



(51) International Patent Classification:
A01D 45/02 (2006.01)

(21) International Application Number:
PCT/US2011/065783

(22) International Filing Date:
19 December 2011 (19.12.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

61/425,804	22 December 2010 (22.12.2010)	US
61/426,090	22 December 2010 (22.12.2010)	US
61/425,836	22 December 2010 (22.12.2010)	US
61/425,887	22 December 2010 (22.12.2010)	US
61/425,907	22 December 2010 (22.12.2010)	US
61/425,920	22 December 2010 (22.12.2010)	US
61/425,935	22 December 2010 (22.12.2010)	US
61/426,072	22 December 2010 (22.12.2010)	US
61/426,119	22 December 2010 (22.12.2010)	US
61/426,141	22 December 2010 (22.12.2010)	US
61/426,167	22 December 2010 (22.12.2010)	US
61/426,193	22 December 2010 (22.12.2010)	US
61/426,213	22 December 2010 (22.12.2010)	US
61/426,234	22 December 2010 (22.12.2010)	US
61/426,263	22 December 2010 (22.12.2010)	US
61/426,277	22 December 2010 (22.12.2010)	US
61/426,300	22 December 2010 (22.12.2010)	US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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Published:

— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: CANTILEVERED GATHERING AUGER FOR CORN HEADER

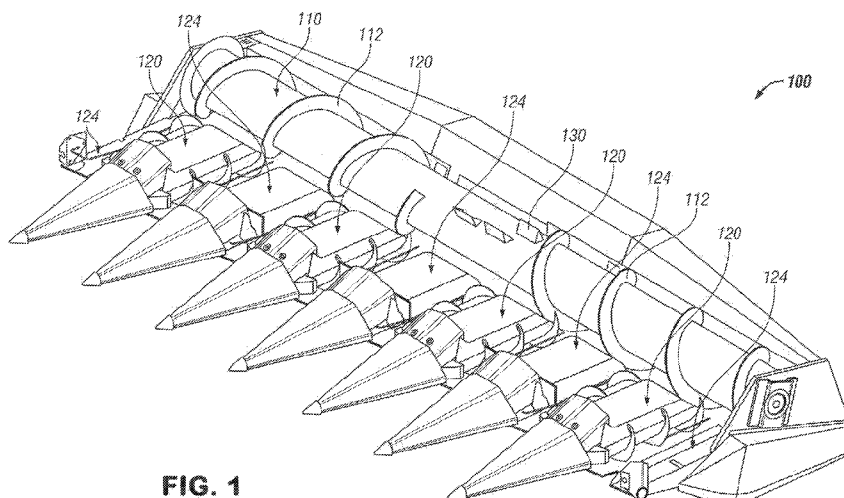


FIG. 1

(57) Abstract: A cantilevered gathering auger for a row unit of a harvesting header. The gathering auger cooperates with a stripper plate to remove useable parts from crop stalks gathered in a crop passage and to convey the stripped useable parts rearward into a cross auger of the header. The useable parts are conveyed rearward free of obstruction to the cross auger.



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

CANTILEVERED GATHERING AUGER FOR CORN HEADER

TECHNICAL FIELD

[001] This invention relates to cutting and gathering stalk crops such as corn with a header coupled to an agricultural vehicle.

5 BACKGROUND

[002] Agricultural harvesters such as combines are typically equipped with a harvesting header. Corn headers are specifically designed to pick corn and vary in size from two-row units to twelve-row units or more. As the harvester moves through the field, each row-unit passes between rows of corn. Corn header row units typically
10 use gathering chains to convey crop material and ears rearward toward a cross auger. A set of driven snap rolls, which rotate based on the speed of the harvester, grabs the corn stalks and forces them downward between stripper plates. The ears of corn are snapped free of the stalk and the cross auger passes the ears to the feeder housing of the harvester. If the snap rolls are operated too fast or too slow, ears of corn may be
15 lost or entire corn stalks may be passed to the cross auger and feeder housing.

[003] Known row units require two gathering chains and two tensioners which are heavy, expensive and wear out easily. Furthermore, the gathering chains create a complicated drive mechanism because the axes of the drive sprockets driving the chains are at right angles to the axes of the snap rolls. Also, the gathering chains do
20 not effectively convey a large mass of crop in conditions when material other than ears of corn, such as stalks and leaves, are severed from the ground. What is needed is a simpler and more cost effective row unit that is capable of conveying a large mass of crop.

BRIEF DESCRIPTION OF THE DRAWINGS

25 [004] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate various embodiments of the present invention. In the drawings:

[005] FIG. 1 shows a perspective view of a corn header having a plurality of row units for an agricultural vehicle;

30 [006] FIG. 2 shows a top view of the header of FIG.1;

[007] FIG. 3 shows a close-up view of a portion of the header of FIG. 1;

[008] FIG. 4 shows a portion of the bottom of the header of FIG. 1;

[009] FIG. 5 shows a close-up view of a portion of the bottom of the header of FIG. 1;

5 [010] FIG. 6 shows a perspective view of a frame which forms part of a live row unit and part of an adjacent dead row unit;

[011] FIG. 7 shows a close-up view of the header from the front with the gather auger in a horizontal position, offset and opposing stripper plates, and an idler roll offset from an opposing powered snap roll.

10 [012] FIG. 8 shows a perspective view of a pair of gathering augers and means for driving the augers and allowing them to pivot.

[013] FIG. 9 shows a close-up view of the position of fasteners in slots in a frame of a row unit which allows the gathering auger to pivot;

[014] FIG. 10 shows a gathering auger pivoted upward; and

15 [015] FIG. 11 shows the fasteners moved all the way to the opposite end of the slots when the gathering auger is pivoted upward.

DESCRIPTION OF EXAMPLE EMBODIMENTS

[016] The present invention is susceptible of embodiment in many different forms. While the drawings illustrate and the specification describes certain preferred
20 embodiments of the invention, it is to be understood that such disclosure is by way of example only. There is no intent to limit the principles of the present invention to the particular disclosed embodiments. References hereinafter made to certain directions, such as, for example, "left" and "right", are made as viewed from the front looking rearward.

25 [017] The exemplary header 100 selected for illustration in FIGS. 1-5 has a cross auger 110 with spiral flighting 112 for sweeping the ears of corn toward the center of the header 100. Large cross augers 110 may also have paddles 130, fingers 132 or some other means to facilitate the delivery of the crop rearward to the feeder housing of a harvester. The header 110 has a plurality of forward-extending live row-units

120 and a plurality of forward-extending dead row units 124. The row units 120, 124 and the cross auger 110 define a feeder plane therebetween where useable parts of stalk crops are conveyed rearward from the row units 120, 124 to the cross auger 110.

[018] Live row units 120 and dead row units 124 cooperate with one another.

5 Live row units 120 have powered components, as described in greater detail below, whereas the dead row units 124 generally do not have powered components. In one embodiment, as best shown in FIGS. 1 and 2, the header 110 has four live row units 120, three dead row units 124, plus one half of a dead row unit 130 on each end of the header 110. The row units 120, 124 are arranged relative to one another so that the
10 row units 120, 124 alternate relative to each other along the length of the header 110. In other words, every other row unit is a live row unit 120 with a dead row unit 124 adjacent to each live row unit 120. The row units 120, 124 are spaced relative to one another to correspond with the spacing of the crop to be harvested and to provide a path to receive the crop therebetween. For example, a live row unit 120 may be
15 placed between two dead row units 124 to cooperate therewith.

[019] FIG. 6 illustrates a row assembly 138 having a frame 140, a back end 142 and a forward end 144. Half of the frame 140 forms part of a live row unit 120 and the other half forms part of a dead row unit 124. Therefore, one live row unit 120 includes two halves of two separate and adjacent frames 140. One dead row unit 124
20 includes two halves of two separate and adjacent frames. Each frame 140 includes a first portion 146 and a second portion 148 which are spaced from one another and protrude outwardly and forward from the back end 142. At the front and between adjacent row units 120, 124 is a crop entry 150 for receiving the stalks of the crop. The first and second portions 146, 148 receive stripper plates 152 which cooperate
25 with one another to define the crop passage 156 between adjacent row units 120, 124. The stripper plates 152 strip useable parts such as ears of corn from crop stalks that are received in the crop passage 156.

[020] Each live row unit 120 of the present invention includes at least one fore-to-aft gathering auger 160, in place of the two gathering chains and tensioners, for
30 conveying the useable parts rearward to the cross auger 110. Each gathering auger 160 has a proximal end and a distal end and is preferably aligned substantially with a corresponding crop passage 156. However, the axis of rotation of the gathering auger

160 may instead be misaligned with the crop passage 156 such that the crop stalks in the back of the crop passage may be urged more so toward the gathering auger 160 than the crop stalks are at the beginning of the crop passage 156.

[021] Preferably, each live row unit 120 includes a pair of counter-rotating
5 augers 160. The dead row units 124, on the other hand, do not include gathering
augers 160 or any gathering chains. Therefore, the complexity of the header 110 is
reduced by utilizing gathering augers 160 on live row units 120 instead of gathering
chains and tensioners. Also, by utilizing dead row units 124 in combination with the
live row units 120 the overall complexity of the header 110 is substantially reduced
10 because the dead row units 124 do not have gathering augers 160 or gathering chains
and tensions and also because the drive means for driving the gathering augers 160 is
simpler than known drives used in combination with gathering chains.

[022] The gathering augers 160 are preferably driven independently of the snap
rolls. The gathering auger 160 may be driven by electrical, mechanical or hydraulic
15 means. Preferably, each gathering auger 160 is cantilevered from the frames 140 and
rotationally driven from the forward most end of its respective row unit 120 away
from the cross auger 110 rather than the rear of the row unit 120 in close proximity to
the cross auger 110 so that the delivery or the distal end of the gathering auger 160 is
not obstructed. This allows ears and stalks to be delivered to the cross auger 110
20 unimpeded by bearing supports, drive mechanisms or some other crop impeding
structure.

[023] In one or more embodiments of the present invention, the proximal end
162 of one or more gathering augers 160 is coupled to the frame 140 of the row unit
120 in a manner that permits the distal end 164 of the gathering auger 160 to move
25 into and out of the feeder plane. In one embodiment, a mechanism coupled to the
proximal end 162 of the gathering auger 160 allows the gathering auger 160 to rotate
or pivot in a vertical plane between a first position for processing crops when
harvesting and a second position for maintenance purposes. Preferably, the distal end
164 of the gathering auger when in the first position is higher in the vertical plane
30 than when the distal end 164 is in the second position.

[024] Also, the gathering auger 160 preferably pivots partially about a substantially horizontal rotational axis that extends substantially transversely between the row units 120. The gathering auger 160 may be pivoted such that its distal end 164 is raised upward above the row unit 120 to allow the gathering auger 160 to be repaired, replaced or perform maintenance without interference from the cross auger 110. Also, when the gathering auger 160 is pivoted upward out of the feeder plane other components can be more easily accessed.

[025] An arrangement of gears or wheels such as bevel gears 182, 184 may be used for transmission of the driving motion to the gathering auger 160 from a driven shaft 166 within each live row unit 120 while also allowing the distal end of the gathering auger 160 to pivot upward about the same axis of the shaft 166. Each shaft 166 preferably drives a pair of gathering augers 160 of a single live row unit 120 so that the pair of gathering augers are driven about the same axis about which they may pivot into and out of the feeder plane. When the gathering auger 160 is pivoted upward, fasteners may be removed from the auger 160 so that the outer flighting portion of the gathering auger 160 may slide rearward so that it may be removed from an inner shaft and from cylindrical bearings allowing the flighting portion to rotate about the inner shaft.

[026] A mounting bracket 210 rotationally couples the gathering auger 160 to an outer side of the frame 140 of the row assembly 138, such as vertical mounting support 220, to secure the gathering auger 160 to the frame 140 in an operational manner. The vertical mounting support 220 includes radial extending openings or arched slots 224 for receiving fasteners 226 for securing the mounting bracket 210 to the frame 140. When the distal end 164 of the gathering auger 160 is pivoted upward, the distal end 164 of the gathering auger 160 coupled to the mounting bracket 210 causes the mounting bracket 210 to rotate in the slots 224 of the vertical mounting support 220. The length of the arched slots 224 dictate the range the gathering auger 160 can be pivoted between the first and second positions. FIGS. 1-3 and 7 illustrate the gathering auger 160 pivoted into the first position for processing crops. The fasteners 226 are moved all the way to one end of the slots 224 as shown in FIG. 9. On the other hand, FIGS. 10 and 11 illustrate the gathering auger 160 pivoted into the second position for maintenance where the fasteners 226 have moved to the opposite

end of the slots 224. The range of motion of the distal end 162 of the gathering auger 160 may be limited by the length or shape of the slots 224.

[027] The pair of straight bevel gears 182, 184, in mesh are used to drive the gathering auger 160 while harvesting. The shaft 166 of the live row unit 120

5 corresponds with the axis upon which one or more augers 160 pivot. The distal end of the gathering auger 160 is coupled to the bevel gear 182 which is driven by the bevel gear 184 on shaft 166. The shaft 166 may be chain driven by a hydraulic drive motor 178 with sprocket 180. Preferably, the drive motor 178 is sufficiently sized to drive all of the gathering augers 160. The drive motor 178 and sprocket 180 with
10 chain 198 drives sprocket 188 and shaft 186 which extends in a transverse manner along the length of the header 100. There are preferably numerous other sprockets 188 along the length of the shaft 186. The number of sprockets 188 depends on the number of live row units 120. Chains 190 extend from the sprockets 188 of the shaft 186 to sprockets 192 on shaft 166.

15 [028] Because the augers 160 are driven by the drive motor 178, the speed of the augers 160 is independent of the speed of the cross auger 110. The chain 190 driving the sprocket 192 which in turn drives the shaft 166 with bevel gears 182. The speed of the augers 160 can be changed automatically or manually in relation to the ground speed much like current grain headers on harvesters that control reel speed.

20 Moreover, the augers 160 can be driven independent of the snap rolls. The speed of the gathering augers 160 may be varied while either or both the harvester and the snap rolls are maintained at a constant speed.

[029] In addition to the apparatuses described herein, the inventions include a method for harvesting crop with an attachment for an agricultural vehicle that

25 includes the gathering augers 160. The method includes operating the gathering augers 160 at a first speed to gather crop stalks in the crop passages 156 and operating a snap roll for removing useable parts from crop stalks at a second speed independently of the gathering augers 160. The method may also include one or more of the following steps: varying the speed of the gathering augers 160 while the speed
30 of the snap rolls remain constant, increasing the speed of the gathering augers 160 while the speed of the snap rolls remain constant, decreasing the speed of the gathering augers 160 while the speed of the snap rolls remain constant, varying the

speed of the snap rolls while the speed of the gathering augers 160 remain constant, increasing the speed of the snap rolls while the speed of the gathering augers 160 remain constant, decreasing the speed of the snap rolls while the speed of the gathering augers 160 remain constant, and/or changing the speed of the gathering
5 augers 160 relative the ground speed of the harvester.

[030] To keep stalks captured and engaged by the gathering auger 160 an elongated member 196 such as a rod is positioned in close proximity to the flighting of the gathering auger 160. Preferably, the elongated member 196 is substantially parallel aligned with the gathering auger 160. However, in other embodiments, at
10 least a portion of the elongated member 196 may be shaped or curved along its length or the distal end of the elongated member 196 may be closer in proximity to the distal end of the gathering auger 160. The elongated member 196 may be rigid, flexible, or semi-flexible to urge the stalks in the crop passage toward the gathering auger 160. In one or more embodiments, the elongated member 196 is cantilevered off the forward
15 end 144 of the frame 136 of the dead row unit 124 to urge the stalks in the crop passage 156 toward the gathering auger 160 of the opposing live row unit 120. The dead row unit may also include a second elongated member 196 extending toward another gathering auger 160 of another live row unit. In an alternative embodiment, the elongated member 196 may be a strap or be detachably coupled or mounted to a
20 row unit.

The foregoing has broadly outlined some of the more pertinent aspects and features of the present invention. These should be construed to be merely illustrative of some of the more prominent features and applications of the invention. Other beneficial results can be obtained by applying the disclosed information in a different
25 manner or by modifying the disclosed embodiments. Accordingly, other aspects and a more comprehensive understanding of the invention may be obtained by referring to the detailed description of the exemplary embodiments taken in conjunction with the accompanying drawings, in addition to the scope of the invention defined by the claims.

CLAIMS

What is claimed is:

5

1. In an attachment for a harvester having a cross auger, a forward-extending first row unit comprising at least one fore-and-aft extending first gathering auger and a first stripper plate, said first stripper plate at least partially defining a first crop passage and said first gathering auger cooperating with said first stripper plate to
10 remove ears of corn from corn stalks gathered in said first crop passage and to convey the stripped ears of corn rearward into the cross auger, wherein said first gathering auger is supported and rotationally driven from its front in a cantilevered manner such that the ears of corn are otherwise free of obstruction into the cross auger.

15

2. The first row unit of Claim 1 wherein said first gathering auger is aligned substantially parallel with said first crop passage.

3. The first row unit of Claim 1 wherein said first gathering auger rotates at a speed independent of the speed of the harvester.

20

4. The first row unit of Claim 1 further comprising at last one powered snap roll, said first gathering auger rotating at a speed independent of the speed of said snap roll.

5. The first row unit of Claim 1 wherein said first gathering auger is powered by a
25 first drive means and a powered snap roll is powered by a second drive means such that said first gathering auger and said powered snap roll are operated at different speeds.

6. The first row unit of Claim 1 further comprising a second gathering auger and a second stripper plate, said second stripper plate at least partially defining a second crop passage and said second auger cooperating with said second stripper plate to remove ears of corn from corn stalks gathered in said second crop passage and to
5 convey the stripped ears of corn rearward into the cross auger.
7. The first row unit of Claim 6 wherein said first and second gathering augers rotate in opposite directions.
- 10 8. The first row unit of Claim 6 in combination with a second row unit, said second row unit having a third stripper plate opposing said first stripper plate of said first row unit to further define said first crop passage between said first and second row units, wherein said second row unit is otherwise free of gathering augers.
- 15 9. The first and second row units of Claim 8 in combination with a third row unit, said third row unit having a fourth stripper plate opposing said second stripper plate of said first row unit to further define said second crop passage between said first and third row units, wherein said third row unit is otherwise free of gathering augers.
- 20 10. The first and second row units of Claim 9 wherein said second and third row units are otherwise free of powered snap rolls.
11. The first and second row units of Claim 9 wherein said second row unit comprises an unpowered idler snap roll positioned to oppose said powered snap roll
25 of said first row unit.
12. The first row unit of Claim 1 wherein said gathering auger can pivot between a first position for harvesting and a second position for maintenance.

13. The first row unit of Claim 1 wherein a distal end of said first gathering auger when in said second position is higher than said distal end of said first gathering auger when in said first position.

5 14. The first row unit of Claim 1 wherein said first gathering auger pivots about an axis of a shaft for driving said first gathering auger.

15. The first row unit of Claim 1 wherein said first gathering auger pivots substantially about a transverse axis.

10

16. The first row unit of Claim 1 wherein said first gathering auger pivots to prevent obstruction of a distal end of said first gathering auger from a cross auger.

17. The first row unit of Claim 1 feeling otherwise free of gathering chains.

15

18. The first row unit of Claim 1 wherein the ears of corn conveyed into the cross auger by said gathering auger are unobstructed by a distal end of said gathering auger.

19. In an attachment for a harvester having a cross auger, a forward-extending first
20 row unit comprising at least one fore-and-aft extending first gathering auger and a first stripper plate, said first stripper plate at least partially defining a first crop passage and said first gathering auger cooperating with said first stripper plate to remove useable parts from crop stalks gathered in said first crop passage and to convey the stripped useable parts rearward into the cross auger, wherein said first
25 gathering auger is supported and rotationally driven from its front in a cantilevered manner such that the useable parts are otherwise free of obstruction into the cross auger.

20. In an attachment for an agricultural vehicle, a live row unit in combination with a dead row unit, said live row unit comprising at least one powered gathering auger and a powered snap roll, said dead row unit free of powered augers and powered snap rolls, said live and dead row units each having stripper plates cooperating with one
- 5 another to define a crop passage therebetween, wherein crop stalks in said crop passage are urged into said gathering auger of said live row unit to convey the crop stalks rearward and wherein said gathering auger and said stripper plates cooperate to strip useable parts of the crop from the crop stalk and said gathering auger conveys the useable parts of the crop rearward.

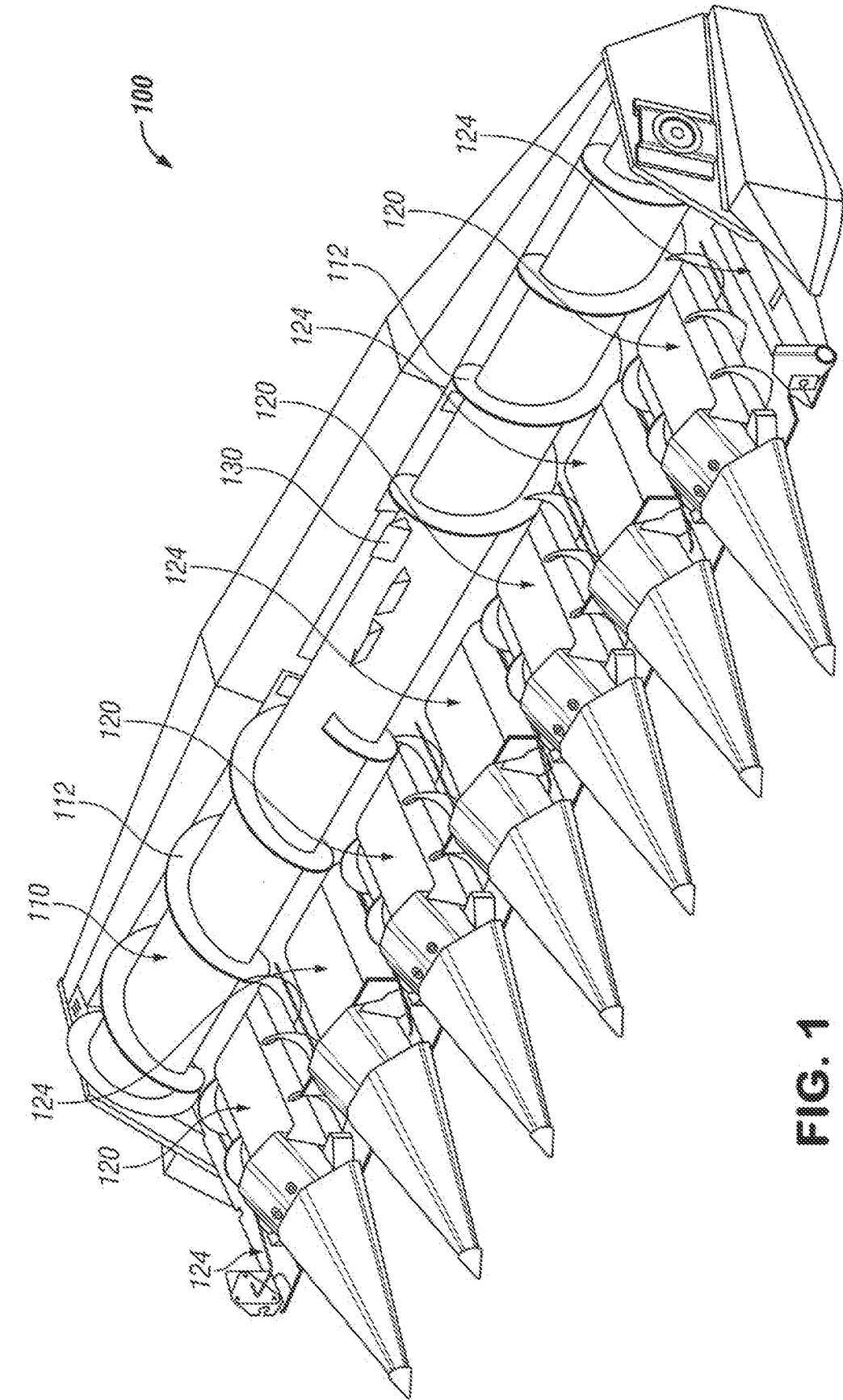
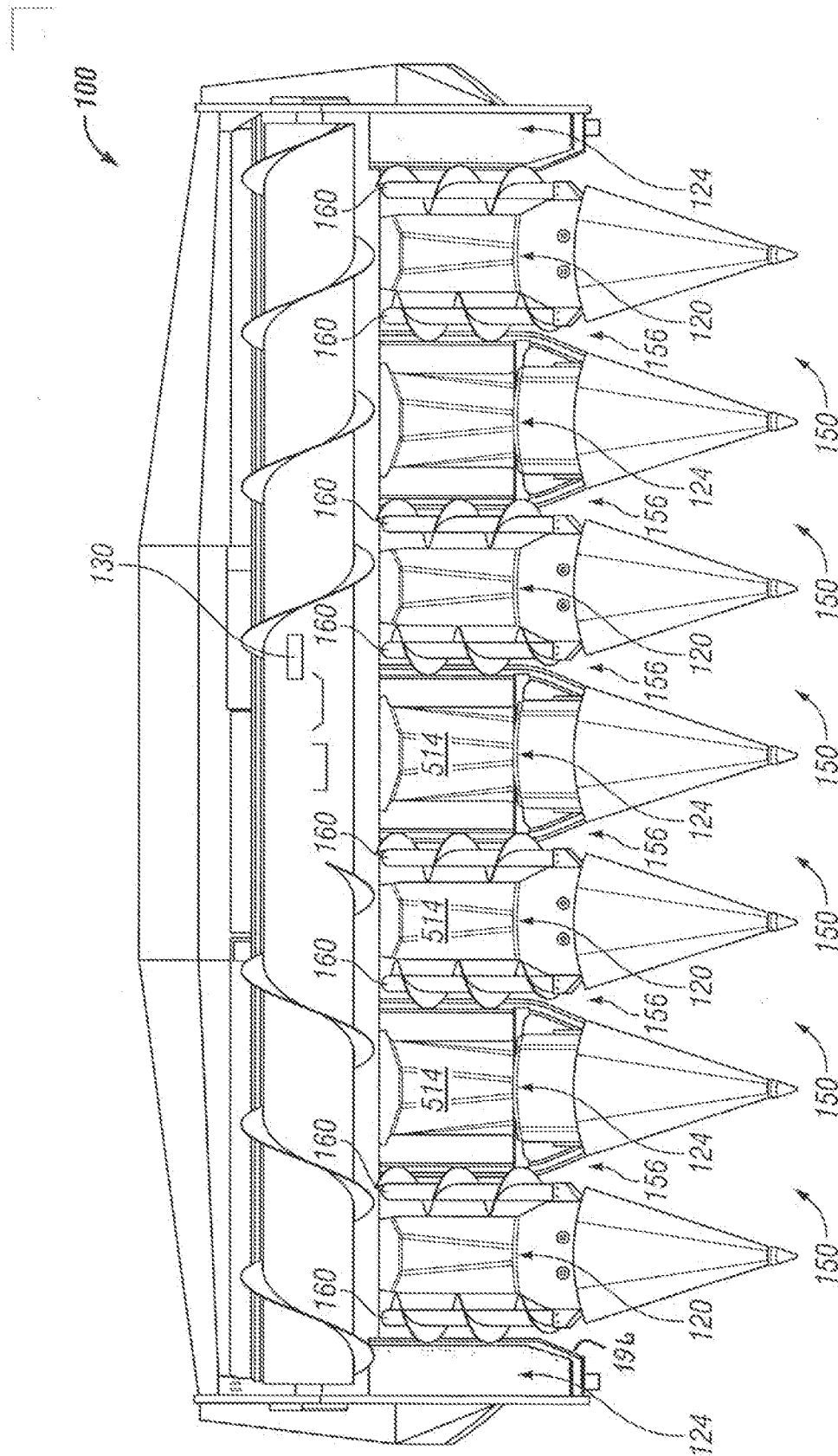


FIG. 1



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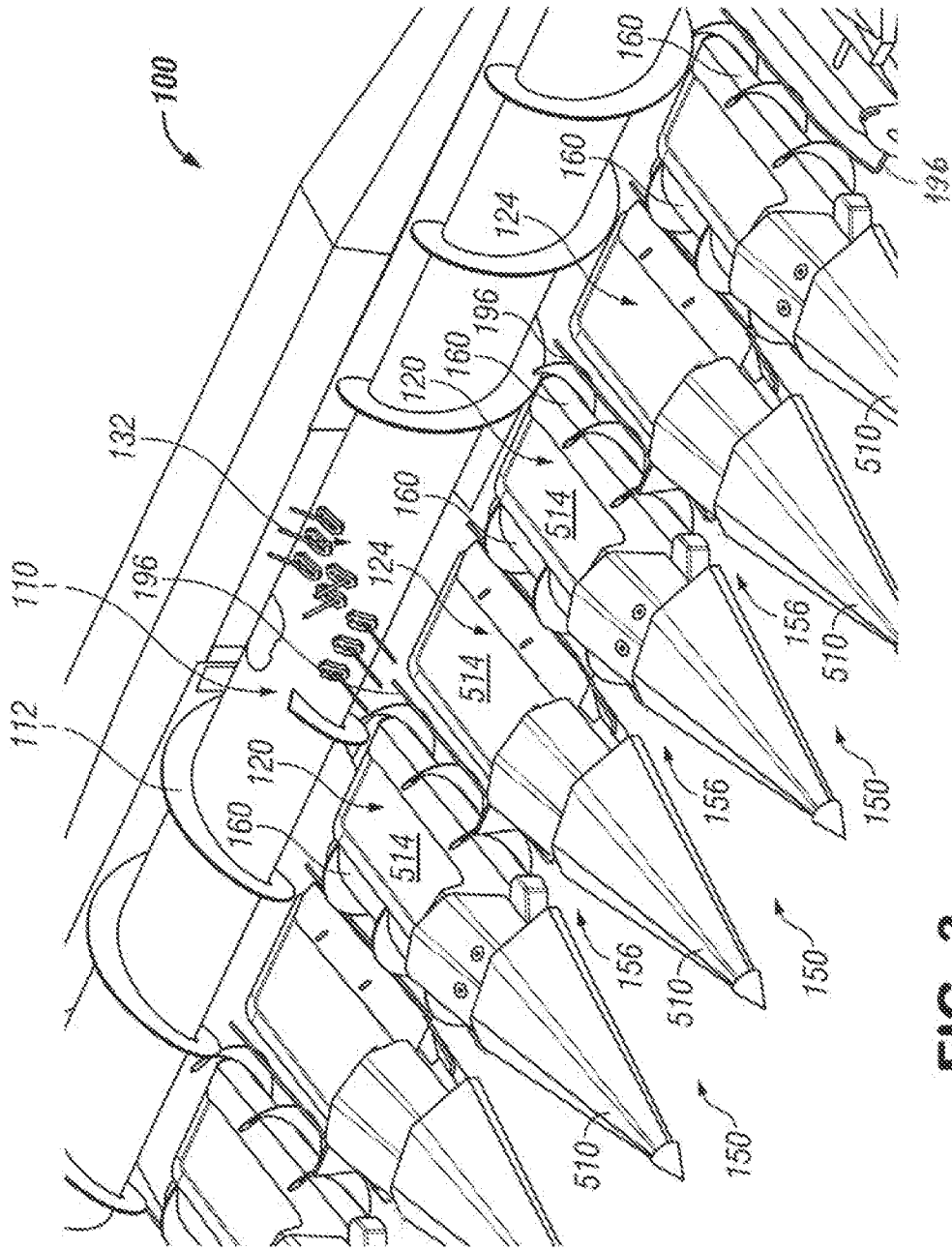


FIG. 3

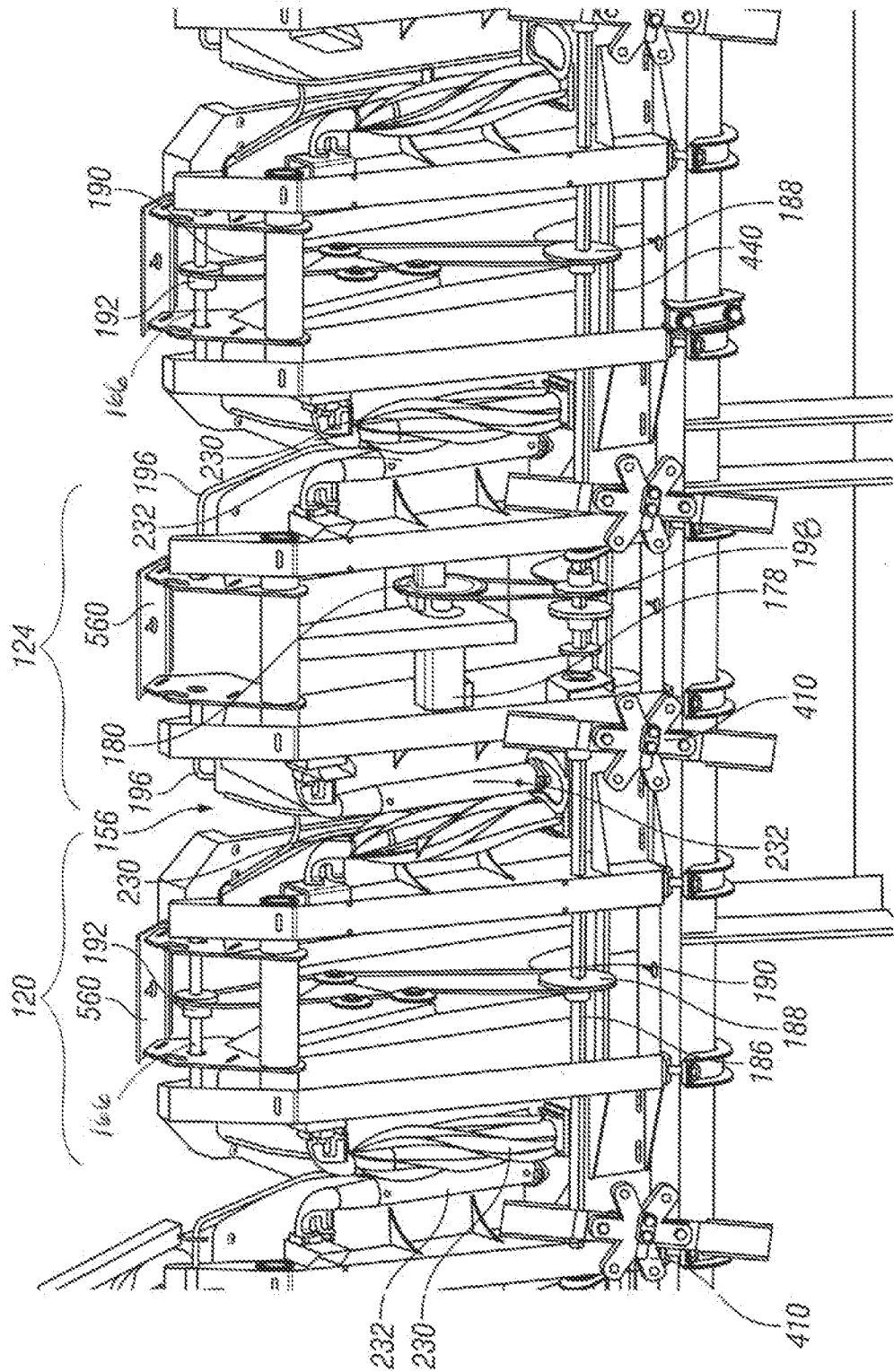
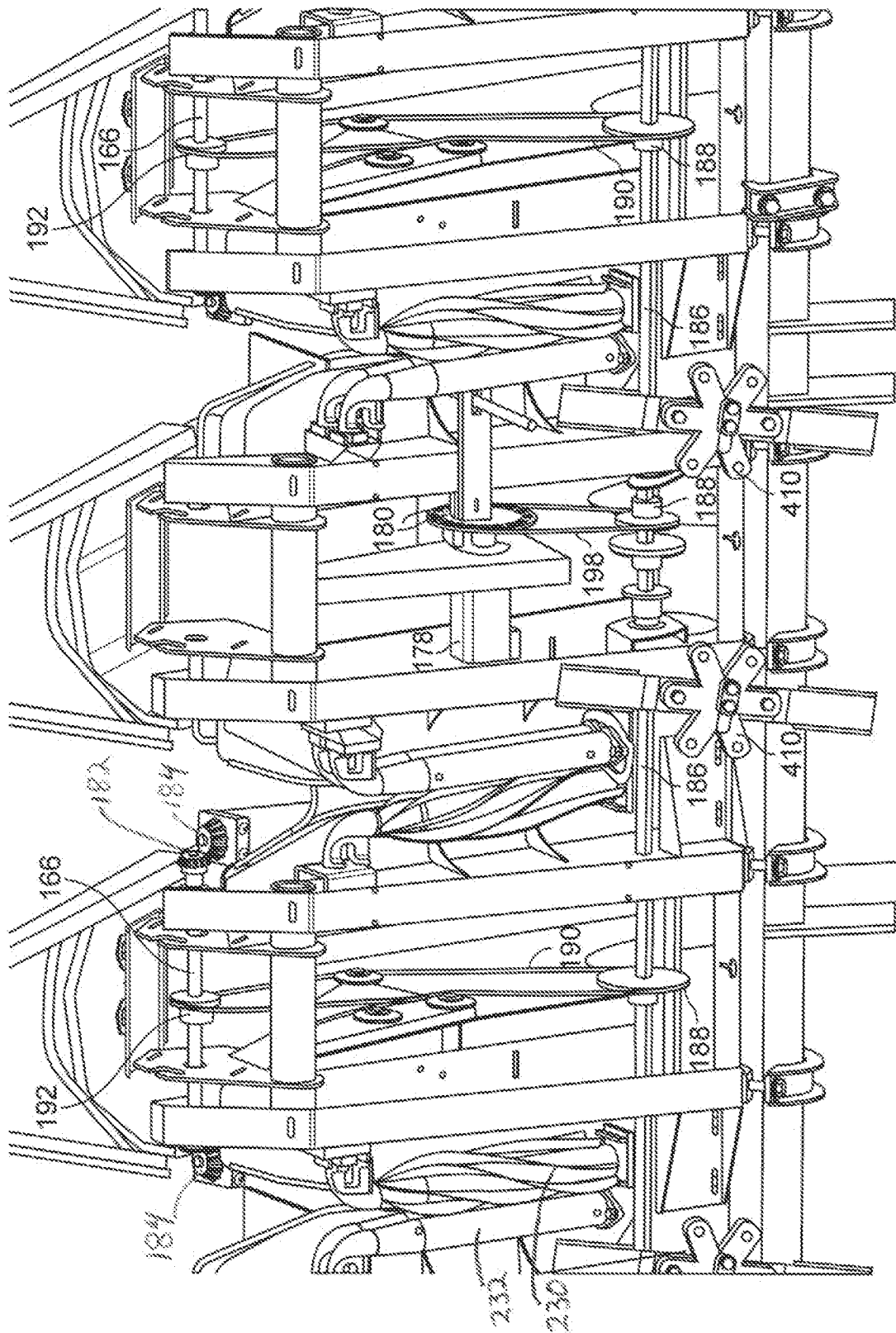
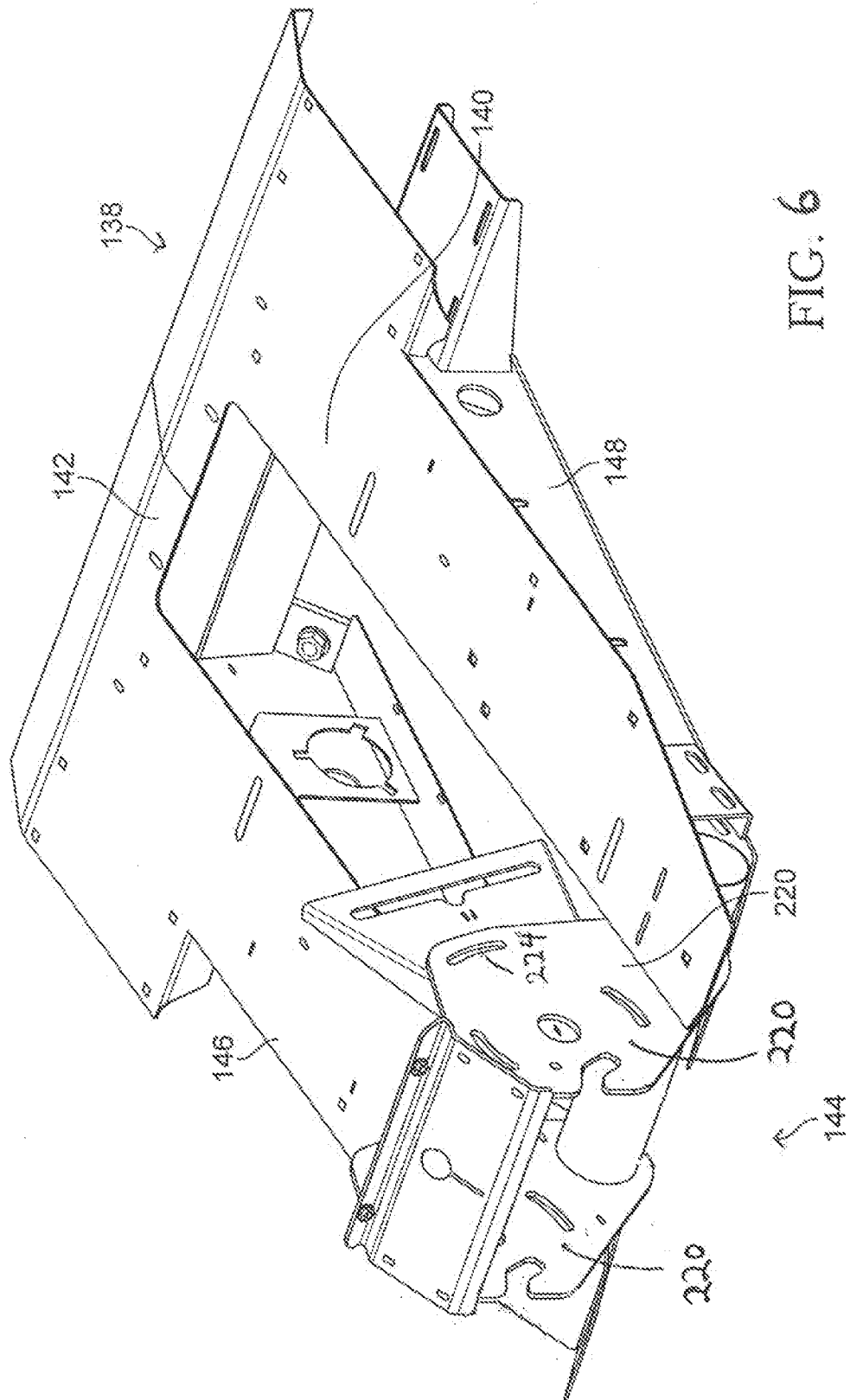


FIG. 4



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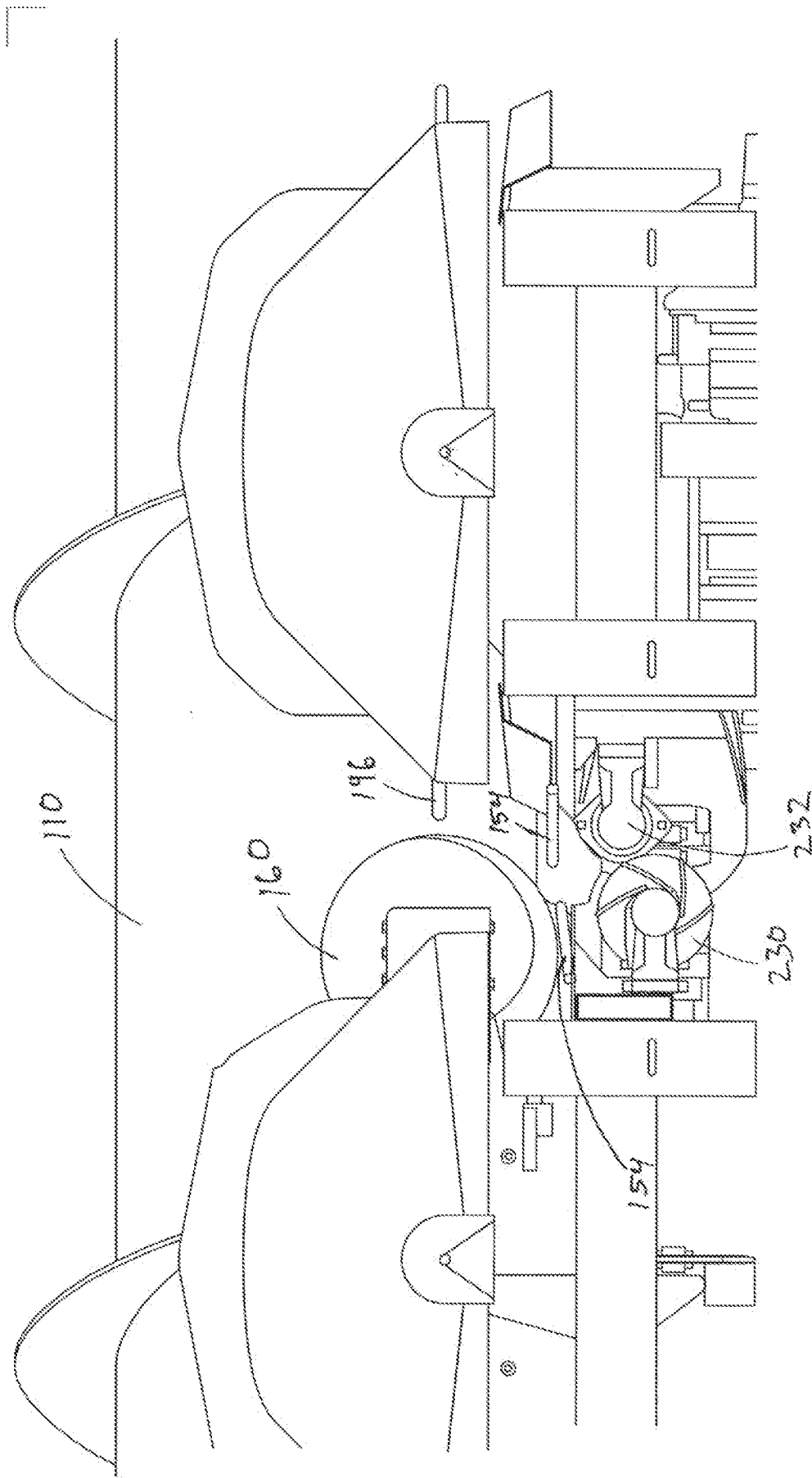


FIG. 7

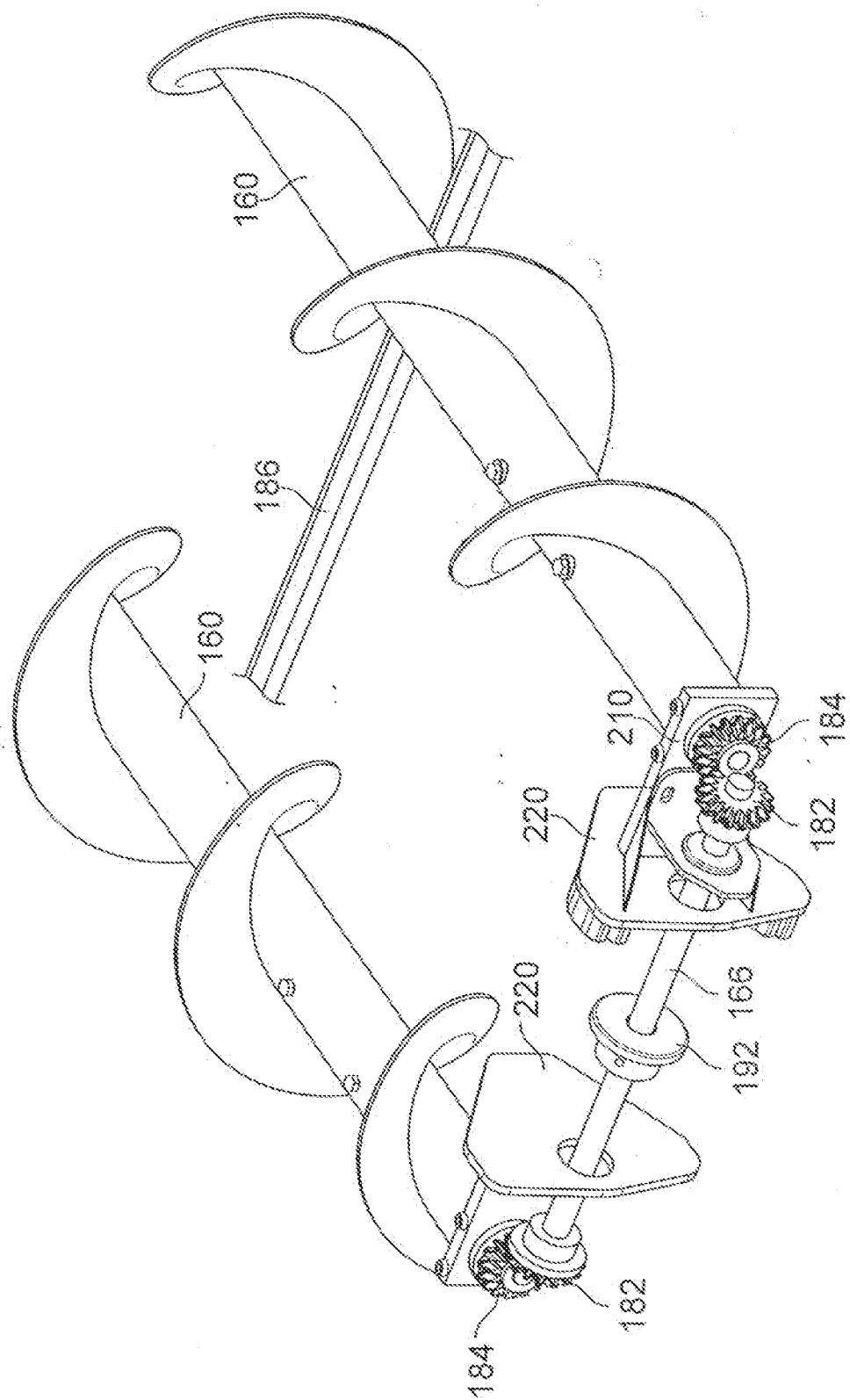


FIG. 8

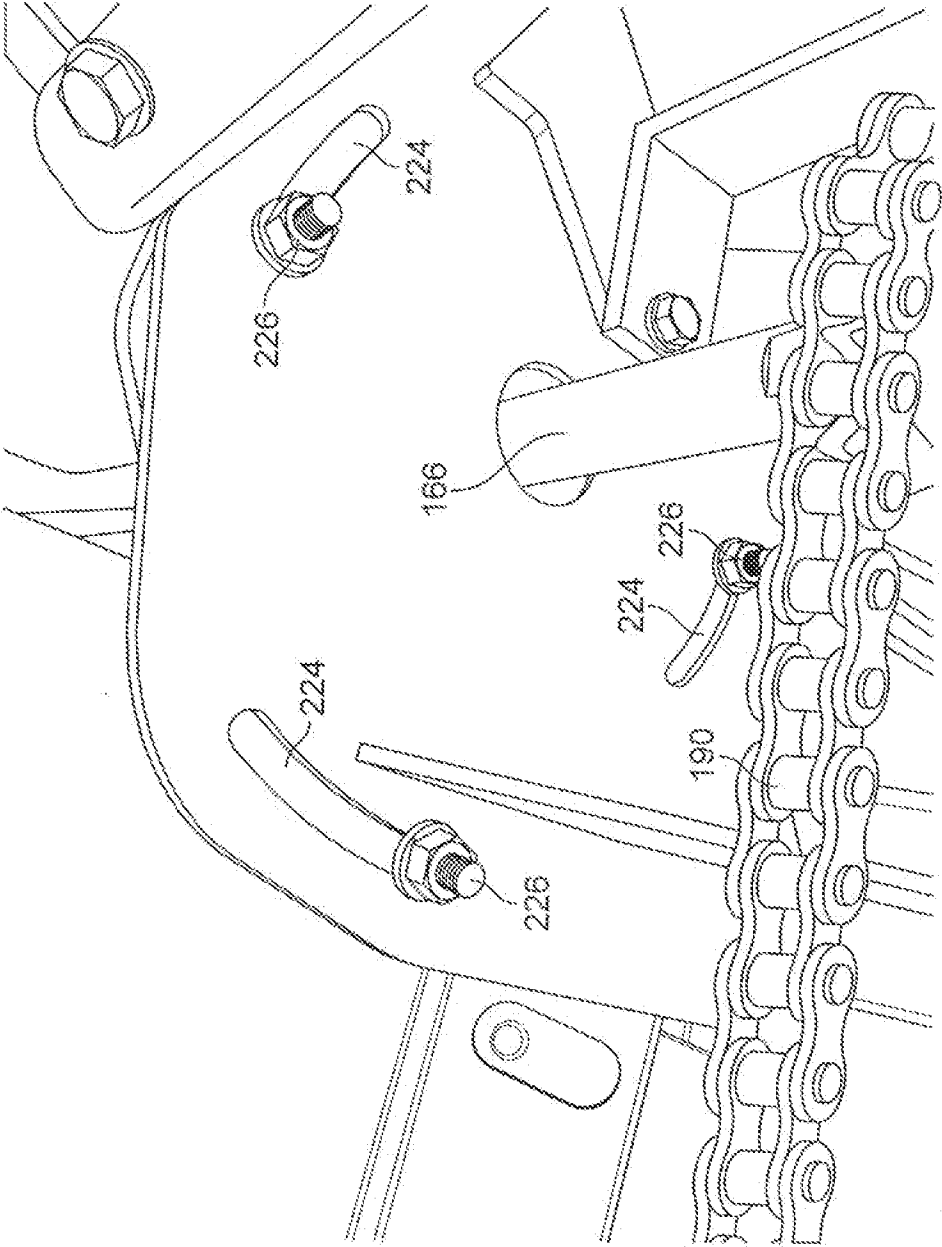


FIG. 9

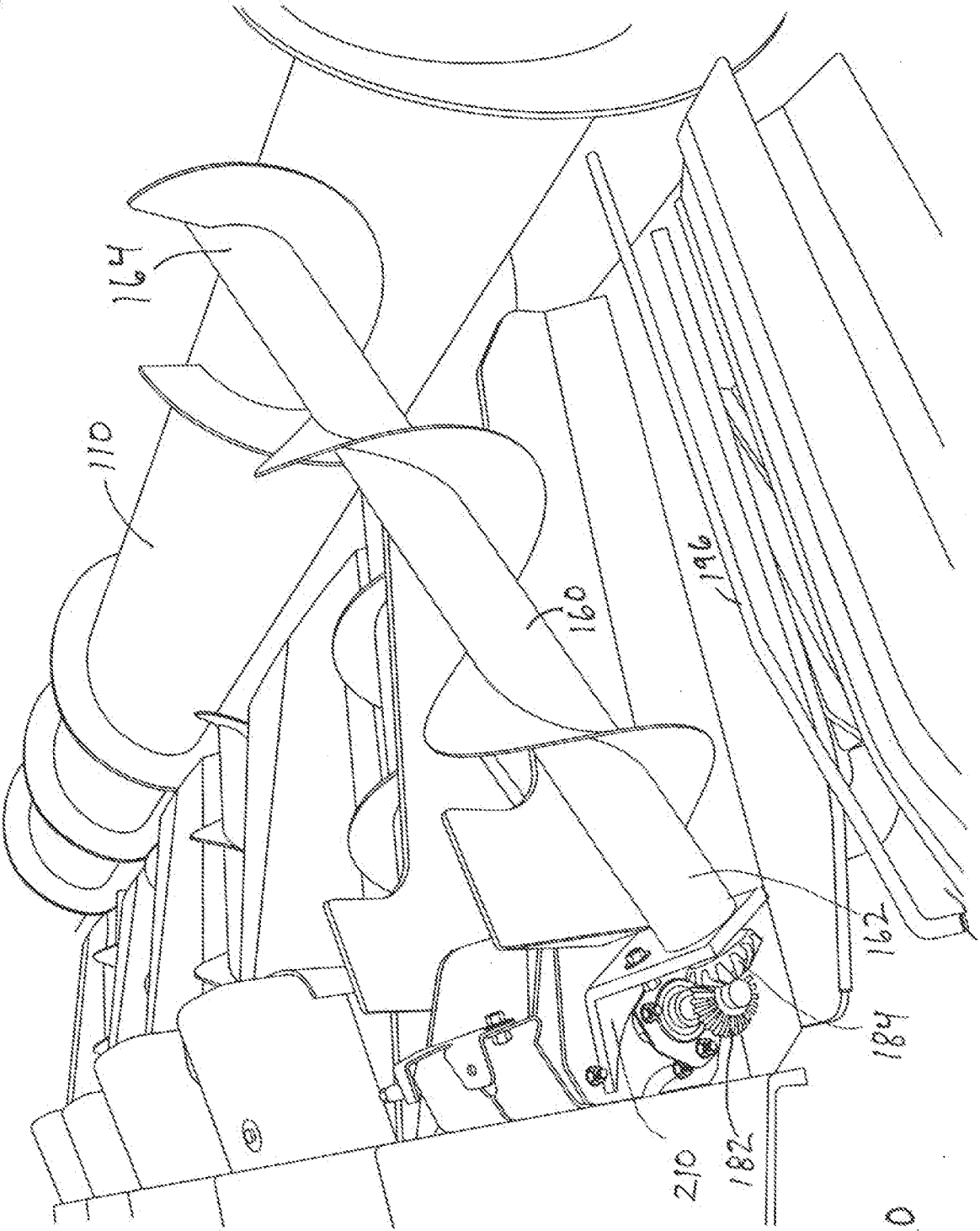


FIG. 10

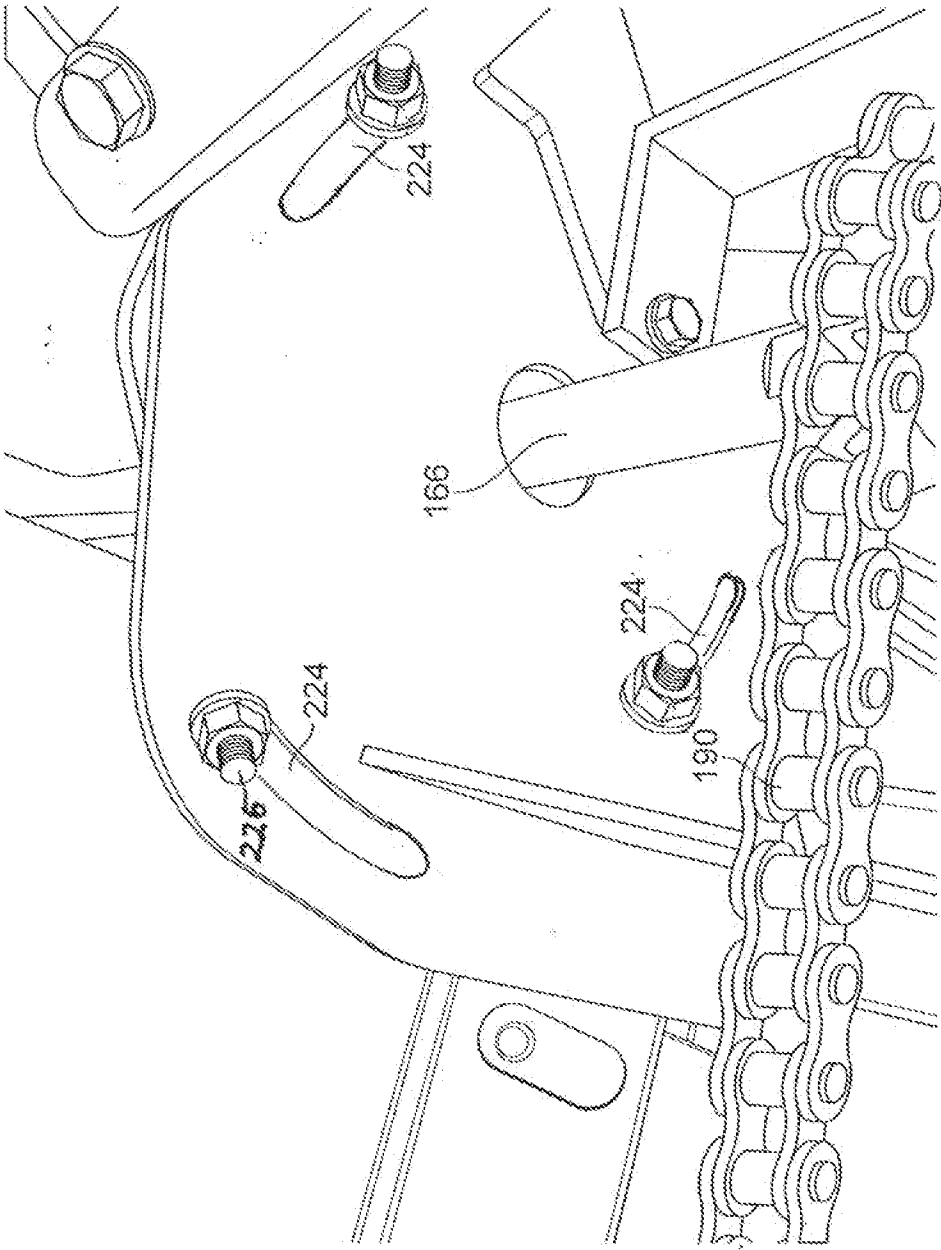


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/065783

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01D45/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1 509 508 A (LAVERDA SPA PIETRO) 12 January 1968 (1968-01-12) the whole document -----	1-4,6,7, 17-19



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

24 April 2012

Date of mailing of the international search report

21/05/2012

Name and mailing address of the ISA/

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Authorized officer

Alff, Robert

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/065783

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 1509508	A	12-01-1968	NONE
