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(54) **FORMING SHIELD FOR A HARVESTING IMPLEMENT**

(71) Applicant: **MACDON INDUSTRIES LTD.**, Winnipeg (CA)

(72) Inventors: **Matthew James Stephens**, Niverville (CA); **Kirk Kevin Calvadores**, West St Paul (CA)

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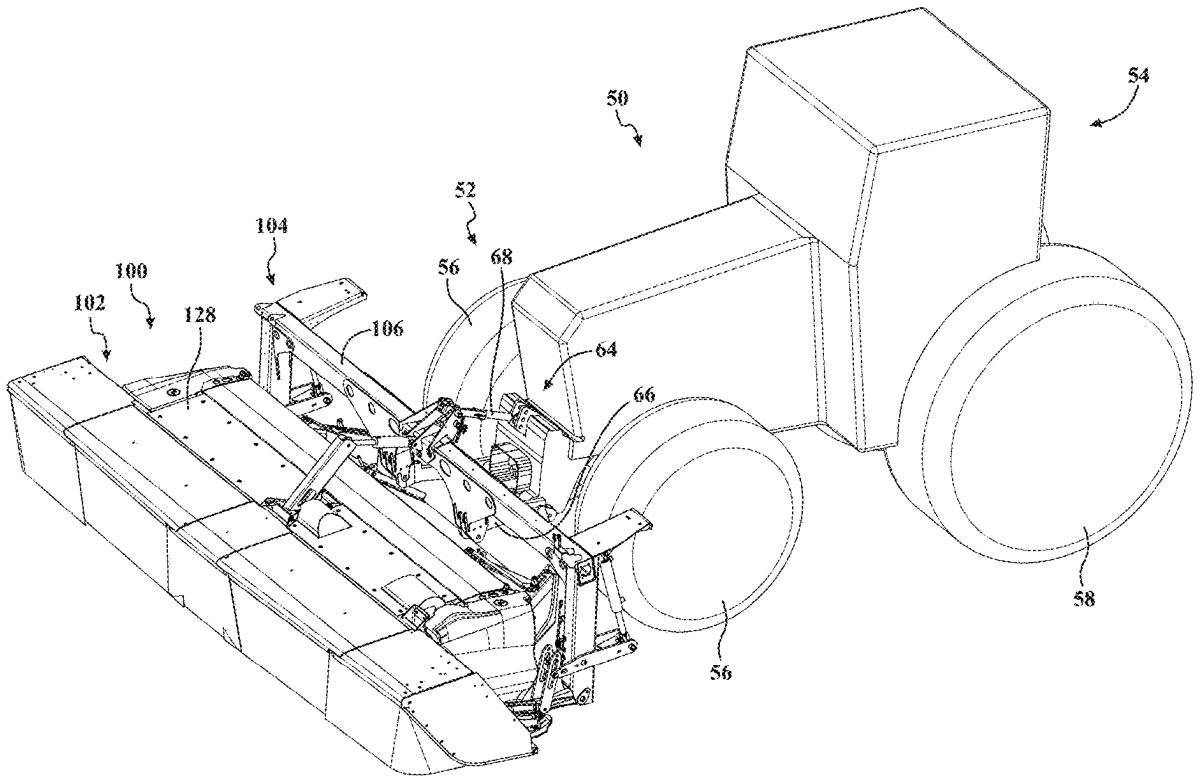
A01D 34/40	(2006.01)

(52) **U.S. Cl.**

CPC ***A01D 34/125*** (2013.01); ***A01D 34/046*** (2013.01); ***A01D 34/14*** (2013.01); ***A01D 34/40*** (2013.01)

(57) **ABSTRACT**

A crop harvesting header including a carrier frame configured to be mounted to a tractor to cut crop. The crop harvesting header includes a header frame movably coupled to the carrier frame and defining a discharge opening on a rear side. The crop harvesting header further includes a discharge shaper assembly, which includes a height deflector. The height deflector is pivotably coupled to the header frame adjacent to the discharge opening to control a height of discharged cut crop. The discharge shaper assembly may further include a width deflector to control a width of discharged cut crop.



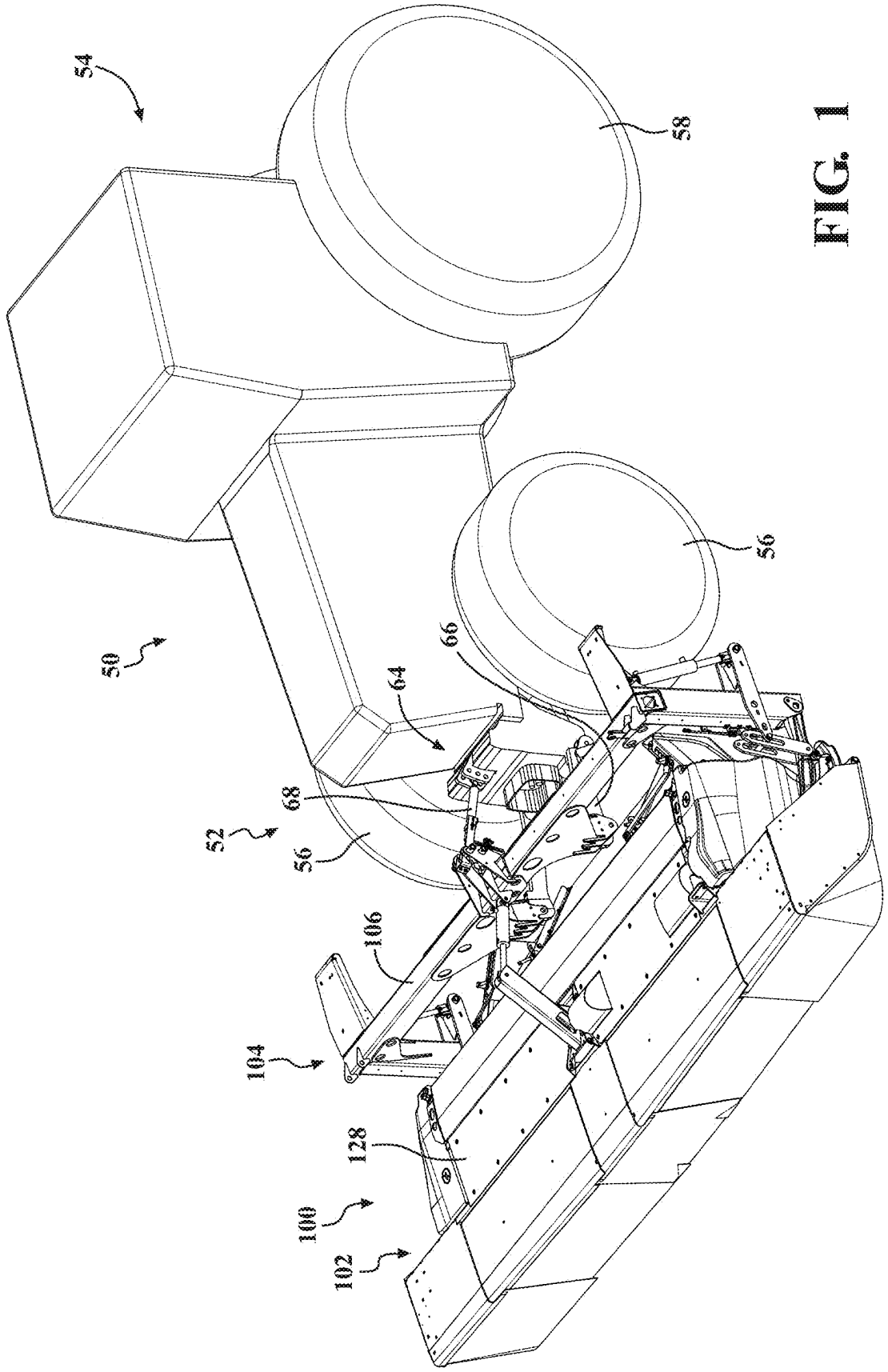


FIG. 1

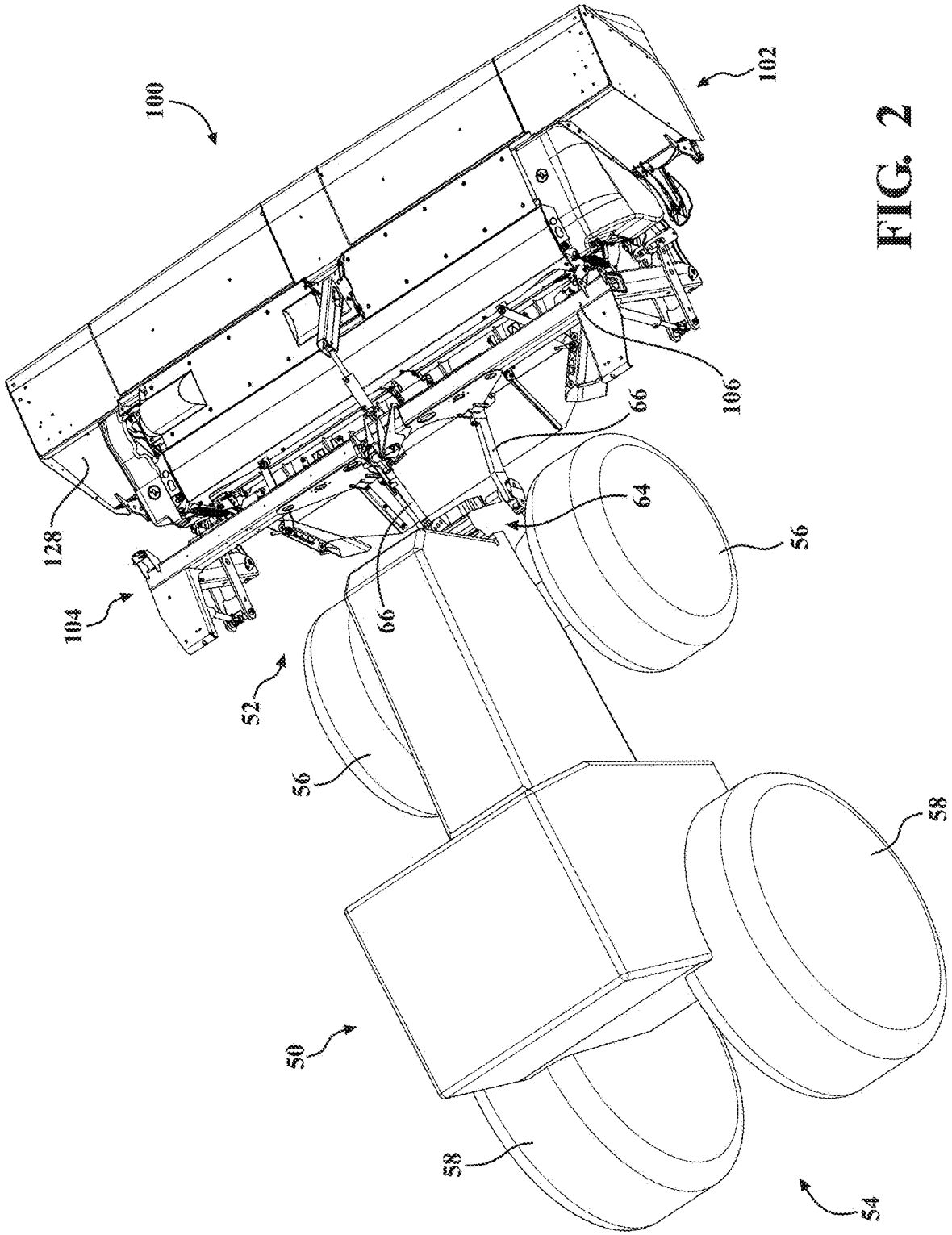


FIG. 2

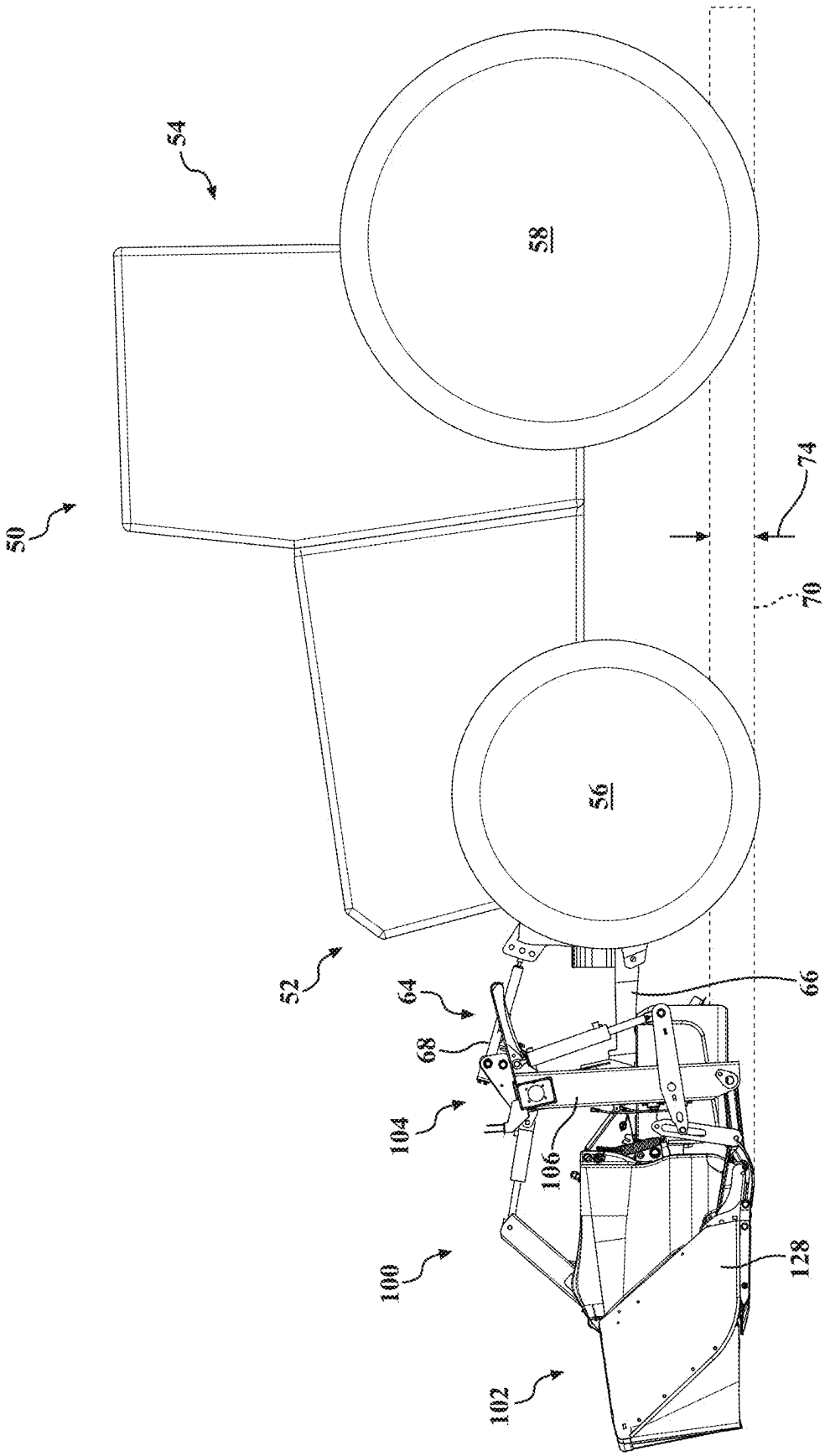


FIG. 3

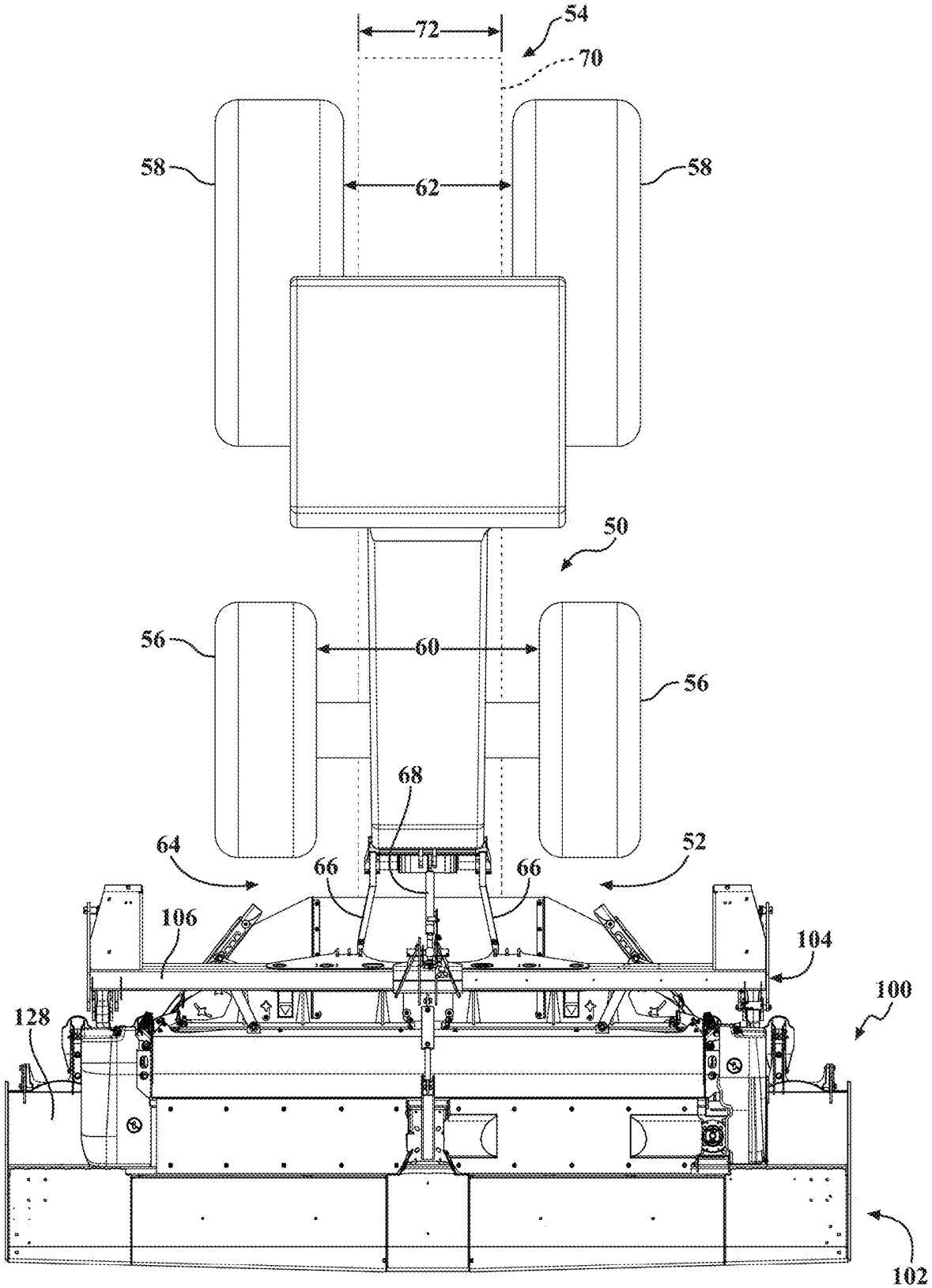
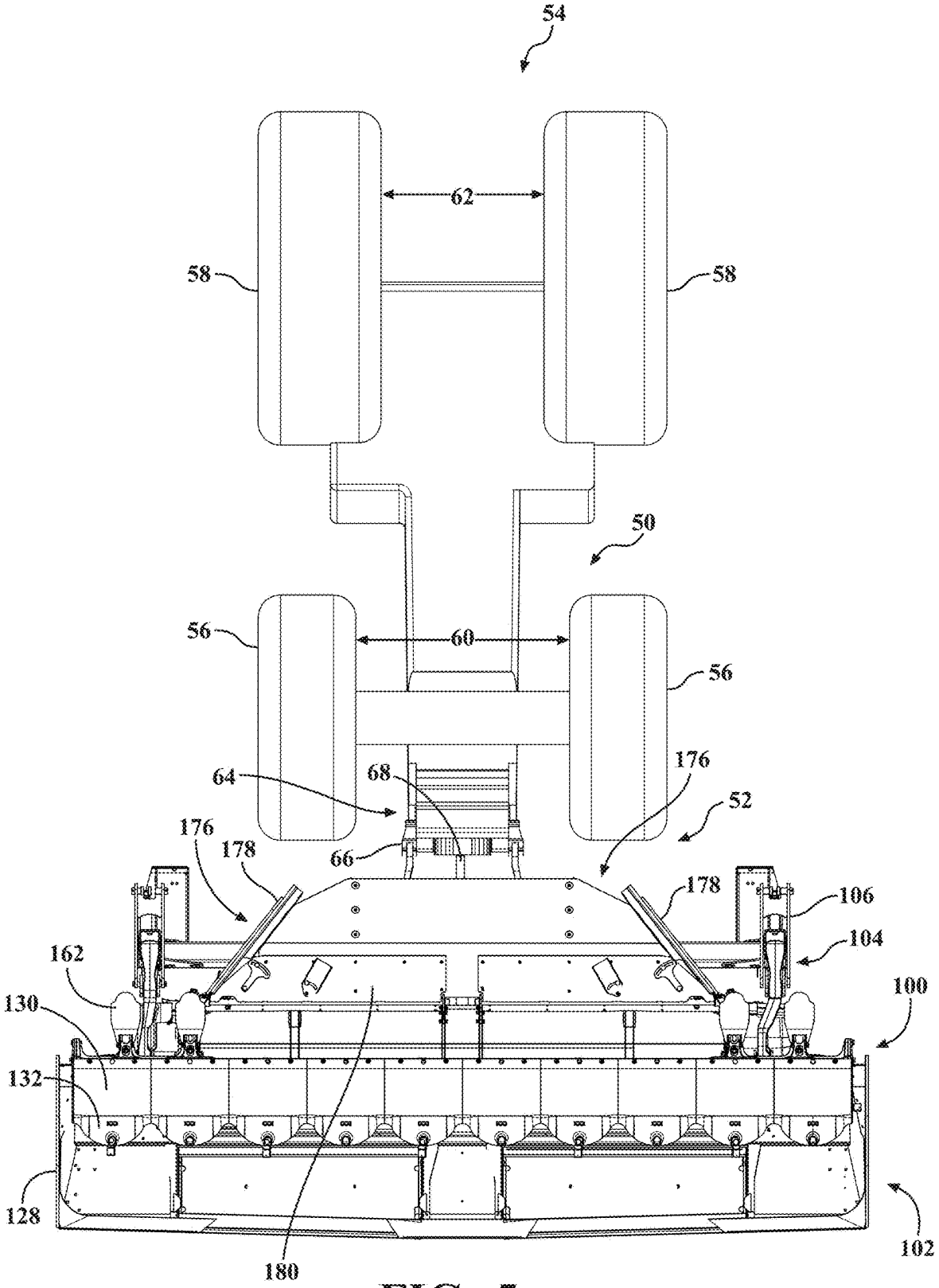


FIG. 4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56
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102

FIG. 5

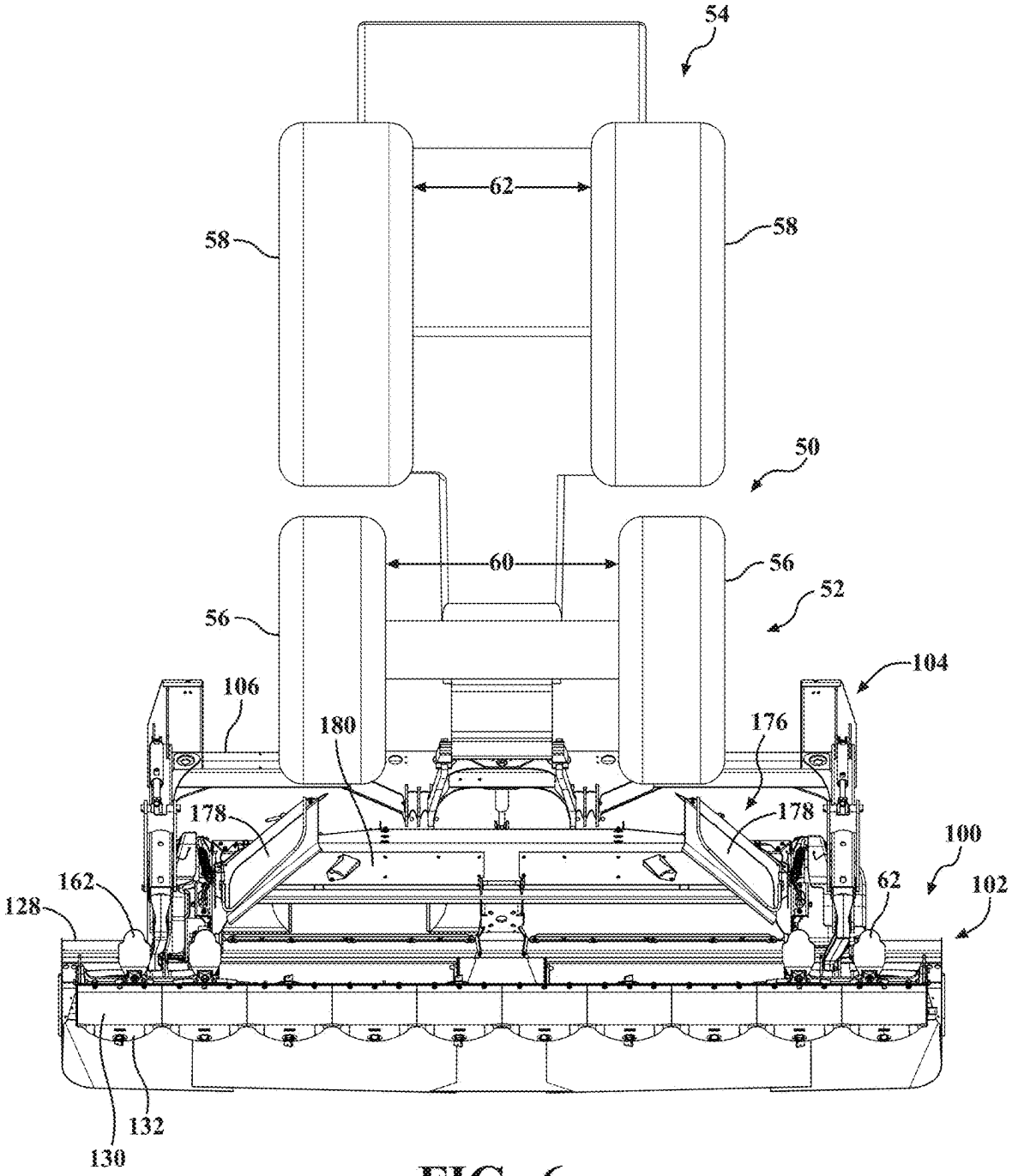
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FIG. 6

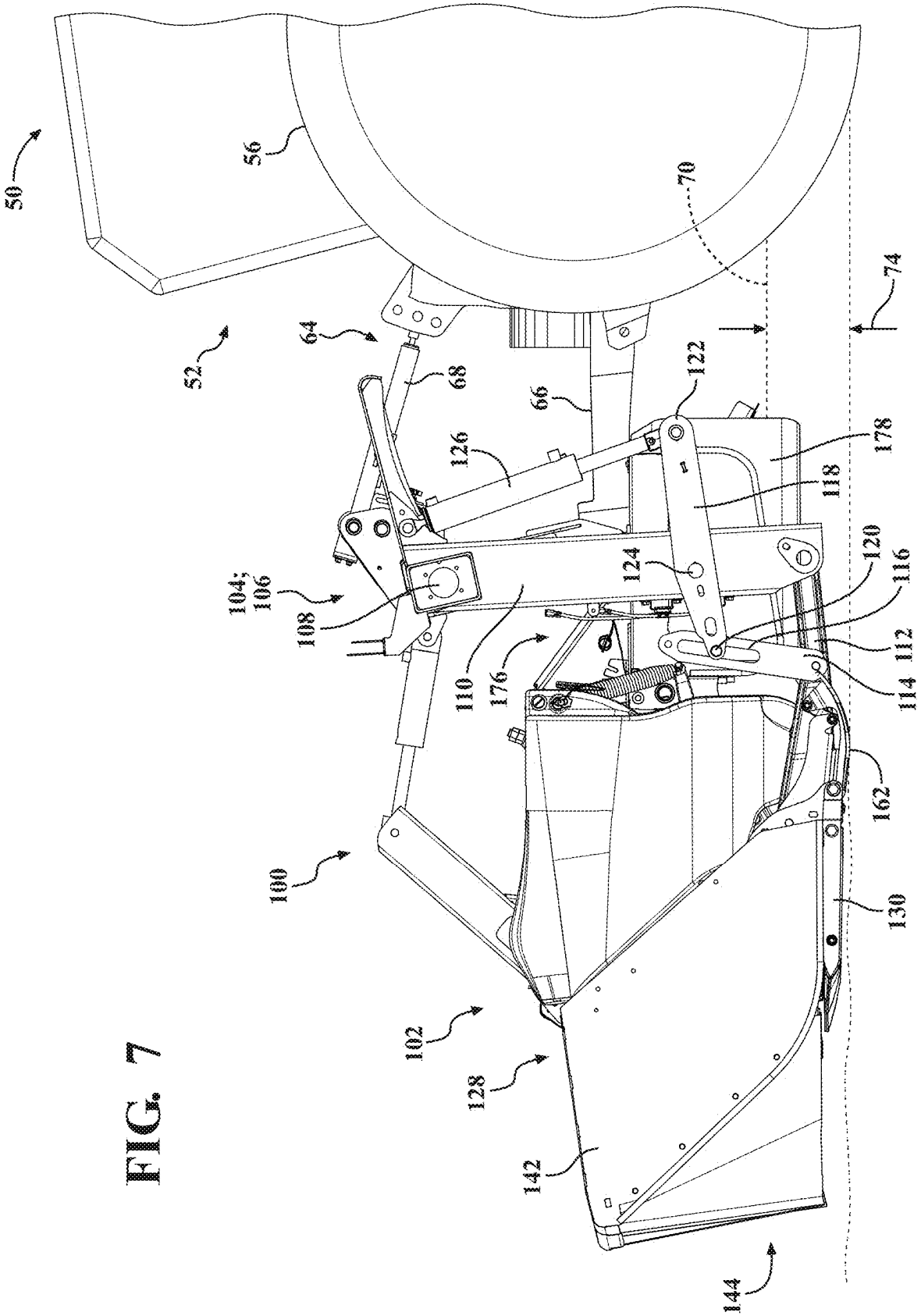
50
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FIG. 7

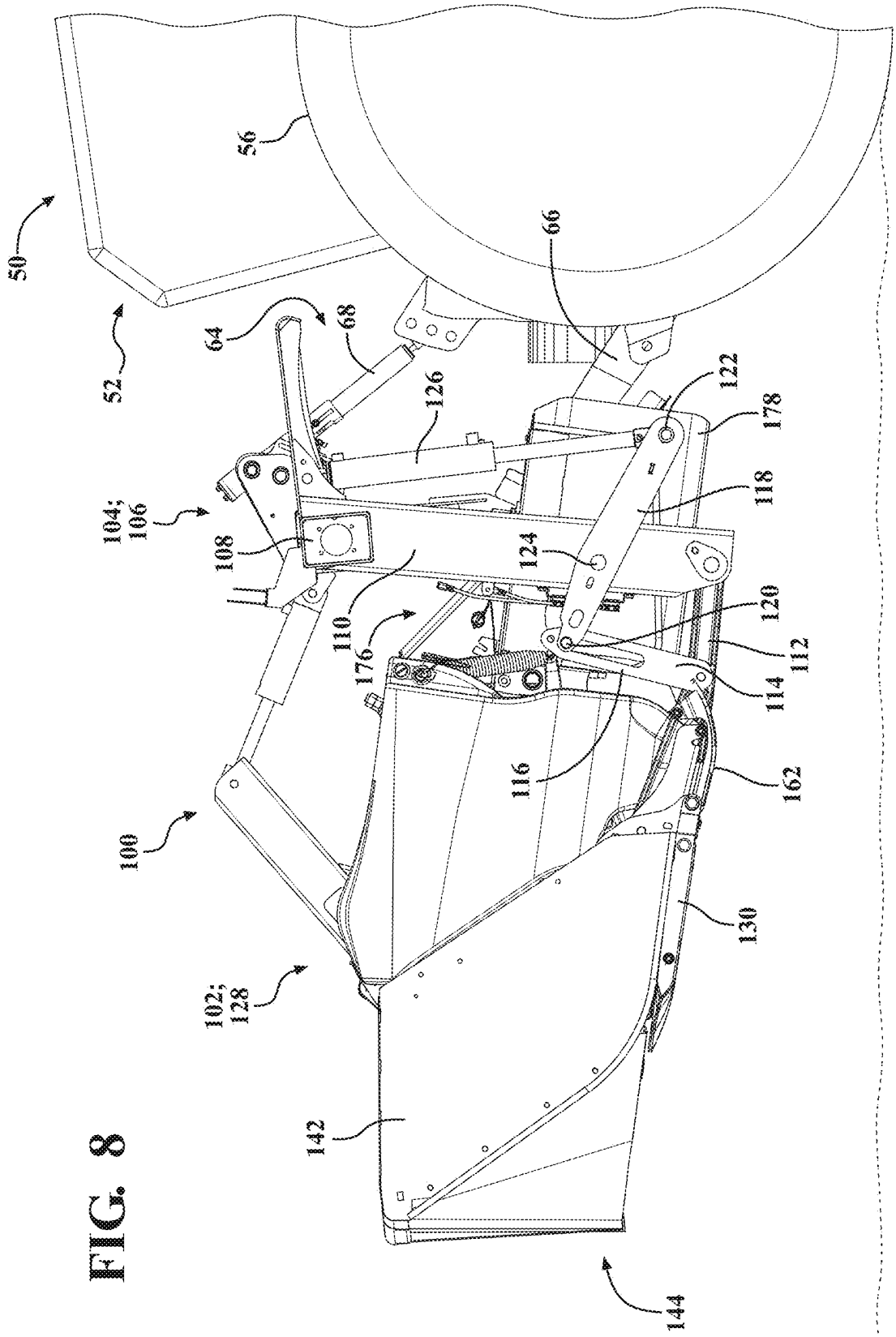
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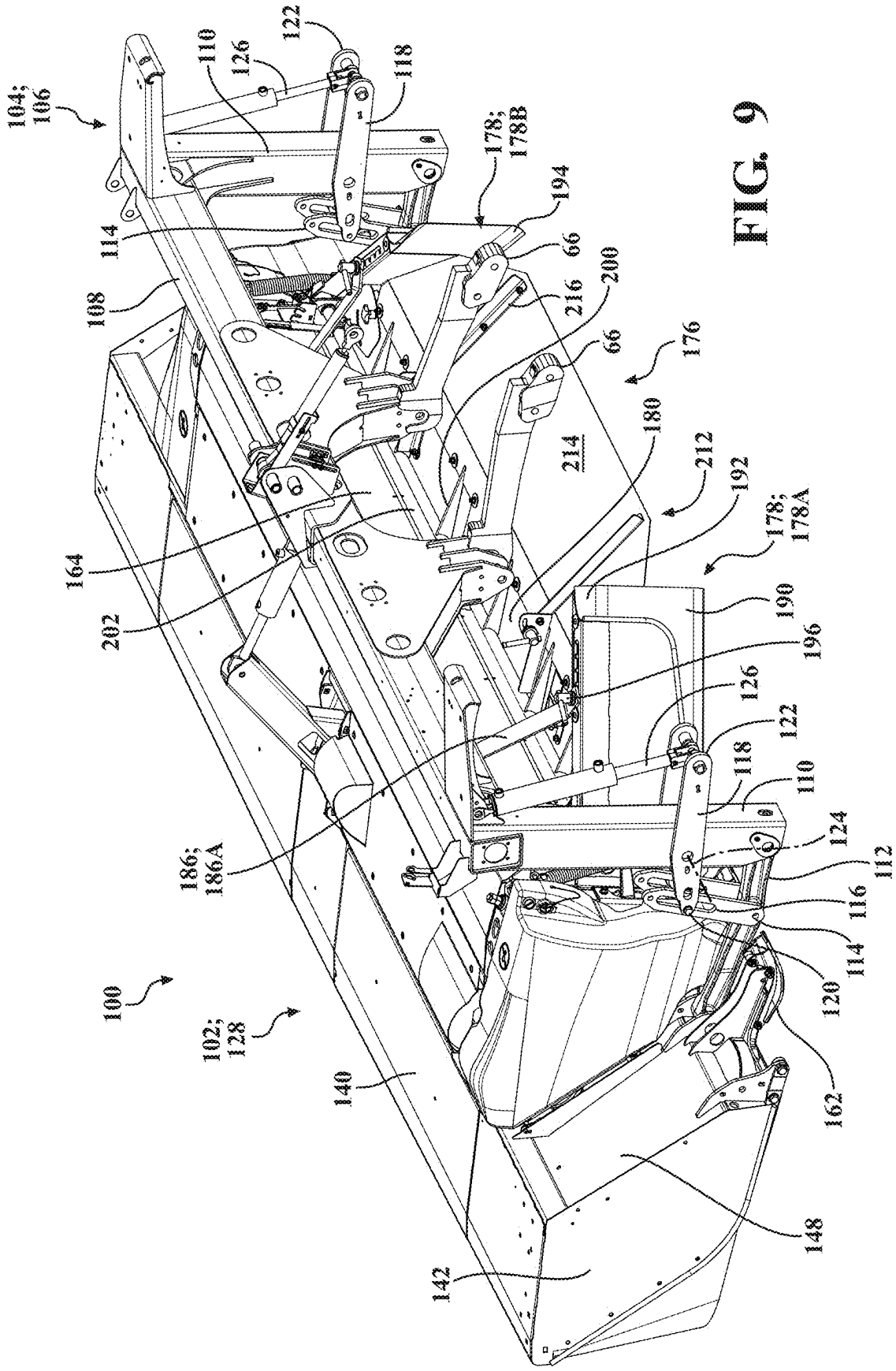
FIG. 8


104; 106
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164
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FIG. 9

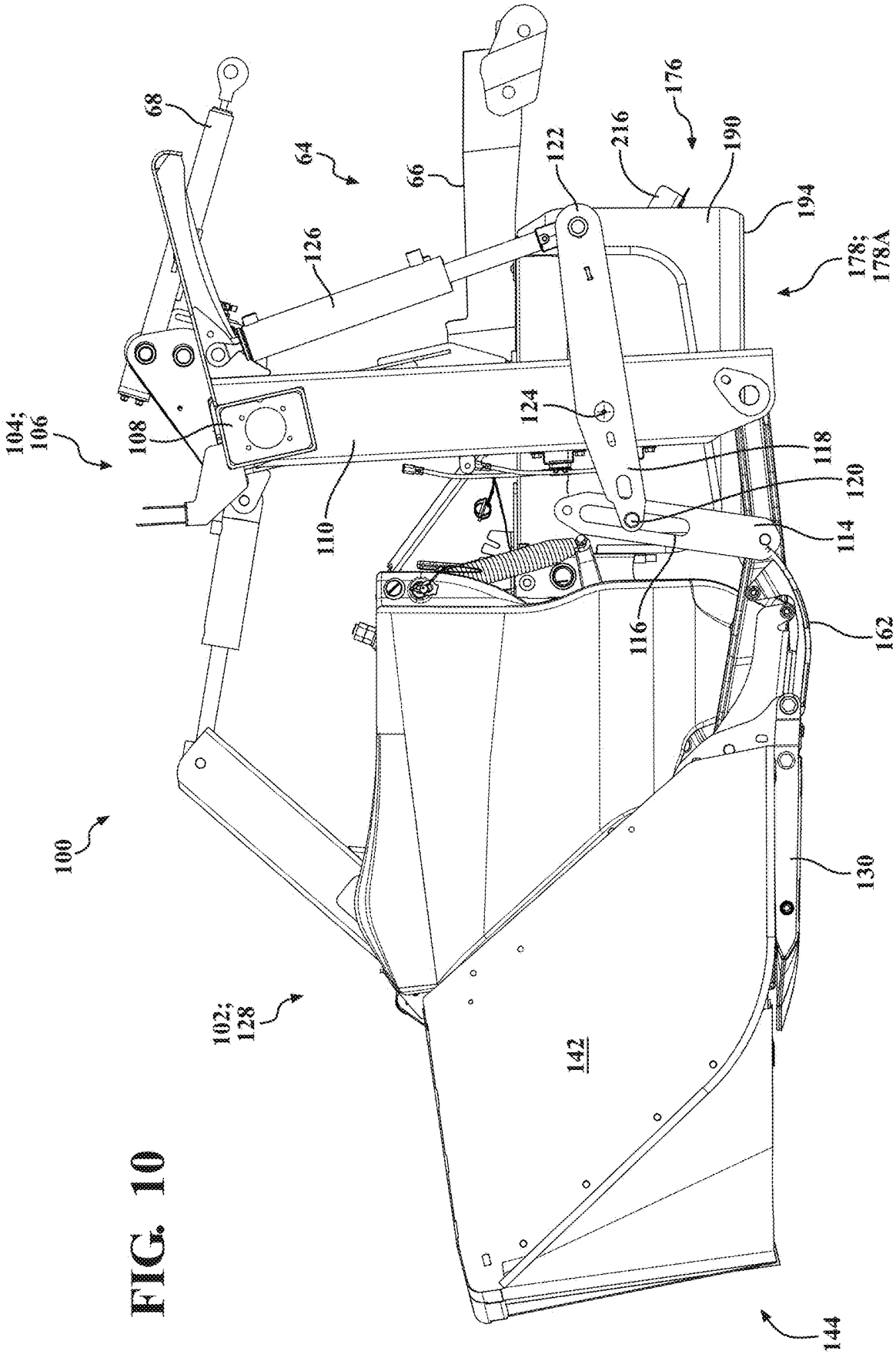
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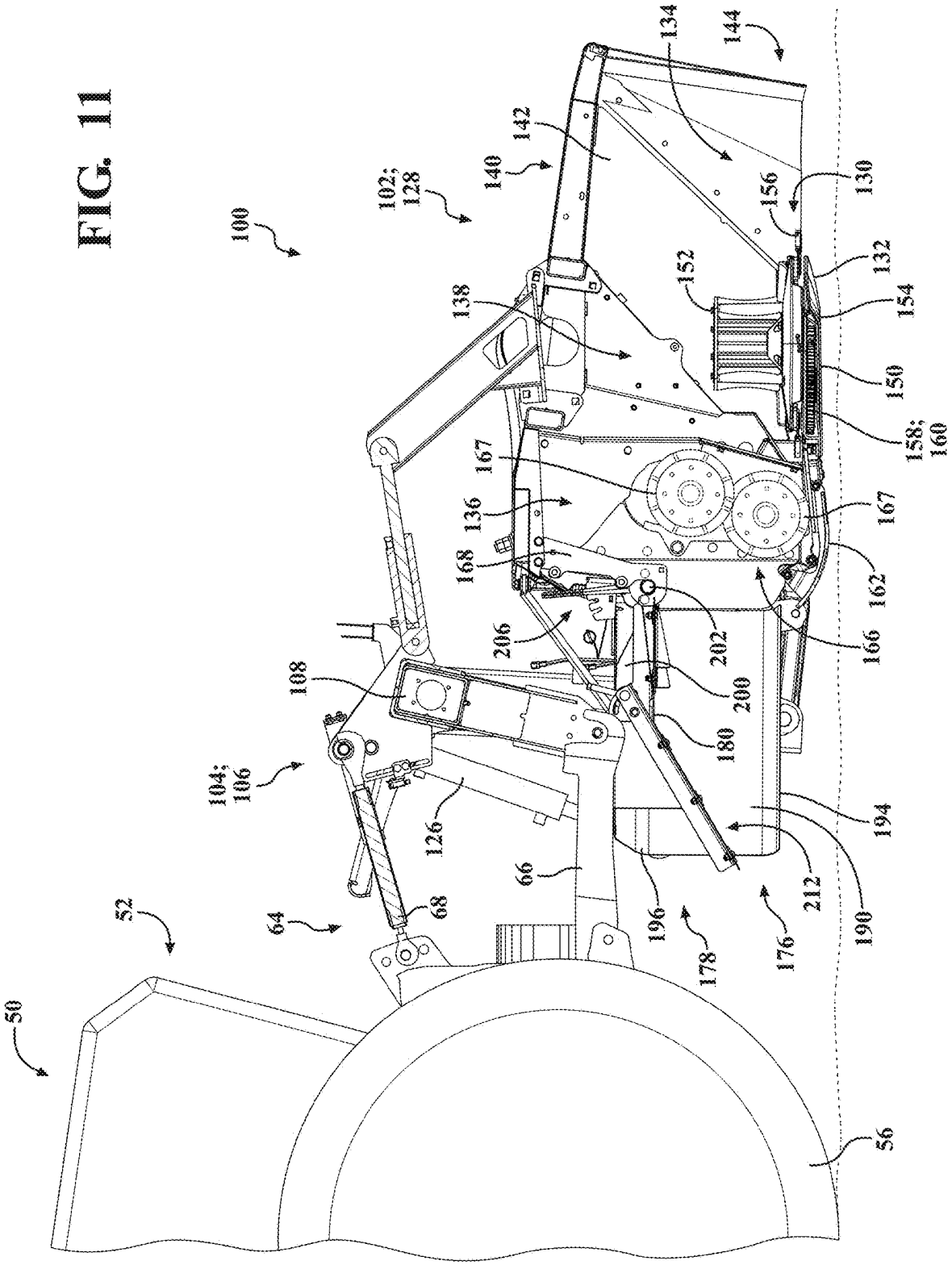
FIG. 10

FIG. 11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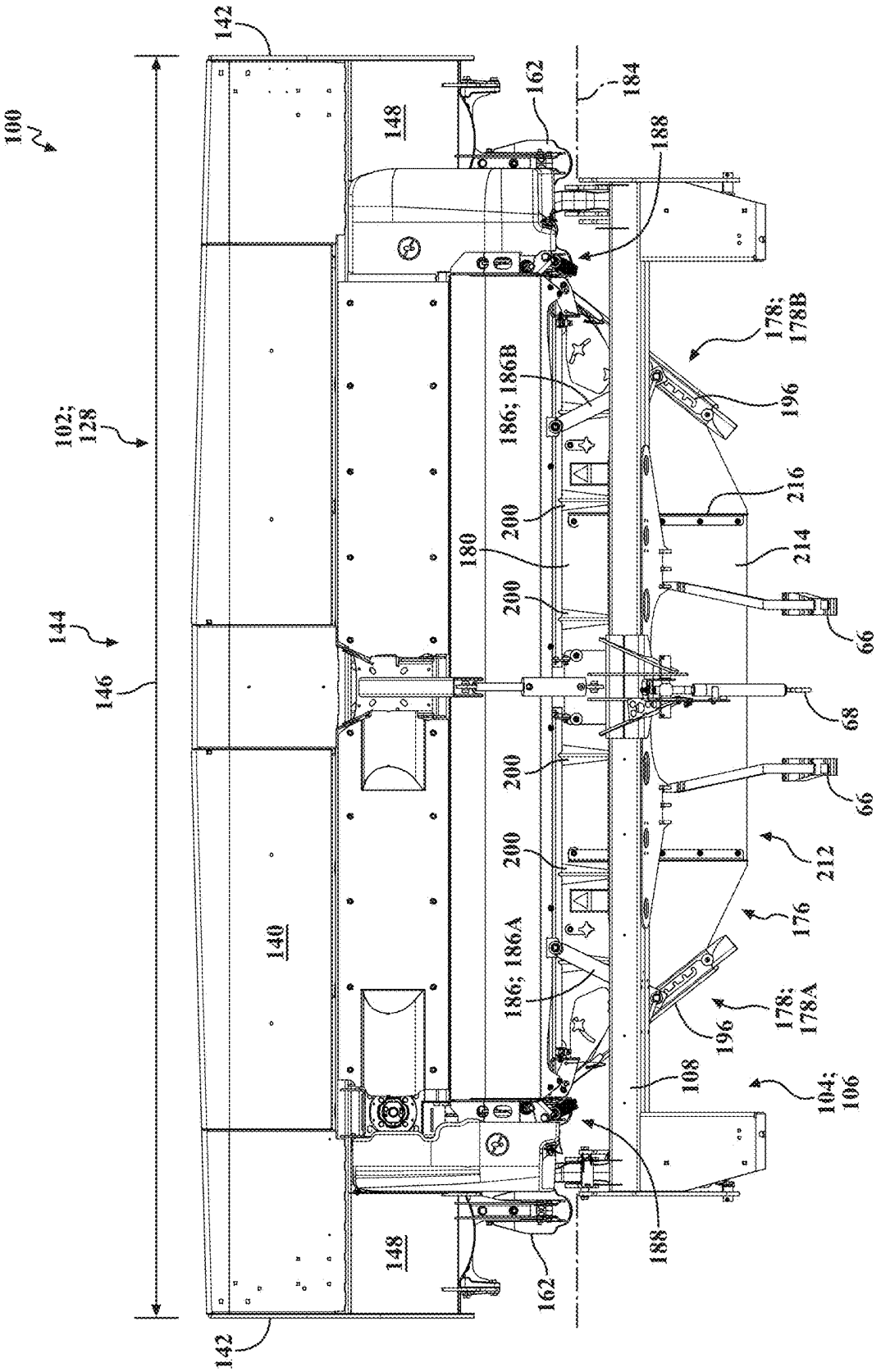
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FIG. 12

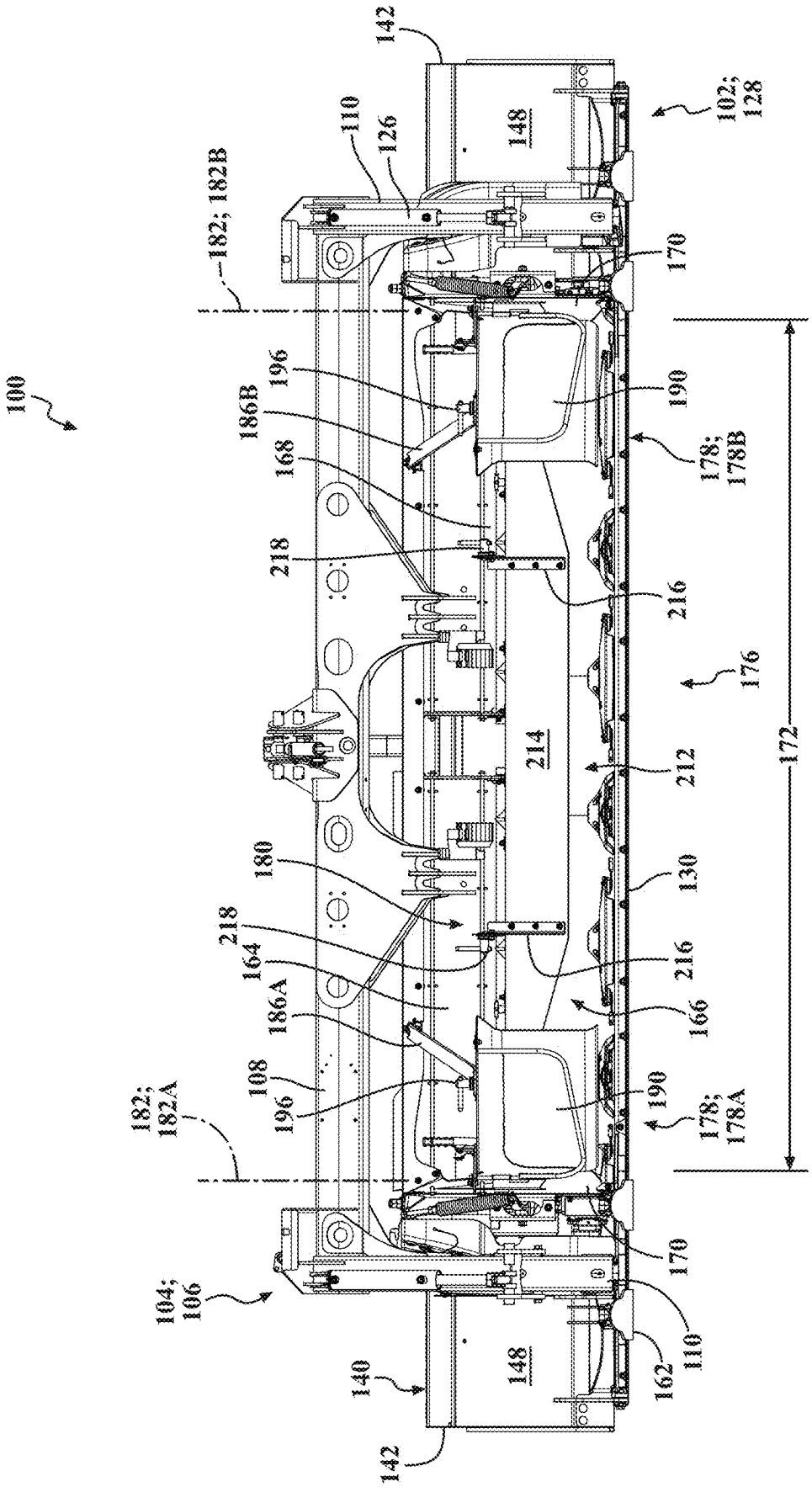
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FIG. 13

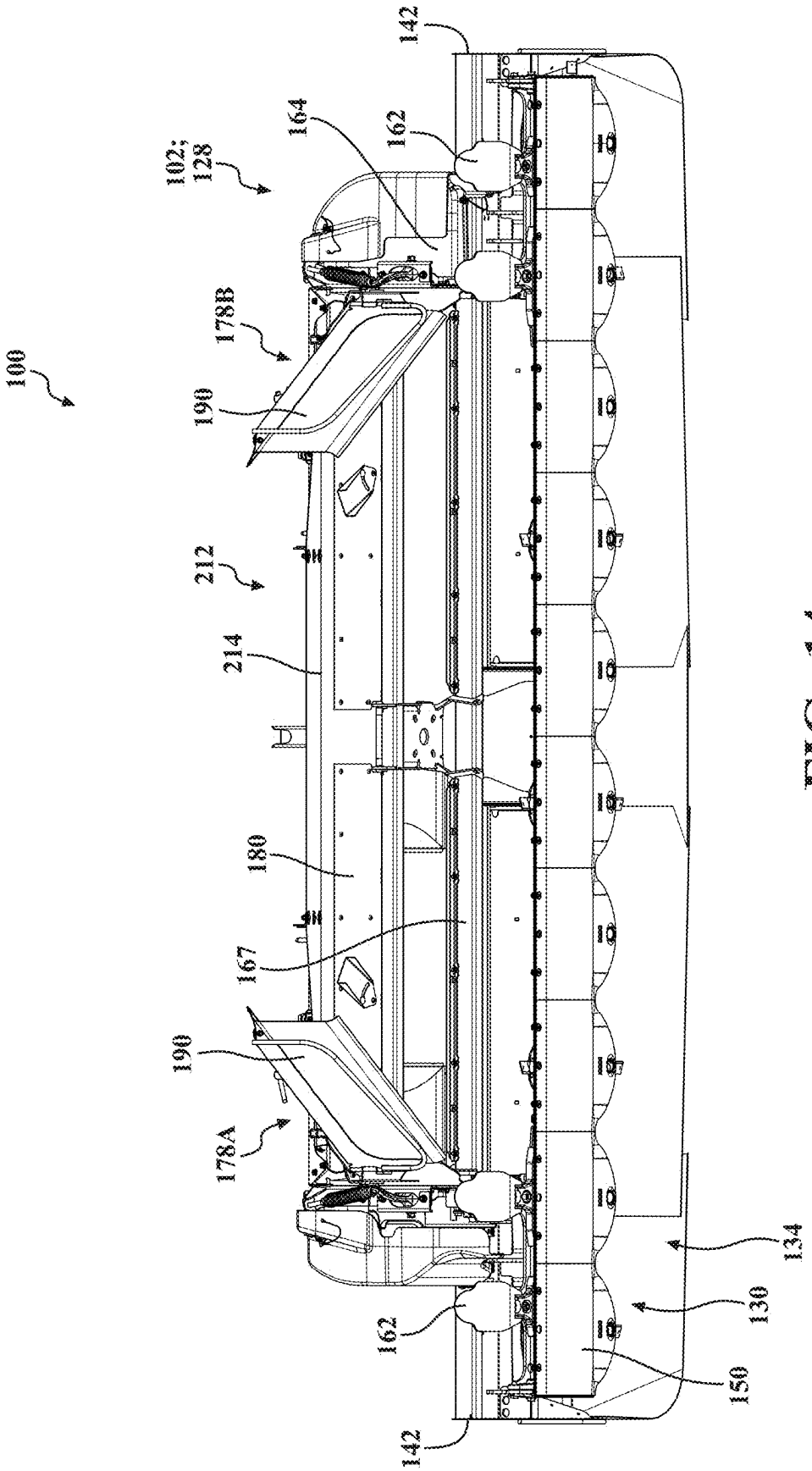
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FIG. 14

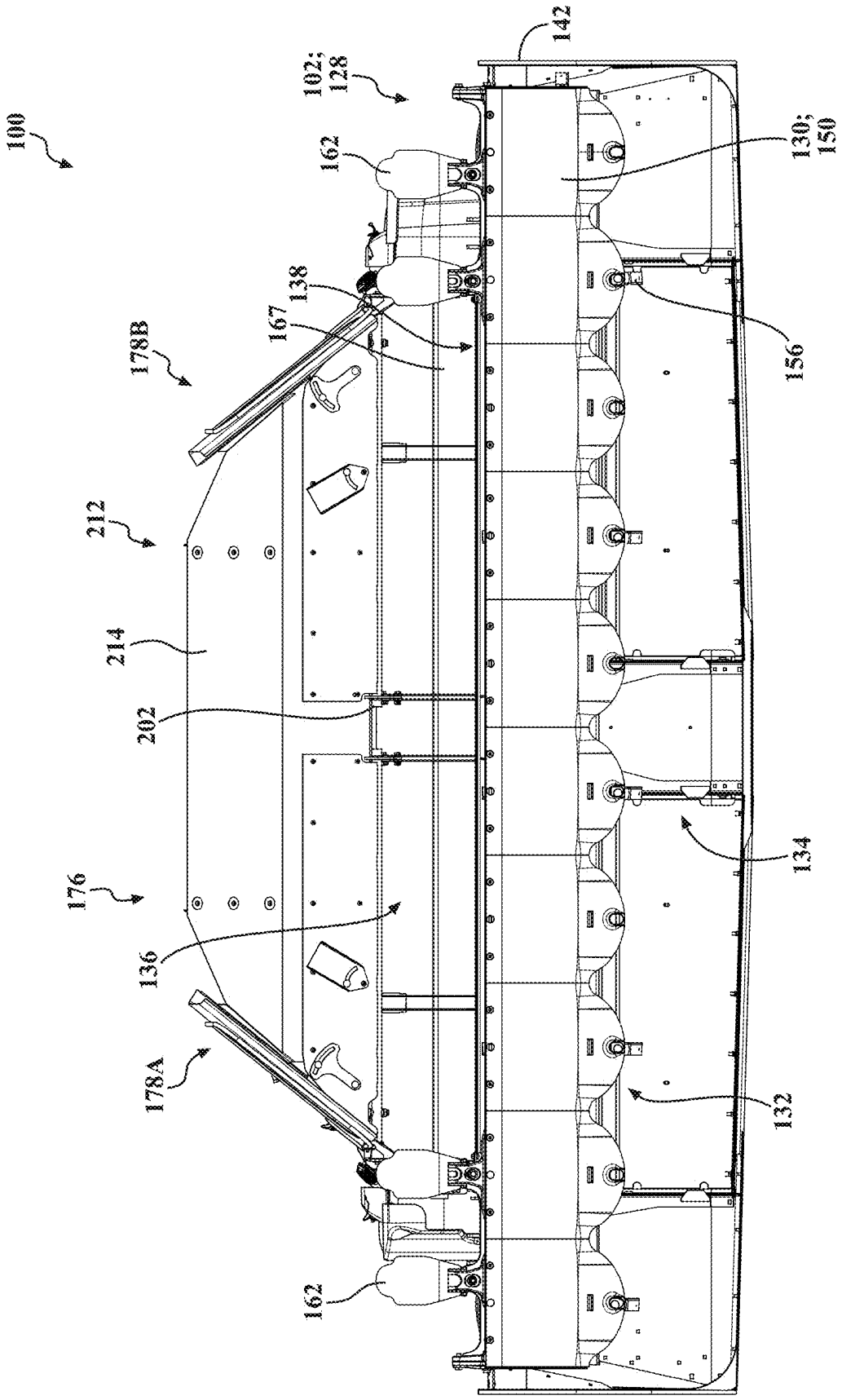
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FIG. 15

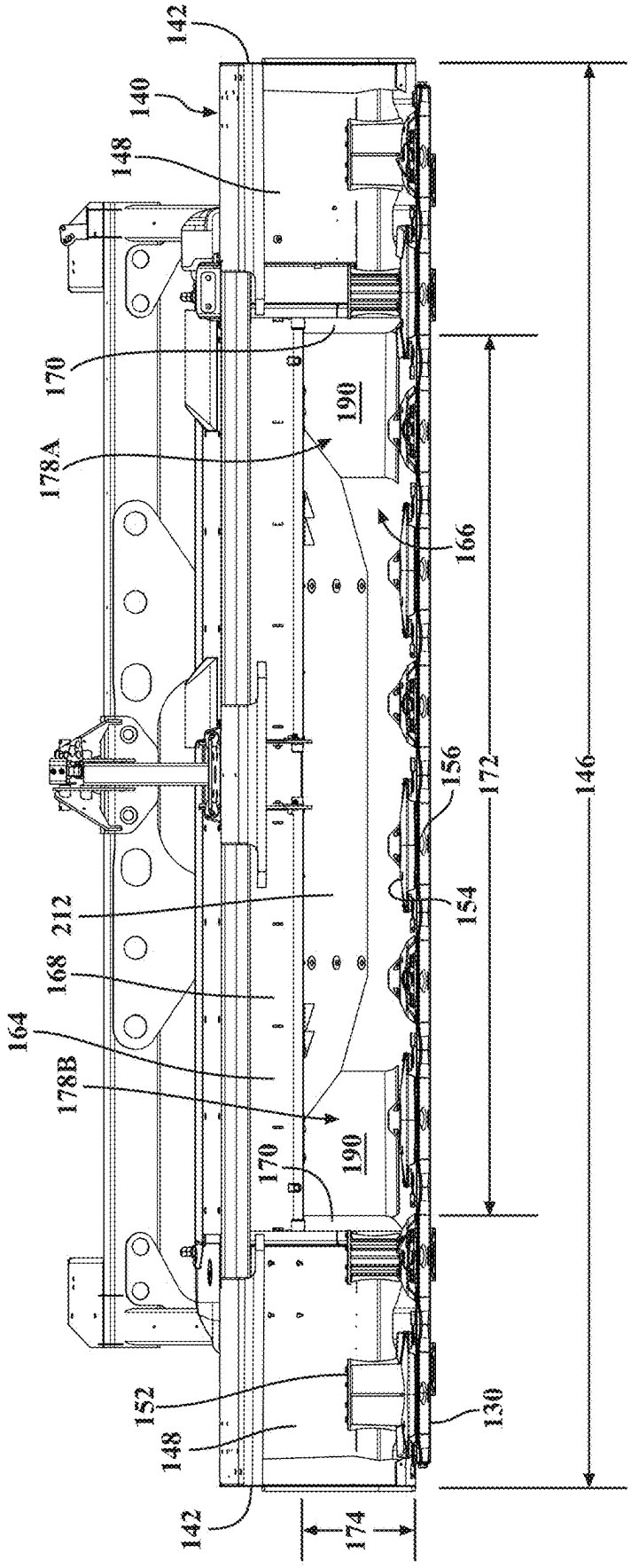
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FIG. 16

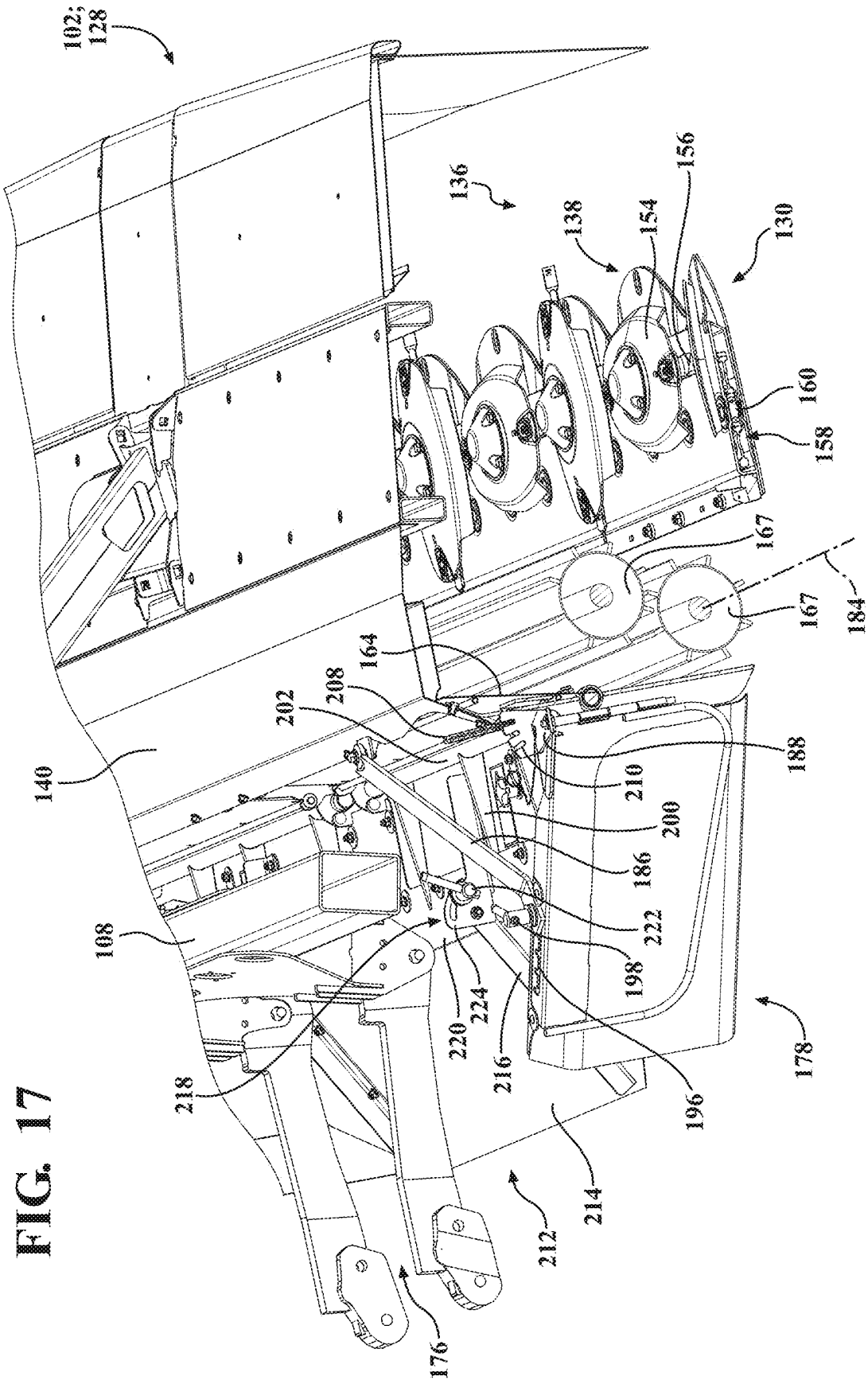
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FIG. 17

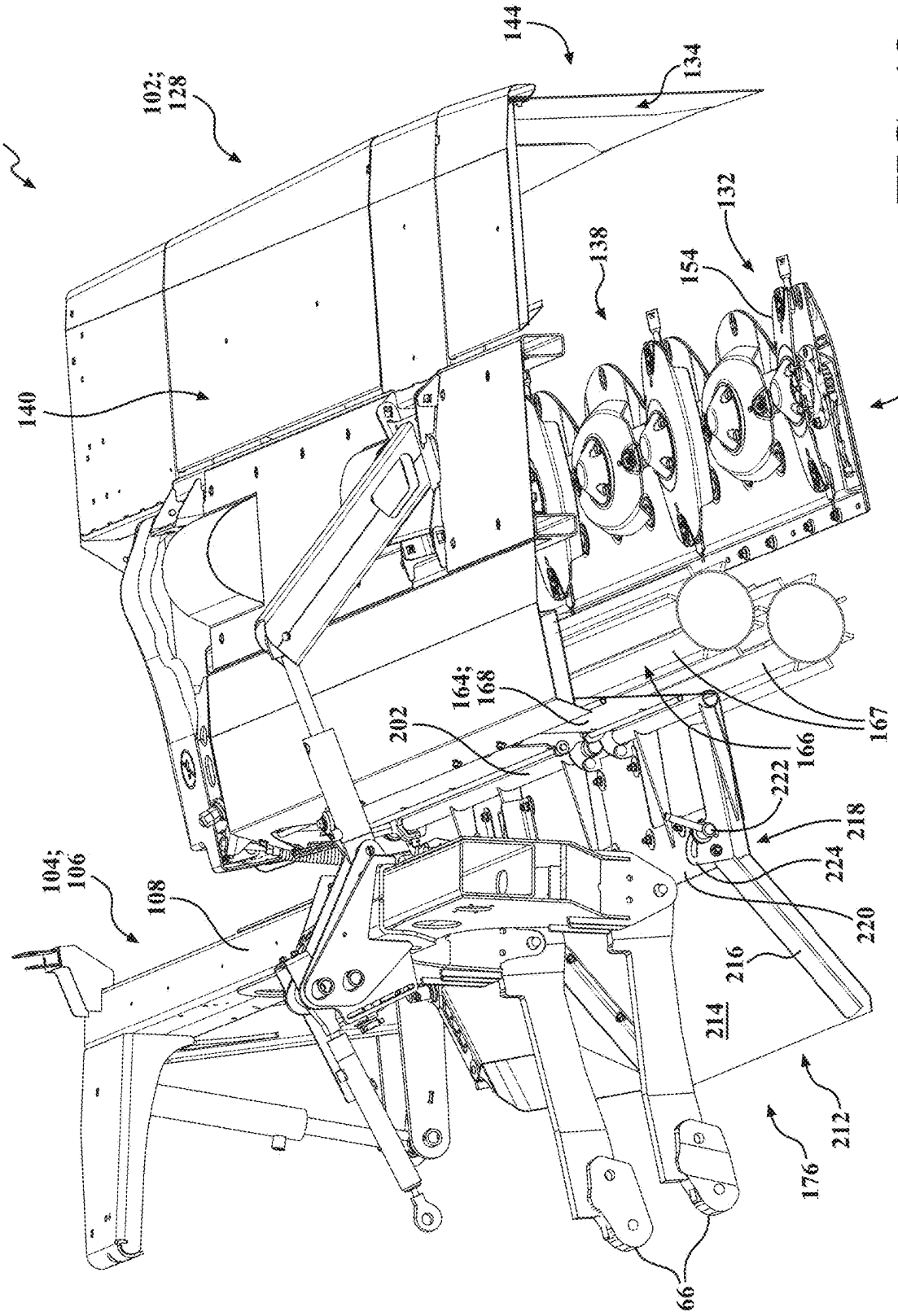
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FIG. 18

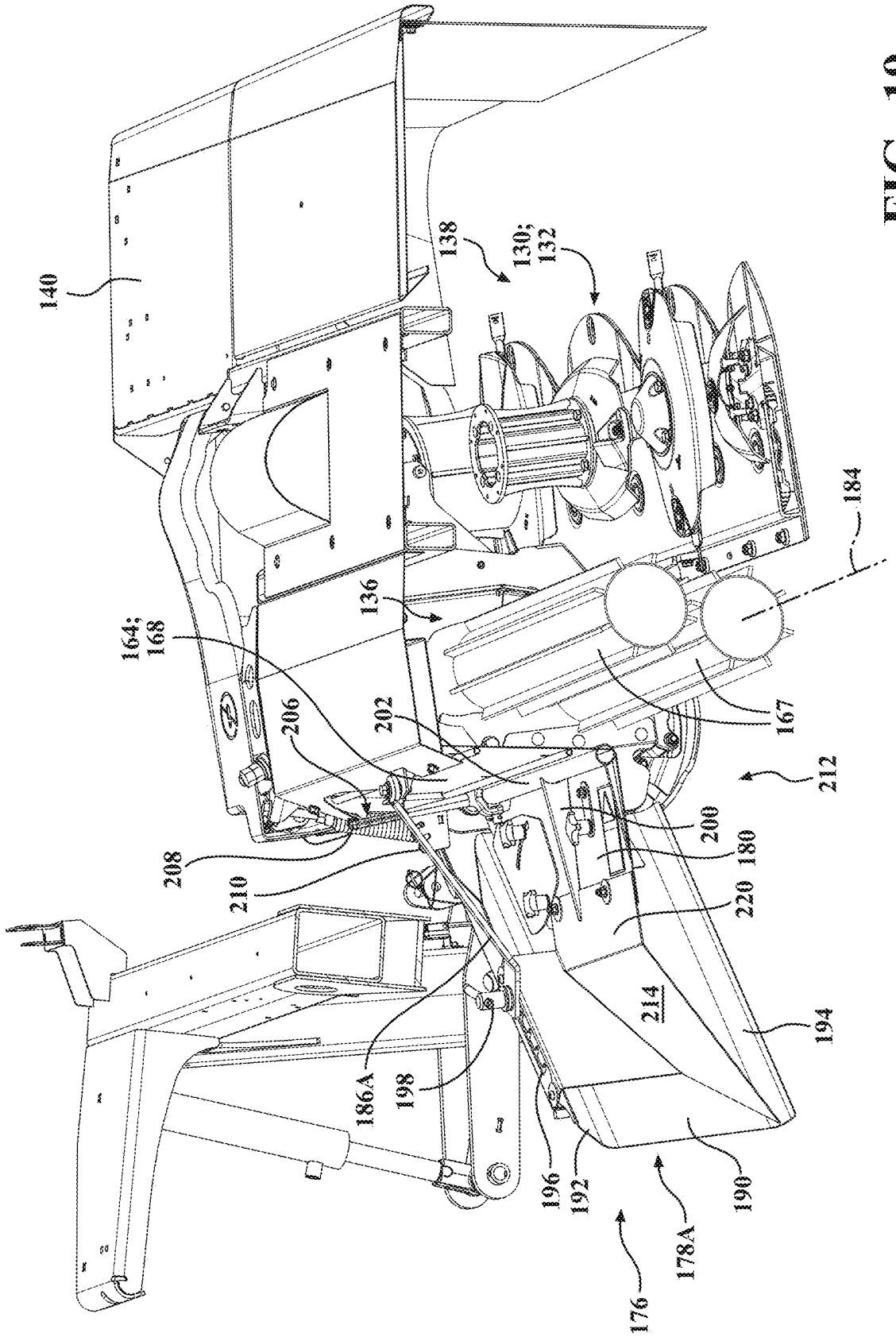
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FIG. 19

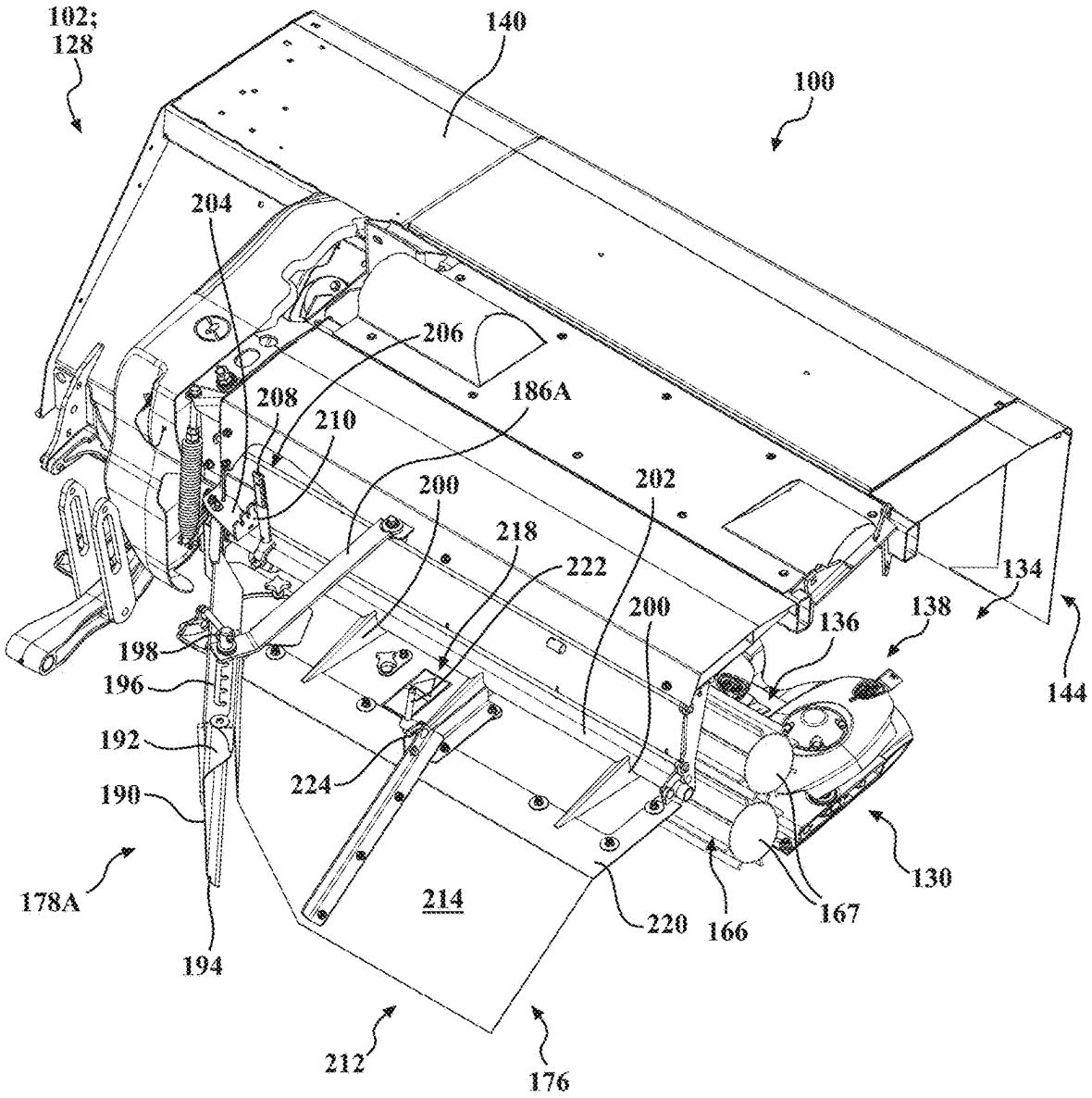
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FIG. 20

FORMING SHIELD FOR A HARVESTING IMPLEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The subject patent application claims priority to, and all the benefits of, U.S. Provisional Patent Application No. 63/554,688, filed on Feb. 16, 2024, the entire contents of which are incorporated by reference herein.

BACKGROUND

[0002] Crop harvesting headers are typically classified as a pull-type, being pulled behind a tractor to harvest crops, or a push-type, being coupled to the front of a tractor and pushed. Each arrangement has certain advantages depending on the type of crop being harvested. Some crops are formed into windrows by the harvesting header to be collected by a separate machine. In general, a harvesting header having a greater width is able to process crops at a greater rate than a harvesting header having a narrower width. For this reason, a wide harvesting header is advantageous. In order to avoid running over discharged crops with the wheels of the tractor, a specialized windrowing tractor with widely spaced wheels is commonly used in combination with a front mounted harvesting header. The harvesting header may also be mounted to the front of a conventional tractor. However, the wheel spacing of a conventional tractor is typically narrower than a windrowing tractor and the frame height of a conventional tractor is typically lower than the frame height of a windrowing tractor. As such, the wheels and/or frame of the conventional tractor are subject to interfering with the cut crops discharged from the harvesting header. Therefore, it is desirable to shape the cut crop as it is discharged from the header to flow beneath the tractor.

SUMMARY

[0003] In one aspect, a crop harvesting header is operable to form harvested crops into windrows. The crop harvesting header may include a carrier frame, a header frame, and a cutter bar. The carrier frame is configured to be mounted to a tractor during use. The header frame is movably coupled to the carrier frame and a discharge opening is defined on a rear side of the header frame. The cutter bar is coupled to the header frame and operable to cut crops. The crop harvesting header further includes a discharge shaper assembly. The discharge shaper assembly includes a height deflector coupled to the header frame adjacent to the discharge opening. The height deflector is pivotable to control a height of a windrow formed from crops ejected through the discharge opening during operation.

[0004] Any of the above aspects can be combined in full or in part. Any features of the above aspects can be combined in full or in part. Any of the above implementations for any aspect can be combined with any other aspect. Any of the above implementations can be combined with any other implementation whether for the same aspect or a different aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Advantages of the present disclosure will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings.

[0006] FIG. **1** is a first environmental view showing a front perspective of a harvesting header mounted to the front of a tractor.

[0007] FIG. **2** is another environmental view showing a rear perspective of the harvesting header of FIG. **1** mounted to the front of a tractor.

[0008] FIG. **3** is another environmental view showing a side view of the harvesting header of FIG. **1** mounted to a tractor and harvested crop being formed into a windrow and discharged from the harvesting header.

[0009] FIG. **4** is another environmental view showing a top view of the harvesting header and tractor of FIG. **3** with harvested crop being formed into a windrow and discharged from the harvesting header below the tractor.

[0010] FIG. **5** is another environmental view showing a bottom view of the harvesting header and tractor of FIG. **1**.

[0011] FIG. **6** is another environmental view showing a bottom perspective of the harvesting header and tractor of FIG. **5**.

[0012] FIG. **7** is an enlarged side view of the harvesting header and tractor of FIG. **3** with the harvesting header shown in a harvest position.

[0013] FIG. **8** is an enlarged side view of the harvesting header and tractor of FIG. **7** with the harvesting header shown in a transport position.

[0014] FIG. **9** is rear perspective view of the harvesting header removed from the tractor showing a header frame, a carrier frame, and a discharge shaper.

[0015] FIG. **10** is a side view of the harvesting header of FIG. **9**.

[0016] FIG. **11** is a cross-sectional side view of the harvesting header showing the header frame, the carrier frame, the discharge shaper, a cutter bar, and a pair of conditioner rolls.

[0017] FIG. **12** is a top side view of the harvesting header of FIG. **9**.

[0018] FIG. **13** is a rear side view of the harvesting header of FIG. **9** with the conditioner rolls removed.

[0019] FIG. **14** is a bottom perspective view of the harvesting header of FIG. **9**.

[0020] FIG. **15** is a bottom side view of the harvesting header of FIG. **9**.

[0021] FIG. **16** is a cross-sectional front view of the harvesting header with the conditioner rolls removed showing the header frame having a discharge opening and the discharge shaper.

[0022] FIG. **17** is a fragmentary cross-sectional perspective view of the harvesting header showing the header frame and the discharge shaper.

[0023] FIG. **18** is another fragmentary cross-sectional perspective view of the harvesting header showing the header frame, the cutter bar, and the discharge shaper.

[0024] FIG. **19** is another cross-sectional perspective view of the harvesting header showing the header frame, the cutter bar, and the discharge shaper.

[0025] FIG. **20** is yet another cross-sectional perspective view of the harvesting header showing the header frame, the cutter bar, and the discharge shaper.

DETAILED DESCRIPTION

[0026] In FIGS. **1-6**, an implement **100** for harvesting crops is shown coupled to a traditional style tractor **50**. In general, the tractor **50** has a front **52** and a rear **54** associated with forward and reverse directions of travel. The tractor **50**

illustrated herein comprises front wheels **56** and rear wheels **58** arranged proximate the corresponding front **52** and rear **54** thereof. It will be appreciated that the tractor **50** may be configured as shown with wheels, or may utilize other propulsion configurations such as tracks, or a combination of tracks and wheels (not shown). Best shown in FIGS. **4** and **5**, each of the front wheels **56** is arranged on one side of the tractor **50** and laterally spaced from the other. The front wheels **56** are laterally spaced from each other by a first wheel width **60**. Similarly, each of the rear wheels **58** is arranged on one side of the tractor **50** and laterally spaced from the other. The rear wheels **58** are laterally spaced from each other by a second wheel width **62**. Said differently, the first wheel width **60** and the second wheel width **62** define the clearance between inner sides of each of the front wheels **56** and each of the rear wheels **58**, respectively. The first wheel width **60** and the second wheel width **62** vary according to the model of the tractor **50**, as well as the configuration of the tractor **50**. For example, some tractors **50** may be configured with wheels that are arranged in pairs or triples (not shown), and may have first and second wheel widths **60**, **62** that are less than are illustrated herein. Furthermore, wheels of differing widths may be utilized depending on the type of crops that are being harvested or the type of terrain being traversed. Similarly, a tractor **50** configured with tracks (not shown) may have a wheel width that is greater than illustrated herein.

[0027] The tractor **50** is used to operate and control the implement **100** by providing power, via a tractor PTO system. A hydraulic system pumps hydraulic fluid to the implement **100**, which is utilized to actuate and control various components of the implement **100**, as will be discussed below. The tractor **50** further comprises a hitch **64** arranged at the front **52** to couple the implement **100** to the tractor **50**. Here, the hitch **64** is a three-point hitch, which comprises a pair of lifting arms **66** and a top link **68**. The lifting arms **66** may be powered by the hydraulic system to pivot between a raised position (FIG. **8**) and a lowered position (FIG. **7**) for controlling a height of the implement **100** above the ground. The top link **68** controls the angle of the implement **100** as it is lifted and lowered, and typically has an adjustable length which may be controlled manually or hydraulically. The lifting arms **66** carry the harvesting implement **100** and are controllable by an operator to raise or lower the harvesting implement **100** during use.

[0028] The harvesting implement **100** illustrated herein is a rotary mower **100**. The rotary mower **100** includes a header **102** and a carrier **104**. The carrier **104** is coupled or mounted to the hitch **64** of the tractor **50** and supports the header **102** during operation. The header **102** is movably coupled to the carrier **104** to facilitate independent movement of the header **102** relative to the carrier **104** and the tractor **50**. During use, the header **102** is pushed along the ground by the tractor **50** and is able to float relative to the carrier **104** and closely follow contours of the ground to maintain a steady height above the ground. The floating action of the header **102** allows the header **102** to move independently of the tractor **50** such that movement of the tractor **50** does not influence the height of the header **102**, which facilitates consistent cut height when harvesting crops. Crops that have been cut by the rotary mower **100** are discharged at a rear of the header **102** into a windrow **70** for later collection.

[0029] As mentioned above, the rotary mower **100** includes the carrier **104**. The carrier **104** includes a carrier frame **106** having a base member **108** and two side members **110** arranged on opposing ends of the base member **108**. The carrier **104** further includes a pair of float links **112** each pivotably coupled to one of the side members **110** and to the rotary mower **100**. The float links **112** control the relative movement between the header **102** and the carrier frame **106**. The carrier **104** further includes a sliding link **114** and a limiter link **118**. The sliding link **114** is pivotably coupled to one of the float links **112** and defines a guide slot **116**. The limiter link **118** has a first end **120** and a second end **122** spaced from the first end **120**. The first end **120** of the limiter link **118** is movably coupled to the guide slot **116** for pivoting and sliding movement relative to the sliding link **114**. Furthermore, the limiter link **118** is pivotably coupled to one of the side members **110** of the carrier frame **106** at a pivot axis **124** between the first end **120** and the second end **122**. A lift actuator **126** is coupled between the carrier frame **106** and the second end **122** of the limiter link **118**. The lift actuator **126** is movable between a retracted position (FIG. **7**) and an extended position (FIG. **8**) to effect coordinated movement of the limiter link **118** and the float links **112**. In this way, a couple moment is formed by the first end **120** and the second end **122** of the limiter link **118** as it pivots about the pivot axis **124**.

[0030] Similarly, the header **102** includes a header frame **128**, the header frame **128** being coupled to and arranged forwardly of the carrier frame **106** by the float links **112**. Said differently, a first end of the float links **112** is coupled to the carrier frame **106** and a second end of the float links **112** is coupled to the header frame **128**. The header **102** further includes a cutter bar **130** coupled to the header frame **128**. The cutter bar **130** includes a plurality of rotary cutters **132**, which are driven by the tractor PTO. The cutter bar **130** is operable to cut crops that are received in the header **102**. The header frame **128** has front and rear sides longitudinally spaced along a centerline, and lateral sides arranged opposite one another across the centerline. The header frame **128** has an inlet portion **134** on the front side of the header **102**, a discharge portion **136** at the rear side of the header **102**, and a cutter portion **138**, in which the cutter bar **130** is disposed, arranged between the inlet portion **134** and the discharge portion **136**. The header frame **128** further includes a top wall **140** that extends between the inlet portion **134** and the cutter portion **138**. During operation, as the rotary mower **100** progresses forward, crops are received in the inlet portion **134** and into the cutter portion **138** where the crops are cut by the cutter bar **130**. Cut crops enter the discharge portion **136** and are discharged through the rear side of the header frame **128**.

[0031] Best shown in FIGS. **9-11**, the inlet portion **134** includes two side inlet walls **142** spaced from each other to form an inlet opening **144** having an inlet width **146**. The inlet opening **144** is arranged at the frontmost end of the rotary mower **100** and receives uncut crops as the rotary mower **100** is advanced forward by the tractor **50**. The header frame **128** may further include rear header walls **148** at a rear of the header frame **128**. The rear header walls **148** guide crops processed in the cutter portion **138** toward the discharge portion **136**. The side inlet walls **142**, the rear header walls **148**, and the top wall **140** cooperate to enclose the inlet portion **134** and the cutter portion **138** of the header frame **128**. As the tractor **50** continues to advance the rotary mower **100** forward, crops move from the inlet portion **134** into the cutter portion **138**.

[0032] Crops entering the cutter portion **138** are cut by the rotary cutters **132** of the cutter bar **130**. The cutter bar **130** includes a cutter housing **150**, which is coupled to the header frame **128**. The cutter bar **130** may further include one or more drums **152** coupled to the rotary cutters **132** and configured to direct the cut crop toward the center of the discharge portion **136**. Each of the rotary cutters **132** is supported by the cutter housing **150** for rotation during operation and includes a hub **154** and a pair of blades **156** coupled to the hub **154**. To this end, the cutter housing **150** defines an interior **158**, in which a transmission **160** is disposed. The transmission **160** may comprise one or more gears that transfer rotational motion to the rotary cutters **132** to spin the blades **156** and to one or more drums **152**. The transmission **160** may alternatively comprise other mechanical couplings that facilitate the transfer of rotational motion such as a belt and pulleys, a chain and sprockets, or may be a direct drive connection to the rotary cutters **132**. The cutter bar **130** may further include one or more float shoes **162**, or skid shoes, that are coupled to the cutter housing **150** and support the cutter bar **130** on the ground. The float shoes **162** slide along the ground as the rotary mower **100** is pushed by the tractor **50** and follow the contours of the ground to maintain the height of the rotary cutters **132** relative to the ground.

[0033] With continued reference to FIGS. **11** and **12**, the discharge portion **136** of the header frame **128** is shown. The discharge portion **136** includes a rear discharge wall **164** defining a rear side of the header frame **128**. A discharge opening **166** is defined on a rear side of the header frame **128** and in the rear discharge wall **164** and is further arranged centrally on the rear side of the header frame **128**. The discharge opening **166** is defined by a horizontal head jamb **168** and two laterally spaced side jambs **170**. The discharge opening **166** has a discharge opening width **172** defined by the horizontal distance between the opposing side jambs **170**, and a discharge opening height **174** defined by the vertical distance between the cutter bar **130** and the head jamb **168**. The discharge opening width **172** is less than the inlet width **146** and the horizontal distances between each of the side jambs **170** and an adjacent one of the side inlet walls **142** is approximately equal.

[0034] As mentioned above, crops that have been cut in the cutter portion **138** progress into the discharge portion **136** and toward the discharge opening **166** and into a pair of conditioner rolls **167**, which eject the cut crop through the discharge opening **166** and out of the rotary mower **100** to form windows **70**. The rotary mower **100** is able to cut crops in a path corresponding to the inlet width **146** of the inlet opening **144** and form a windrow **70** having a windrow width **72** and a windrow height **74**. In general, increasing the inlet width **146** facilitates harvesting crops at a greater rate. Best shown in FIGS. **3** and **4**, the rotary mower **100** cuts crops along the inlet width **146**, which is larger than the width of the tractor **50**. Because the rotary mower **100** is attached to the front **52** of the tractor **50**, crops discharged from the discharge opening **166** pass underneath the tractor **50**. In order to prevent discharged crops being run over by the wheels **56**, **58** of the tractor **50**, the windrow width **72** should be less than the width between the wheels **56**, **58** of the tractor **50**. Said differently, the windrow width **72** should be less than both the first wheel width **60** and the second wheel width **62**. Additionally, the windrow height **74** should be less than the distance between the ground and the lowest point, typically the frame, of the tractor **50**, i.e., the ground clearance.

[0035] In order to accommodate a wide variety of tractors **50**, the rotary mower **100** further includes a discharge shaper **176** that forms the cut crops into windrows **70**. The discharge shaper **176** is configurable to control and adjust the windrow width **72** and the windrow height **74**. The discharge shaper **176** is configurable by a user to form a windrow **70** having a windrow width **72** less than the first wheel width **60** and the second wheel width **62**. The discharge shaper **176** is further configurable by a user to form a windrow **70** having a windrow height **74** less than the ground clearance of the tractor **50**. As mentioned above, the cut crop is guided into the conditioner rolls **167**. The conditioner rolls **167** add energy to the cut crop that is ejected into the discharge shaper **176**. The ejected cut crop is guided by the discharge shaper **176** and formed into a windrow.

[0036] To this end, the discharge shaper **176** is coupled to the header frame **128** and extends rearwardly toward the carrier frame **106**. The discharge shaper **176** extends rearwardly beyond the carrier frame **106** to a distance further from the header frame **128** than the carrier frame **106**. The discharge shaper **176** may include a width deflector **178** and a height deflector **180**. Both the width deflector **178** and the height deflector **180** are pivotably coupled to the header frame **128** adjacent to the discharge opening **166**. The width deflector **178** and the height deflector **180** cooperate to form the cut crops into a windrow **70** and control the windrow width **72** and windrow height **74**. Specifically, the width deflector **178** controls the windrow width **72** and the height deflector **180** controls the windrow height **74**. The width deflector **178** is pivotable about a height axis **182** of the rotary mower **100** and the height deflector **180** is pivotable about a lateral axis **184** of the rotary mower **100**. Here, rotary mower **100** may comprise more than one width deflector **178** pivotably coupled to the header frame **128**. A first width deflector **178**A may be pivotable about a first height axis **182**A and a second width deflector **178**B may be pivotable about a second height axis **182**B. The first width deflector **178**A and the second width deflector **178**B are arranged adjacent to the discharge opening **166** and on opposing sides of the height deflector **180**. Said differently, the first width deflector **178**A may be coupled to one of the side jambs **170** of the discharge opening **166** and the second width deflector **178**B may be coupled to the other of the side jambs **170** of the header frame **128**. Each of the first width deflector **178**A and the second width deflector **178**B may be constructed from a polymer material such as a rubber or plastic. The rubber material may provide some flexibility to the width deflectors **178**A, **178**B to avoid over-compressing the cut crops when forming the windrow **70**. Additionally, a rubber material is resistant to damage from impacts during operation. The flexibility of the width deflectors **178** and the height deflector **180** facilitates forming the windrow by providing variability to how densely the cut crop will be packed to form the windrow. Said differently, as the discharge shaper **176** forms the cut crop into the windrow, the width deflectors **178** and the height deflector **180** are able to flex, which prevents the cut crop from becoming too densely packed. As will be discussed in greater detail below, the first width deflector **178**A and the second width deflector **178**B may be pivoted independently of one another to adjust the windrow width **72** as well as the position of the windrow **70**

relative to the discharge opening **166**. If only one of the width deflectors **178** is adjusted, the position of the windrow **70** will be shifted in a lateral direction (i.e., left and right) relative to the rotary mower **100**.

[0037] The discharge shaper **176** may further comprise a width limiting arm **186** coupled to the width deflector **178** and the header frame **128**. The width limiting arm **186** is configured to adjust the angle of the width deflector **178** to control the windrow width **72**. Here, the discharge shaper **176** comprises a first width limiting arm **186**A coupled to the first width deflector **178**A and a second width limiting arm **186**B coupled to the second width deflector **178**B. Each of the first width limiting arm **186**A and the second width limiting arm **186**B is coupled between the header frame **128** and the corresponding width deflector **178**A, **178**B.

[0038] Each of the first width deflector **178**A and the second width deflector **178**B may include a hinge **188** and a deflector shield **190** coupled to the hinge **188**. The hinge **188** is coupled to the rear discharge wall **164** and arranged on the height axis **182** to facilitate the pivoting movement of the corresponding width deflector **178**A, **178**B. The deflector shield **190** may include an upper wing portion **192** and a lower wing portion **194** spaced from each other to define a C-shaped profile of the deflector shield **190**. The C-shaped profile directs cut crops exiting the discharge opening **166** along the deflector shield **190** to form the windrow **70**. The C-shaped profile is curved toward the height deflector **180** and facilitates forming the windrows **70** by preventing cut crops from rolling over an upper and lower side of the width deflector **178**, which increases efficiency and further prevents cut crops from being run over by the tractor **50**.

[0039] As mentioned above, the discharge shaper **176** includes the width limiting arms **186**A, **186**B coupled between the header frame **128** and the corresponding width deflector **178**A, **178**B. To this end, the upper wing portion **192** of each of the width deflectors **178**A, **178**B may include a width latch **196** coupled to the corresponding width limiting arm **186**A, **186**B. Here, the width latch **196** includes a slot with at least one notch, the notch being engageable with the width limiting arm **186** to limit adjustment of the width deflector **178**. The width latch **196** may include a clamp **198** that is coupled to the width limiting arm **186** and disposed in the slot. The clamp **198** secures the width limiting arm **186** to the width deflector **178** to prevent relative movement therebetween.

[0040] The width limiting arm **186** is movable along a length of the slot of the width latch **196** to adjust the angle of the width deflector **178** relative to the rear discharge wall **164**. The at least one notch of the width latch **196** may define a discrete position or angle relative to the rear discharge wall **164** of each of the width deflectors **178**A, **178**B to facilitate symmetric adjustment. When the first width deflector **178**A and the second width deflector **178**B are adjusted to the same angle, the windrow **70** will be formed at a centered position relative to the width of the rotary mower **100**. If the first width deflector **178**A and the second width deflector **178**B are adjusted to angles that are different from each other, the windrow **70** will be formed at a position that is off center relative to the width of the rotary mower **100**. Generally, the first width deflector **178**A and the second width deflector **178**B are adjusted symmetrically (i.e., to the same angle), however asymmetric adjustment may permit the windrow width **72** to be more precisely controlled. The clamp **198** is engageable with the at least one notch to set the angle of the width deflector **178**.

[0041] Turning to FIGS. **18-20**, details of the height deflector **180** are shown. Similar to above, the discharge shaper **176** may further include a height limiting arm **200**. The height limiting arm **200** is coupled to the height deflector **180** and the header frame **128** and configured to adjust the angle of the height deflector **180** relative to the rear discharge wall **164** to control the windrow height **74** of the windrow **70**. The height deflector **180** may be constructed from a polymer material such as a rubber or plastic. The rubber material may provide some flexibility to the height deflector **180** to avoid over-compressing the cut crops when forming the windrow **70**. Additionally, a rubber material is resistant to damage from impacts during operation.

[0042] Here, discharge shaper **176** may include more than one height limiting arms **200** spaced along the height deflector **180** to control the angle. For example, the discharge shaper **176** may include a pair of height limiting arms **200**, which are arranged on opposing sides of the centerline of the header frame **128**. The discharge shaper **176** may further include a pivot rod **202** coupled to each of the height limiting arms **200** to facilitate pivoting movement of the height deflector **180**. The pivot rod **202** is supported for pivoting movement about the lateral axis **184** by a pivot socket **204**. The pivot socket **204** is coupled to the rear discharge wall **164** adjacent to the head jamb **168** of the discharge opening **166**.

[0043] Again, similar to the width deflector **178** above, the height deflector **180** is adjusted by pivoting about the lateral axis **184** varying the angle of the height deflector **180** relative to the rear discharge wall **164**. To this end, the height deflector **180** may include a height latch **206** coupled to the pivot rod **202** and engageable with the header frame **128** to control the angle of the height deflector **180**. The height latch **206** includes a handle **208** coupled to the pivot rod **202** and operable by a user to move the pivot rod **202** relative to the pivot socket **204**. The pivot socket **204** defines a plurality of notches **210** arranged in a radial pattern about the lateral axis **184**. The handle **208** is selectively engageable with each of the notches **210** to prevent the handle **208** and pivot rod **202** from pivoting. When the user disengages the handle **208** from the notches **210**, the handle **208** is movable to pivot the pivot rod **202** and the height deflector **180** about the lateral axis **184** and adjust the windrow height **74** of the windrow **70**. The user engages the handle **208** with one of the notches **210** to prevent pivoting movement of the pivot rod **202** and the height deflector **180** about the lateral axis **184** and set the windrow height **74** of the windrow **70**.

[0044] The discharge shaper **176** may further include a height shaper **212** coupled to the height deflector **180**. The height shaper **212** may cooperate with the height deflector **180** to further control the windrow height **74**. The height shaper **212** may include a shaper shield **214**, a shaper brace **216**, and a shaper latch **218**. Here, the height shaper **212** includes more than one shaper brace **216**, each coupled to one of the height limiting arms **200**. For example, the discharge shaper **176** may include a pair of shaper braces **216**, which are arranged on opposing sides of the centerline of the header frame **128**. Each shaper brace **216** is pivotably coupled to a distal end of one of the height limiting arms **200** to independently adjust the angle of the shaper shield **214** relative to the height deflector **180**. The height shaper **212**

may further include more than one shaper latch **218**, each of which is coupled to one of the height limiting arms **200** and the corresponding shaper brace **216** to control the angle between the shaper brace **216** and the height limiting arm **200**. The shaper latch **218** includes a clamp **222** disposed in an arcuate slot **224**. The clamp **222** is configured to move within the arcuate slot **224** as the shaper brace **216** moves relative to the height limiting arm **200** and, when tightened, prevent movement of the shaper brace **216** relative to the height limiting arm **200**.

[0045] The shaper shield **214** is pivotably coupled at a first end to the height deflector **180** and extends in a generally rearward direction therefrom. The shaper shield **214** is further coupled to each of the shaper braces **216**. The shaper shield **214** may also be constructed from a polymer material such as a rubber or plastic. The rubber material may provide some flexibility to the shaper shield **214** to avoid over-compressing the cut crops when forming the windrow **70**. Additionally, a rubber material is resistant to damage from impacts during operation. The shaper shield **214** may include a shaper hinge **220** that is coupled to the height deflector **180** to facilitate pivoting movement therebetween. The shaper hinge **220** may be a piano type hinge having two independent portions pivotably supported on a hinge pin. Alternatively, the shaper hinge **220** may be a strip of flexible material having a unitary construction. In another example, the shaper hinge **220** may be integrally formed with the height deflector **180** and the shaper shield **214** as a living hinge.

[0046] Several instances have been discussed in the foregoing description. However, the aspects discussed herein are not intended to be exhaustive or limit the disclosure to any particular form. Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects without departing from the scope of the disclosure. The terminology that has been used is intended to be in the nature of words of description rather than of limitation. Many modifications and variations are possible in light of the above teachings and the disclosure may be practiced otherwise than as specifically described.

What is claimed is:

1. A crop harvesting header operable to form windrows, the crop harvesting header comprising:

a carrier frame configured to be mounted to a tractor;

a header frame movably coupled to the carrier frame and defining a discharge opening on a rear side;

a cutter bar coupled to the header frame and operable to cut crops; and

a discharge shaper assembly coupled to the header frame and comprising:

a height deflector coupled to the header frame adjacent to the discharge opening and pivotable to control a height of a windrow formed from crops ejected through the discharge opening during operation.

2. The crop harvesting header of claim **1**, wherein the header frame is arranged forwardly of the carrier frame.

3. The crop harvesting header of claim **1**, wherein the discharge shaper assembly further comprises a height latch coupled between the height deflector and the header frame and configured to control the angle of the height deflector relative to the header frame.

4. The crop harvesting header of claim **1**, wherein the discharge shaper assembly further comprises a height limiting arm coupled to the height deflector and the header frame and configured to adjust an angle of the height deflector to control a height of discharged crop.

5. The crop harvesting header of claim **1**, wherein the discharge shaper assembly further comprises a first width deflector and a second width deflector each pivotably coupled to the header frame adjacent to the discharge opening, wherein the first width deflector and the second width deflector are arranged on opposing sides of the height deflector.

6. The crop harvesting header of claim **5**, wherein the discharge shaper assembly further comprises a width limiting arm coupled to the first width deflector and the header frame and configured to adjust an angle of the first width deflector to control a width of discharged crop.

7. The crop harvesting header of claim **5**, wherein the first width deflector and the second width deflector each include a wing portion, wherein the wing portion is curved toward the height deflector and configured to facilitate forming the windrows.

8. The crop harvesting header of claim **7**, wherein the wing portion of the first width deflector and the second width deflector is further defined as an upper wing portion and a lower wing portion, and wherein the upper wing portion and the lower wing portion cooperate to define a c-shaped profile of each of the first width deflector and the second width deflector.

9. The crop harvesting header of claim **5**, wherein the first width deflector and the second width deflector are formed from a flexible material.

10. The crop harvesting header of claim **9**, wherein the flexible material is a rubber.

11. The crop harvesting header of claim **1**, wherein the height deflector is formed from a flexible material.

12. The crop harvesting header of claim **1**, further comprising a pair of conditioner rolls operably coupled to the header frame and arranged adjacent to the discharge opening for ejecting cut crops through the discharge opening.

13. The crop harvesting header of claim **1**, wherein the discharge shaper assembly extends rearwardly from the header frame toward the carrier frame.

14. The crop harvesting header of claim **13**, wherein the discharge shaper assembly extends rearwardly beyond the carrier frame to a distance further from the header frame than the carrier frame.

15. The crop harvesting header of claim **1**, wherein the discharge shaper assembly further comprises a height shaper coupled to the height deflector and pivotable to further control the height of the windrow formed from crops ejected through the discharge opening during operation.

16. The crop harvesting header of claim **15**, wherein the discharge shaper assembly further comprises a shaper latch coupled between the height deflector and the height shaper and configured to control the angle of the height shaper relative to the height deflector.

17. The crop harvesting header of claim **15**, wherein the discharge shaper assembly further comprises a pair of shaper braces coupled to the height shaper, and wherein the shaper braces are arranged on opposing sides of a centerline of the header frame.

18. The crop harvesting header of claim **15**, wherein the height shaper is formed from a flexible material.

19. The crop harvesting header of claim **18**, wherein the flexible material is a rubber.

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