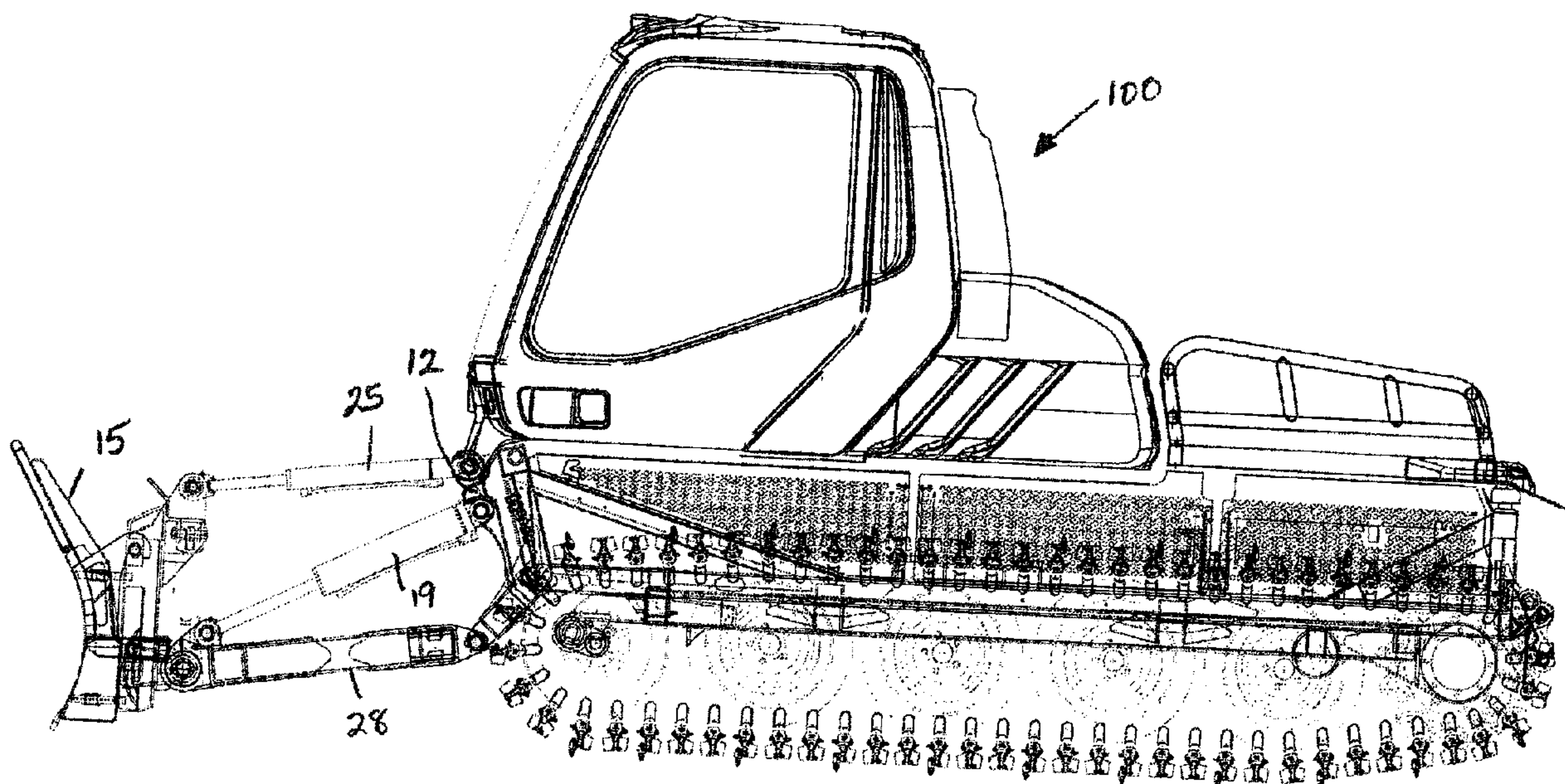




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(54) Titre : LAME DE DAMEUSE DE NEIGE  
(54) Title: SNOW GROOMER PLOW ASSEMBLY



(57) Abrégé/Abstract:  
A plow is supported for movement with respect to a frame of a vehicle with a lifting cylinder and a rolling cylinder. The lifting cylinder and the rolling cylinder are pivotally connected with respect to each other by a bracket that is pivotally supported by the frame. By this connection, the rolling cylinder can freely rotate with the bracket, thus increasing the plow displacement in both a raised and lowered position without adversely affecting the aggressivity of the plow while grooming terrain.

## ABSTRACT OF THE DISCLOSURE

A plow is supported for movement with respect to a frame of a vehicle with a lifting cylinder and a rolling cylinder. The lifting cylinder and the rolling cylinder are pivotally connected with respect to each other by a bracket that is pivotally supported by the frame. By this connection, the rolling cylinder can freely rotate with the bracket, thus increasing the plow displacement in both a raised and lowered position without adversely affecting the aggressivity of the plow while grooming terrain.

## SNOW GROOMER PLOW ASSEMBLY

### CROSS REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims the benefit of priority to U.S. Provisional Patent Application Serial Number 60/419,995 entitled "SNOW GROOMER PLOW ASSEMBLY" which was filed on October 22, 2002, the contents of which are incorporated herein by reference in their entirety.

### BACKGROUND

#### 1. Field of the Invention

**[0002]** The present invention relates to a plow assembly for a snow groomer. In particular, the present invention concerns a design where the displacement capability of the plow is increased.

#### 2. Discussion of Related Art

**[0003]** The front plow of a snow groomer is designed to accomplish multiple functions. In particular, it can be used for pushing snow to make a snow park. A snow park is defined as a recreational area where a snow bank is fashioned in a specific manner to welcome snowboarders, skiers and the like. When constructing the snow bank, the plow pushes snow up to a certain height that is limited by the plow assembly. More specifically, it is limited by the extension of the cylinders and the rolling angle of the plow. The assembly of prior art snow plows limits the displacement of the plow because the rolling cylinder has a fixed pivot point.

**[0004]** There are examples in the prior art of snow plows with an increased plow displacement. Specifically, the prior art includes the description of an adaptor that can be fixed to the plow assembly. The system consists of removing the whole plow assembly in order to install the adaptor and then reinstalling the plow assembly over the adaptor. The adaptor is considered complicated to install (over 8 hours required for installation) and costly (thousands of dollars).



## SUMMARY OF THE INVENTION

**[0005]** A basic principle underlying the apparatus of the present invention is to use a parallelogram configuration to replace a triangle configuration for the cylinder assembly of the bracket assembly that is used to attach the plow to the vehicle. More specifically, the movement of the bracket, relative to (or dependant from) the lifting cylinder pivot point increases the displacement of the rolling cylinder. Therefore, the increased displacement of the rolling cylinder increases the “roll” of the apparatus.

**[0006]** Effectively, the bracket assembly of the present invention allows the plow displacement to increase in an elevated position and in a lowered position without affecting the agressivity of the plow while grooming.

**[0007]** The aggressivity of the plow is described as the increase of the rolling angle of the plow when using the lifting cylinder without the rolling cylinder. The rolling cylinder pivot point being free of displacement and depending on a parallelogram configuration decreases this effect compared to a triangle configuration where the rolling angle is increased.

**[0008]** This invention is directed to a plow vehicle comprising a frame, a plow, a lifting cylinder pivotally connected to the plow for lifting the plow with respect to the frame, a rolling cylinder pivotally connected to the plow for tilting the plow with respect to the frame, and a bracket pivotally connected to the frame. The lifting cylinder is fixedly connected to the bracket and the rolling cylinder is pivotally connected to the bracket.

**[0009]** This invention is also directed to a plow vehicle comprising a frame, a plow, a lifting cylinder pivotally connected to the plow and pivotally connected to the frame, and a rolling cylinder connected to the plow at a first end and pivotally connected to the lifting cylinder at a second end. Displacement of the lifting cylinder causes a displacement of the pivotal connection between the rolling cylinder and the lifting cylinder.

**[0010]** This invention is further directed to a plow vehicle comprising a frame, a plow, a lifting cylinder pivotally connected to the plow and pivotally connected to the frame, and a rolling cylinder pivotally connected to the plow at a first end and pivotally connected to the frame at a second end. Displacement of the lifting cylinder causes a displacement of the pivotal connection between the rolling cylinder and the frame.

**[0011]** These and other aspects of the invention will become apparent upon reading the following disclosure in accordance with the Figures.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0012]** The details and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings.

**[0013]** FIG. 1 is side view of a cylinder assembly used to connect a plow support to a vehicle in accordance with the prior art:

**[0014]** FIG. 2 is a side view of a cylinder assembly using the bracket in accordance with this invention to connect a plow support to a vehicle.

**[0015]** FIG. 3 is a side view of the plow and support of FIG. 1 connected to a vehicle in accordance with the prior art shown in a lowered position and a raised position;

**[0016]** FIG. 4 is side view of the plow and support with the bracket of FIG. 2 connected to a vehicle in accordance with this invention shown in a lowered position and a raised position; and

**[0017]** FIG. 5 is a view of a vehicle using the bracket in accordance with the invention as part of the plow support assembly.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

**[0018]** This invention is described for illustrative purposes for use on a vehicle such as a snow groomer, which is typically a tracked vehicle having snow grooming tools and accessories connected thereto. As would be appreciated by one of ordinary skill in the art, this device would be applicable to any type of vehicle used to move and shape the ground, including snow and earth. Thus, this invention is not limited to use on a snow groomer, but rather is intended to be applicable to earth moving equipment used in farming and construction as well.

**[0019]** Typically, a snow groomer 100 has a plow 15, seen in FIGS. 3 and 4, used to move material and shape terrain. Control of the vehicle and the plow 15 is conventional and



would be understood by those skilled in the art and therefore is not discussed in detail herein.

**[0020]** In prior art assemblies, as seen in FIGS. 1 and 3, a plow support is formed as a series of pistons 10 including cylinders, such as hydraulic or pneumatic as known, connected to a vehicle frame 21. A rigid arm 28 also connects to the plow 15.

**[0021]** As seen in FIG. 1, the plow support includes a lifting cylinder 19, a rolling cylinder 25, and rigid arm 28. The lifting cylinder 19 is connected to the frame 21 at pivot point 13 to rotate around pivot point axis 18. The slidable piston associated with lifting cylinder 19 is secured to an end 30 of the rigid arm 28 at a pivot point 34. The rigid arm 28 is connected at one end 32 to the frame 21 and the other end 30 to the plow 15 at a pivotal connection 36, also seen in FIG. 3. The rolling cylinder 25 is connected to the frame 21 above the lifting cylinder 19 at a pivot point 14 to rotate around a pivot axis 17. The other end of the rolling cylinder 25 is connected to the plow 15 at the other end 24, as seen schematically in FIG. 3. As can be seen in dashed lines in FIG. 1, the movable cylinders that define the movement of the plow define a triangle with the pivot points 13 and 14 in a fixed relationship. By this, the lifting and rolling movement of the plow 15, illustrated in FIG. 3, is constrained. In FIG. 3, the lowered position 30 is shown in solid lines, while the raised position 40 is shown in dotted lines.

**[0022]** FIG. 2 shows a side elevation of the cylinders assembly 10 after the installation of the bracket 12 in accordance with this invention that makes the rolling cylinder pivot point 14 unconstrained by attachment to the frame 21 to which the plow 15 is attached. FIG. 4 shows a side elevation of the whole plow assembly 20 after the installation of the bracket 12 that makes the rolling cylinder pivot point 14 unconstrained in its movement. FIG. 4 also shows the plow 15 in a lowered 30 position in solid lines and a raised position 40 in dotted lines.

**[0023]** As shown in FIG. 4, the rolling cylinder pivot point 14 and the lifting cylinder pivot point 13 are rotatably secured to the bracket 12 around their respective axis 17 and 18. The rolling cylinder pivot point 14 is also secured so that it can freely rotate with the bracket 12 around the lifting cylinder pivot point axis 18 with the displacement of the lifting cylinder 19. The lifting cylinder pivot point 18 is also attached to the frame 21. Therefore, it is

rotatably secured to the frame 21 and the bracket 12. By this, the movable cylinders 10 define a movable parallelogram with the pivot point 13 being the only fixed position.

**[0024]** As shown in FIG. 2, the new bracket 12 allows the plow displacement 16 to increase from about 25.5 to 43.1 degrees in an elevated position 40 and from about 22.3 to 34.4 degrees in a lowered position 30 without affecting the aggressivity of the plow 15 while grooming. FIG. 2 also shows the rolling cylinder 25 attached to plow 15 at a first end 24 (plow 15 shown in FIG. 4) and rolling cylinder 25 pivotally attached to bracket 12 at a second end 26.

**[0025]** The rigid arm 28 is also shown in FIG. 2. Arm 28 is pivotally connected to the plow 15 at its first end 30 at pivotal connection 36 (plow 15 shown in FIG.4) and to the frame 21 at its second end 32. It would be recognised by one skilled in the art that when lifting cylinder 19 is activated, arm 28 is forced to pivot about its second end 32 with respect to the frame 21 and thus displaces the plow 15 in a generally vertical direction. Preferably, lifting cylinder 19 is pivotally connected to the arm 28 at pivotal connection 34 to prevent any tilting of the plow 15 while plow 15 is being vertically lifted. As would be recognised by one skilled in the art, pivot point 34 could be situated on the plow 15 as well.

**[0026]** Other arrangements of the present invention will be apparent to those skilled in the art and are, therefore, encompassed by the description hereinbefore.

**What is claimed is:**

1. A plow vehicle comprising:
  - a frame;
  - a plow;
  - a lifting cylinder pivotally connected to the plow for lifting the plow with respect to the frame;
  - a rolling cylinder pivotally connected to the plow for tilting the plow with respect to the frame; and
  - a bracket pivotally connected to the frame,wherein the lifting cylinder is fixedly connected to the bracket and the rolling cylinder is pivotally connected to the bracket.
2. The plow vehicle of claim 1, further comprising a rigid arm pivotally connected to the plow and pivotally connected to the frame.
3. The plow vehicle of claim 2, wherein the lifting cylinder is pivotally connected to the rigid arm.
4. A plow vehicle comprising:
  - a frame;
  - a plow;
  - a lifting cylinder pivotally connected to the plow and pivotally connected to the frame;and



a rolling cylinder connected to the plow at a first end and pivotally connected to the lifting cylinder at a second end,

whereby displacement of the lifting cylinder causes a displacement of the pivotal connection between the rolling cylinder and the lifting cylinder.

5. The plow vehicle of claim 4, wherein the pivotal connection between the lifting cylinder and the rolling cylinder has a pivot axis that coincides with the pivotal connection between the lifting cylinder and the frame.
6. The plow vehicle of claim 4, further comprising a bracket fixedly attached to the lifting cylinder, the bracket including the pivotal connection between the lifting cylinder and the rolling cylinder.
7. The plow vehicle of claim 6, wherein the bracket further comprises the pivotal connection between the lifting cylinder and the frame.
8. The plow vehicle of claim 7, further comprising a rigid arm pivotally connected to the plow and pivotally connected to the frame.
9. The plow vehicle of claim 8, wherein the lifting cylinder is pivotally connected to the rigid arm.
10. A plow vehicle comprising:
  - a frame;
  - a plow;

a lifting cylinder pivotally connected to the plow and pivotally connected to the frame;  
and

a rolling cylinder pivotally connected to the plow at a first end and pivotally connected to the frame at a second end,

whereby displacement of the lifting cylinder causes a displacement of the pivotal connection between the rolling cylinder and the frame.

11. The plow vehicle of claim 10, further comprising a bracket pivotally connected to the frame and fixedly connected to the lifting cylinder.

12. The plow vehicle of claim 11, wherein the bracket is pivotally connected to the rolling cylinder such that movement of the lifting cylinder causes displacement of the pivotal connection between the bracket and the rolling cylinder.

13. The plow vehicle of claim 12, further comprising a rigid arm pivotally connected to the plow and pivotally connected to the frame.

14. The plow vehicle of claim 13, wherein the lifting cylinder is pivotally connected to the rigid arm.



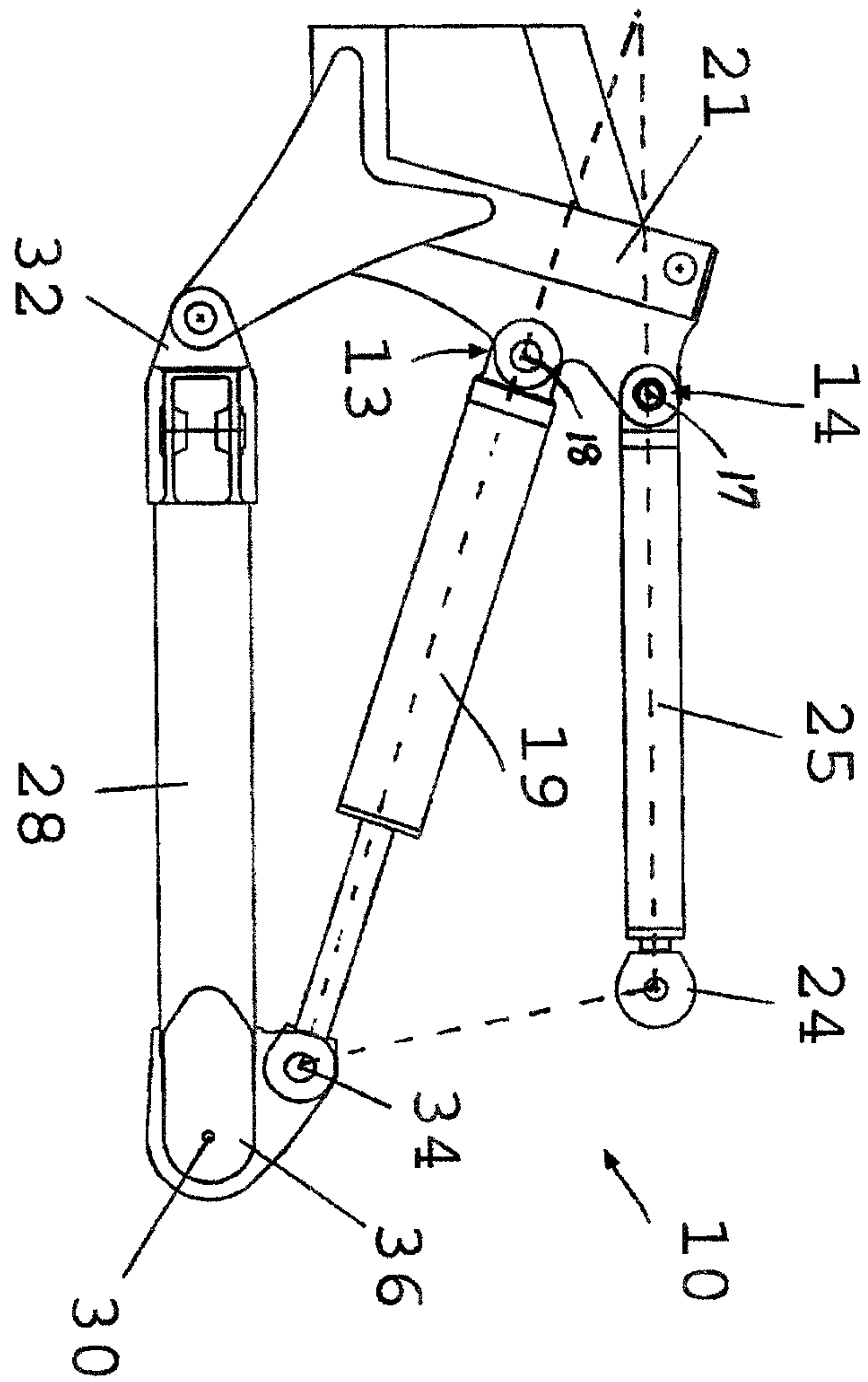
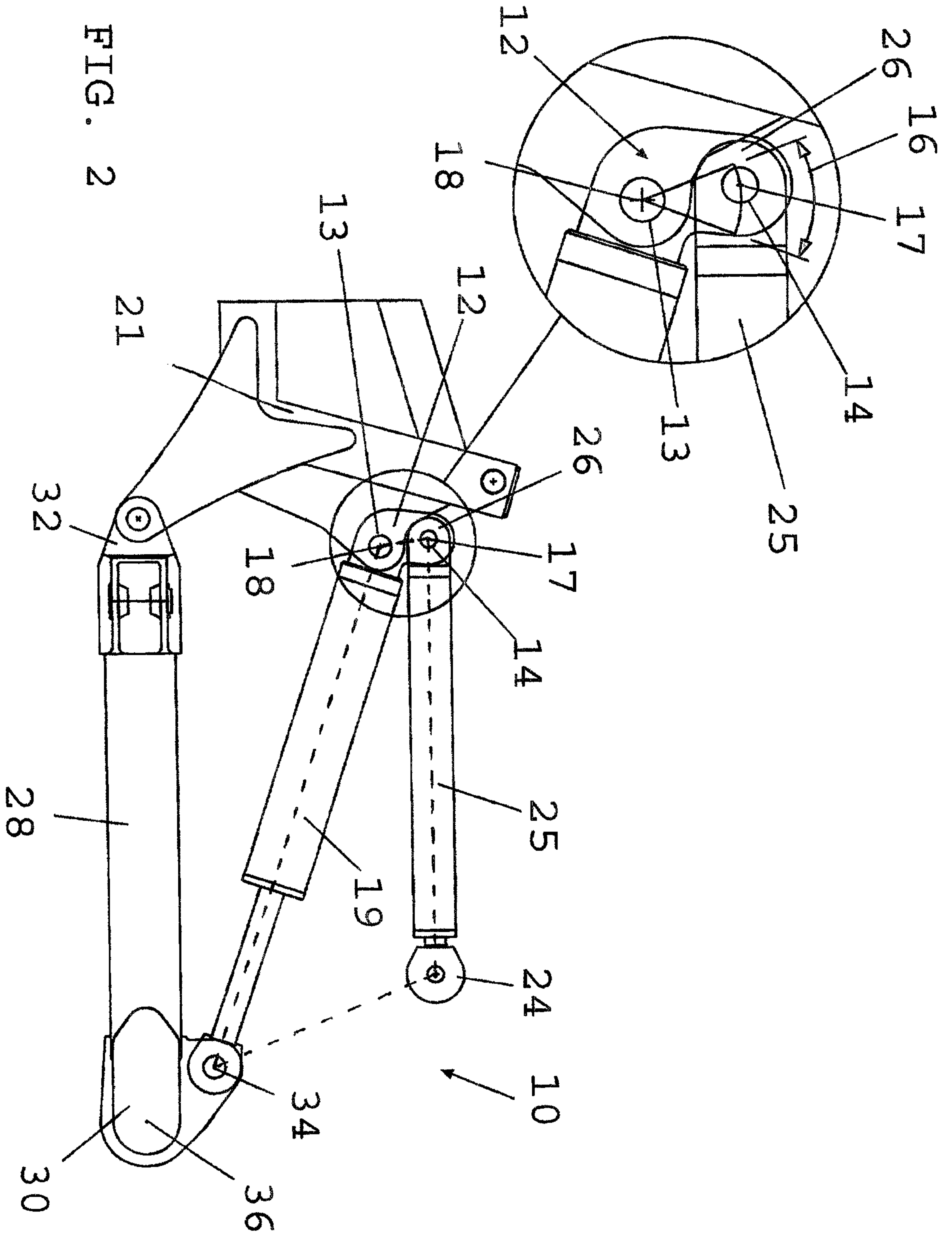


FIG. 1  
PRIOR ART





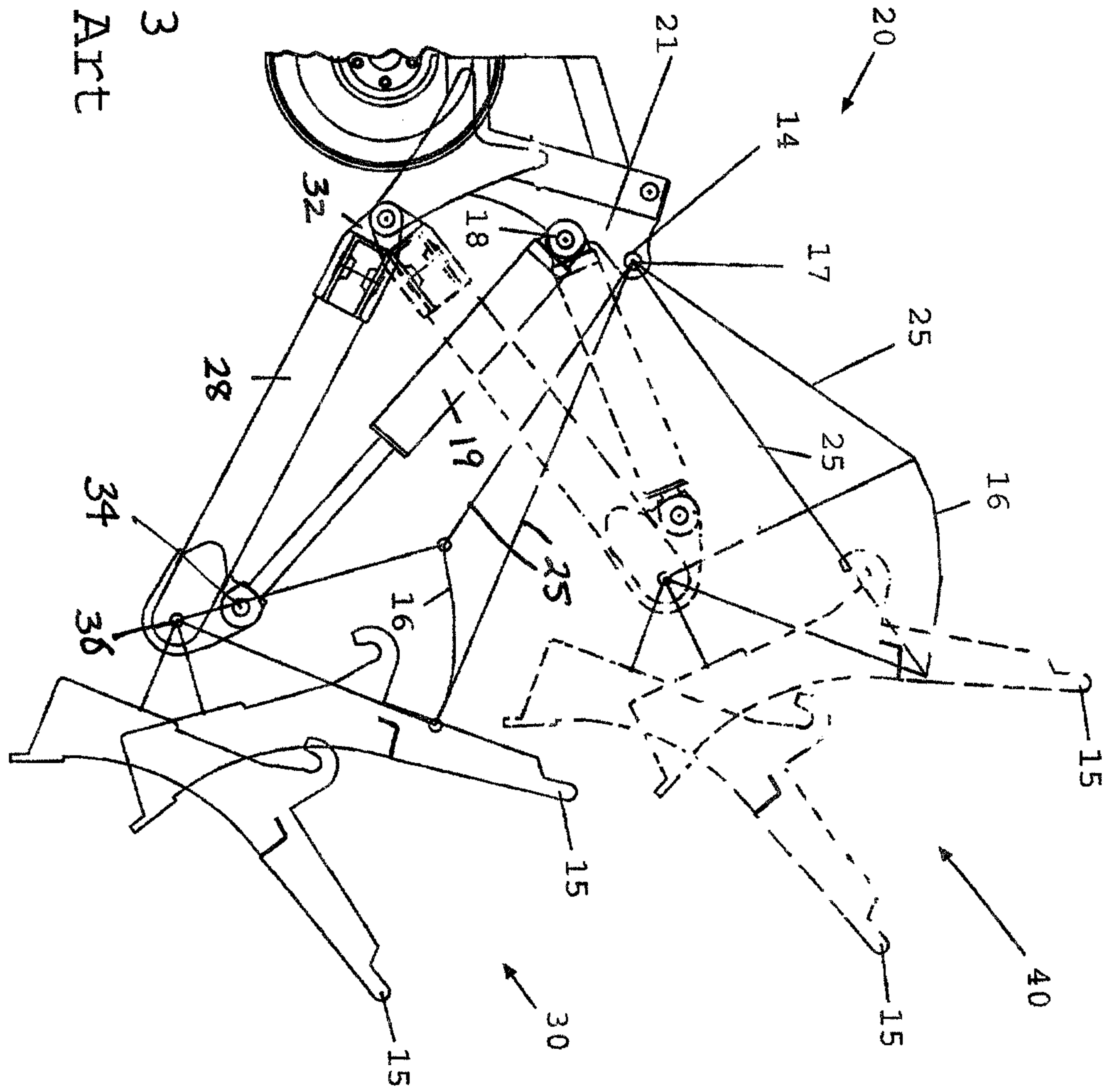


FIG. 3  
PRIOR ART

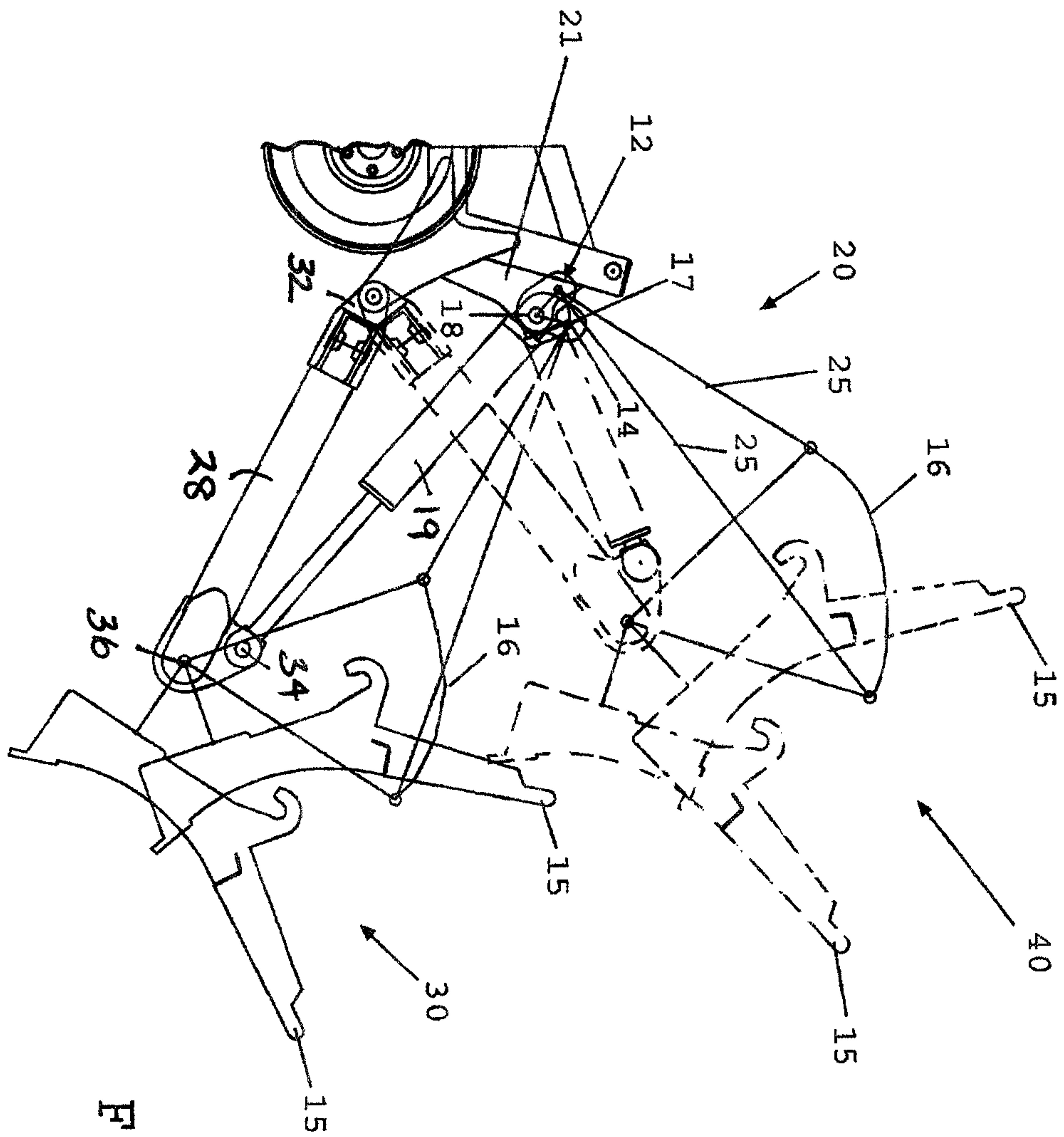


FIG. 4



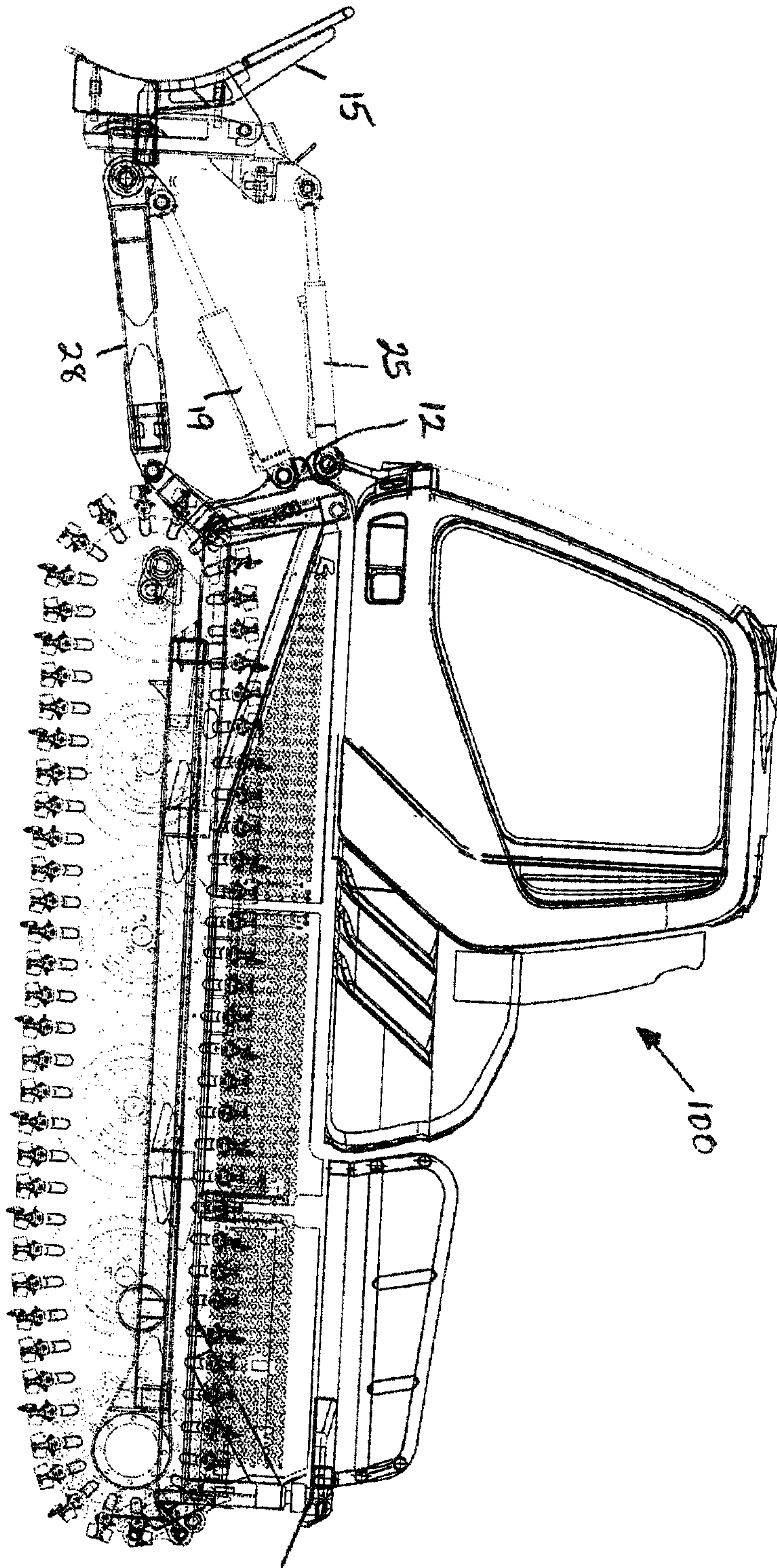


FIG. 5

