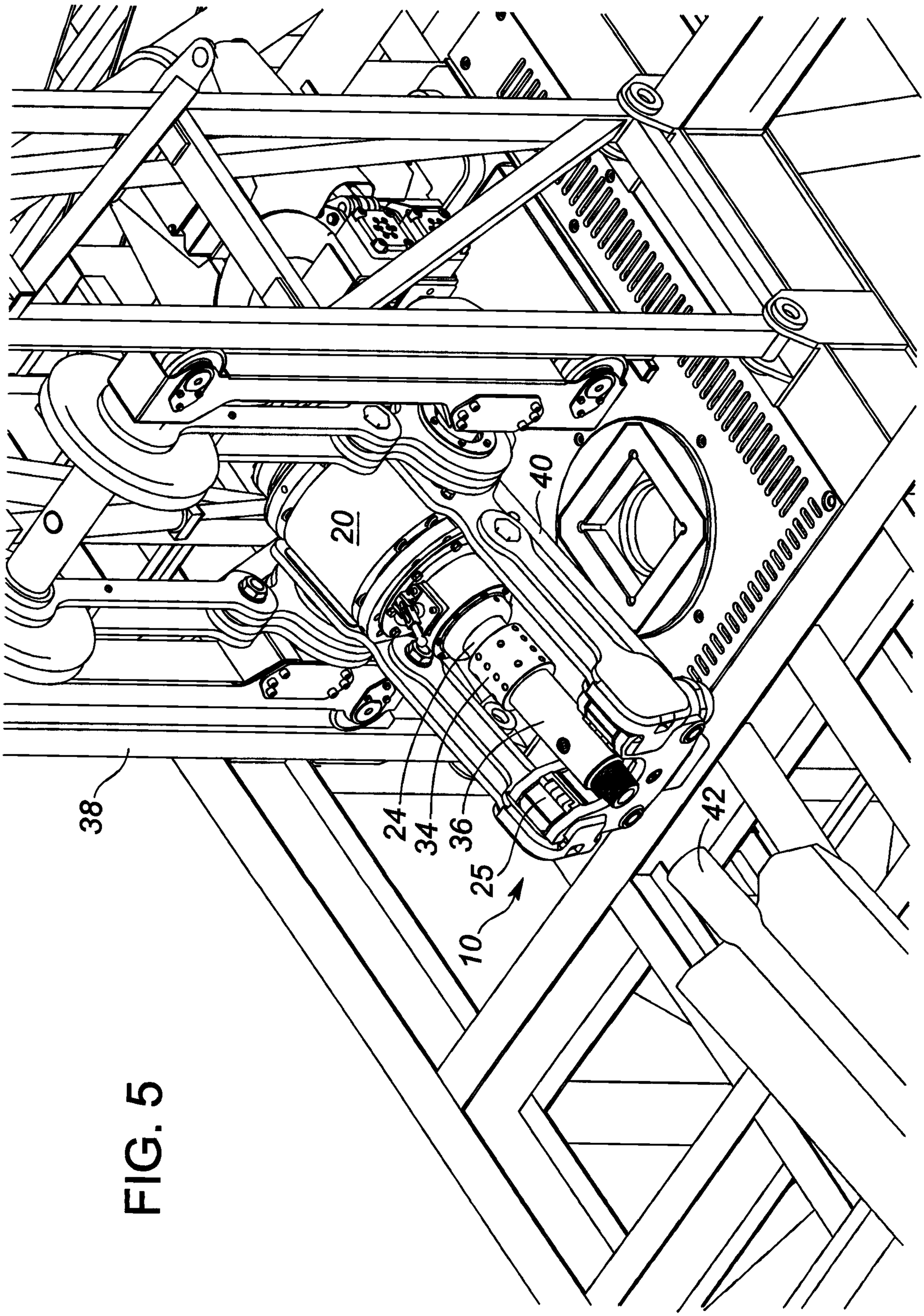


FIG. 5

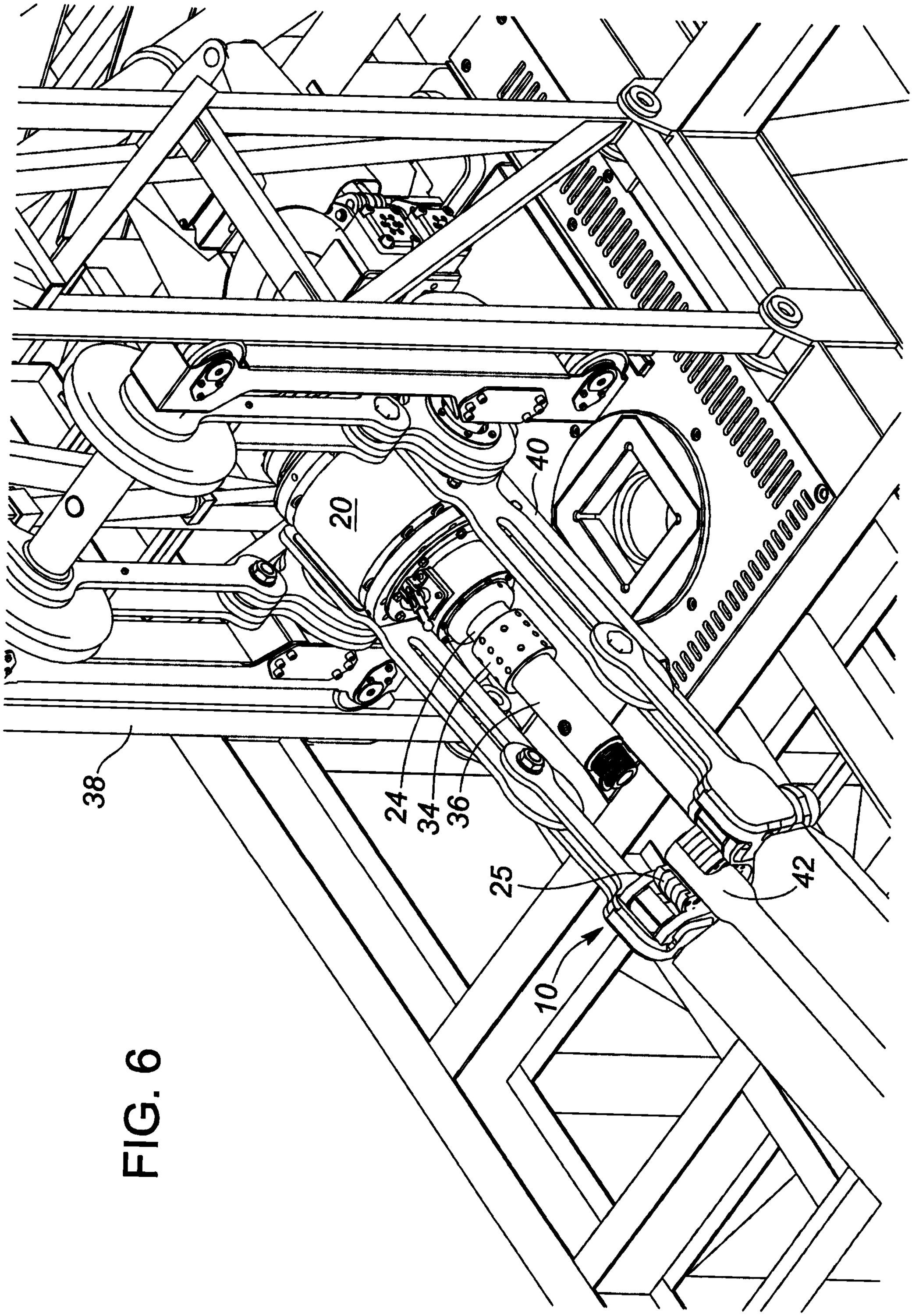


FIG. 6

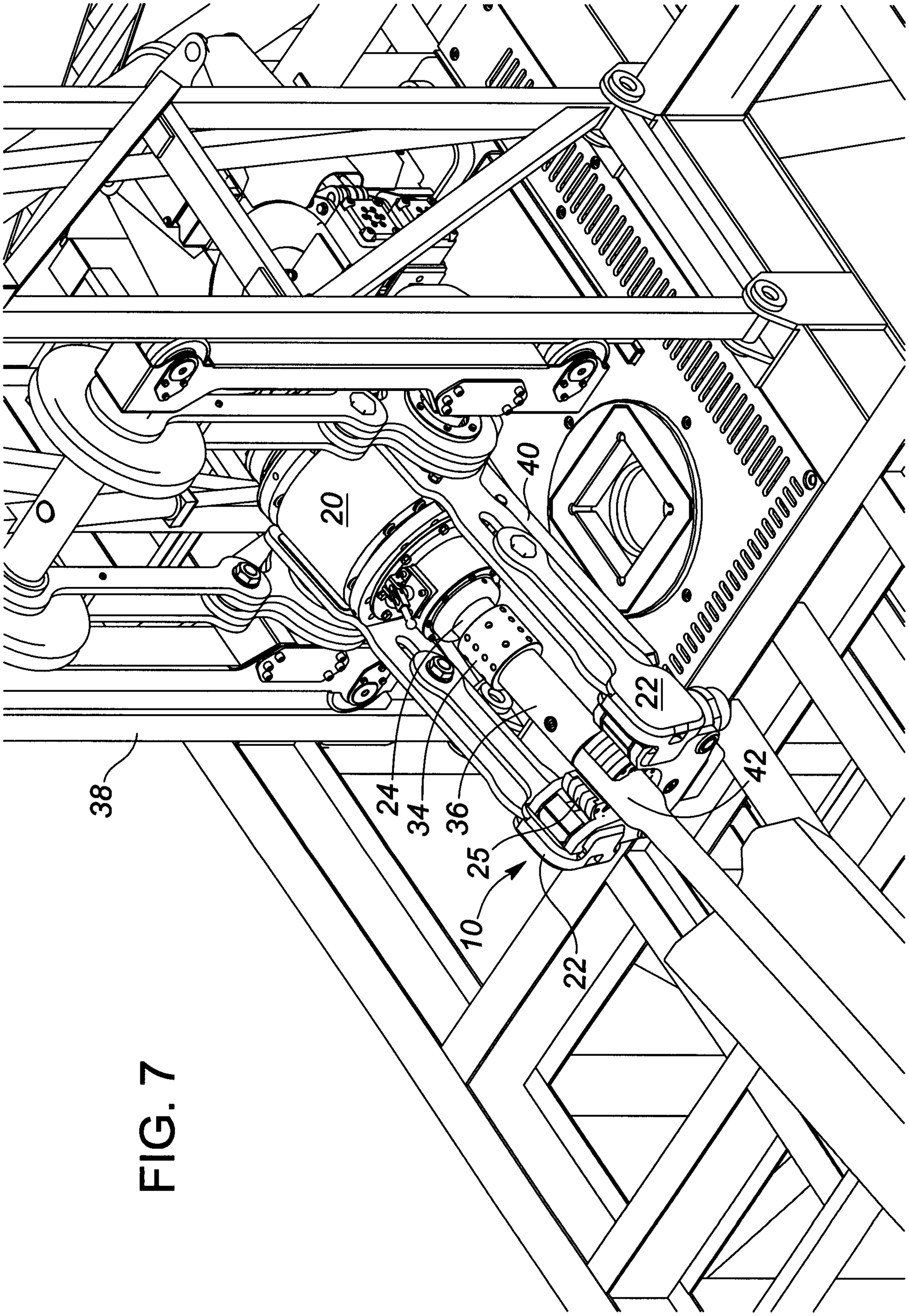
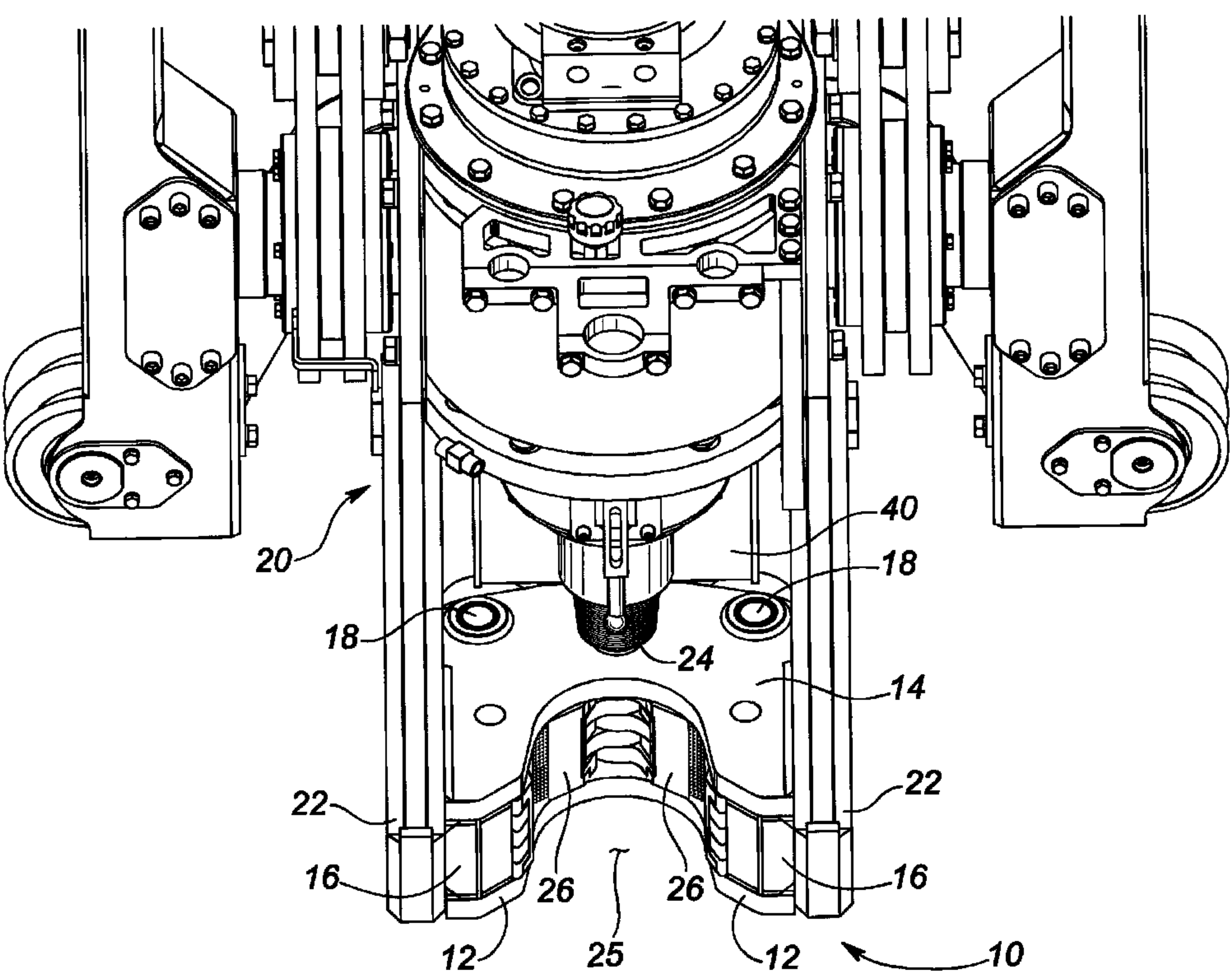


FIG. 7


40
20
18
18
24
14
22
22
16
26
26
16
12
25
12
10