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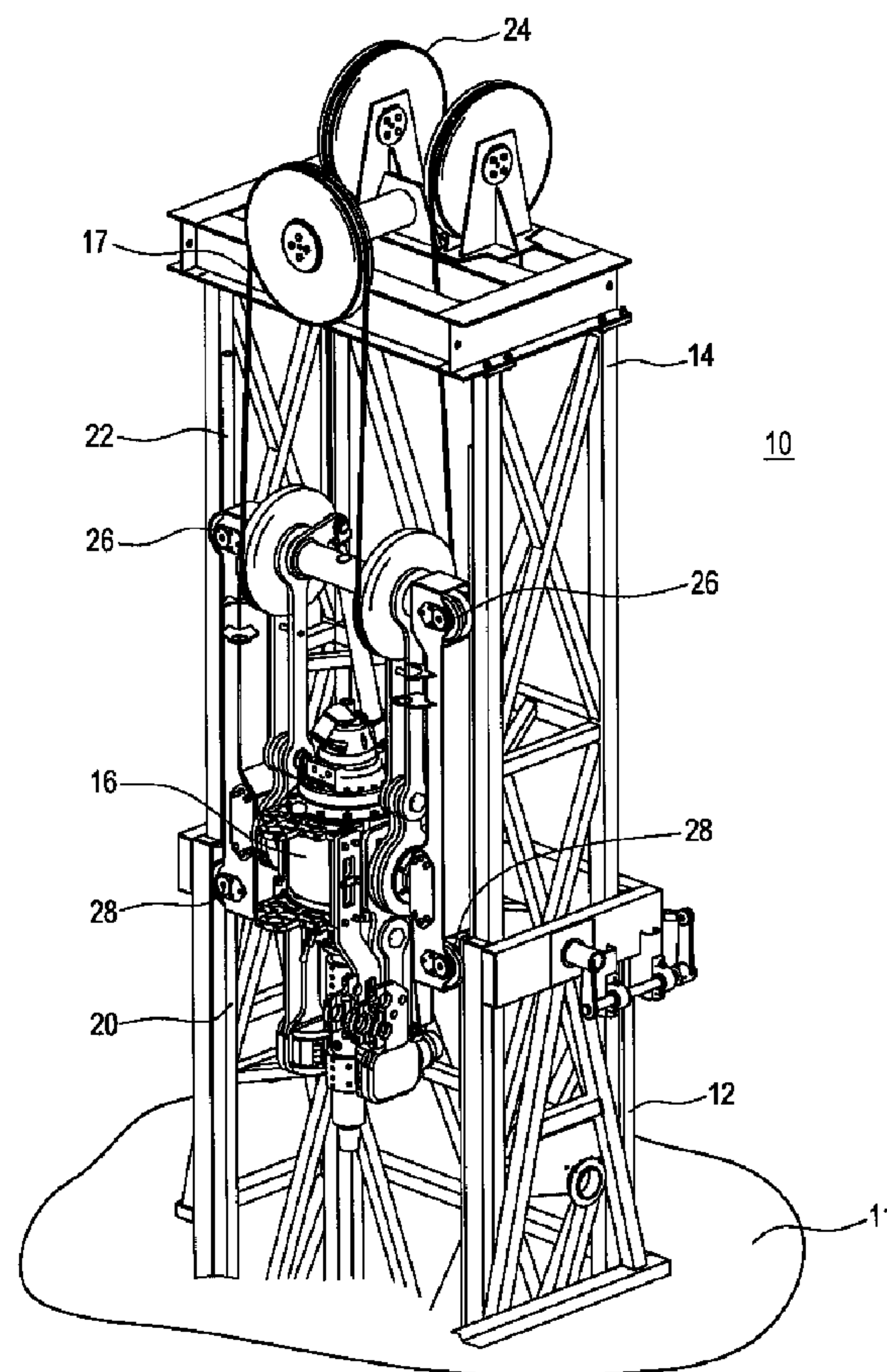
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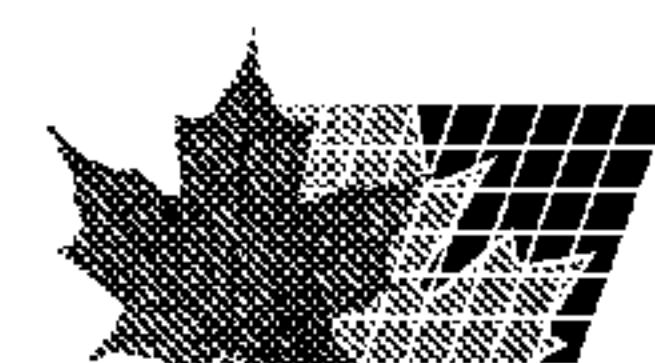
(54) Titre : SYSTÈME DE GUIDE POUR MAT TELESCOPIQUE D'APPAREIL DE FORAGE

(54) Title: A GUIDE RAIL SYSTEM FOR A TELESCOPING MAST ON A DRILLING RIG



(57) Abrégé/Abstract:

A guide track system for a tool that can be raised and lowered within a telescoping drilling rig tower is provided. The system consists of parallel guide rails mounted on a fixed lower tower section and on a movable upper tower section of the drilling rig



(57) **Abrégé(suite)/Abstract(continued):**

tower. The lower and upper guide rails are parallel to one another and overlap one another when the lower tower section is nested within the upper tower section. Guide wheels rotatably attached to the tool can have parallel grooves to roll on the guide rails. The grooves have sidewalls that flare outward so that they do not scuff against the guide rails as the tool travels up and down within the tower.

1 **ABSTRACT**

2 A guide track system for a tool that can be raised and lowered within a
3 telescoping drilling rig tower is provided. The system consists of parallel
4 guide rails mounted on a fixed lower tower section and on a movable upper
5 tower section of the drilling rig tower. The lower and upper guide rails are
6 parallel to one another and overlap one another when the lower tower section
7 is nested within the upper tower section. Guide wheels rotatably attached to
8 the tool can have parallel grooves to roll on the guide rails. The grooves have
9 sidewalls that flare outward so that they do not scuff against the guide rails as
10 the tool travels up and down within the tower.

1 **“A GUIDE RAIL SYSTEM FOR A TELESCOPING MAST**
2 **ON A DRILLING RIG”**

3 Inventor: Gerald Lesko

4 **FIELD OF THE INVENTION**

5 The present invention is related to the field of telescoping drilling rigs
6 towers and a guide rail system for mounting thereon.

7 **BACKGROUND**

8 It is known to assemble drilling rig towers by providing a telescoping
9 tower structure where an upper frame section or mast is raised within a lower
10 frame section fixed to a drilling platform. Often, these sections are pyramid-
11 shaped to provide rigidity and structural strength. In providing a telescoping
12 tower in this configuration, it is not possible to place guide rails on the tower
13 sections such that the rails on the lower section will align with rails on the
14 upper section as the upper section is raised or lowered within the lower
15 section so as to allow a top drive motor unit to travel within the tower along
16 the guide rails.

17 It is, therefore, desirable to have a telescoping rig tower that has guide
18 rails on both the upper and lower tower sections that allow a tool, such as a
19 top drive unit, to be raised and lowered vertically therein.

20 **SUMMARY**

21 A guide rail system is provided for a telescoping drilling tower having
22 guide rails mounted on the lower and upper tower sections whereby a tool,
23 such as a top drive motor unit, can travel on the guide rails and be raised and

1 lowered within the telescoping tower no matter where the upper tower section
2 is positioned with respect to the lower tower section.

3 An embodiment of the guide rail system comprises a lower tower frame
4 section that is operatively mounted on a drilling rig platform base and remains
5 stationary. An upper tower section is slidably coupled to the lower tower
6 section. In a representative embodiment, the upper tower section can be a
7 parallelopiped structure and can be sized to slide inside the lower tower
8 section, which also can be a parallelopiped structure, although it would be
9 obvious to one skilled in the art that the upper tower section can be sized to
10 slide on the outside of the lower tower section.

11 In one embodiment, the upper tower section is raised and lowered with
12 respect to the lower tower section using means suited thereto. It would be
13 obvious to one skilled in the art that any number of mechanisms can be used
14 to telescope the upper tower section. These means could include a motorized
15 rack and pinion gear set or a cable and pulley mechanism. In one
16 embodiment, hydraulic rams can be operatively coupled between the upper
17 and lower tower sections to raise and lower the upper tower section using
18 hydraulic control systems as well known to those skilled in the art.

19 On one side of each of the upper and lower tower sections, the guide
20 rails can be placed on vertical frame members of the sections. The guide rails
21 can be positioned such that they are facing or opposing one another and are
22 substantially parallel. The guide rails can be welded to the tower sections or
23 they can be attached to the tower sections using suitable fasteners as well
24 known to those skilled in the art.

1 In another embodiment, the upper tower guide rails can be adjacent to
2 at least a portion of the lower tower guide rails as well as being substantially
3 parallel to them when the upper tower section is slidably coupled to the lower
4 tower section.

5 In another embodiment, the guide rail system can further comprise at
6 least one pair of guide wheels that are configured to be rotatably attached to
7 the top drive unit, one wheel on each side of the top drive unit. The guide
8 wheels can be integral to the top drive unit or they can be separate devices
9 that can be attached to the top drive unit by welding, by fasteners or by using
10 any other suitable means as well known to those skilled in the art.

11 In one embodiment, each guide wheel is adapted to roll on a guide rail
12 on the tower sections thereby positioning the top drive unit between the
13 vertical members within the tower sections bearing the guide rails. In a
14 representative embodiment, the top drive unit can have two pairs of guide
15 wheels adapted to roll on the guide rails, two guide wheels vertically spaced
16 apart on each side of the top drive unit. This arrangement steadies the top
17 drive unit within the tower sections and keeps it from pitching forwards and
18 backwards or from rocking side to side as the top drive unit is raised or
19 lowered within the drilling rig tower. The guide wheels can be adapted to
20 have two parallel grooves where one groove rolls on the lower tower section
21 guide rails and whereas the other groove rolls on the upper tower section
22 guide rails as the top drive unit is raised within the drilling rig tower from the
23 lower tower section to the upper tower section.

1 In a representative embodiment, the guide rails are rectangular or
2 square tubing having rounded outside corners. The grooves on the guide
3 wheels are adapted to roll on the tubing and have flat bottom surfaces and
4 rounded corners on the bottom of the grooves to correspond to the rolling
5 surface of the guide rail tubing. The side walls of the guide wheel grooves
6 flare outwards such that these side walls do not touch or scuff against the side
7 walls of the guide rail tubing as the guide wheels roll up and down the guide
8 rails. In this manner, the guide rail groove can be centered on the guide rail
9 as the rounded corners of the groove ride on the rounded corners of the guide
10 rail tubing yet the groove side walls do not drag against the tubing side walls
11 allowing the top drive unit to ride smoothly and securely on the guide rails.

12 Broadly stated, a guide rail system is provided for a tool configured to
13 be raised and lowered within a telescoping tower structure having a stationary
14 lower tower section and an upper tower section slidably coupled to said lower
15 tower section, said upper tower section configured to be raised and lowered
16 with respect to said lower tower section, the system comprising: a pair of
17 opposing first guide rails configured to be disposed on said lower tower
18 section, said first guide rails substantially parallel and facing each other; a pair
19 of opposing second guide rails configured to be disposed on said upper tower
20 section, said second guide rails substantially parallel and facing each other,
21 said second guide rails adjacent and substantially parallel to at least a portion
22 of said first guide rails when said upper tower section is slidably coupled to
23 said lower tower section; and at least one pair of guide wheels configured to
24 be rotatably coupled to said tool, one of said at least one pair of guide wheels

1 adapted to roll on one of said first opposing guide rails, the other of said at
2 least one pair of guide wheels adapted to roll on the other of said first
3 opposing guide rails whereby said guide wheels roll on said first guide rails as
4 said tool is raised within said lower tower section, said guide wheels further
5 adapted to roll on said second opposing guide rails when said tool is raised
6 from said lower tower section to said upper tower section within said tower
7 structure.

8 Broadly stated, a telescoping drilling rig tower is provided for a tool
9 configured to be raised or lowered within said tower, comprising: a lower
10 tower section adapted for stationary mounting on a rig mounting base; an
11 upper tower section slidably coupled to said lower tower section; means for
12 raising and lowering said upper tower section with respect to said lower tower
13 section; a pair of opposing first guide rails disposed on said lower tower
14 section, said first guide rails substantially parallel and facing each other; and a
15 pair of opposing second guide rails disposed on upper tower section, said
16 second guide rails substantially parallel and facing each other, said second
17 guide rails adjacent and substantially parallel to at least a portion of said first
18 guide rails when said upper tower section is slidably coupled to said lower
19 tower section.

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

21 Figure 1 is a perspective view depicting a telescoping rig tower having
22 a top drive unit wherein the upper and lower rig tower sections are shown in a
23 collapsed configuration.

1 Figure 2 is perspective view depicting the rig tower of Figure 1 in an
2 extended configuration with the top drive unit positioned in the lower rig tower
3 section.

4 Figure 3 is perspective view depicting the rig tower of Figure 1 in an
5 extended configuration with the top drive unit positioned where the upper and
6 lower rig tower sections overlap.

7 Figure 4 is perspective view depicting the rig tower of Figure 1 in an
8 extended configuration with the top drive unit positioned in the upper rig tower
9 section.

10 Figure 5 is a front elevational view depicting the top drive unit of Figure
11 1.

12 Figure 6 is a side elevational view depicting the top drive unit of Figure
13 1.

14 Figure 7 is perspective view depicting the top drive unit of Figure 1.

15 Figure 8 is a top plan view depicting the guide rail components of the
16 rig tower of Figure 1.

17 Figure 9 is a close up top plan view depicting the guide rail
18 components of Figure 8.

19 Figure 10 is a perspective view depicting the guide rail components of
20 the rig tower of Figure 2.

21 Figure 11 is a perspective view depicting the guide rail components of
22 Figure 10 when the top drive unit is positioned where the upper and lower rig
23 tower sections overlap.

24 **DETAILED DESCRIPTION OF EMBODIMENTS**

1 Illustrated in Figure 1 is an embodiment of a guide rail system for a
2 telescoping drilling rig tower. This embodiment comprises rig tower 10 having
3 lower tower section 12 that can be mounted on top of rig platform 11. Rig
4 platform 11 may be part of a stationary drilling rig or part of a portable drilling
5 rig structure mounted on a vehicle such as a flat-bed truck adapted for such
6 use, as well known to those skilled in the art. In this Figure 1, upper tower
7 section 14 is shown fully nested in lower tower section 12. Upper tower
8 section 14 can be slidably coupled to lower tower section 12. In one
9 embodiment, lower tower section 12 and upper tower section 14 can be
10 parallelopiped structures. In a representative embodiment, upper tower
11 section 14 can slide within lower tower section 12 in a telescoping fashion
12 although it would be obvious to those skilled in the art that upper tower
13 section 14 can be sized to slide on the outside of lower tower section 12.

14 In another embodiment, mounted within tower 10 is a tool such as top
15 drive unit 16 that is supported by cable 17 that, in turn, rolls over the pulleys in
16 king block 24 to a cable drawworks mechanism (not shown). Upper tower
17 section 14 can be raised or lowered with respect to lower tower section 12
18 using a mechanism such as a rack and pinion gear set, cable and pulley
19 system or a hydraulic ram system. In a representative embodiment, hydraulic
20 rams (not shown) coupled between tower sections 12 and 14 provide the
21 means to raise or lower upper tower section 14 with respect to lower tower
22 section 12 as well known to those skilled in the art.

1 Referring to Figures 2, 3 and 4, top drive unit 16 is shown in a lower
2 position, in a halfway position and in an upper position, respectively, within
3 tower 10.

4 Referring to Figures 5, 6 and 7, top drive unit 16 is shown having upper
5 guide wheels 26 and lower guide wheels 28, one of each mounted on each
6 side of top drive unit 16. Guide wheels 26 and 28 are vertically spaced-apart
7 so as to provide stability to top drive unit 16 as it travels within tower 10 as
8 discussed in further detail below.

9 Referring to Figures 8 and 9, guide wheels 26 and 28 can roll on guide
10 track 18 that consists of upper guide rails 22 mounted on vertical frame
11 members 15 of upper tower section 14, and lower guide rails 20 mounted on
12 vertical frame members 13 of lower tower section 12. Both sets of guide rails
13 20 and 22 are parallel to one another and oppose or face one another within
14 tower 10. When upper tower section 14 is slidably coupled to lower tower
15 section 12, upper guide rails 22 overlap lower guide rails 20 such that the
16 guide rails are adjacent to at least a portion of each other and are parallel to
17 one another as to form a continuous guide track 18 along the height of tower
18 10. Guide rails 20 and 22 can be welded to the tower sections or can be
19 attached to the tower sections using suitable fasteners as known to those
20 skilled in the art.

21 In one embodiment, guide wheels 26 and 28 can have parallel grooves
22 42 and 44 in a side-by-side arrangement. Groove 42 rolls on lower guide rail
23 20 whereas groove 44 rolls on upper guide rail 22. When upper and lower
24 tower sections 14 and 12 overlap, guide wheels 26 and 28 are positioned on

1 guide track 18 such that guide wheels 26 and 28 roll on both lower and upper
2 guide rails 20 and 22. With this arrangement, guide rails 26 and 28 smoothly
3 roll from guide rails 20 to guide rails 22 as top drive unit 16 is raised from
4 lower tower section 12 to upper tower section 14.

5 Referring to Figure 9, a detailed top view of a representative
6 embodiment of the guide rail system is shown. As described above, each
7 guide rail 26 and 28 has grooves 42 and 44 that are adapted to roll on guide
8 rails 20 and 22. In one embodiment, both guide rails 20 and 22 can be
9 rectangular in cross-section. In a representative embodiment, guide rails 20
10 and 22 are square in cross-section. Grooves 42 and 44 are formed between
11 sidewall 36, center ridge 38 and sidewall 40 on guide wheels 26 and 28.
12 Groove 42 can have groove sidewalls 60, groove base 46 and base corners
13 50. Groove 44 can have groove sidewalls 61, groove base 48 and base
14 corners 51. Groove bases 46 and 48 correspond to guide rail faces 54 and
15 55 of guide rails 20 and 22. Base corners 50 and 51 can be rounded and
16 adapted to roll smoothly on guide rail corners 56 and 57 of guide rails 20 and
17 22 with little or no side-to-side movement of guide rails 20 and 22 within
18 grooves 42 and 44.

19 In another embodiment, groove sidewalls 60 and 61 can flare
20 outwardly in each of grooves 42 and 44 at angles 52 and 53. By angling
21 sidewalls 60 and 61 in this manner, there is clearance between groove
22 sidewalls 60 and 61 and guide rail sidewalls 58 and 59 such that groove
23 sidewall 60 and 61 will not scuff against guide rail sidewalls 58 and 59 as

1 guide wheels 26 and 28 roll on guide track 18. In a representative
2 embodiment, angles 52 and 53 can be in the range of 1° to 10°.

3 Referring to Figures 10 and 11, top drive unit 16 is shown being raised
4 in tower 10 from lower tower section 12 (Figure 10) to upper tower section 14
5 (Figure 11). Guide wheels 26 and 28 roll on both guide rails 20 and 22 where
6 upper tower section 14 overlaps lower tower section 12. As guide wheels 26
7 and 28 roll up guide track 18, groove 42 rolls off of guide rail 22 thereby
8 leaving groove 44 rolling on guide rail 22 by itself. As shown in Figures 5, 6
9 and 7, guide rails 26 and 28 are vertically spaced apart on top drive 16 to
10 provide stability to top drive unit 16 and keep it from pitching forwards or
11 backwards or rocking side-to-side as it travels on guide track 18 within tower
12 10.

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

22

1 We claim:

2 1. A guide rail system for a tool configured to be raised and lowered
3 within a telescoping tower structure having a stationary lower tower
4 section and an upper tower section slidably coupled to said lower tower
5 section, said upper tower section configured to be raised and lowered
6 with respect to said lower tower section, the system comprising:

7 a) a pair of opposing first guide rails configured to be disposed on
8 said lower tower section, said first guide rails substantially
9 parallel and facing each other;

10 b) a pair of opposing second guide rails configured to be disposed
11 on said upper tower section, said second guide rails
12 substantially parallel and facing each other, said second guide
13 rails adjacent and substantially parallel to at least a portion of
14 said first guide rails when said upper tower section is slidably
15 coupled to said lower tower section; and

16 c) at least one pair of guide wheels configured to be rotatably
17 coupled to said tool, one of said at least one pair of guide
18 wheels adapted to roll on one of said first opposing guide rails,
19 the other of said at least one pair of guide wheels adapted to roll
20 on the other of said first opposing guide rails whereby said guide
21 wheels roll on said first guide rails as said tool is raised within
22 said lower tower section, said guide wheels further adapted to
23 roll on said second opposing guide rails when said tool is raised

1 from said lower tower section to said upper tower section within
2 said tower structure.

3 2. The system as set forth in claim 1 wherein said tool is a top drive unit.

4 3. The system as set forth in claim 1 wherein said rails are comprised of
5 rectangular tubing.

6 4. The system as set forth in claim 1 wherein said system comprises two
7 pairs of opposing guide wheels configured to be rotatably coupled to
8 said tool.

9 5. The system as set forth in claim 3 wherein said tubing comprises
10 rounded outside corners.

11 6. The system as set forth in claim 5 wherein said guide wheels further
12 comprise grooves adapted to roll on said tubing.

13 7. The system as set forth in claim 6 wherein said grooves substantially
14 contact said rounded outside corners on said guide wheels roll on said
15 guide rails.

16 8. The system as set forth in claim 7 wherein said grooves have sidewalls
17 that do not contact said tubing as said guide wheels roll on said guide
18 rails.

19 9. The system as set forth in claim 1 wherein said upper tower section is
20 adapted to slide up and down inside said lower tower section.

21 10. The system as set forth in claim 1 wherein said upper tower section is
22 adapted to slide up and down outside said lower tower section.

1 11.A telescoping drilling rig tower for a tool configured to be raised or
2 lowered within said tower, comprising:

- 3 a) a lower tower section adapted for stationary mounting on a rig .
4 mounting base;
5 b) an upper tower section slidably coupled to said lower tower
6 section;
7 c) means for raising and lowering said upper tower section with
8 respect to said lower tower section;
9 d) a pair of opposing first guide rails disposed on said lower tower
10 section, said first guide rails substantially parallel and facing
11 each other; and
12 e) a pair of opposing second guide rails disposed on upper tower
13 section, said second guide rails substantially parallel and facing
14 each other, said second guide rails adjacent and substantially
15 parallel to at least a portion of said first guide rails when said
16 upper tower section is slidably coupled to said lower tower
17 section.

18 12.The tower as set forth in claim 11 further comprising at least one pair of
19 guide wheels configured to be rotatably coupled to said tool, one of
20 said at least one pair of guide wheels adapted to roll on one of said first
21 opposing guide rails, the other of said at least one pair of guide wheels
22 adapted to roll on the other of said first opposing guide rails whereby
23 said guide wheels roll on said first guide rails as said tool is raised
24 within said lower tower section, said guide wheels further adapted to

1 roll on said second opposing guide rails when said tool is raised from
2 said lower tower section to said upper tower section within said drilling
3 rig tower.

4 13. The tower as set forth in claim 12 wherein said tool is a top drive unit.

5 14. The tower as set forth in claim 12 wherein said rails comprise
6 rectangular tubing.

7 15. The tower as set forth in claim 12 further comprising two pairs of guide
8 wheels configured to be rotatably coupled to said tool.

9 16. The tower as set forth in claim 14 wherein said tubing comprises
10 rounded outside corners.

11 17. The tower as set forth in claim 16 wherein said guide wheels further
12 comprise grooves adapted to roll on said tubing.

13 18. The tower as set forth in claim 17 wherein said grooves substantially
14 contact said rounded outside corner as said guide wheels roll on said
15 guide rails.

16 19. The tower as set forth in claim 18 wherein said grooves have sidewalls
17 that do not contact said tubing as said guide wheels roll on said guide
18 rails.

19 20. The tower as set forth in claim 11 wherein said upper tower section is
20 adapted to slide up and down inside said lower tower section.

21 21. The tower as set forth in claim 11 wherein said upper tower section is
22 adapted to slide up and down outside said lower tower section.

23 22. The tower as set forth in claim 11 wherein said means for raising and
24 lowering said upper tower section is selected from the group consisting

1 of motorized rack and pinion mechanisms, cable and pulley
2 mechanisms, and hydraulic ram mechanisms.

3

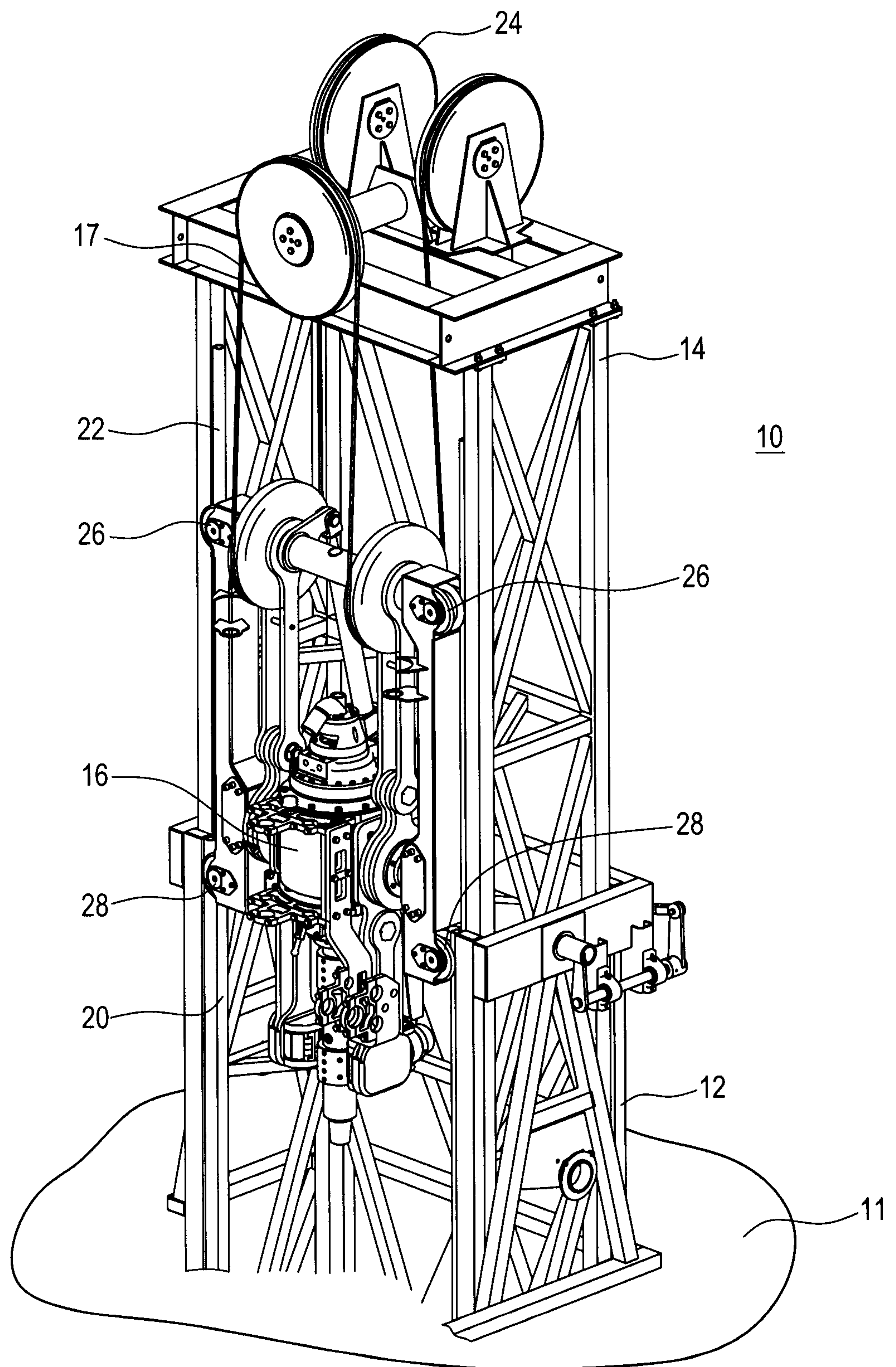


FIG. 1

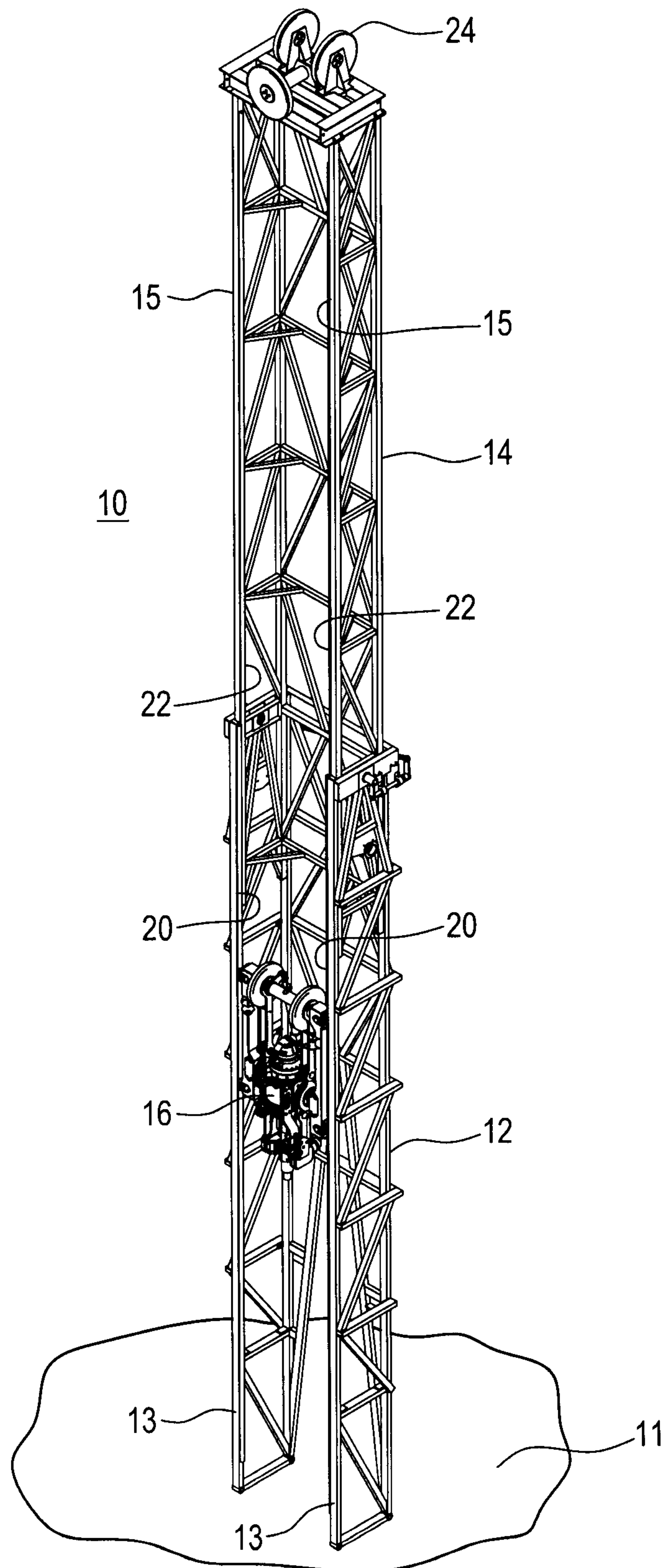


FIG. 2

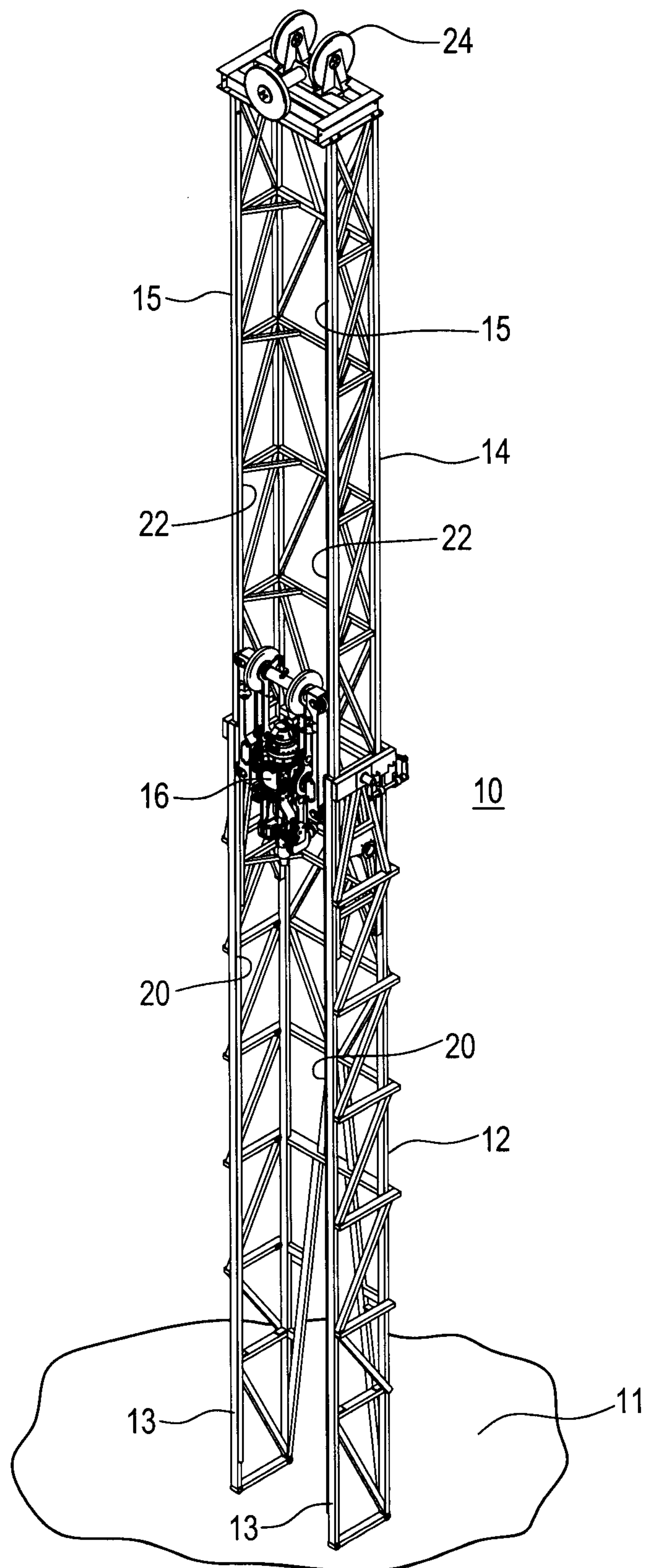


FIG. 3

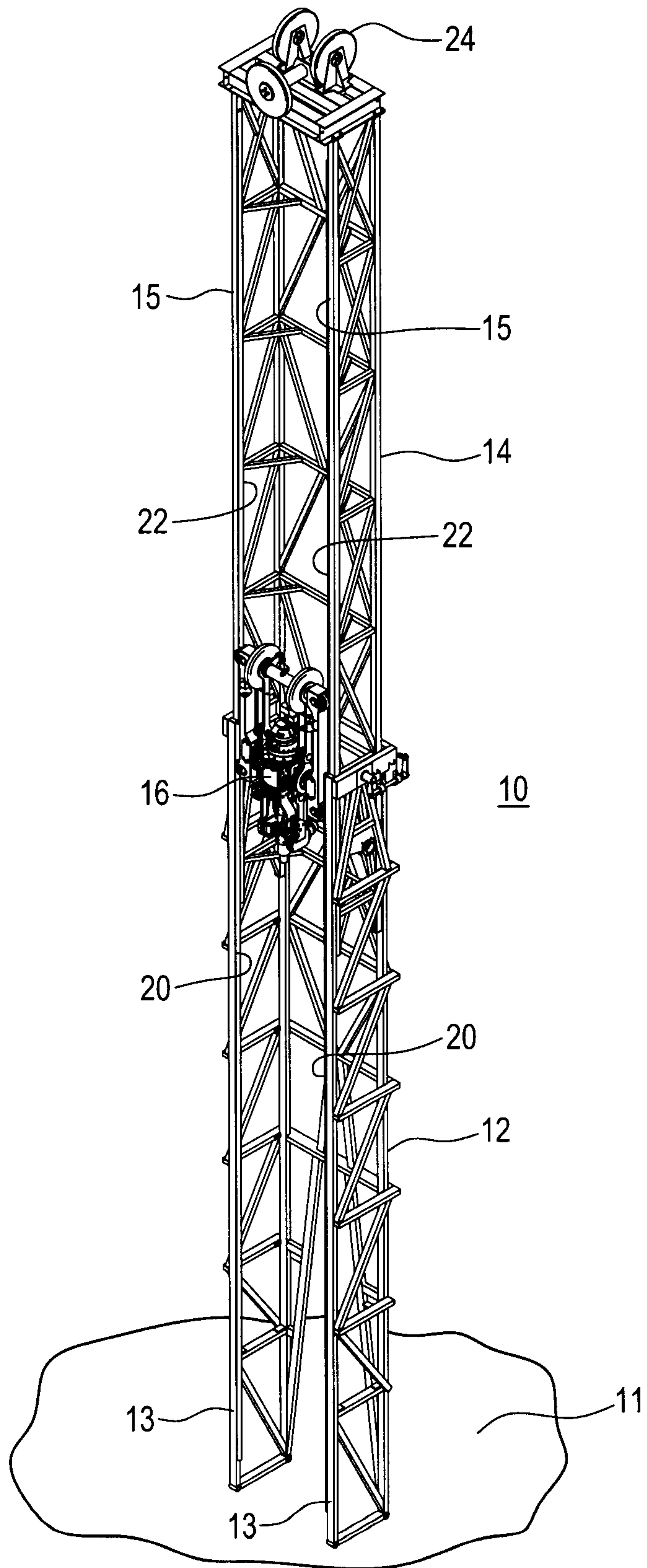


FIG. 4

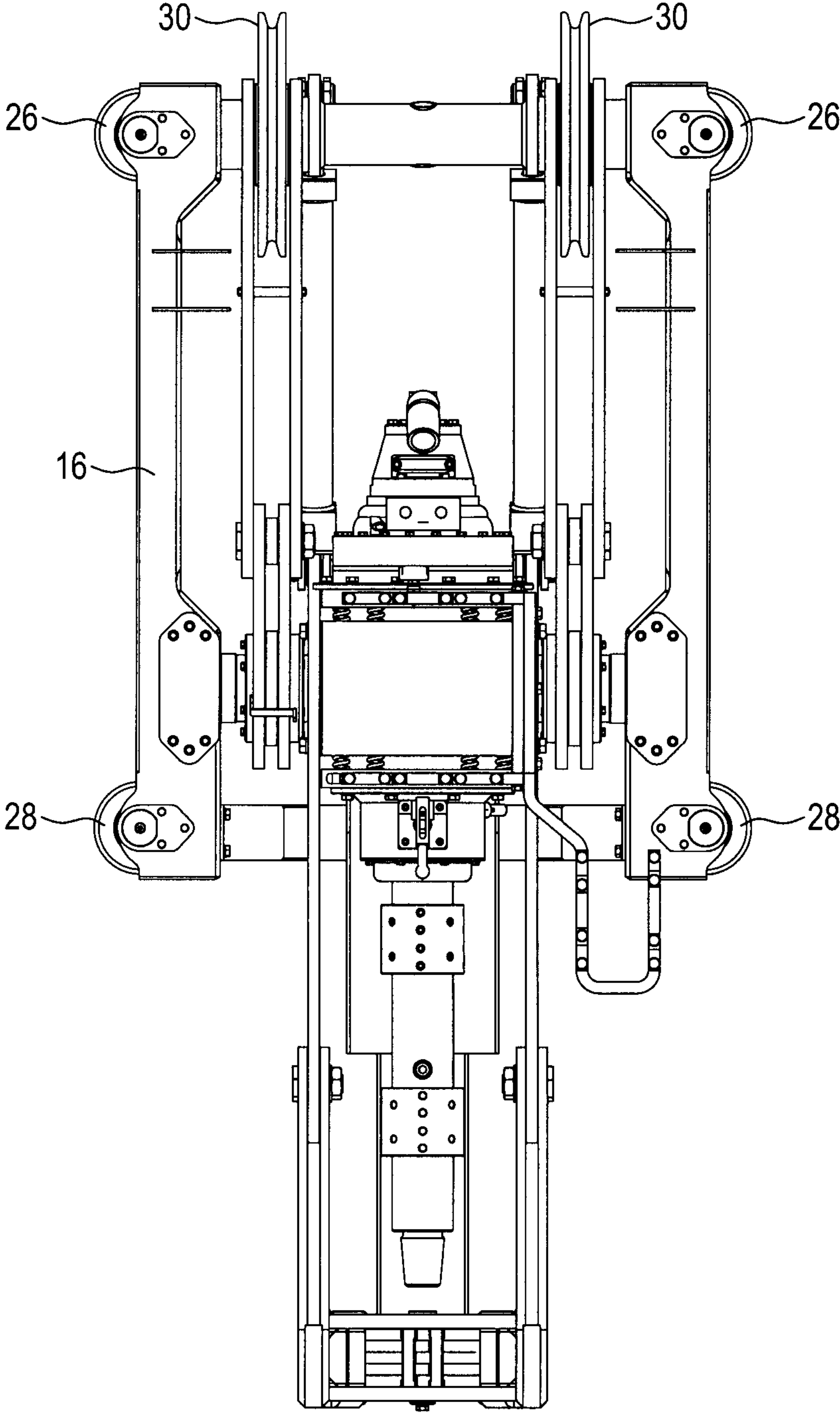


FIG. 5

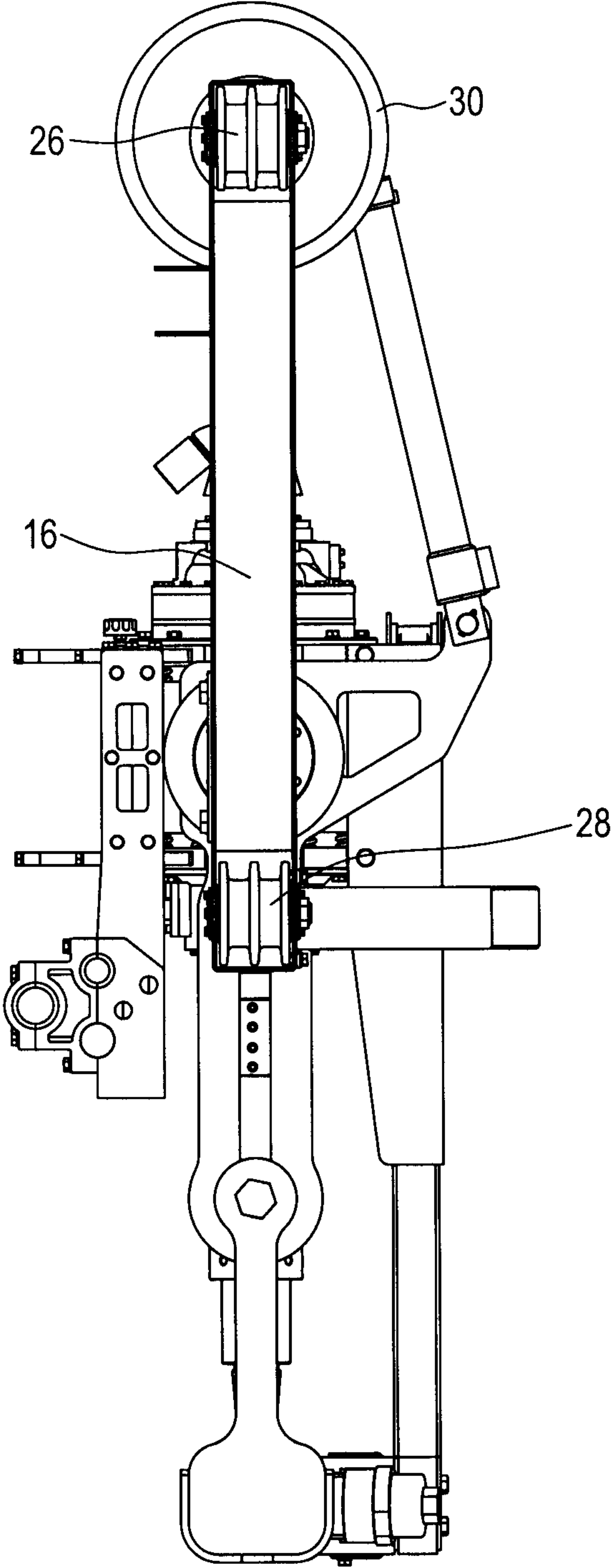


FIG. 6

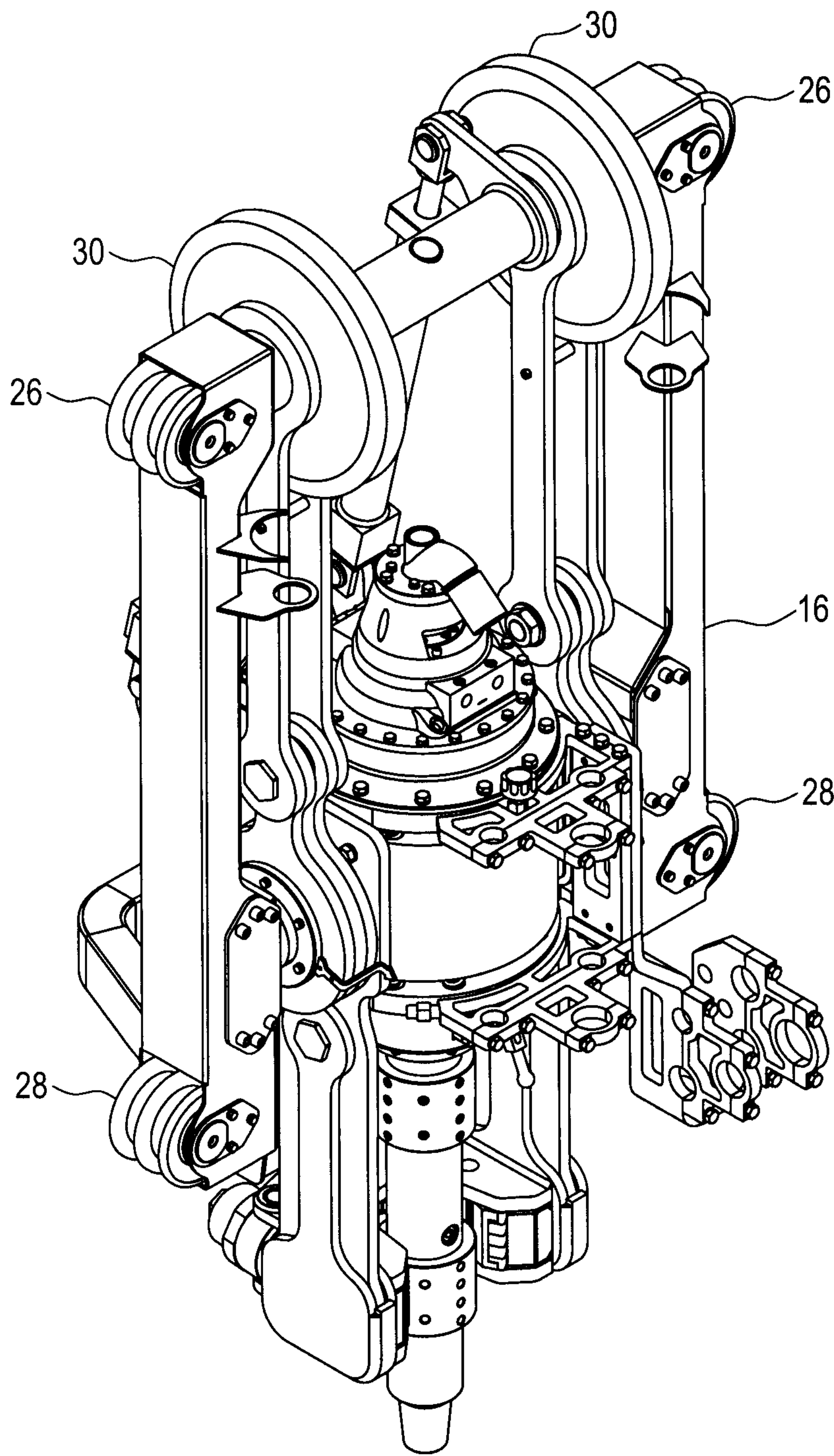


FIG. 7

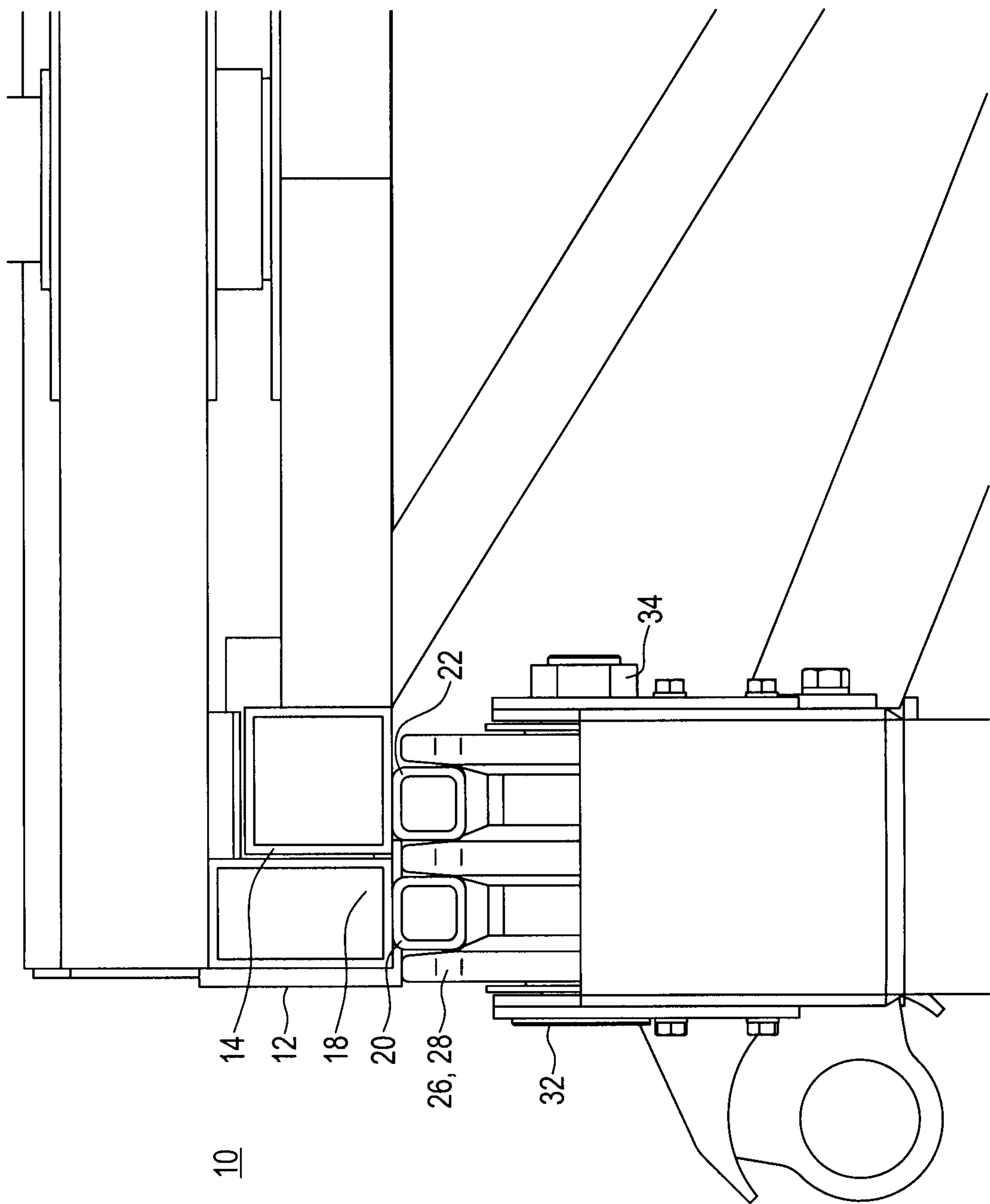


FIG. 8

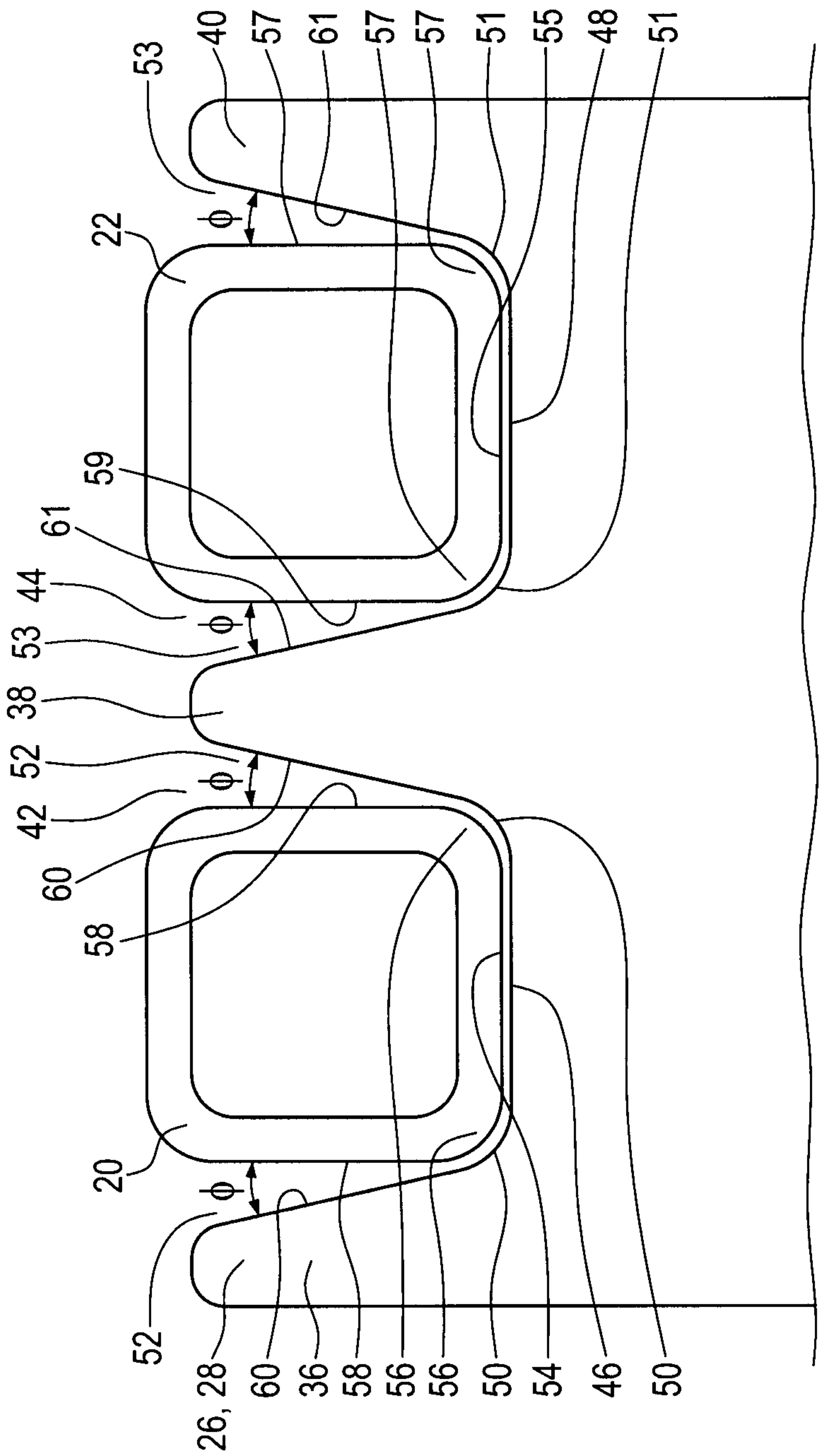


FIG. 9

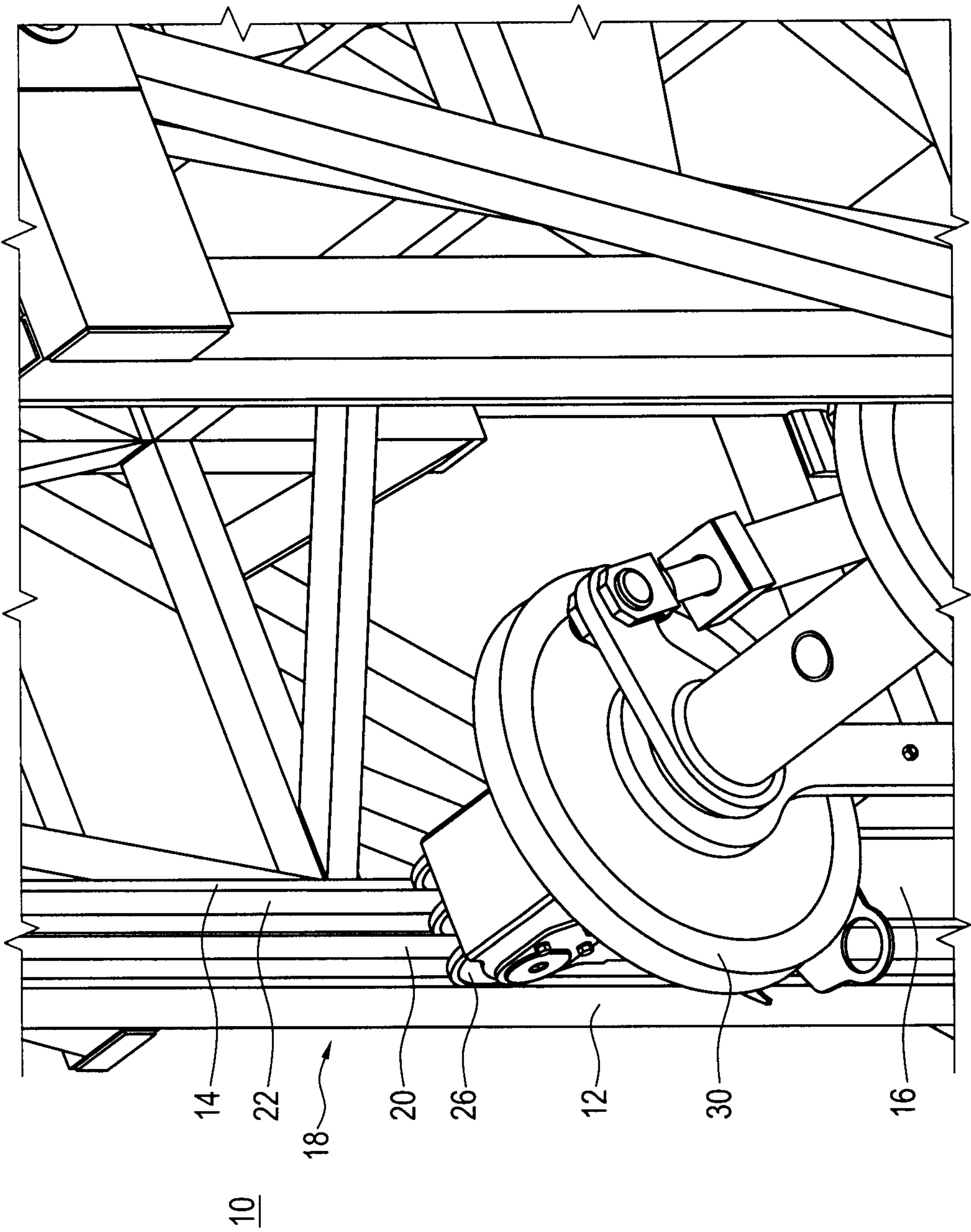


FIG. 10

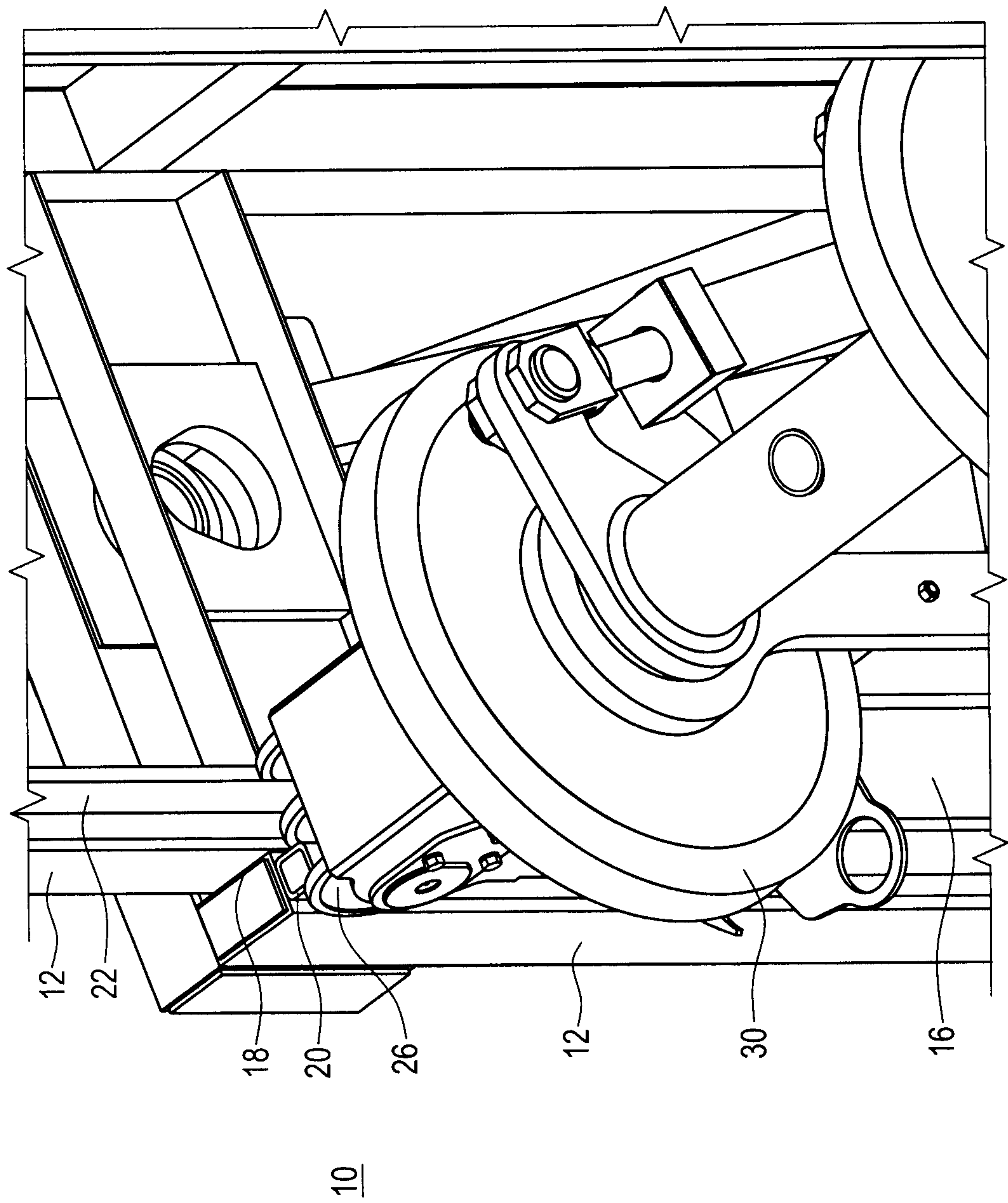


FIG. 11

