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(54) **WORK TOOL WITH EXCHANGE SYSTEM**
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Description

Technical Field

[0001] The present disclosure relates to an implement of a machine, and more particularly to an exchange system for the implement.

Background

[0002] Due to various types of operational and terrain conditions, machines are required to use different types and sizes of implements, such as grapples. Typically, such grapples include a number of moveable components, such as shells, tines, jaws etc. These grapples and the corresponding moveable components may need to be changed every time for different types of operations. Generally, these grapples are attached to an implement system of the machine by using fastening elements. However, while assembling and/or exchanging the grapples, the fastening elements are fastened and unfastened manually, which is a cumbersome and a time consuming task. Moreover, grapples may be very heavy and fastening and unfastening of these grapples may be an unsafe task.

[0003] Also, the moveable components may tend to fall apart from each other while assembling and/or exchanging the grapples, which may not be desired as it can be hazardous to the operator of the machine and the surroundings of the machine.

[0004] US-A-5024397 discloses a clamshell attachment for a crescent shaped, concave-convex log grapple, to convert the log grapple to a scoop or bucket type device for handling bulk material such as wood chips. It consists of a pair of concave-convex scoops pivoted together at their upper ends. A holding pin connects each grapple half to a respective scoop, with the concave portion or side of each grapple half positioned over and adjacent the convex side of a respective scoop. The only modification required of the log grapple is the addition of apertured tabs to its convex sides, the tabs receiving the holding pins.

Summary

[0005] In an aspect of the present disclosure, a work tool assembly is provided according to claim 1.

[0006] In another aspect of the present disclosure, a work machine is provided according to claim 11.

[0007] Other features and aspects of this disclosure will be apparent from the following description and the accompanying drawings.

Brief Description of the Drawings

[0008]

FIG. 1 illustrates an exemplary machine having a

grapple assembly with an exchange system, according to an embodiment of the present disclosure;

FIG. 2 illustrates a perspective view of a first and a second arm of the grapple assembly of FIG. 1;

FIG. 3 illustrates a perspective view of a first and a second grapple shell of the grapple assembly of FIG. 1;

FIGS. 4 and 5 illustrate perspective view of the first and the second grapple shells having a positioning system, according to an embodiment of the present disclosure; and

FIGS. 6 to 8 illustrate perspective views of various positions of the grapple assembly with the exchange system of FIG. 1

Detailed Description

[0009] The present disclosure relates to an exchange system for a grapple of a machine. The present disclosure will now be described in detail with reference being made to accompanying figures. FIG. 1 illustrates an exemplary machine 100, such as a hydraulic excavator. In other embodiments, the machine 100 may be a backhoe loader, a digger, a knuckle boom loader, a harvester, etc. The machine 100 may include an implement system 102 configured to move or position an implement 104. The implement 104 may be attached to a stick member 106 of the implement system 102. As shown in FIG. 1, the machine 100 may further include a frame 108, a drive system 110 for propelling the machine 100, a power source 112 that provides power to the implement 104 and the drive system 110, and an operator station 114 to control the implement 104 and the drive systems 110. The operator station 114 includes one or more operator input devices configured to receive and/or transmit various inputs indicative of an operator desired movement of the implement 104 and/or the machine 100.

[0010] In an embodiment of the present disclosure, the implement 104 may be embodied as a clamshell grapple assembly, hereinafter referred to as the grapple assembly 104. In various alternative embodiments, the implement 104 may be two hydraulic cylinder operated crusher, shear, or any other demolition tool. It may be understood by a person having ordinary skill in the art, the machine 100 may include additional implements mounted on the machine 100 for various other purposes. The grapple assembly 104 may include a number of moveable components, such as a first moveable component 116 and a second moveable component 118 pivotally attached to a frame 120 of the grapple assembly 104. In an exemplary embodiment, the first and the second moveable components 116, 118 of the grapple assembly 104 may be grapple shells, hereinafter interchangeably referred to as grapple shells 116, 118. The grapple as-

sembly 104 may be operated by pivoting the grapple shells 116, 118 using a first hydraulic cylinder 122 and a second hydraulic cylinder 124, respectively.

[0011] In an exemplary embodiment, an exchange system 126 for the grapple assembly 104 is provided. The exchange system 126 is configured to facilitate quick changing of the grapple shells 116, 118 as per operation specific requirements. For example, different sizes of the grapple shells 116, 118 may be chosen for different sort of operations and operating conditions. In an embodiment of the present disclosure, the exchange system 126 includes the frame 120, a first arm 128 and a second arm 130, and the first and the second hydraulic cylinders 122, 124. The first and the second hydraulic cylinders 122, 124 are disposed between the frame 120 and the respective first and the second arms 128, 130. Further, the first and the second arms 128, 130 are configured to pivotally couple the frame 120 to the grapple assembly 104.

[0012] FIG. 2 illustrates a perspective view of the first arm 128 and the second arms 130 of the exchange system 126. Each of the first arm 128 and the second arm 130 has an inner end 202, 204 and an outer end 206, 208 respectively. In an exemplary embodiment, the inner ends 202, 204 include a first opening 210 and a second opening 212 configured to receive a first inner pin 214 and a second inner pin 216 respectively. The first and the second inner pins 214, 216 are configured to pivotally couple the first arm 128 and the second arm 130 at the inner ends 202, 204 respectively. For example, the first and the second inner pins 214, 216 may be identical elongated fastener pins. Each of the first and the second inner pins 214, 216 include a protruded portion 218, 220 disposed on the opposite sides of the first and the second inner pins 214, 216 respectively. In an embodiment, each of the protruded portions 218, 220 include a pair of chord cut out portions 222, 224 respectively. As shown in FIG. 2, each chord cut out portion of the pair of chord cut out portions 222, 224 may be disposed on opposite sides of the protruded portions 218, 220.

[0013] Further, each of the first arm 128 and the second arm 130 includes a third opening 226 and a fourth opening 228 disposed at the outer ends 206, 208 respectively. The third opening 226 and the fourth opening 228 are configured to receive a first outer pin 230 and a second outer pin 232 respectively. The first and the second outer pins 230, 232 may be identical elongated fastener pins. In an embodiment, each of the first and the second outer pins 230, 232 include a second protruded portion 234, 236 having a second pair of chord cut out portions 238, 240. Similar to the protruded portions 218, 220, the second protruded portions 234, 236 are disposed on the opposite sides of the first and the second outer pins 230, 232 respectively. In an alternative embodiment, the first and the second outer pins 230, 232 may be elongated fastener pins without any protruded portion.

[0014] Furthermore, each of the first and the second arms 128, 130 may include a disc 242, 244 disposed at the outer ends 206, 208 respectively. In an embodiment,

each of the discs 242, 244 may include a second opening 246 (only one shown) configured to receive the first and the second outer pins 230, 232 respectively. It may be contemplated that the second opening 246 is aligned adjacent to the third and the fourth openings 226, 228 respectively. In an exemplary embodiment, the shape of the second opening 246 may be similar to the outer shape of the second protruded portions 234, 236 having the second pair of chord cut out portions 238, 240, such that the second protruded portions 234, 236 align to engage within the opening 246.

[0015] In an embodiment, each of the first arm 128 and the second arm 130 may include a first upper pin 248 and a second upper pin 250 respectively, and disposed between the inner ends 202, 204 and an outer ends 206, 208. The first and the second upper pins 248, 250 are configured to pivotally support the first hydraulic cylinder 122 and the second hydraulic cylinder 124 respectively. In an alternative embodiment, the first and the second outer pins 230, 232 may be configured to pivotally support the first and the second hydraulic cylinders 122, 124 respectively. The first and the second hydraulic cylinders 122, 124 are configured to pivot the first arm 128 and the second arm 130 about the inner ends 202, 204 respectively.

[0016] FIG. 3 illustrates a perspective view of the first and the second grapple shells 116, 118 according to an embodiment of the present disclosure. Referring to FIGS. 2 and 3, the first and the second grapple shells 116, 118 include first pair of inner openings 302 and a second pair of inner openings 304 respectively. The first and the second pair of inner openings 302, 304 are configured to receive the first and the second inner pins 214, 216 respectively. In an embodiment, the first and the second inner pins 214, 216 are received at the protruded portions 218, 220 into the first and the second pair of inner openings 302, 304, such that upon rotation the chord cutout portions 222, 224 lock the first and the second inner pins 214, 216 within the first and the second pair of inner openings 302, 304. For example, when the pins 214, 216 are inserted into the pair of inner openings 302, 304, the chord cutout portions 222, 224 are in vertical position. Further, when the pins 214, 216 are inserted and rotated, the chord cutout portions 222, 224 turn into substantially horizontal orientation, thereby locking the pins 214, 216 within the pair of inner openings 302, 304. In an exemplary embodiment, the first and the second inner pins 214, 216 are rotated automatically by the hydraulic cylinders 122, 124 respectively.

[0017] In an embodiment, the first and the second grapple shells 116, 118 further include a first pair of outer openings 306 and a second pair of outer openings 308. The first and the second pair of outer openings 306, 308 are configured to receive the first and the second outer pins 230, 232 respectively. In an embodiment, the second protruded portions 234, 236, with the chord cutout portions 238 and 240, lock the outer pins 230, 232 within the first and the second pair of outer openings 306, 308

in a similar manner as explained previously with reference to the first and the second inner pins 214, 216. In an exemplary embodiment, the first and the second outer pins 230, 232 are rotated manually to lock them within the first and the second pair of outer openings 306, 308 respectively.

[0018] However, in an alternative embodiment, each of the first and the second pair of outer openings 306, 308 may include a first end and a second end (not shown). The second end rotates when the outer pins 230, 232 engages within the first and the second pair of outer openings 306, 308 and flips over the outer pins 230, 232 to lock the outer pins 230, 232 within the second pair of outer openings 306, 308 respectively.

[0019] Furthermore, the first and the second outer pins 230, 232 are fastened within the first and the second pair of outer openings 306, 308 by a fastener 252, such as a bolt (as shown in FIG. 2). In an exemplary embodiment, the disc 242 may include a pair of semicircular notches 247, 249 disposed 90 degrees apart from each other on an outer diameter of the disc 242. The fastener 252 is engaged with either one of the notches 247, 249 to selectively lock and unlock the outer pins 230, 232 within the first and second pair of outer openings 306, 308. For example, to lock the outer pins 230, 232 within the first and second pair of outer openings 306, 308, the disc 242 is fastened by securing the fastener 252 to the first notch 247. However, for unlocking the outer pins 230, 232, the disc 242 along with the outer pins 230, 232 are rotated, such that the disc 242 is fastened by securing the fastener 252 to the second notch 249. Also, the outer pins 230, 232 are rotated to be in vertical position, thereby unlocking the outer pins 230, 232 from the first and the second pair of outer openings 306, 308. Furthermore, the outer pins 230, 232 are removed from the first and the second pair of outer openings 306, 308 without detaching from the first and the second arms 128, 130 respectively.

[0020] FIGS. 4 and 5 illustrate a perspective view of the first and the second grapple shells 116, 118 having a positioning system 400. The positioning system 400 is configured to position the first and the second grapple shells 116, 118 during the exchange process. For example, the positioning system 400 is configured to secure the first and the second grapple shells 116, 118 against an axial movement during the grapple exchange process.

[0021] As illustrated in FIGS. 4 and 5, the positioning system 400 may include a first element 402 attached to the first grapple shell 116 and a second element 404 attached to the second grapple shell 118. The first element 402 is configured to engage with the second element 404 to secure the first and the second grapple shells 116, 118. For example, when the grapple shells 116, 118 are not being used, such as in a closed position, then the first and the second elements 402, 404 may engage with each other thereby restrict a further axial and/or transverse movement of the grapple shells 116, 118. Whereas, when the grapple shells 116, 118 move opposite to each other, for an open position, the first element 402

and the second element 404 may disengage to thereby allow the movement of the grapple shells 116, 118. It may be contemplated that only one positioning system 400 with the first and the second elements 402, 402 is shown in FIGS. 4 and 5, however, the positioning system 400 may also be positioned on the back side (not shown) of the grapple assembly 104.

[0022] In an exemplary embodiment, the first element 402 includes a protruded portion 406. The second element 404 includes an opening 408 configured to receive the protruded portion 406 of the first element 402 to secure the first and the second grapple shell 116, 118 during the exchange process (as shown in FIG. 5). In an exemplary embodiment, the protruded portion 406 is circular in shape and the opening 408 is a partial arcuate opening.

[0023] In an alternative embodiment, the first element 402 and the second element 404 may include flanged portions that may engage with each other. In this example, the flanged portions when engaged with each other may restrict the axial movement of the grapple shells 116, 118 thereby securing the two during the exchange process and during transportation or storage of the grapple shells. In a yet alternative embodiment, the flanged portions of the first and the second elements 402, 402 may snap fit into each other, thereby securing the grapple shells 116, 118 during the exchange process and during transportation or storage of the grapple shells.

Industrial Applicability

[0024] The industrial applicability of the exchange system 126 and the positioning system 300 of the grapple assembly 104 will be readily understood from the foregoing discussion.

[0025] As explained previously, exchanging of the grapples may be a cumbersome task when done manually. Therefore, the present disclosure relates to the exchange system 126 and the positioning system 400 for the grapple assembly 104. In an embodiment, the exchange system 126 facilitates quick exchanging of the grapple assembly 104, and/or the shells 116, 118 involving minimum human intervention. Therefore, the exchange system 126 provides a convenient, safe, cost efficient, and error free system for changing the grapple assembly 104 and/or the shells 116, 118 as per the requirements.

[0026] Further, the positioning system 400 facilitates securing of the grapple shells 116, 118 against the axial and/or transverse movement during the exchange process. For example as the grapple shells 116, 118 are heavy they tend to fall in the axial direction by virtue of their design and weight. The positioning system 400 therefore, secures the grapple shells 116, 118 thereby preventing falling of the grapple shells 116, 118.

[0027] FIGS 6 to 8 illustrate perspective views of the grapple assembly 104 having the exchange system 126 according to an embodiment of the present disclosure. As shown in FIG. 6, the frame 120 along with the first

and the second arms 128, 130 are placed above the grapple shells 116, 118 respectively. The grapple shells 116, 118 may be supported by fixed stand 600 and the first element 402 and the second element 404 are engaged to avoid any axial movement between the grapple shells 116, 118. The first and the second inner pins 214, 216 are aligned above the first and the second pairs of inner openings 302, 304. As shown in the figure, the first and the second hydraulic cylinders 122, 124 are pivotally supported on the first and the second upper pins 248, 250 respectively. Furthermore, the first and the second outer pins 230, 232 are received within the third and the fourth openings 226, 228 respectively.

[0028] As shown in FIG. 7, the frame 120 along with the first and the second arms 128, 130 is lowered towards the grapple shells 116, 118. In an embodiment, the first and the second inner pins 214, 216 are received within the first and the second pair of inner openings 302, 304 respectively. For example, the chord cutout portions 222, 224 are aligned vertically with respect to the first and the second pair of inner openings 302, 304 respectively.

[0029] Further, as shown in FIG. 8, the frame 120 is coupled to the grapple shells 116, 118. In an exemplary embodiment, the first and the second hydraulic cylinders 122, 124 extend to position the first and the second outer pins 230, 232 within the first and the second pairs of outer openings 306, 308 respectively. As shown in FIG. 8, the first and the second inner pins 214, 216 rotate to align the chord cut out portions 222, 224 horizontally with respect to the first and the second pairs of inner openings 302, 304, thereby locking the first and the second inner pins 214, 216 within the first and the second pairs of inner openings 302, 304 respectively.

[0030] Furthermore, the first and the second outer pins 230, 232 also rotate and lock within the first and the second pairs of outer openings 306, 308 in a similar manner as described above with respect to the first and the second inner pins 214, 216. In an exemplary embodiment, the fasteners 252 may be used to fasten and unfasten the first and the second outer pins 230, 232 within the first and the second pair of outer openings 306, 308.

[0031] While aspects of the present disclosure have been particularly shown and described with reference to the embodiments above, it will be understood by those skilled in the art that various additional embodiments may be contemplated by the modification of the disclosed machines, systems and methods. Such embodiments should be understood to fall within the scope of the present disclosure as determined by the claims.

Claims

1. A work tool assembly comprising a work tool implement (104) having a plurality of moveable components (116,118) with inner openings (302,304) and outer openings (306,308) and an exchange system (126), the exchange system (126) comprising:

a frame (120);

a first arm (128) and a second arm (130), each of the first arm (128) and the second arm (130) having an inner end (202,204) and an outer end (206,208);

a first inner pin (214) and a second inner pin (216) to pivotally couple the first arm (128) and the second arm (130) to the frame (120) at the inner ends (202,204) respectively;

a first hydraulic cylinder (122) disposed between the frame (120) and the first arm (128) and configured to pivot the first arm (128) about the first inner pin (214);

a second hydraulic cylinder (124) disposed between the frame (120) and the second arm (130) and configured to pivot the second arm (130) about the second inner pin (216); and

a first outer pin (230) and a second outer pin (232) disposed at the outer ends (206,208) of the first and the second arms (128,130) respectively; and

wherein each of the first and second outer pins (230, 232) are configured to be received within the outer openings (306, 308) of the moveable components (116,118),

characterized in that each of the first and the second inner pins (214,216) include a protruded portion (218,220) configured to be received within the inner opening (302,304) of the moveable components (116,118), each protruded portion (218,220) comprising a pair of chord cut out portions (222,224) such that a rotation of the first and the second inner pins (214,216) locks the first and second inner pins (214,216) with the inner openings (302,304) of the moveable components (116,118).

2. The work tool assembly of claim 1 further includes a first upper pin (248) and a second upper pin (250) disposed between the inner ends (202,204) and the outer ends (206,208) of the first arm (128) and the second (130) respectively.

3. The work tool assembly of claim 2, wherein the first and the second upper pins (248,250) are configured to pivotally support the first hydraulic cylinder (122) and the second hydraulic cylinder (124).

4. The work tool assembly of claim 1, wherein each of the outer pins (230,232) include a first end and a rotatable second end.

5. The work tool assembly of claim 1, wherein each of the first and the second outer pins (230,232) include a second protruded portion (234,236), the second protruded portion (234,236) comprising a pair of chord cut out portions (238,240).

6. The work tool assembly of claim 1, wherein each of the outer ends (206,208) of the first and the second arms (128,130) include an opening (226,228) configured to receive the first and the second outer pins (230,232) respectively. 5
7. The work tool assembly of claim 6, wherein the outer ends (206,208) of the first and the second arms (128,130) include a disc (242,244) having a second opening (246) disposed adjacent to the opening (226,228). 10
8. The work tool assembly of claim 7, wherein the first and the second outer pins (230,232) are configured to be received into the second opening (246) of the disc at the outer ends (206,208) of the first and the second arms (128,130) respectively. 15
9. The work tool assembly of claim 1, wherein the work tool implement (104) is a grapple assembly comprising a plurality of grapple shells (116,118). 20
10. The work tool assembly of claim 9, wherein the grapple assembly (104) is a clamshell grapple. 25
11. A work machine (100) comprising:
- the work tool assembly of any one of claims 1 to 10; and
- a power source (112) configured to supply power to the implement (104). 30

Patentansprüche

1. Arbeitswerkzeuganordnung, umfassend ein Arbeitswerkzeuggerät (104), das eine Vielzahl von beweglichen Komponenten (116, 118) mit inneren Öffnungen (302, 304) und äußeren Öffnungen (306, 308) und ein Austauschsystem (126) aufweist, wobei das Austauschsystem (126) Folgendes umfasst:
- einen Rahmen (120);
- einen ersten Arm (128) und einen zweiten Arm (130), wobei der erste Arm (128) und der zweite Arm (130) jeweils ein inneres Ende (202, 204) und ein äußeres Ende (206, 208) aufweisen;
- einen ersten inneren Stift (214) und einen zweiten inneren Stift (216), um den ersten Arm (128) und den zweiten Arm (130) jeweils an den inneren Enden (202, 204) schwenkbar mit dem Rahmen (120) zu koppeln;
- einen ersten Hydraulikzylinder (122), der zwischen dem Rahmen (120) und dem ersten Arm (128) angeordnet und dazu konfiguriert ist, den ersten Arm (128) um den ersten inneren Stift (214) zu schwenken;
- einen zweiten Hydraulikzylinder (124), der zwi-

schen dem Rahmen (120) und dem zweiten Arm (130) angeordnet und dazu konfiguriert ist, den zweiten Arm (130) um den zweiten inneren Stift (216) zu schwenken; und

einen ersten äußeren Stift (230) und einen zweiten äußeren Stift (232), die jeweils an den äußeren Enden (206, 208) des ersten und des zweiten Arms (128, 130) angeordnet sind; und wobei der erste und zweite äußere Stifte (230, 232) jeweils dazu konfiguriert sind, innerhalb der äußeren Öffnungen (306, 308) der beweglichen Komponenten (116, 118) aufgenommen zu werden,

dadurch gekennzeichnet, dass der erste und der zweite innere Stift (214, 216) jeweils einen vorstehenden Abschnitt (218, 220) einschließen, der dazu konfiguriert ist, innerhalb der inneren Öffnung (302, 304) der beweglichen Komponenten (116, 118) aufgenommen zu werden, wobei jeder vorstehende Abschnitt (218, 220) ein Paar von Sehnenaussparungsabschnitten (222, 224) umfasst, so dass eine Drehung des ersten und des zweiten inneren Stifte (214, 216) den ersten und zweiten inneren Stift (214, 216) mit den inneren Öffnungen (302, 304) der beweglichen Komponenten (116, 118) verriegelt.

2. Arbeitswerkzeuganordnung nach Anspruch 1, die ferner einen ersten oberen Stift (248) und einen zweiten oberen Stift (250) einschließt, die jeweils zwischen den inneren Enden (202, 204) und den äußeren Enden (206, 208) des ersten Arms (128) und des zweiten (130) angeordnet sind.
3. Arbeitswerkzeuganordnung nach Anspruch 2, wobei der erste und der zweite obere Stift (248, 250) dazu konfiguriert sind, den ersten Hydraulikzylinder (122) und den zweiten Hydraulikzylinder (124) schwenkbar zu stützen.
4. Arbeitswerkzeuganordnung nach Anspruch 1, wobei die äußeren Stifte (230, 232) jeweils ein erstes Ende und ein drehbares zweites Ende einschließen.
5. Arbeitswerkzeuganordnung nach Anspruch 1, wobei der erste und der zweite äußere Stift (230, 232) jeweils einen zweiten vorstehenden Abschnitt (234, 236) einschließen, wobei der zweite vorstehende Abschnitt (234, 236) ein Paar von Sehnenaussparungsabschnitten (238, 240) umfasst.
6. Arbeitswerkzeuganordnung nach Anspruch 1, wobei die äußeren Enden (206, 208) des ersten und des zweiten Arms (128, 130) jeweils eine Öffnung (226, 228) einschließen, die jeweils dazu konfiguriert ist, den ersten und den zweiten äußeren Stift (230, 232) aufzunehmen.

7. Arbeitswerkzeuganordnung nach Anspruch 6, wobei die äußeren Enden (206, 208) des ersten und des zweiten Arms (128, 130) eine Scheibe (242, 244) einschließen, die eine zweite Öffnung (246) aufweist, die benachbart zu der Öffnung (226, 228) angeordnet ist. 5
8. Arbeitswerkzeuganordnung nach Anspruch 7, wobei der erste und der zweite äußere Stift (230, 232) dazu konfiguriert sind, jeweils in die zweite Öffnung (246) der Scheibe an den äußeren Enden (206, 208) des ersten und des zweiten Arms (128, 130) aufgenommen zu werden. 10
9. Arbeitswerkzeuganordnung nach Anspruch 1, wobei das Arbeitswerkzeuggerät (104) eine Greiferanordnung ist, die eine Vielzahl von Greiferschalen (116, 118) umfasst. 15
10. Arbeitswerkzeuganordnung nach Anspruch 9, wobei die Greiferanordnung (104) ein zweisechaliger Greifer ist. 20
11. Arbeitsmaschine (100), umfassend: 25
 - die Arbeitswerkzeuganordnung nach einem der Ansprüche 1 bis 10 und
 - eine Energiequelle (112), die dazu konfiguriert ist, dem Gerät (104) Energie zuzuführen. 30

Revendications

1. Ensemble d'outil de travail comprenant un outil de travail (104) ayant une pluralité de composants mobiles (116, 118) avec des ouvertures internes (302, 304) et des ouvertures externes (306, 308) et un système d'échange (126), le système d'échange (126) comprenant : 35
 - un châssis (120) ;
 - un premier bras (128) et un deuxième bras (130), chacun du premier bras (128) et du deuxième bras (130) ayant une extrémité interne (202, 204) et une extrémité externe (206, 208) ; 45
 - une première broche interne (214) et une deuxième broche interne (216) pour coupler de manière pivotante le premier bras (128) et le deuxième bras (130) au châssis (120) au niveau des extrémités internes (202, 204) respectivement ; 50
 - un premier cylindre hydraulique (122) disposé entre le châssis (120) et le premier bras (128) et configuré pour faire pivoter le premier bras (128) autour de la première broche interne (214) ; 55
 - un deuxième cylindre hydraulique (124) disposé entre le châssis (120) et le deuxième bras (130) et configuré pour faire pivoter le deuxième bras (130) autour de la deuxième broche interne (216) ; et
 - une première broche externe (230) et une deuxième broche externe (232) disposées au niveau des extrémités externes (206, 208) des premier et deuxième bras (128, 130) respectivement ; et
 - dans lequel chacune des première et deuxième broches externes (230, 232) est configurée pour être reçue à l'intérieur des ouvertures externes (306, 308) des composants mobiles (116, 118), **caractérisé en ce que** chacune des première et deuxième broches internes (214, 216) inclut une partie saillante (218, 220) configurée pour être reçue à l'intérieur de l'ouverture interne (302, 304) des composants mobiles (116, 118), chaque partie saillante (218, 220) comprenant une paire de parties découpées de corde (222, 224) de telle sorte qu'une rotation des première et deuxième broches internes (214, 216) verrouille les première et deuxième broches internes (214, 216) avec les ouvertures internes (302, 304) des composants mobiles (116, 118).
2. L'ensemble d'outil de travail selon la revendication 1 inclut en outre une première broche supérieure (248) et une deuxième broche supérieure (250) disposées entre les extrémités internes (202, 204) et les extrémités externes (206, 208) du premier bras (128) et du deuxième bras (130) respectivement.
3. Ensemble d'outil de travail selon la revendication 2, dans lequel les première et deuxième broches supérieures (248, 250) sont configurées pour supporter de manière pivotante le premier cylindre hydraulique (122) et le deuxième cylindre hydraulique (124).
4. Ensemble d'outil de travail selon la revendication 1, dans lequel chacune des broches externes (230, 232) inclut une première extrémité et une deuxième extrémité rotative.
5. Ensemble d'outil de travail selon la revendication 1, dans lequel chacune des première et deuxième broches externes (230, 232) inclut une deuxième partie saillante (234, 236), la deuxième partie saillante (234, 236) comprenant une paire de parties découpées de corde (238, 240).
6. Ensemble d'outil de travail selon la revendication 1, dans lequel chacune des extrémités externes (206, 208) des premier et deuxième bras (128, 130) inclut une ouverture (226, 228) configurée pour recevoir les première et deuxième broches externes (230, 232) respectivement.

7. Ensemble d'outil de travail selon la revendication 6, dans lequel les extrémités externes (206, 208) des premier et deuxième bras (128, 130) incluent un disque (242, 244) ayant une deuxième ouverture (246) disposée à côté de l'ouverture (226, 228). 5
8. Ensemble d'outil de travail selon la revendication 7, dans lequel les première et deuxième broches externes (230, 232) sont configurées pour être reçues dans la deuxième ouverture (246) du disque au niveau des extrémités externes (206, 208) des premier et deuxième bras (128, 130) respectivement. 10
9. Ensemble d'outil de travail selon la revendication 1, dans lequel l'outil de travail (104) est un ensemble de grappin comprenant une pluralité de godets de grappin (116, 118). 15
10. Ensemble d'outil de travail selon la revendication 9, dans lequel l'ensemble de grappin (104) est une benne preneuse. 20
11. Machine de travail (100) comprenant :
- l'ensemble d'outil de travail selon l'une quelconque des revendications 1 à 10 ; et 25
- une source d'alimentation (112) configurée pour fournir de l'énergie à l'outil (104).

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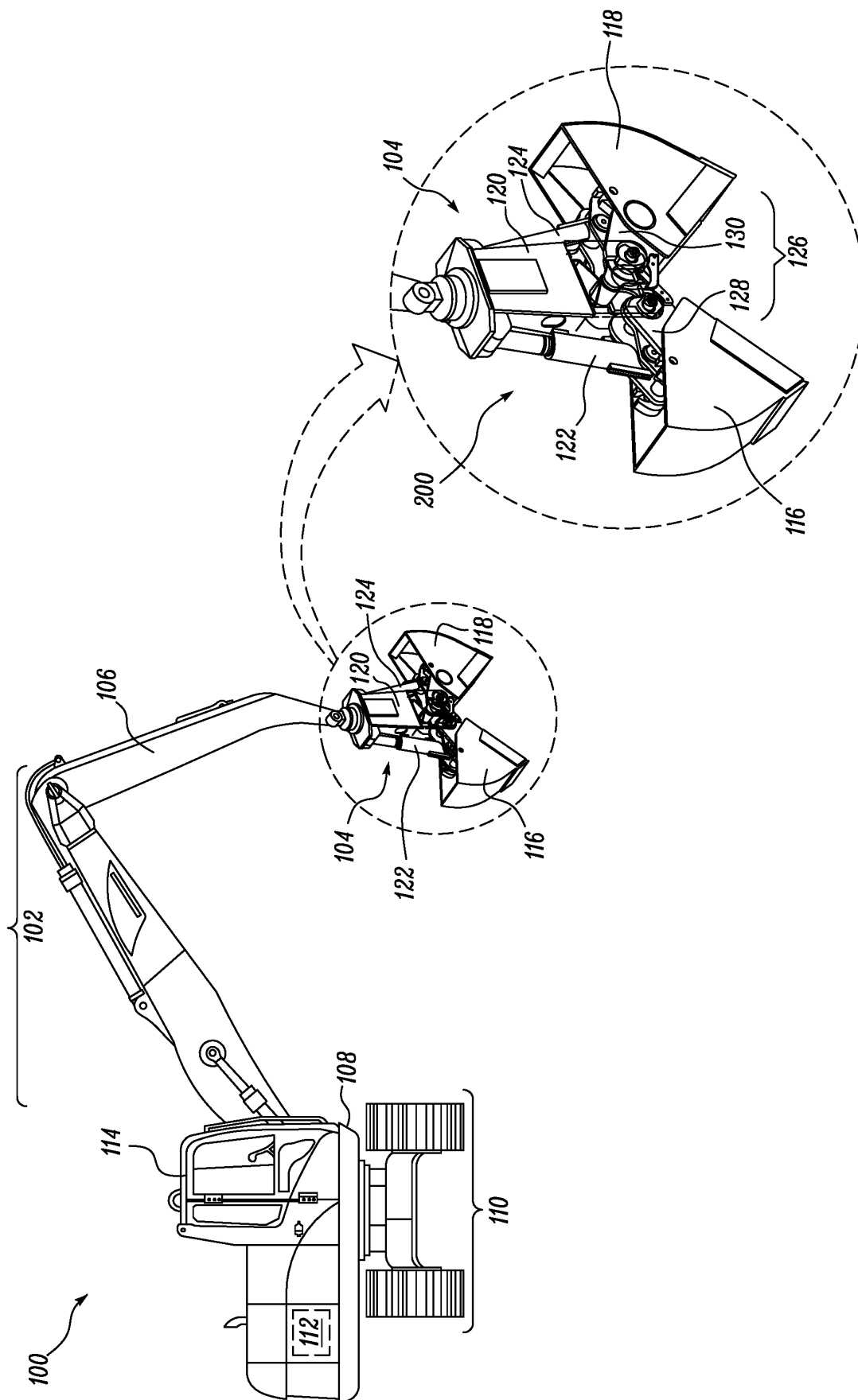


FIG. 1

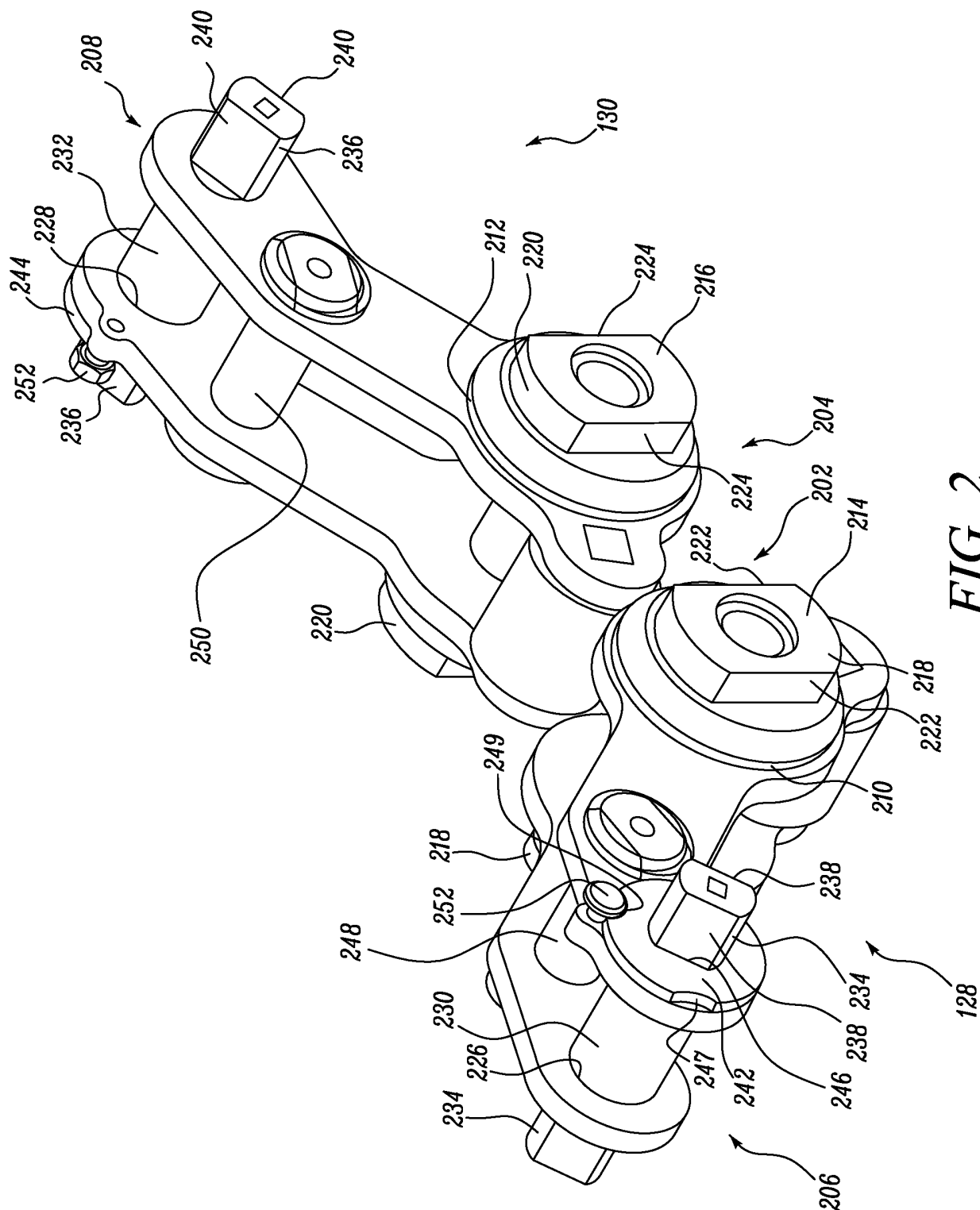


FIG. 2

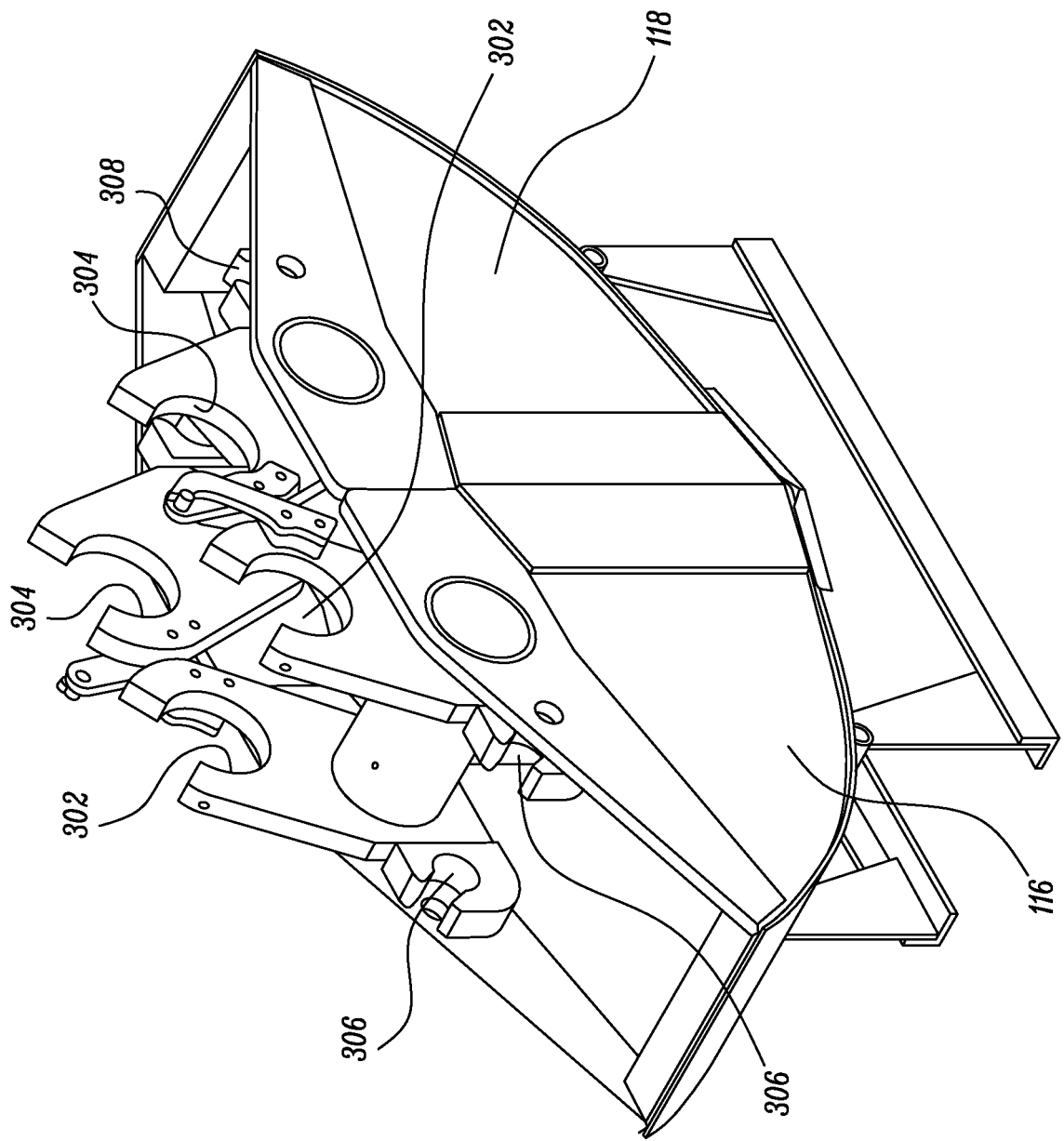


FIG. 3

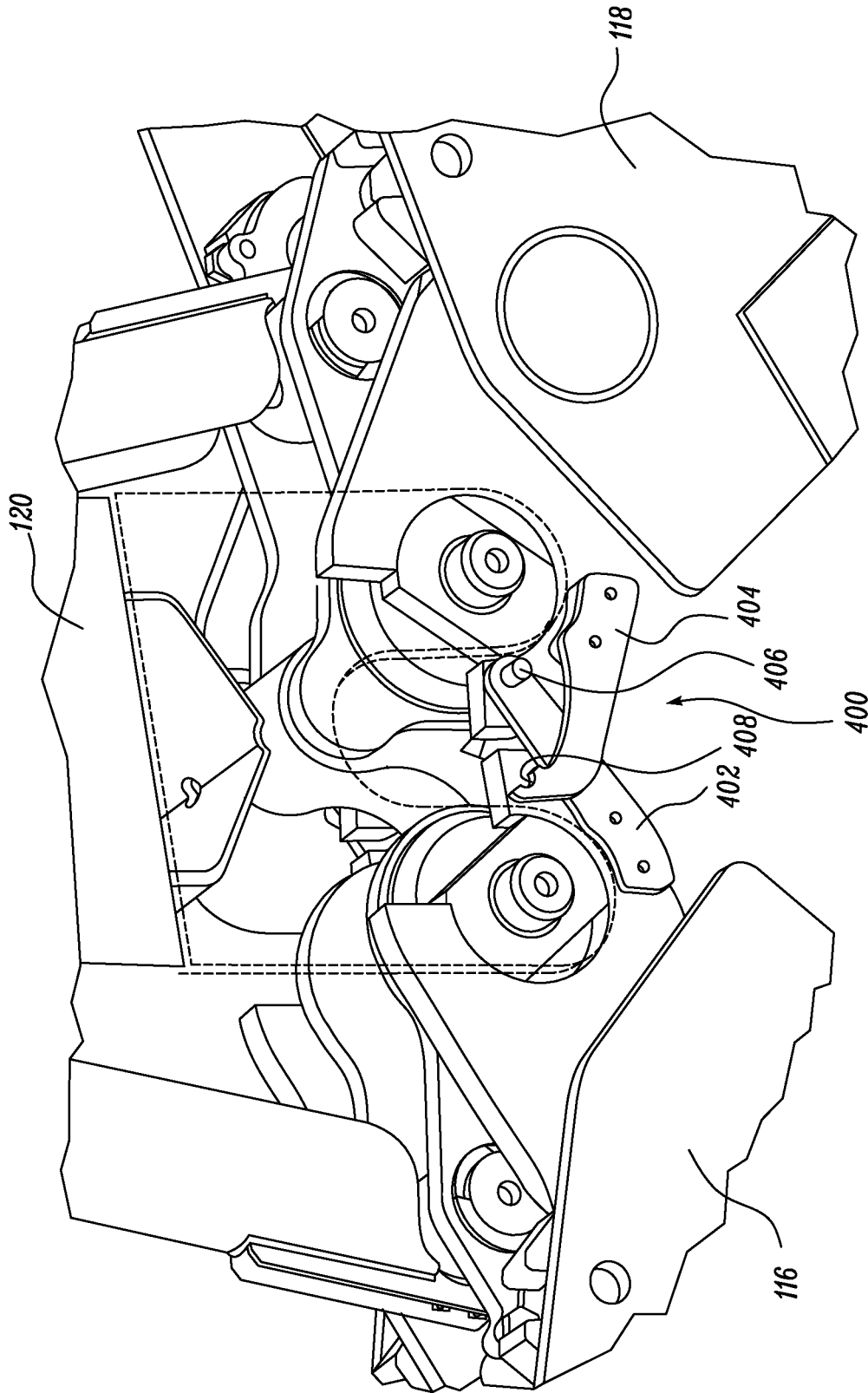


FIG. 4

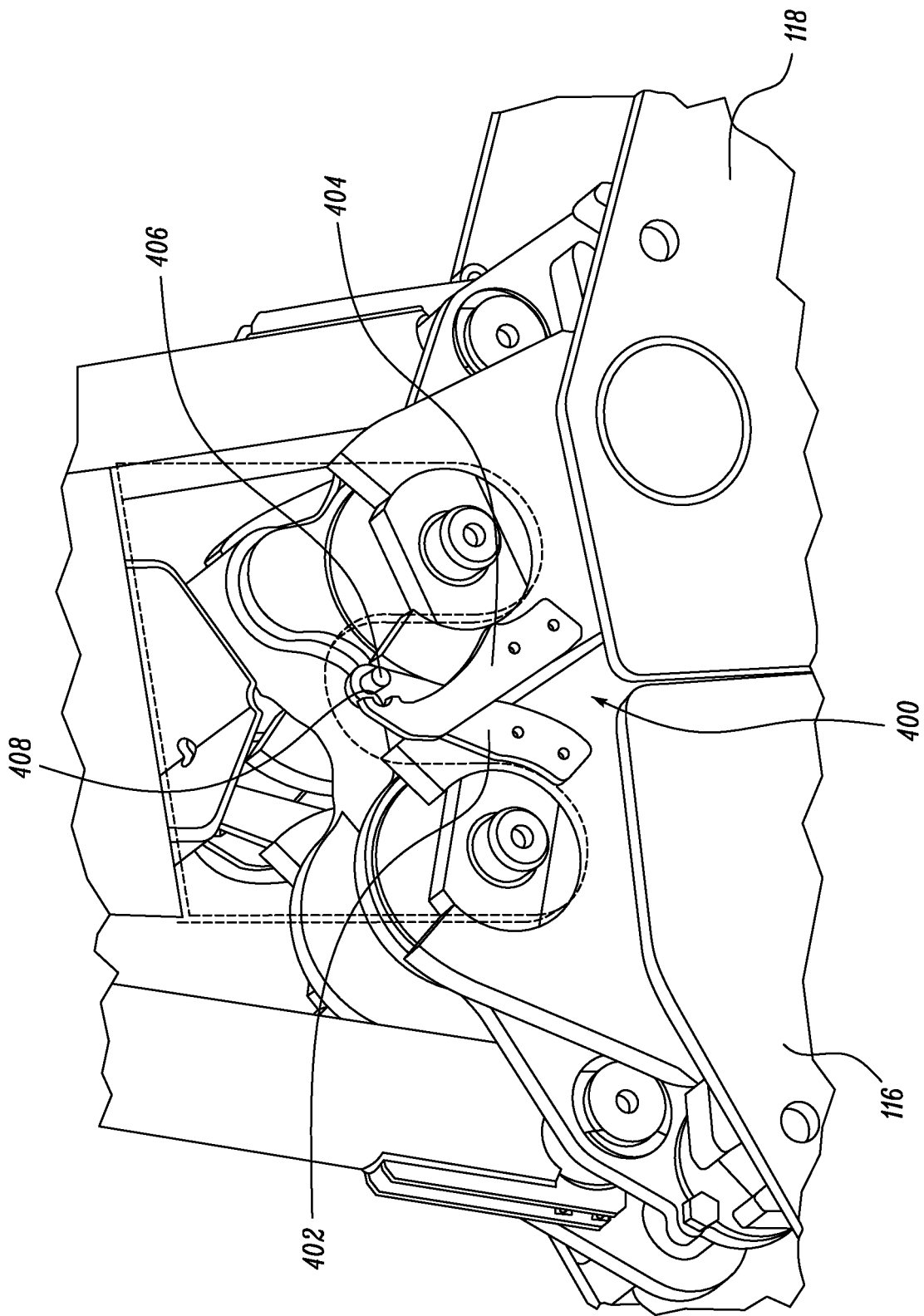


FIG. 5

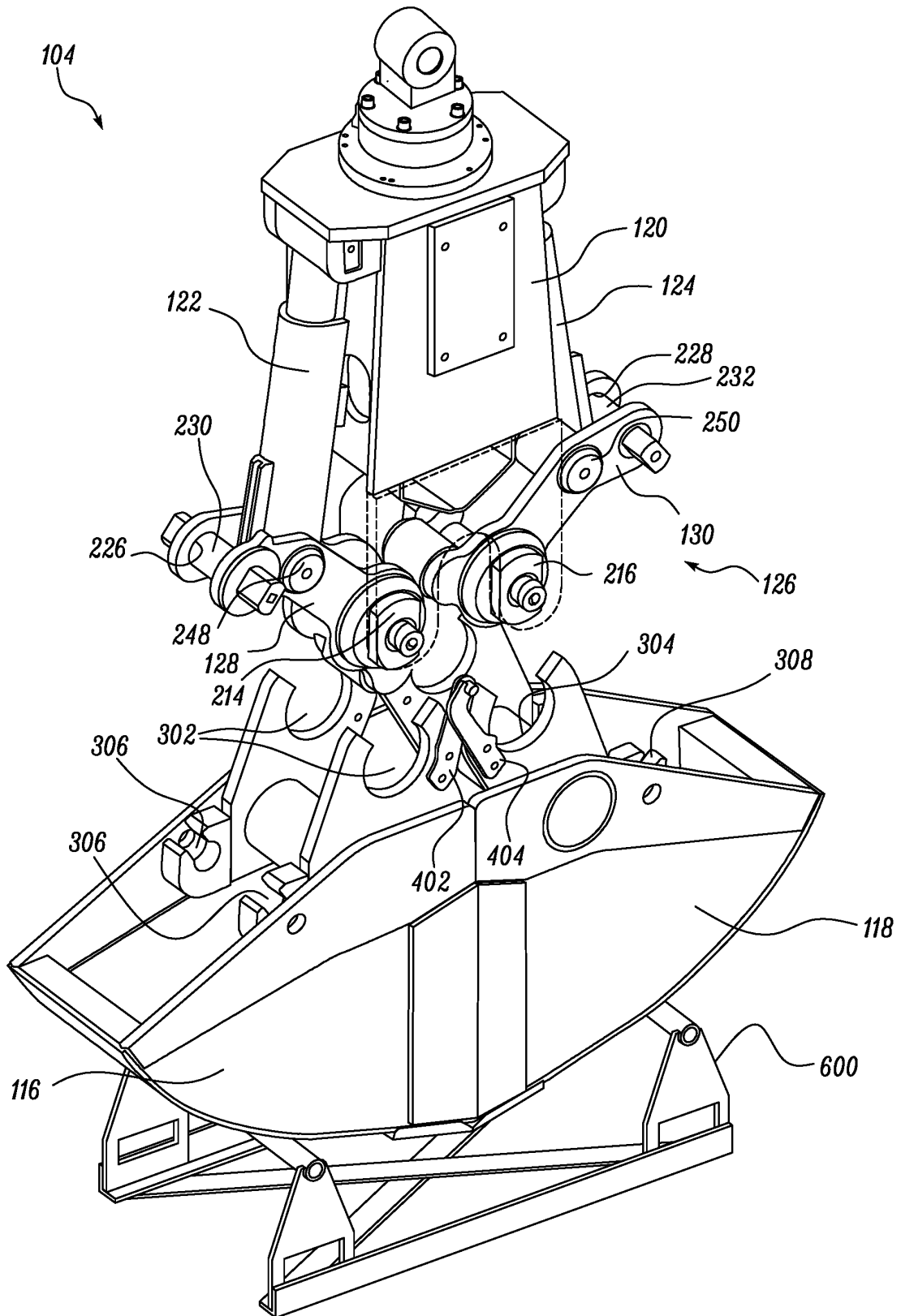


FIG. 6

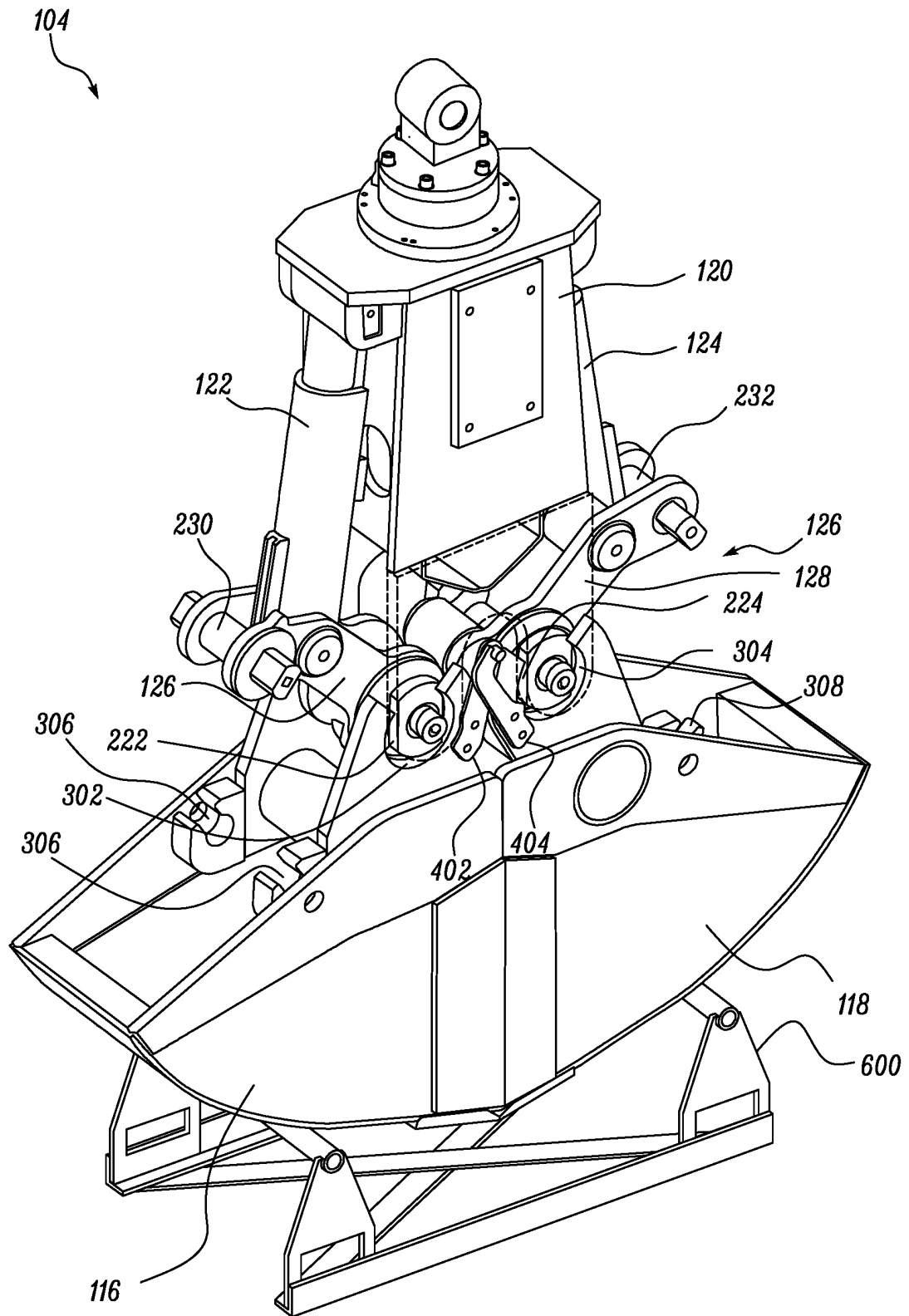


FIG. 7

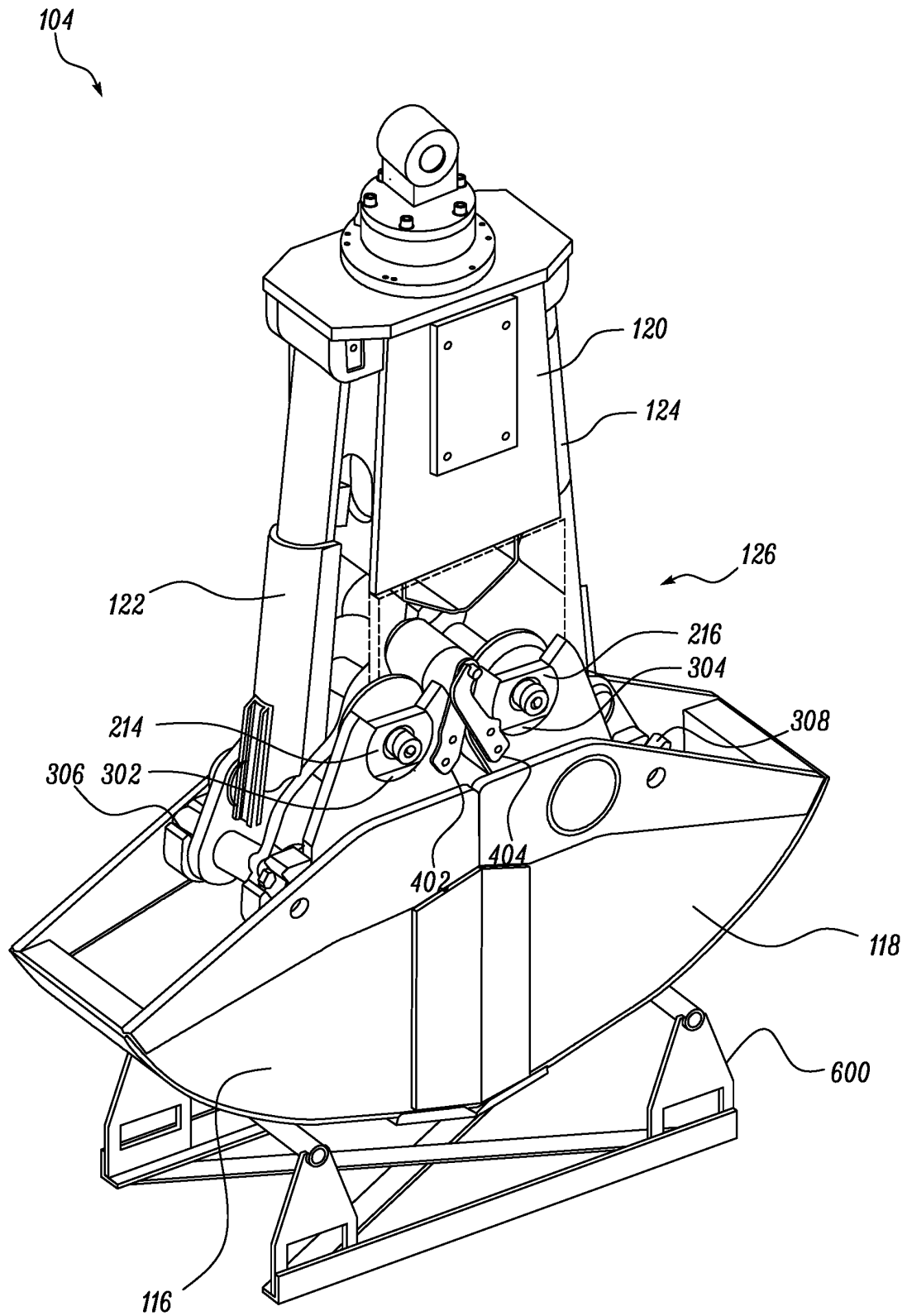


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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