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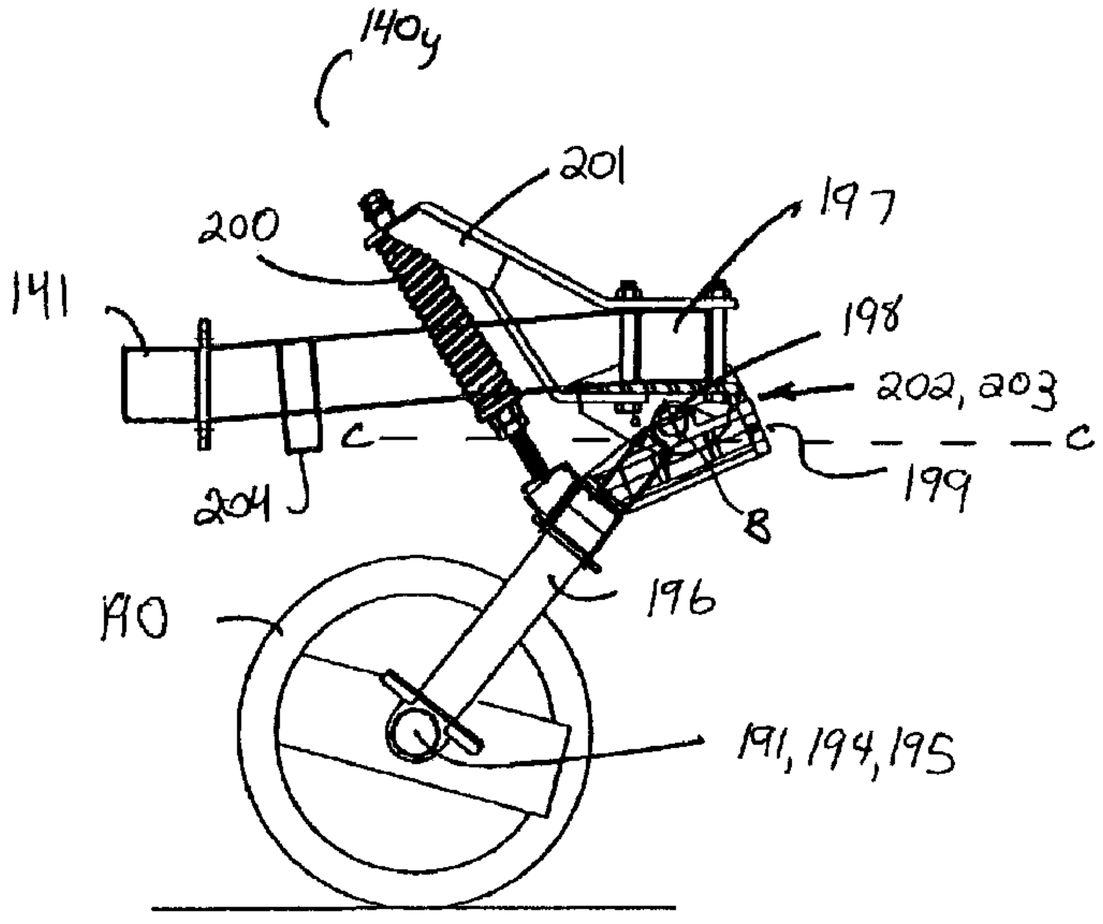
(54) Titre : EQUIPEMENT COMPRENANT UN NOUVEAU CADRE DE SOUTIEN
(54) Title: IMPLEMENT COMPRISING NEW FRAME SUPPORT MEANS



(57) Abrégé/Abstract:
The present invention relates to a new frame support that prevents implement frames and parts from experiencing high forces and instead, transmits the forces through the ground working tools down to the ground. The frame support can be used in conjunction with the suspension system of any implement adapted for travel over the ground and preferably, the invention is used in conjunction with an agricultural packer. The packer may be of any size, but typically is of a five section configuration. In the preferred embodiment, the frame support is a rigid protrusion fixed to the packer frame above the packer coil. The frame support could also be a flat plate, or a rolling element. The frame support is adapted to contact the packer coil during the wing up and wing down operations of the implement. When the frame support and the packer coil contact, the high forces incurred during the wing up and wing down operations are transmitted through the frame support and packer coil down to the ground. In this way, the packer coil subframe does not experience these high loads. The packer coils are preferably mounted to the forward lateral member of each frame section, alternating between being mounted behind the lateral member and being mounted in front of the lateral member. Another embodiment would be to mount the packer coils to the frame alternating between the forward and rearward lateral frame members. Alternately, the packer coils could be mounted to the implement frame in any fashion deemed suitable. In another embodiment, the individual packer coils could be replaced with a gang of packer coils for mounting to the frame.

ABSTRACT

The present invention relates to a new frame support that prevents implement frames and parts from experiencing high forces and instead, transmits the forces through the ground working tools down to the ground. The frame support can be used in conjunction with the suspension system of any implement adapted for travel over the ground and preferably, the invention is used in conjunction with an agricultural packer. The packer may be of any size, but typically is of a five section configuration. In the preferred embodiment, the frame support is a rigid protrusion fixed to the packer frame above the packer coil. The frame support could also be a flat plate, or a rolling element. The frame support is adapted to contact the packer coil during the wing up and wing down operations of the implement. When the frame support and the packer coil contact, the high forces incurred during the wing up and wing down operations are transmitted through the frame support and packer coil down to the ground. In this way, the packer coil subframe does not experience these high loads. The packer coils are preferably mounted to the forward lateral member of each frame section, alternating between being mounted behind the lateral member and being mounted in front of the lateral member. Another embodiment would be to mount the packer coils to the frame alternating between the forward and rearward lateral frame members. Alternately, the packer coils could be mounted to the implement frame in any fashion deemed suitable. In another embodiment, the individual packer coils could be replaced with a gang of packer coils for mounting to the frame.

IMPLEMENT COMPRISING NEW FRAME SUPPORT MEANS

FIELD OF THE INVENTION

The invention relates generally to implements with suspension systems adapted for travel over the ground and specifically to wing type implements that are comprised of wing sections that fold up for transport.

BACKGROUND

Wing type packers are packers generally comprised of wing sections extending laterally and being pivotally attached to one another. These agricultural packers can include a number of wing sections extending laterally across the packer drawbar resulting in an implement extremely long in width. Therefore, it has been common practice to provide a means to fold these wing sections upwards about a horizontal axis to provide a narrow width for transporting the implement between different locations. This wing up method for putting the implement in a transport position is accomplished a variety of ways by different manufacturers. Similarly, the packer also includes means to wing down for putting the implement in a working position.

In the prior art, it is common for the wing up and wing down operations to incur heavy forces on the packer coil subframe. These high forces are concentrated along the hinge line about which the wing sections are rotating. Generally this means the packer frame must be designed to withstand these forces over a number of years. If the packer frame is not sufficiently designed with this in mind, the packer will invariably fail over extended use.

There exists a demand by farmers for agricultural implements including packers to be efficient and economical in order for the farmer to remain competitive. Generally a packer utilizing standard parts across the whole machine as opposed to utilizing parts specifically designed to meet high forces is more economical. An agricultural packer must also prove durable during multiple occurrences of wing up and wing down operations over a number of years.

For the foregoing reasons, there is a need for a packer design that increases control during wing up and wing down operations of a packer so that the high loads during these operations are not experienced by the frame, but are transmitted through the coil down to the ground.

SUMMARY

The present invention relates to a new frame support that prevents implement frames and parts from experiencing high forces and instead, transmits the forces through the ground working tools down to the ground. The frame support can be used in conjunction with the suspension system of any implement adapted for travel over the ground. Preferably, the invention is used in conjunction with an agricultural packer.

In accordance with one aspect of the invention, there is provided, an implement comprising: a frame; a ground engaging roller mounted to the frame; a suspension system operatively connecting the roller to the frame, the suspension system comprising a spring for biasing the roller toward the ground; and a frame support means fixed to the frame above the roller.

In accordance with one aspect of the invention, a three section agricultural packer comprised of one wing frame section pivotally attached to each side of the middle frame section and extending laterally therefrom, the wing frame section being able to wing up and wing down for putting the implement in the transport and working positions respectively, and a frame support fixed to the frame is provided.

In accordance with another aspect of the invention, a five section agricultural packer comprised of two wing sections pivotally attached to each side of the middle frame section and extending laterally therefrom, the wing frame sections being able to wing up and wing down for putting the implement in transport and working positions, and a frame support fixed to the frame is provided.

In accordance with another aspect of the invention, there is provided an agricultural packer comprising: a frame, the frame comprising a middle frame section and at least one wing frame section pivotally attached and extending laterally from the middle frame section; a hitch affixed to the middle frame section; at least one transport wheel rotatably attached to the middle frame section; at least one packer coil mounted on each

frame section; means for pivotally lifting the wing frame section to a wing up position wherein the wing frame section is in a transport position, and for pivotally lowering the wing frame section to a wing down position wherein the wing frame section is in a working position; at least one frame support means on the frame, the frame support means being positioned above at least one of the packer coils so that the frame support means is adapted to contact the packer coil during the wing up and wing down operations.

In accordance with another aspect of the invention, there is provided an agricultural packer comprising: a frame comprising a forward lateral frame member extending laterally; a hitch affixed to the frame;at least one transport wheel mounted to the frame; multiple packer coils mounted to the forward lateral frame members, the packer coils alternating between being mounted behind the forward lateral frame member and being mounted in front of the forward lateral frame member.

In accordance with yet another aspect of the invention, there is provided an agricultural packer comprising: a frame, the frame comprising a middle frame section and at least one wing frame section pivotally attached and extending laterally from the middle frame section, each frame section comprising a forward frame member extending laterally and a rearward frame member extending laterally; a hitch affixed to the frame; at least one transport wheel mounted to the frame; at least one packer coil mounted to the forward lateral frame member of the middle frame section and at least one packer coil mounted to the rearward lateral frame member of the middle frame section; and multiple packer coils mounted to the remaining forward lateral frame members, the packer coils alternating between being mounted behind the forward lateral frame member and being mounted in front of the forward lateral frame member.

In another aspect of the invention, the frame support means is located above the roller on the wing frame sections that experience the highest loads during the wing up and wing down operations.

In another aspect of the invention, the frame support means is located above all the rollers on the frame of the packer.

In another aspect of the invention, the frame comprises multiple frame supports, each frame support positioned above each packer coil.

In other aspects of the invention, the frame support is either a rigid protrusion, a flat plate, or a rolling element.

Other aspects and advantages of the invention, as well as the structure and operation of various embodiments of the invention, will become apparent to those ordinarily skilled in the art upon review of the following description of the invention in conjunction with the accompanying drawings.

DRAWINGS

Figure 1 is a front perspective view of a five section packer in the working position;

Figure 2 is a rear view of the packer shown in Figure 1 in the transport position;

Figure 3 is a top plan view of the embodiment shown in Figure 1;

Figure 4 is a close up side view of the packer coil in both the working and transport positions;

Figure 5 is a similar view to that of Figure 4 except with the packer coil in the transition position between the working and transport positions;

Figure 6 is a front perspective view of the roller of Figure 5;

Figure 7 is a rear view of the packer shown in Figure 1 in the transition position of Figure 5;

Figure 8 shows a general roller and suspension system in the working position;

Figure 9 shows the assembly of Figure 8 in the transition position;

Figure 10 shows another embodiment of a general roller and suspension system; and

Figure 11 is of the same view of Figure 3 illustrating a different embodiment of the implement.

DETAILED DESCRIPTION

Figures 1-7 show what is generally referred to as an agricultural packer 100. As seen in Figure 3, generally, packer 100 comprises a frame 105 divided into a middle frame section 120 and pair of inner wing frame sections 140, 160 extending laterally from either side of the middle frame section. Some packer designs may further include

an additional pair of outer wing sections 150, 170 extending laterally on either side from the first pair of wing frame section. Figure 1 shows only the middle frame section 120 and two wing frame sections 140, 150 extending laterally therefrom. Wing frame section 140 is comprised of an inner end 140x toward the middle section and an outer end 140y toward outer wing section 150.

It will be understood that the other half of the implement comprised of wing frame sections 160 and 170 is the mirror image along axis AA. It should also be noted that the invention is described in conjunction with a five section packer, the invention can readily be adapted to smaller and larger packers.

A towing hitch 115 extends from the middle frame section 120 for towing the implement behind a power source (not shown) such as a tractor.

Mounted to the frame 105 are rollers 190. In this case the rollers are packer coils. The packer coils traverse the ground as the implement is pulled by the power source and pack the soil over which they are pulled. This results in a reduction in moisture loss from the soil and also breaks down any clods present in the soil. The packer can be used singly or in conjunction with another implement, such as a cultivator or air seeder.

Transport wheels 130, 131 are also mounted to the middle section 120 to facilitate transport of the implement when the wing sections are in the wing up position.

The implement also includes hydraulic cylinders to facilitate the wing up and wing down operations as is detailed below.

As seen in Figure 3, the middle frame section 120 comprises forward and rearward laterally extending frame member 121, 122 rigidly attached by joining members 123, 124, 125, 126. In a similar fashion each wing section also consists of a forward and rearward laterally extending frame member rigidly attached by joining members. For the sake of clarity, only the wing frame sections of Figure 1 will be described in detail. As seen in Figure 3, inner wing section 140 includes lateral frame members 141, 142 rigidly attached by joining members 143, 144. Outer wing section 150 includes lateral frame members 151, 152 rigidly attached by joining member 153.

Each wing section including the middle section is attached to one another by a hinge. Hinge 180 connects lateral frame members 121 and 141, hinge 181 connects lateral frame members 122 and 142, hinge 182 connects lateral frame members 151 and

141, and hinge 183 connects lateral frame members 152 and 142. The axis formed by each hinge is parallel to the direction of travel and is the axis each wing section rotates about for the wing up and wing down operations.

The transport wheels 130, 131 are each mounted to the middle section 120 and can rotate freely about axles 132, 133 respectively. Fixed axles 132, 133 are affixed to the lower end of the wheel support members 134, 135 respectively. Wheel support members 134, 135 are pivotally attached by their upper ends to the rearward laterally extending frame member 122.

Attachment of the roller to the frame can be done in a number of ways. In the preferred embodiment, the roller is a packer coil. As seen in Figure 6, the packer coil 190 is of spiral shape as is common in the art. The packer coil subframe comprises an axle 191 affixed to either end of the packer coil 190 by end plates 192, 193. The ends of axle 191 are rotatably engaged in bearings 194, 195. The bearings 194, 195 are affixed to either end of roller support member 196.

The packer coils may be all mounted to their respective frame similarly and include similar suspension systems. For the sake of clarity, the mounting and suspension system of packer coil 190 to lateral frame member 141 will be detailed. It should be noted that the mounting and suspension system of the packer coils can be done in a number of different ways.

As seen in Figures 4, 5 and 6, roller support member 196 is affixed to lateral frame member 141 by means of two mutually perpendicular axes BB and CC. Axis BB is defined by roller pivot 198 and is parallel to the ground and perpendicular to the direction of travel. Axis CC is defined by pivot member 199 and is parallel to the direction of travel. These axes permit the packer coil 190 to pivot obliquely relative to lateral frame member 141 as it trails behind mount 197 thereby avoiding damage to the packer coils or wing frame sections. Spring 200 is pivotally attached to roller support member 196 and to plate 201. The tightness of the spring is such to bias the packer coil downwards. To limit the downward rotation about BB, stop members 202, 203 are used. Stop member 202 is rigidly attached to roller pivot 198 and mount 197, while stop member 203 is rigidly attached to roller pivot 198 and pivot member 199. In the preferred embodiment, stop member 202 comprises a left plate 202a and right plate 202b

attached to mount 197 and rigidly attached to one another by bar 202c. Stop member 203 preferably is a bar 203d with an upper surface 203.

Multiple packer coils are mounted to the wing frame sections. The layout in which the packer coils are mounted is varied. One embodiment is shown in Figure 1 wherein the packer coils are mounted to the forward lateral frame member of each wing section121, 141, 151, alternating between being placed in front of or behind the lateral frame member. The packer coils are staggered and overlap so as to ensure complete packing of the soil during use. Another embodiment would be to mount the packer coils to the frame alternating between the forward and rearward lateral frame members. Another embodiment would be to include at least one packer coil mounted to the rearward lateral frame member of the middle section and at least one packer coil mounted to the forward lateral frame member of the middle section as seen in Figure 11. Alternately, the packer coils could be mounted to the implement frame in any fashion deemed suitable.

In another embodiment, the individual packer coils could be replaced with a gang of packers for mounting to the frame.

As seen in Figures 4, 5 and 6, spring 200 of the suspension system applies pressure to member 196 to force the packer coil 190 downward relative to frame 141 against stops 202, 203 in the working position. During use, individual packer coils can ride up over obstacles by virtue of axes BB and CC. Spring 200 can also raise the wing frame sections 140, 150, 160, 170 to follow the ground contours and obstacles in the field.

The nature of stop members 202, 203 also limit the vertical rotation of the packer coil in the transport position. As shown in Figure 4, spring 200 pivots about roller pivot 198 until stop member 203 is in contact with stop member 202. Stop members 202, 203 also have width to support the packer coil 190 and prevent rotation about CC when in the wing up position.

The implement frame further includes a frame support means 204 rigidly attached thereto as seen in Figures 4, 5 and 6. The location of 204 is such that the packer coil 190 comes in contact with frame support means 204 when a sufficient predetermined vertical force is applied to the frame, such as the forces applied during the wing up and wing

down operations of the packer. In the current example, frame support means 204 is shown in Figures 4 and 5 to be fixed on the outer end of wing frame 140y.

As is common in the art, hydraulics are used to facilitate the wing up and wing down operations of the implement. As seen in Figure 1, a first pair of hydraulic cylinders are lift cylinders 230, 231 attached between wheel support members 134, 135 to frame members 220, 221 respectively. Activation of lift cylinders 230, 231 lifts the middle frame section 120.

A second pair of hydraulic cylinders are wing cylinders 234, 235. Wing cylinder 235 is attached between lateral frame member 122 and lateral frame member 142. Wing cylinder 234 is attached between lateral frame member 142 and lateral frame member 152. Both wing cylinders are pivotally attached to their respective lateral frame members. Wing cylinders 234, 235 and hinges 180, 181, 182, 183 permit the wing up and wing down operations as detailed below.

In the preferred embodiment, to convert the implement to the transport position as shown in Figure 2, the forward travel of the implement must be stopped. Then, hydraulic cylinders 230, 231, 234, 235 are actuated. All cylinders are free to communicate oil such that the operation which requires the lowest pressure will be accomplished first. Cylinders 230, 231 are actuated to pivot the middle frame section 120 upward with respect to ground engaging wheels 130, 131. This lifts the packer coils mounted to middle frame section 120 upward out of contact with the ground and from the position shown in Figure 4 to the position shown in Figure 5. To a limited extent, the wing sections are also raised as the middle frame section is lifted.

In another embodiment, the frame support 204 could be a rolling element. This would allow the implement to be winged up and winged down while the implement is still moving forward.

Hydraulic cylinders 235, 234 then act on wings 140, 150 respectively pivoting the outer wing section 150 upward about a horizontal axis. The similar operation is carried out on the mirror image of the implement to pivot outer wing section 170 upward.

When the outer wings 150, 170 are in the transition position shown in Figure 7, extremely high forces are required to support the outer end of wings 140, 160. As wings 150, 170 are raised to the position shown in Figure 7, the springs 200 are compressed to

allow rotation of the frame 196 upwards towards element 204 as shown in Figure 5. When element 204 contacts coil 190, the high forces are transmitted from frame 140 directly to the packer coil 190. Preferably, packer coil 190 is a very strong member. The high forces need not be transmitted through the packer implement, as especially through the packer subframe. Further actuation of the wing cylinders will move the packer into the full transport position shown in Figure 2. The packer is then in transport position, for towing on roads or across fields.

To convert the packer back to the working position, the cylinders are actuated in the reverse direction to lower the wings 140, 150, 160, 170 and to lower packer coils 190 into contact with the ground and from the position shown in Figure 5 back to the position shown in Figure 4.

Alternatively, frame support means 204 could also be used on the middle frame section or any wing section where high loads are encountered during the wing up or the wing down operation.

Thus far, the invention has been described in conjunction with an agricultural packer. However, this invention has utility in any implement adapted to travel over the ground. Figures 8, 9 illustrate this more general application of the invention. Figures 8,9 show a roller 300, which is illustrated as a wheel, pivotally attached to member 304 which in turn is pivotally attached to frame 302. Spring 301 is pivotally attached to member 304 on one end and to frame 302 on the other end to provide a suspension system to support frame 302. The spring also serves to bias the wheel 300 towards the ground. Under normal operation, the wheel 300 and the spring suspension system 301 provide adequate forces to carry the frame 302 in the position shown in Figure 8. If, however, there is a requirement for the frame 302 to be supported when extremely high forces are applied to the frame 302, the spring 301 can compress allowing the member 304 to rotate and the frame 302 to lower to the position shown in Figure 9. The wheel 300 comes in contact with frame support means 303 and forces are then transmitted directly through the wheel and down to the ground. This prevents excessively high forces from being transmitted through the suspension system 301. The frame support means 303 is illustrated as a flat plate, however, it could be a rigid protrusion as illustrated in Figures 4 and 5, or any other such suitable means. As mentioned above, it

could also be a rolling element as seen in Figure 10, thereby eliminating the need to stop the forward travel of the implement prior to winging up or winging down.

An advantage of the invention is to prevent the forces resulting from the wing up and wing down operations of the packer to be experienced by the implement frame.

An advantage of the invention is to transmit the forces resulting from the wing up and wing down operations of the packer to the ground.

An advantage of the invention is to allow the implement frame to use standard parts across the packer.

Numerous modifications, variations and adaptations may be made to the particular embodiments of the invention described above without departing from the scope of the invention, which is defined in the claims.

WHAT IS CLAIMED IS:

1. An implement comprising:

a frame;

a ground engaging roller mounted to the frame;

a suspension system operatively connecting the roller to the frame, the suspension system comprising a spring for biasing the roller toward the ground; and

frame support means fixed to the frame above the roller.

2. An implement as defined in claim 1, wherein the frame support means is a rigid protrusion.

3. An implement as defined in claim 1, wherein the frame support means is a flat plate.

4. An implement as defined in claim 1, wherein the frame support means is a rolling element.

5. An implement as defined in claim 1, whereby the suspension is adapted to permit the frame support means to contact the roller when a predetermined vertical force is applied to the frame.

6. An implement as defined in claim 5 in which the implement frame comprises:

a middle frame section; and

a wing frame section pivotally attached and extending laterally from the middle frame section.

7. An implement as defined in claim 6, wherein the frame support means is fixed to the middle frame section.

8. An implement as defined in claim 6 in which the frame support means is fixed to the wing frame section.

9. An implement as defined in claim 6 wherein the implement is an agricultural packer and the roller is a packer coil.

10. An implement as defined in claim 5 wherein the implement is an agricultural packer comprising:

a middle frame section;

a hitch affixed to the middle frame section;

at least one transport wheel rotatably attached to the middle frame section;

wing frame sections pivotally attached and extending laterally from the middle frame section; and

means for pivotally lifting the wing frame sections to a wing up position wherein the wing frame sections are in a transport position, and for pivotally lowering the wing frame sections to a wing down position wherein the wing frame sections are in a working position.

11. An implement as defined in claim 10 wherein the roller is a packer coil.

12. An implement as defined in claim 11, wherein multiple packer coils are mounted on the frame sections.

13. An implement as defined in claim 12, wherein the frame includes:

a forward lateral frame member extending laterally along the frame; and

each packer coil mounted on the wing frame section is mounted to the forward lateral frame member.

14. An implement as defined in claim 12, wherein the frame includes multiple frame support means mounted on the frame with a frame support means positioned above each packer coil.

15. An implement as defined in claim 11 wherein the frame support means is adapted to contact the packer coil during the wing up and wing down operations of the packer.

16. An implement as defined in claim 11 wherein the frame support means and packer coil are located adjacent the point of the highest load on the frame during the wing up and wing down operations.

17. An implement as defined in claim 10 wherein the suspension system permits the roller to pivot about at least one axis.

18. An agricultural packer comprising:

a frame, the frame comprising a middle frame section and at least one wing frame section pivotally attached and extending laterally from the middle frame section;

a hitch affixed to the middle frame section;

at least one transport wheel rotatably attached to the middle frame section;

at least one packer coil mounted on each frame section;

means for pivotally lifting the wing frame section to a wing up position wherein the wing frame section is in a transport position, and for pivotally lowering the wing frame section to a wing down position wherein the wing frame section is in a working position; and

at least one frame support means on the frame, the frame support means being positioned above at least one of the packer coils so that the frame support means is adapted to contact the packer coil during the wing up and wing down operations.

19. An agricultural packer as defined in claim 18, wherein the frame support means is a rigid protrusion.

20. An agricultural packer as defined in claim 18, wherein the frame support means is a flat plate.

21. An agricultural packer as defined in claim 18, wherein the frame support means is a rolling element.

22. An implement as defined in claim 18 wherein the frame support means and packer coil are located on the frame section adjacent to the frame section being winged up or winged down.

23. An implement as defined in claim 18, wherein the frame includes:

a forward lateral frame member extending laterally along the frame; and

each packer coil mounted on the wing frame section is mounted to the forward lateral frame member.

24. An implement as defined in claim 18, wherein the frame comprises multiple frame support means, each frame support means positioned above each packer coil.

25. An agricultural packer comprising:

a frame comprising a forward lateral frame member extending laterally;

a hitch affixed to the frame;

at least one transport wheel mounted to the frame; and

multiple packer coils mounted to the forward lateral frame members, the packer coils alternating between being mounted behind the forward lateral frame member and being mounted in front of the forward lateral frame member.

26. An agricultural packer comprising:

a frame, the frame comprising a middle frame section and at least one wing frame section pivotally attached and extending laterally from the middle frame section, each frame section comprising a forward frame member extending laterally and a rearward frame member extending laterally;

a hitch affixed to the frame;

at least one transport wheel mounted to the frame;

at least one packer coil mounted to the forward lateral frame member of the middle frame section and at least one packer coil mounted to the rearward lateral frame member of the middle frame section; and

multiple packer coils mounted to the remaining forward lateral frame members, the packer coils alternating between being mounted behind the forward lateral frame member and being mounted in front of the forward lateral frame member.

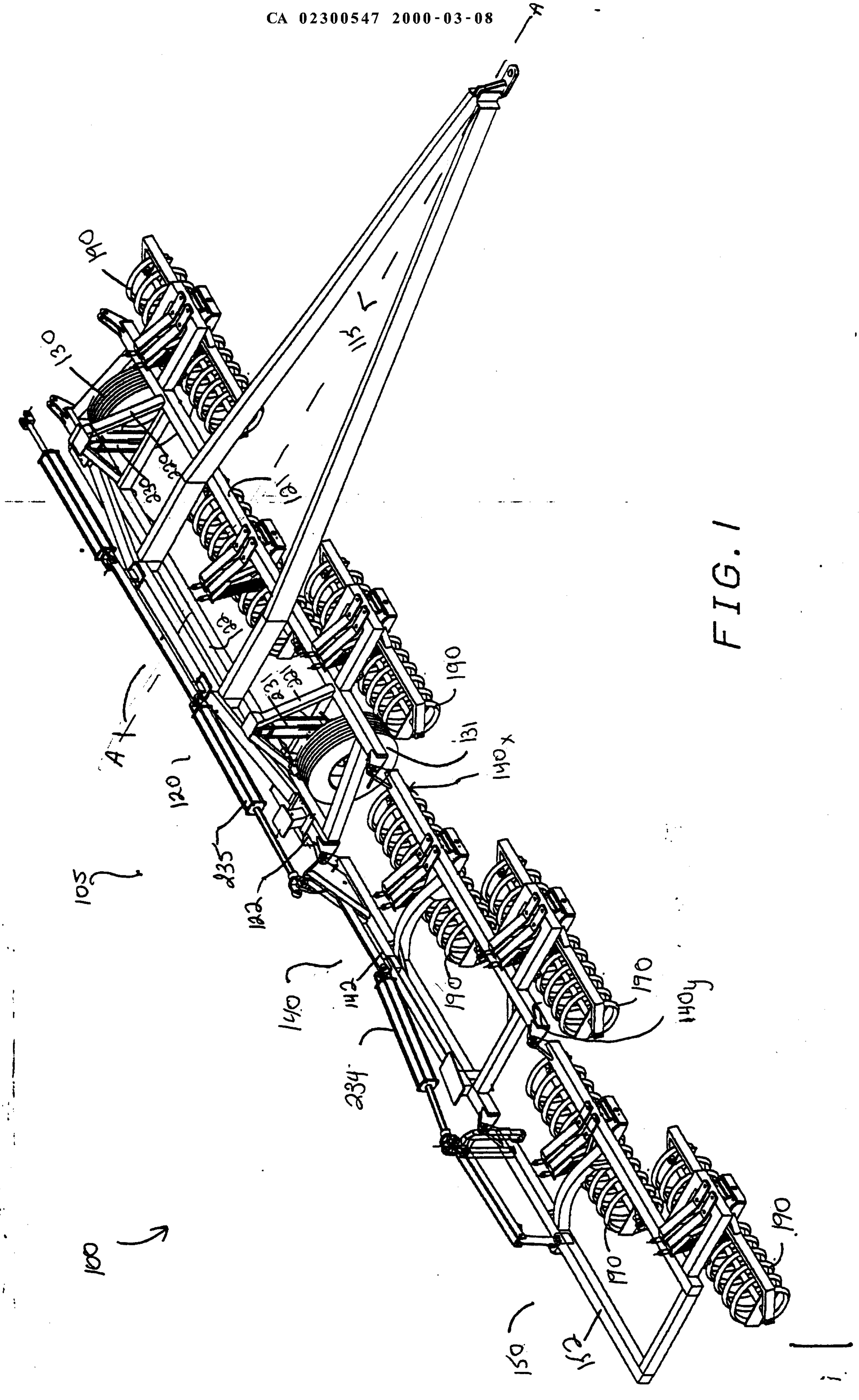


FIG. 1

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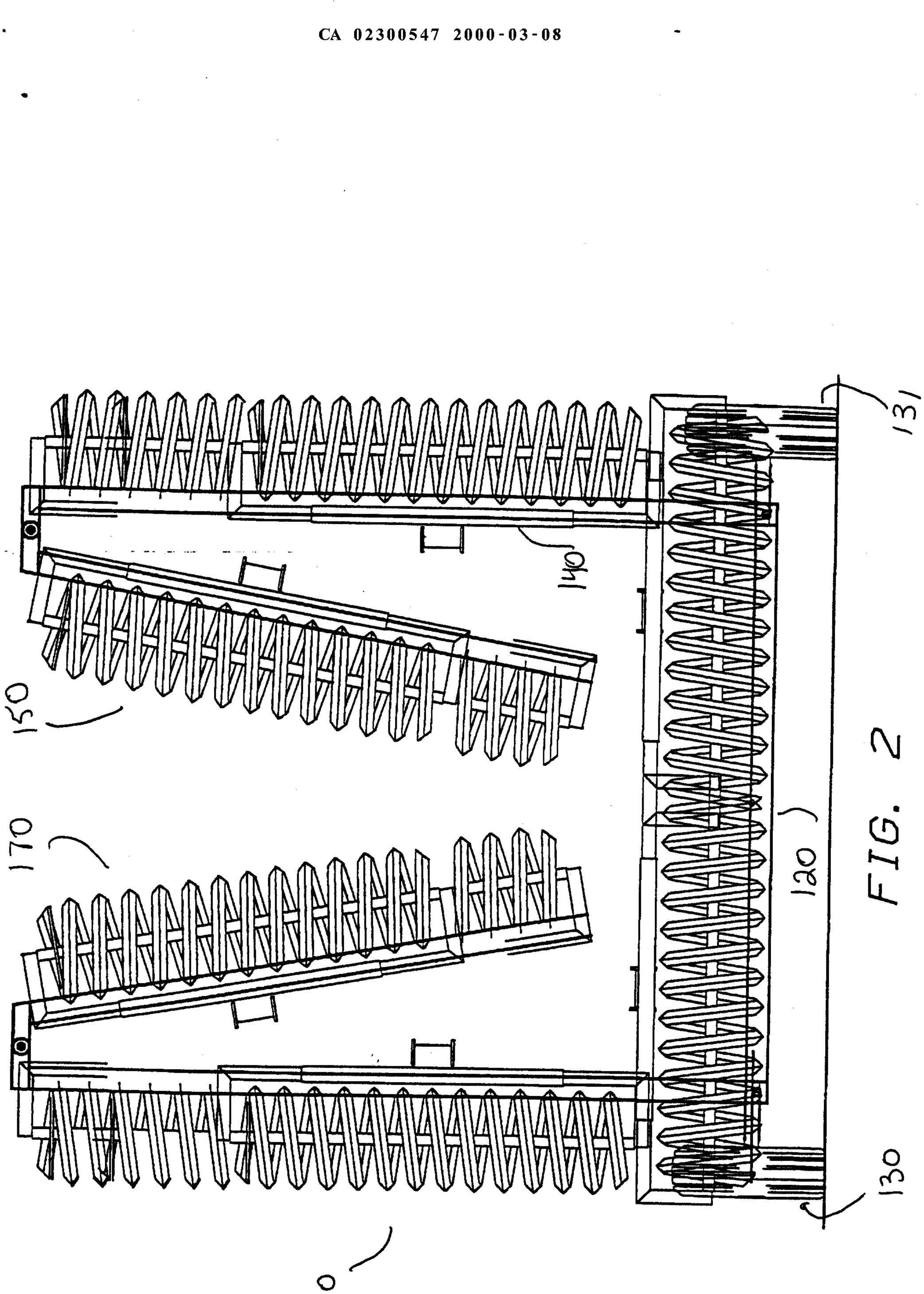

FIG. 2

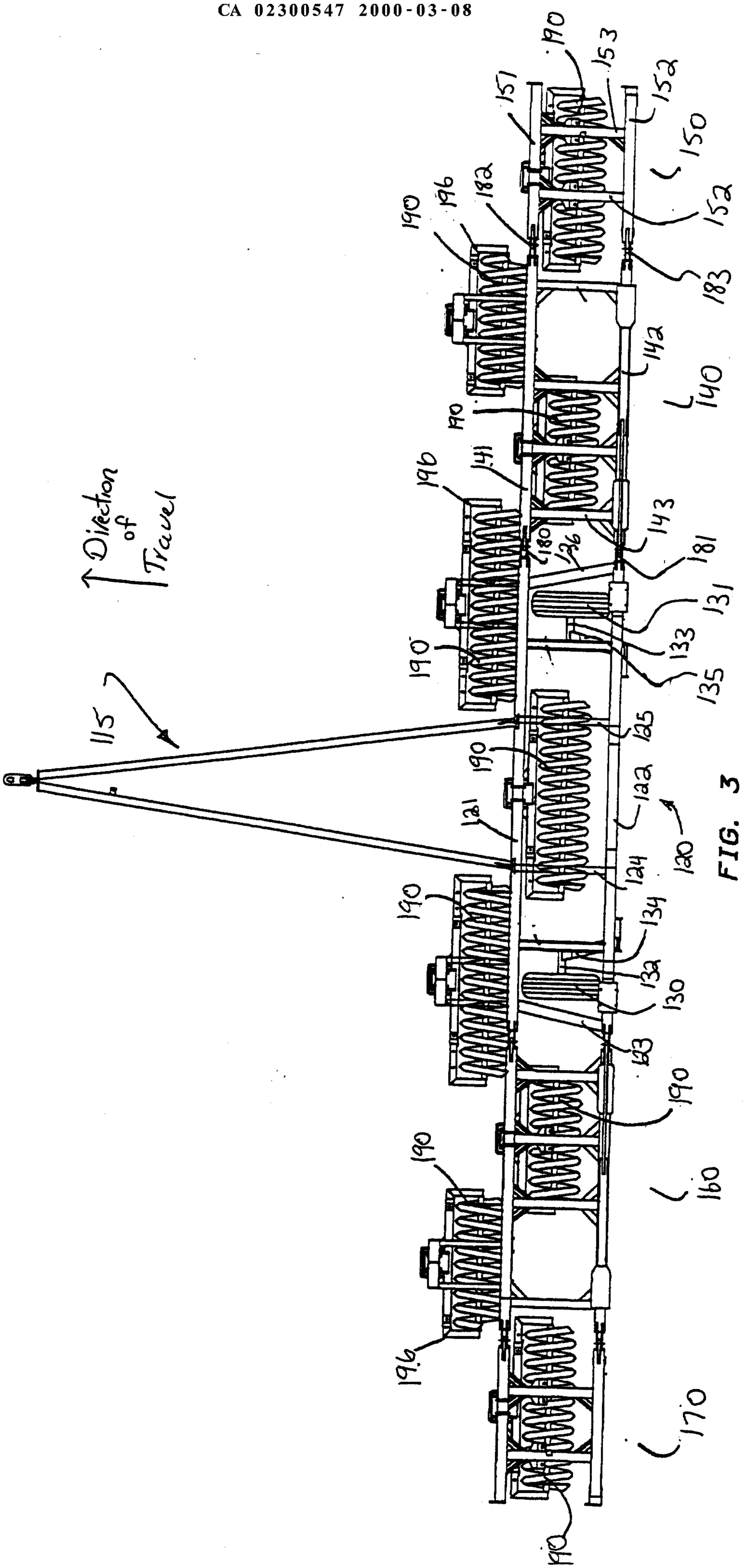
Direction of Travel
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FIG. 3

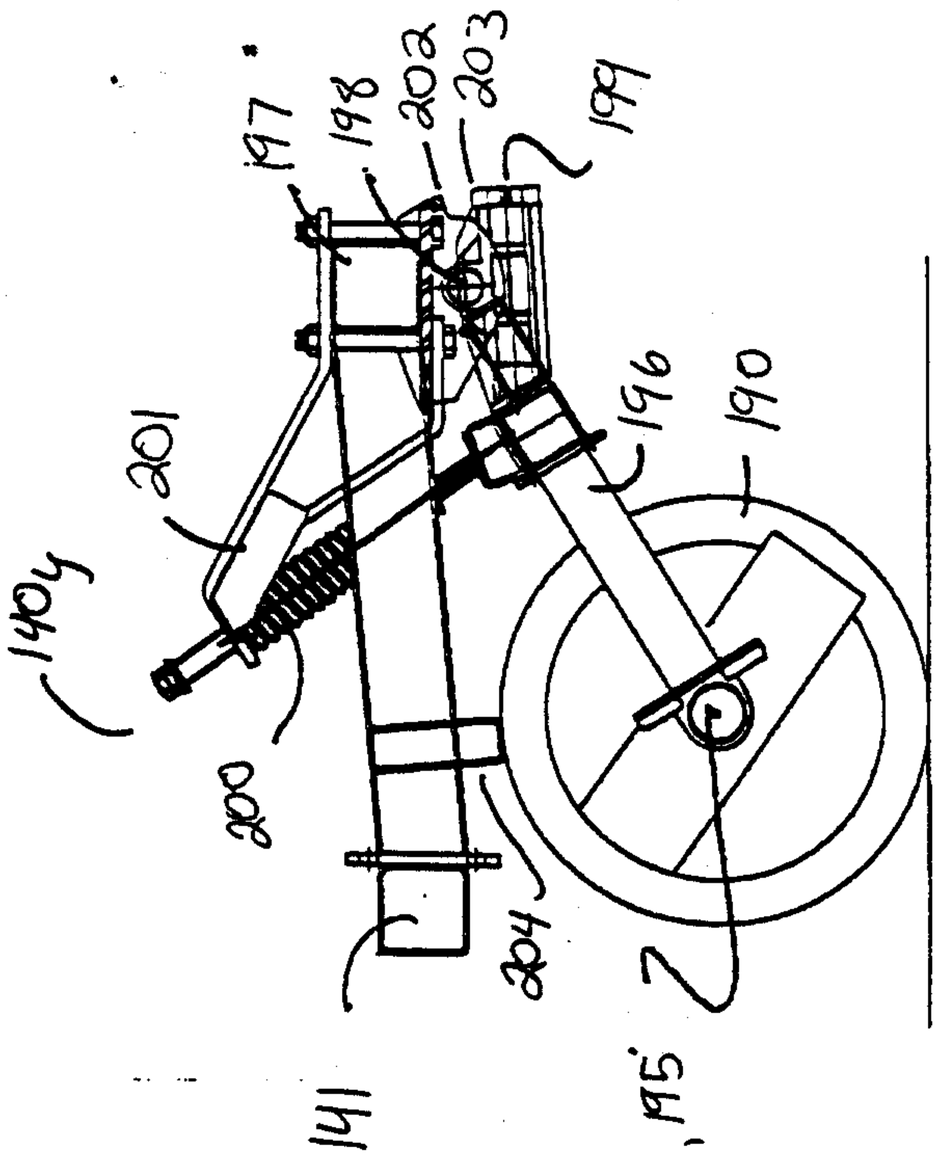

FIG. 5

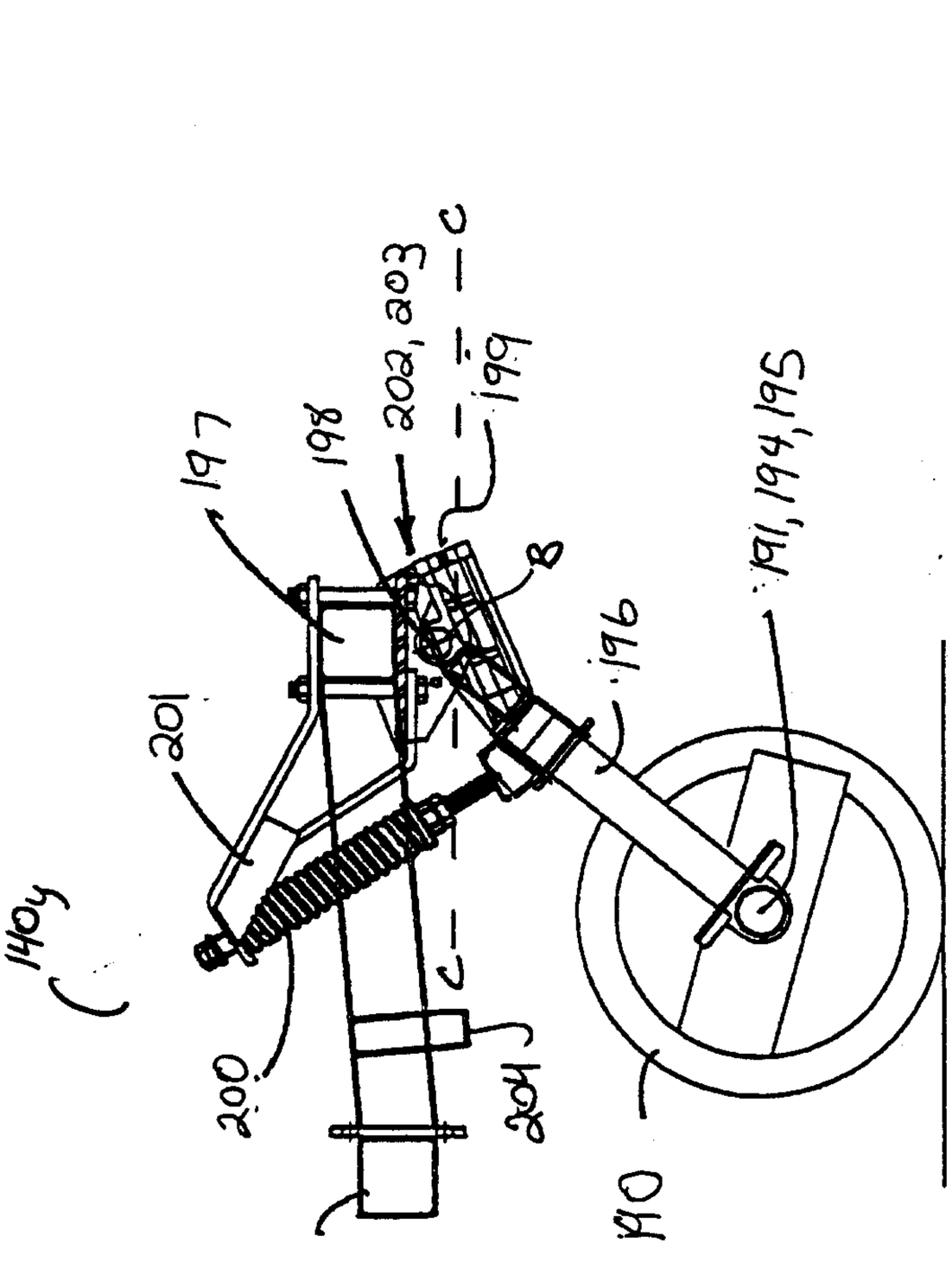

FIG. 4

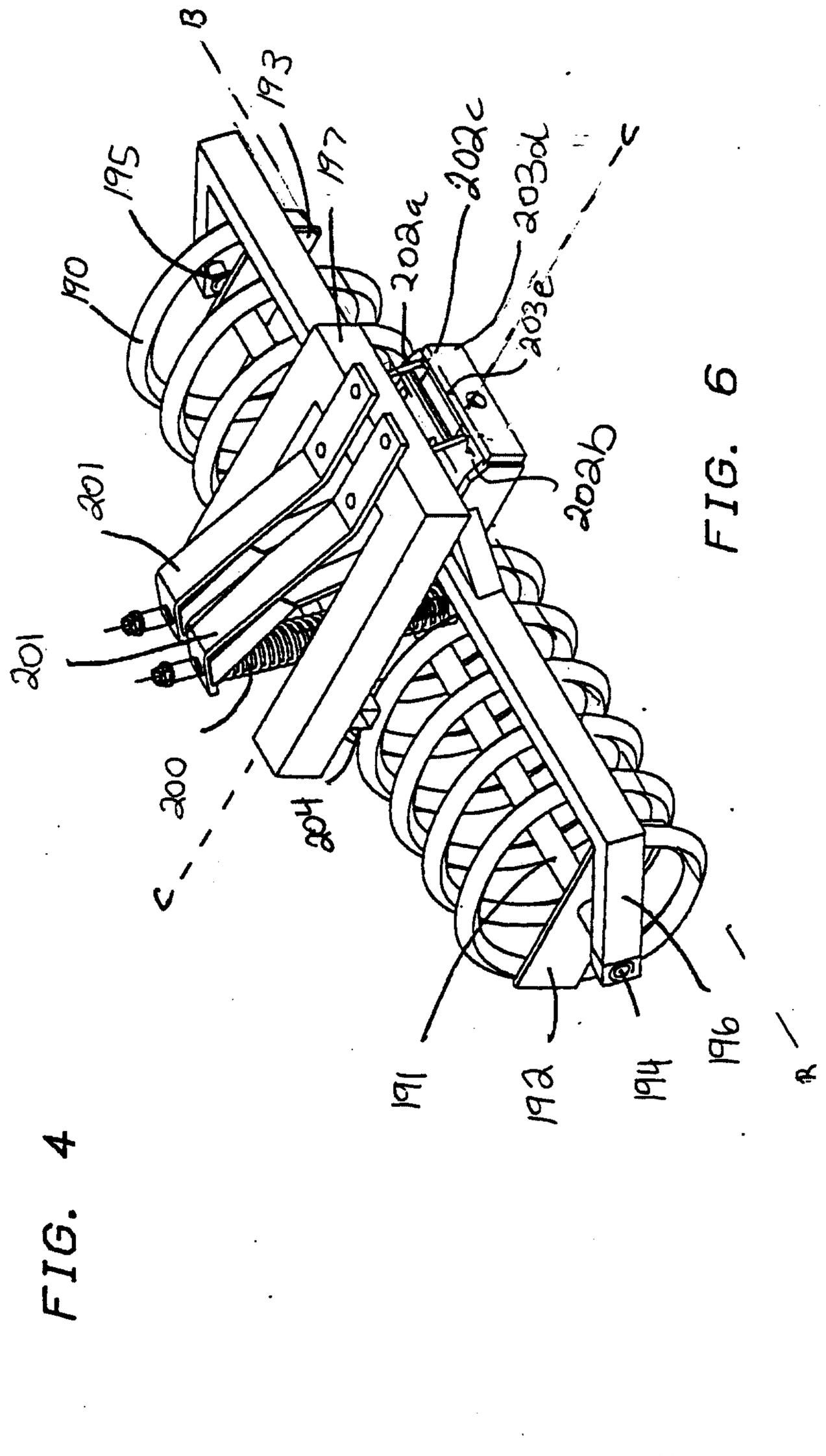

FIG. 6

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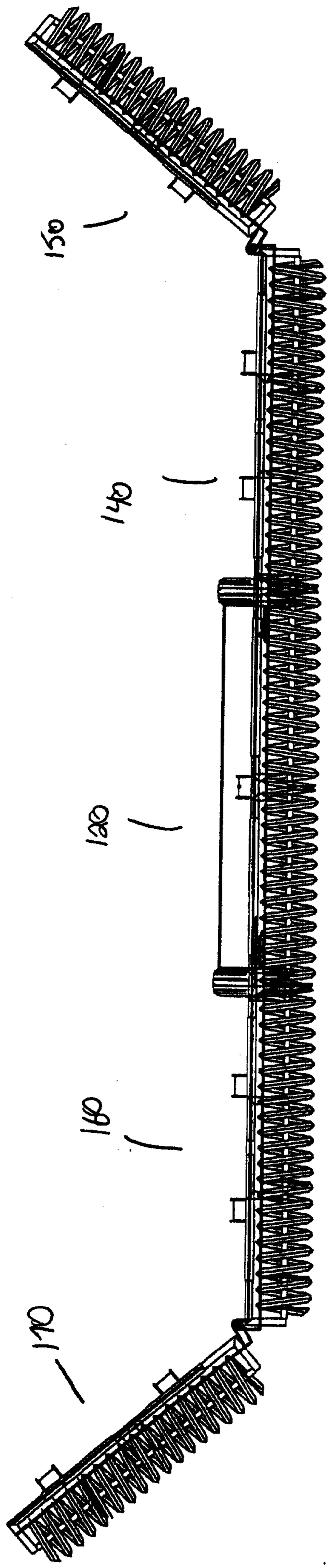


FIG. 7

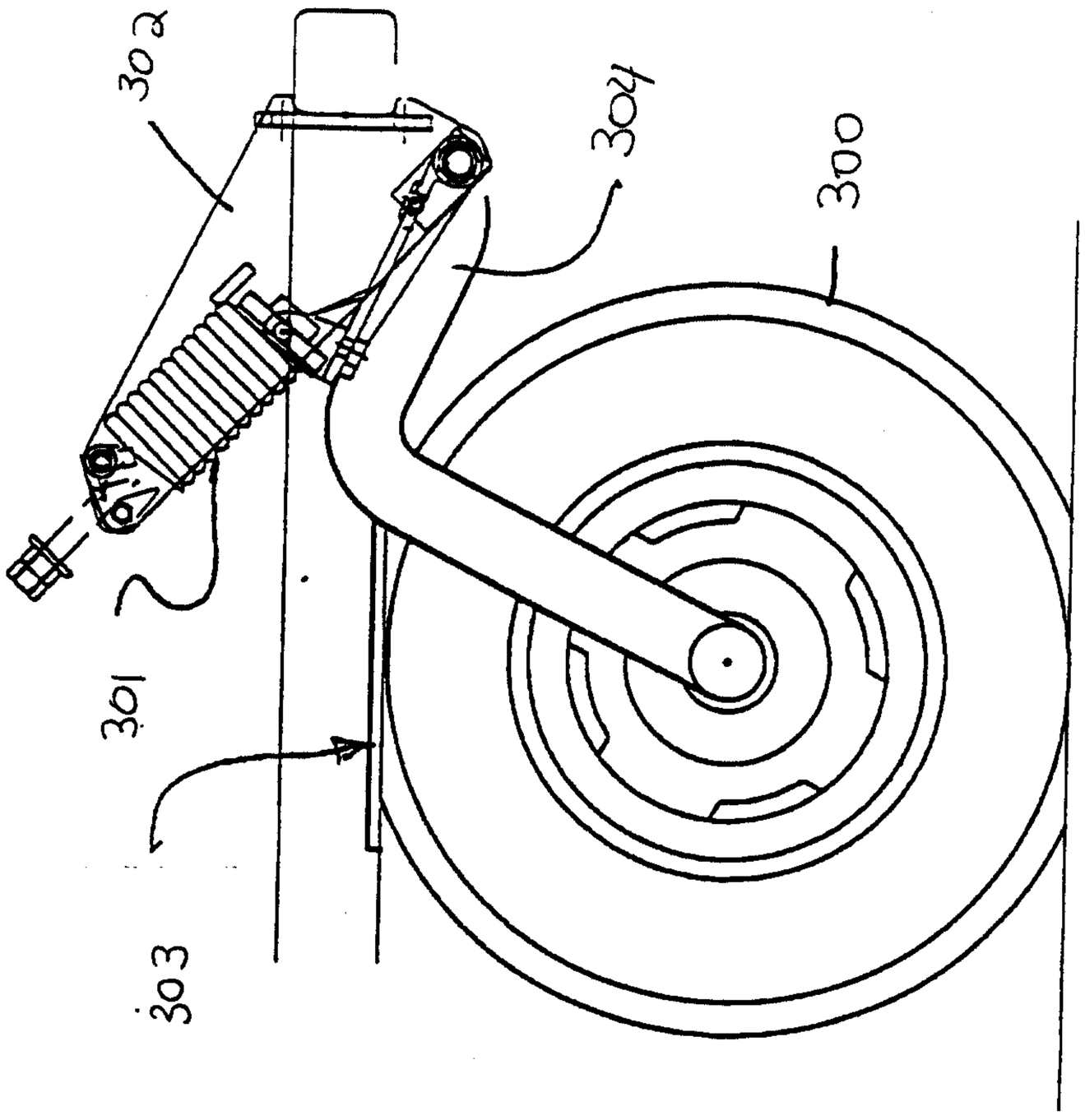


FIG. 6

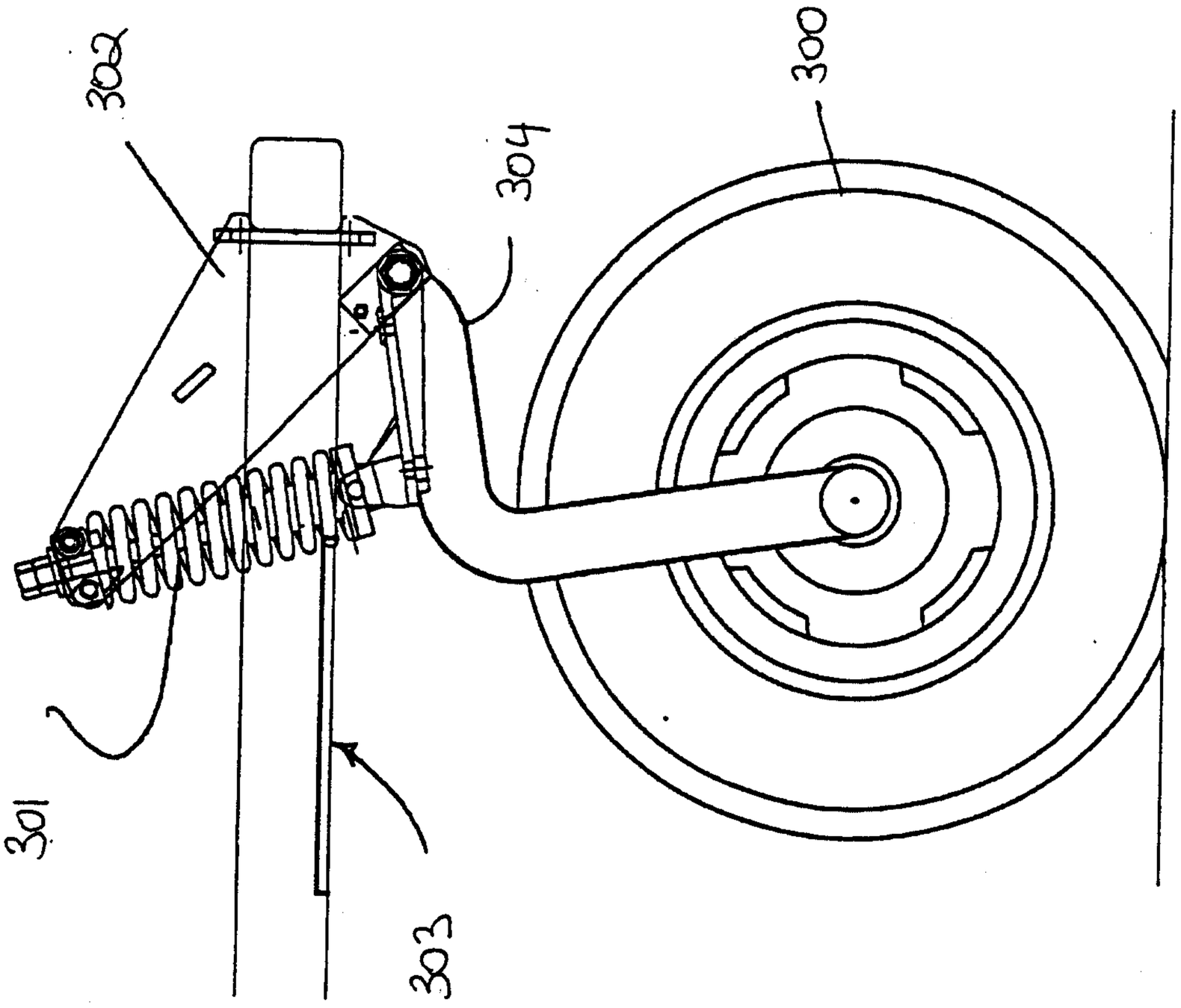


FIG. 8

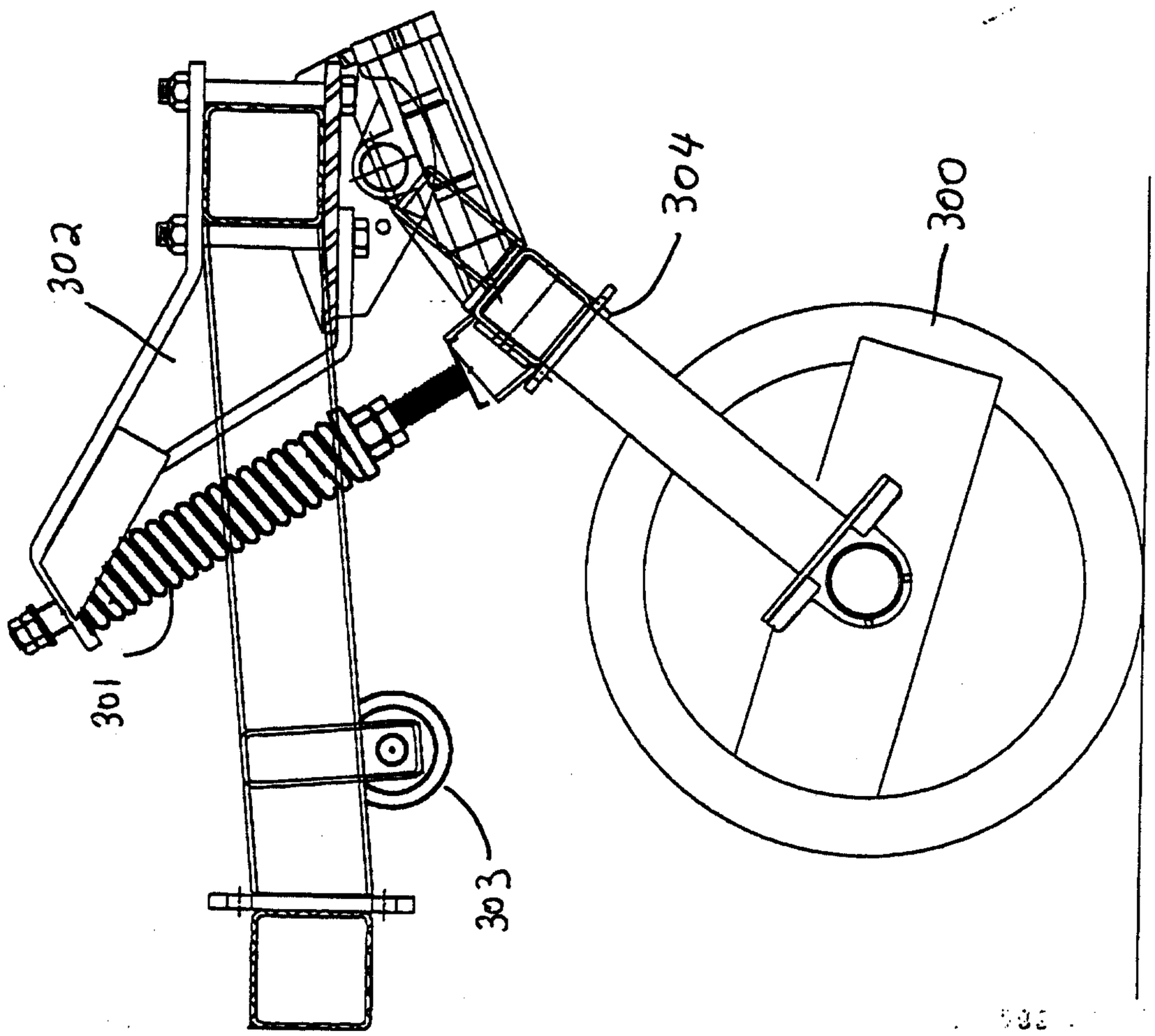


FIG. 10

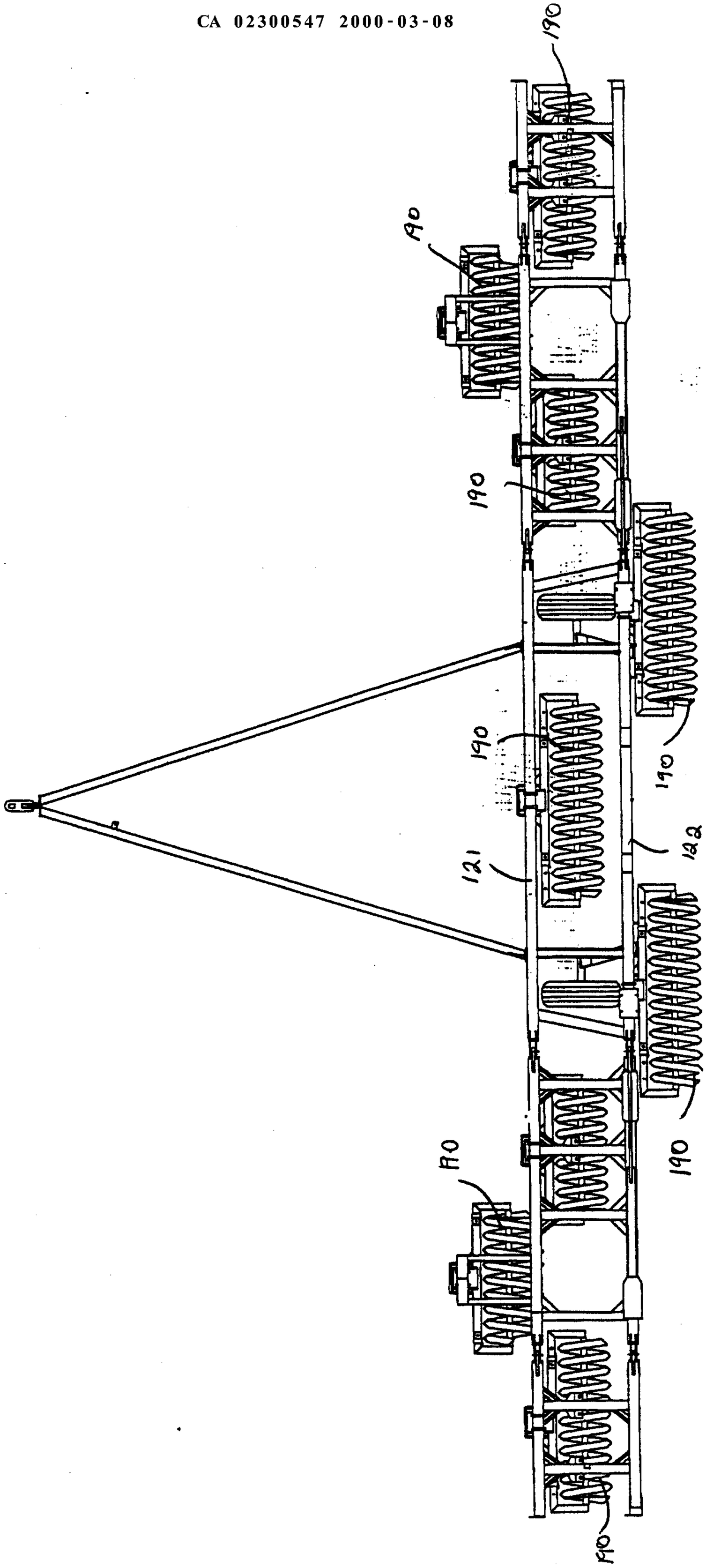
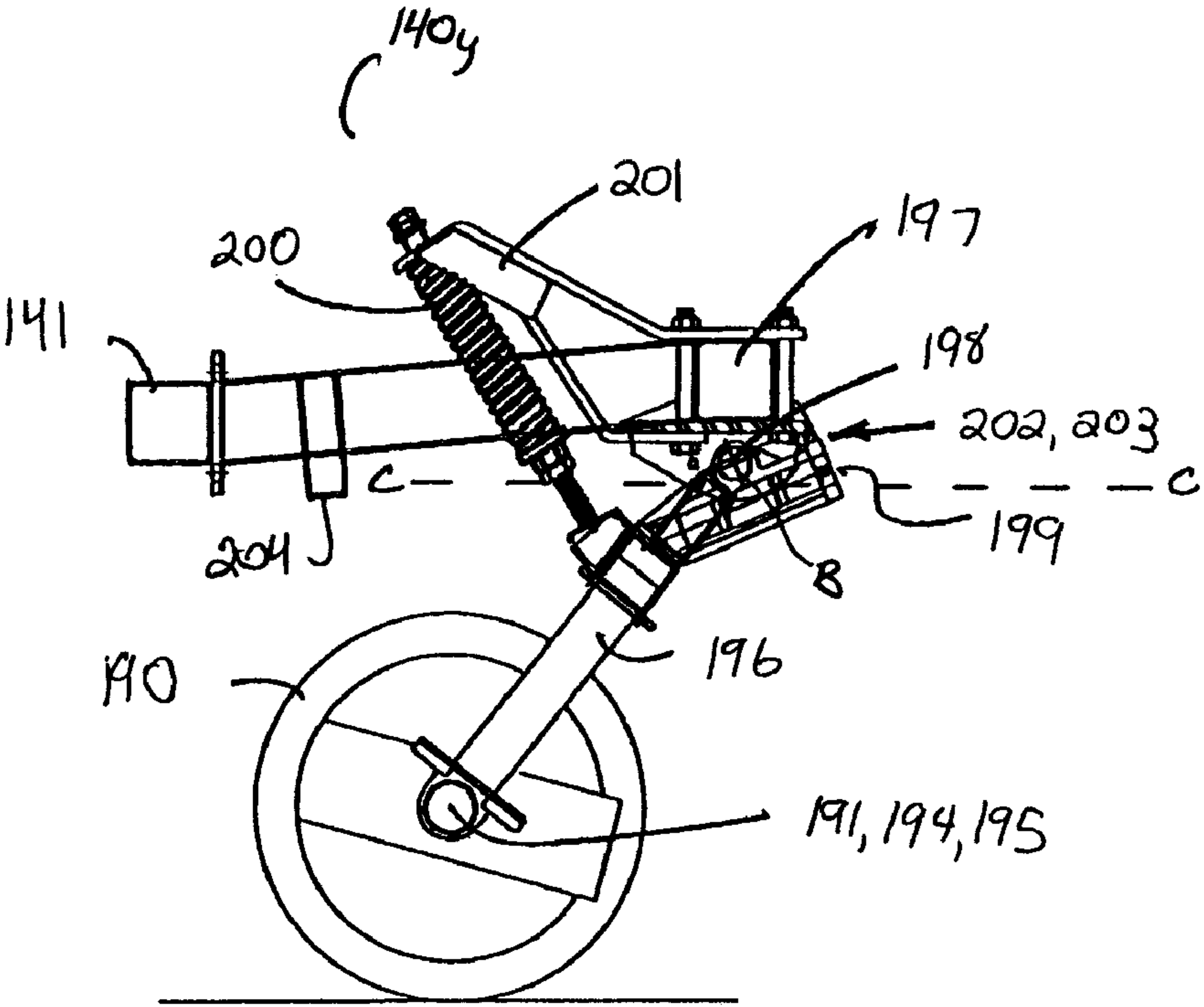


FIG. 11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