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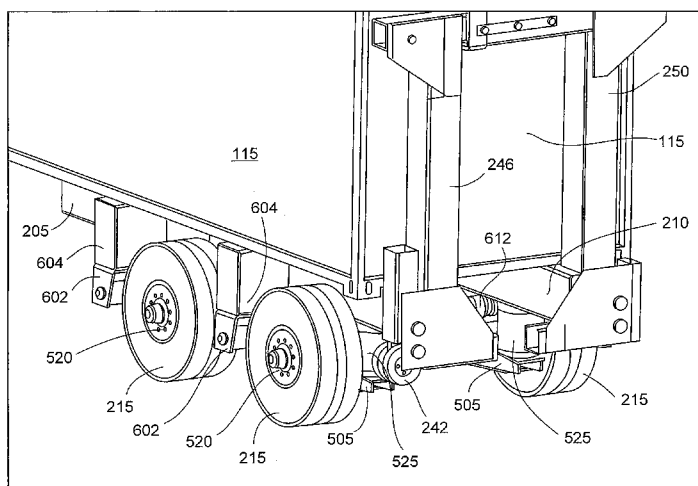


FIG. 8

(57) Abstract: A trailer includes a coupling to attach the trailer to a tractor, and a frame attached to the coupling. The frame is positionable as a single unit about a container such that the frame can be attached to the container in four regions of the container to lift the container. The trailer has road wheels for long-haul transportation over road systems. The trailer frame can be positioned about the container by laterally expanding and retracting, pivoting about a horizontal axis, and pivoting about a vertical axis.



CONTAINER TRAILER

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation in part (and claims the benefit of priority under 35 USC 120) of U.S. Application Serial No. 12/987,562, filed January 10, 2011, which is a continuation of U.S. Application No. 12/326,643, filed December 2, 2008, now U.S. Patent No. 7,866,933. The disclosures of the prior applications are considered part of (and are incorporated by reference in) the disclosure of this application.

BACKGROUND

Containers are used to transport goods between locations. The container is placed at a source location and loaded with goods, and the loaded container is transported to a destination location for drop off. Typically, to transport the container, the container is lifted by a fork-lift and placed onto a trailer and the trailer is hauled to the destination location using a tractor. At the destination location, the container is again lifted by a fork-lift to unload the container from the trailer.

SUMMARY

To facilitate transport of containers by tractor-trailers, a trailer that enables loading of the container onto the trailer without the need for a separate lifting machine is desirable. The disclosed trailer includes a frame and a coupling. The frame can be positioned about the container as a single unit, attached to the container to lift the container and support the container during transport, and attached to a tractor to haul the trailer during transportation, including long-haul transportation.

In one aspect, a trailer includes a coupling configured and arranged to attach the trailer to a tractor, and a frame attached to the coupling. The frame is positionable as a single unit about a container such that the frame can be attached to the container in four regions of the container to lift the container.

This, and other aspects, may include one or more of the following features. The frame includes road wheels for long-haul transportation of the trailer over conventional road systems. The frame is configured to laterally expand and contract. The frame is positionable

as a single unit about the container by advancement of the frame relative to the container when expanded. The frame is positioned for transport of the container when retracted.

In illustrated embodiments, the frame includes a frame member configured to pivot about an axis between a first position and a second position. The frame is positionable
5 as a single unit about the container by advancement of the frame relative to the container when in the first position. The frame is positioned for transport of the container when in the second position. The axis is a horizontal axis and the frame member pivots upward toward the first position. The axis is a vertical axis and the frame member pivots outward toward the
10 first position. The frame member includes two members that each pivot outward in opposite directions. The frame includes at least one supporting wheel that supports the frame when the road wheels are off the ground.

In another aspect, a method includes positioning a trailer as a single unit about a container, attaching the trailer to regions of four lower corners of the container, lifting the container off the ground using the trailer, and attaching the trailer to a tractor. The trailer has
15 road wheels for long-haul transportation of the trailer over conventional road systems.

This, and other aspects, may include one or more of the following features. The method further includes expanding the frame to position the trailer about the container as a single unit. Also, the method includes pivoting the frame to position the trailer about the container as a single unit. The frame is pivoted about a horizontal axis or a vertical axis.

In another aspect, a trailer frame includes two longitudinal members, and a third
20 member connecting the two longitudinal members. The third member is actuatable to laterally expand and retract the frame such that the frame is positionable as a single unit about a container for attaching the frame to the container in four regions of the container to lift the container. The trailer frame includes at least two road wheels for long-haul
25 transportation of the trailer over conventional road systems.

This, and other aspects, may include one or more of the following features. The frame further includes at least one support wheel supporting the frame when the frame moves laterally.

In another aspect, a trailer frame includes a member configured and arranged to
30 pivot about a horizontal axis such that the frame is positionable as a single unit about a container for attaching the frame to the container in four regions of the container to lift and

the container, and at least two road wheels for long-haul transportation of the trailer over conventional road systems.

This, and other aspects, may include one or more of the following features. The frame further includes a support member to support the frame when the road wheels are off the ground. The support member is pivotable between a support position and a transport position.

In another aspect, a trailer frame includes first and second members each configured and arranged to pivot about a vertical axis such that the frame is positionable as a single unit about a container for attaching the frame to the container in four regions of the container to lift the container, and at least two road wheels for long-haul transportation of the trailer over conventional road systems.

This, and other aspects, can include one or more of the following features. The frame further includes a first support wheel associated with the first member and a second support wheel associated with the second member to support the frame when the road wheels are off the ground.

In another aspect, a trailer frame includes two longitudinal members extending generally from a front end region to a back end region of the trailer frame, and a third member connecting the two longitudinal members. The trailer frame is actuatable between a first configuration permitting advancement of the trailer frame relative to a container and a second configuration. The trailer frame is positionable as a single unit about the container when in the first configuration, and is capable of supporting the container in the second configuration when the trailer frame has lifted the container off the ground. The trailer frame includes road wheels for long-haul transportation of the trailer over conventional road systems, the road wheels being supported by stub axles, and supporting wheels configured to support the frame when the road wheels are off the ground.

This, and other aspects, can include one or more of the following features. The trailer frame includes frame extensions. Each frame extension extends laterally outward of one of the longitudinal members and each stub axle is coupled to one of the frame extensions. The trailer frame includes pivotable swing arms, and each swing arm couples one of the stub axles to a respective frame extension. The trailer frame includes hangers and each hanger couples one of the swing arms to a respective frame extension.

In another aspect, a trailer includes a coupling configured and arranged to attach a front end region of the trailer to a tractor by a fifth wheel, and a frame attached to the coupling. The frame includes two longitudinal members extending generally from a front end region to a back end region of the frame. The frame is positionable as a single unit about
5 a container such that the frame can be attached to the container in regions of four corners of the container to lift corresponding front and back ends of the container. The trailer includes road wheels for long-haul transportation of the trailer over conventional road systems. The road wheels are supported by stub axles.

In another aspect, a method includes positioning a trailer as a single unit about a
10 container; attaching the trailer to regions of four lower corners of the container; lifting the container off the ground using the trailer; and attaching the trailer to a tractor. The trailer has road wheels mounted to stub axles for long-haul transportation of the trailer over conventional road systems.

The details of one or more implementations of the specification are set forth in the
15 accompanying drawings and the description below. Other features and aspects of the specification will become apparent from the description, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic of a trailer for lifting and transporting a container.

FIG. 2A is a perspective view of the trailer shown in a retracted configuration.

20 FIG. 2B is a perspective view of the trailer shown in an expanded configuration and positioned about a container.

FIG. 2C is a perspective view of the trailer shown lifting the container.

FIG. 2D is a perspective view of the trailer and container in position for transport.

FIG. 3A is a front view of a mechanism for connecting road wheels to the frame.

25 FIG. 3B is a perspective view of the mechanism of FIG. 3A.

FIG. 3C is a side view of the mechanism of FIG. 3A.

FIG. 4A is a front view of a mechanism for connecting road wheels to the frame.

FIG. 4B is a perspective view of the mechanism of FIG. 4A.

FIG. 4C is a side view of the mechanism of FIG. 4A.

30 FIG. 5A is a perspective view of another embodiment of a trailer shown with a rear support member in a vertical configuration.

FIG. 5B is a perspective view of the trailer of FIG. 5A shown with the rear support member in a horizontal configuration.

FIG. 5C is a perspective view of the trailer of FIG. 5A shown positioned about a container.

5 FIG. 5D is a perspective view of the trailer of FIG. 5A and the container in position for transport.

FIG. 6A is a perspective view another embodiment of a trailer shown with rear vertical members in an aligned configuration.

10 FIG. 6B is a perspective view of the trailer of FIG. 6A shown with the rear vertical members rotated out of alignment and positioned about a container.

FIG. 6C is a perspective view of the trailer of FIG. 6A and the container in position for transport.

FIG. 7A is a perspective rear view of an alternative mechanism for connecting road wheels to the frame.

15 FIG. 7B is a perspective view of the mechanism of FIG. 7A as viewed from the inside of the trailer.

FIG. 7C is a rear view of the mechanism of FIG. 7A.

FIG. 8 is a rear view of the trailer and container utilizing the mechanism of FIG. 7A.

20 DETAILED DESCRIPTION

Referring to FIG. 1, a trailer 110 to load, unload, and transport a container 115 includes a coupling 125 that attaches the trailer 110 to a conventional tractor 105. The trailer 110 includes a frame 120, attached to the coupling 125. The frame 120 is positionable as a single unit about the container 115 to attach the frame to the container 115 to transport the container 115. The coupling 125 is, for example, a standard trailer coupling that couples the tractor and trailer by, for example, a 5th wheel.

After the frame is positioned about the container, as discussed further below, the container is lifted by attaching the frame 120 to the container 115 in regions 136, 138 of the lower four lower corners 132, 134 of the container 115 (only two corners being shown), and actuating the frame 120 to lift the container 115 off the ground. Upon lifting, the frame 120 provides support to and secures the container 115 when the trailer 110 is hauled by the tractor

105 in conventional short and long haul trucking. To do so, in various implementations described below, the frame 120 includes road wheels, castor wheels, and inter-connected members that expand, contract, and/or pivot about horizontal or vertical axes.

Referring to FIG. 2A, in one implementation, a trailer 110a to load, unload, and transport a container 115, for example, an ISO container of standard dimensions, includes a frame 120a having a plurality of interconnected members, for example, two longitudinal members 205 and 210, four vertical members 244, 246, 248, and 250, three transverse members 220, 270, and 272 connecting the longitudinal and vertical members, and a further transverse member 282. The transverse member 282 is located between the front ends 207, 212 of the two longitudinal members 205, 210, respectively, and the coupling 125 is attached to the transverse member 282. The transverse members 220, 270, 272, and 282 are actuated, as described below, to laterally expand and retract the frame 120a.

The frame 120a includes road wheels 215 coupled to each of the two longitudinal members 205 and 210 to permit the tractor 105 to haul the trailer 110a during conventional transportation of the container 115 over roadways and the like. To support the frame 110a during lateral expansion and retraction, the frame 110a includes two castor wheels 240 and 242 attached to the first longitudinal member 205 and oriented in a transverse direction. During lateral expansion and retraction of the frame 120, the castor wheels 240 and 242 contact the ground, and the road wheels 215 are raised off the ground. When the trailer 110a is hauled by the tractor 105, the castor wheels 240 and 242 are off the ground and the road wheels 215 contact the ground.

Referring to FIG. 2B, to position the frame 120a as a single unit about the container 115, the user aligns the back end of the frame 120a adjacent the front face of the container 115, raises the road wheels 215 on the longitudinal member 205 to lower the frame 120a onto the castor wheels 240 and 242 and lifts the road wheels 215 off the ground. Then, the user laterally expands the frame 120a, lowers the road wheels 215 to the ground raising the castor wheels 240 and 242 off the ground, and backs the trailer 110a around the container 115. Referring to FIG. 2C, to load the container 115 on the frame 120a, the user attaches cables 255, discussed below, to the four lower corners of the container 115, and lifts the container 115 off the ground. Referring to FIG. 2D, to prepare the container 115 for transportation, the user raises the road wheels 215 lowering the castor wheels 240 and 242 to

the ground, and retracts the frame 120a to position the frame below the container. Then, the user lowers the road wheels 215 to the ground raising the castor wheels 240 and 242 off the ground. The user then lowers the container 115 onto the frame 120a, for example, onto the longitudinal members 205 and 210, and secures the container 115 to the frame 120a. For
5 example, the user secures the container 115 to the frame 120a using a twistlock such as TANDEMLOC™ twistlock tiedowns (TANDEMLOC, Inc., Havelock, NC).

To enable the raising and lowering of the frame 120a and the lowering and raising of the road wheels 215 to and from ground level, the frame 120a includes mechanisms (FIGS. 3 and 4, described below) that attach the road wheels 215 to the longitudinal members
10 205 and 210. The transverse members 220, 270, 272, and 282 each include a stationary portion 225 and sliding portion 230 to enable lateral expansion and retraction of the frame 120a controlled, for example, by hydraulics 235. The coupling 125 is attached to the stationary portion 225 of the transverse member 282.

To lift and to secure the container 115, the frame 120a includes cables 255 (FIG.
15 2A) attached to the four vertical members 244, 246, 248 and 250 for attaching the frame 120 to the container 115 to lift and lower the container 115. The cables 225 terminate in hooks 257 that are received in standard couplings at the four lower corners of the container 115. The cables 225 route around pulleys 260 attached at the upper end of each of the four vertical members and are controlled by hydraulics 268. The cables and the pulleys are attached such
20 that the tension in the cables, as the container 115 is lifted off the ground, is uniform. Further, the bottom of the container 115 remains substantially parallel to the ground as the container 115 is lifted and lowered.

Techniques similar to those described with reference to FIGS. 2A – 2D are used to unload the container 115. For example, using the tractor 105, the user positions the trailer
25 110a at a location where the container 115 is to be unloaded. The user raises the road wheels 215 lowering the frame 120a until the castor wheels 240, 242 contact the ground and the road wheels 215 are off the ground. Then, the user actuates the transverse members 220, 270, 272, and 282 to laterally expand the frame 120a, and lowers the container 115 to the ground by actuating the hydraulics 268 that operate the cables 255. Once the container 115 is on the
30 ground, the user detaches the cables from the container 115, and lowers the road wheels 215

raising the castor wheels 240, 242 off the ground. Then, using the tractor 105, the user pulls the trailer 110a away from the container 115, and retracts the frame 120a for transport.

Referring to FIGS. 3A-3C, in one implementation, the mechanism by which each road wheel 215 is attached to longitudinal member 205 of the frame 120a to permit the road wheels 215 to be raised and lowered relative to the frame 120a includes a support element 505 pivotally connected to the longitudinal member 205. Mounted to the support element 505 are a wheel axle 515, an airbag 525 and an actuator 510. The actuator 510 is also attached to the longitudinal member 205 such that the extension and retraction of the actuator 510 acts to pivot the support element 505. The wheel axle 515 is coupled to a wheel hub 520 of the road wheel 215, such that when the actuator 510 is actuated, the support element 505 pivots to raise or lower the wheel axle 515, thereby raising or lowering the wheel hub 520 and the attached road wheel 215. Thus, to lower the frame 120a onto castor wheels 240 and 242, the actuator 510 is retracted to raise the road wheels 215 into ground contact; and to raise the frame 120a onto the road wheels 215, the actuator 510 is extended to lower the road wheels 215. An alternative implementations of the mechanism can include springs in addition to or in place of the air bag 325.

In another implementation of the mechanism by which the road wheels 215 are attached to the longitudinal member 205 of the frame 120a, as illustrated in Figs. 4A-4C, two wheel hubs 520 are attached to wheel axle 515 at either end of the wheel axle 515 such that at each axle, one wheel is outside the frame 120a and one wheel is inside the frame 120a. In this construct, the frame expands further to clear the container when compared to the frame that uses the mechanism of FIGS. 3.

Referring to FIGS. 5A and 5B, in another implementation, rather than laterally expanding and retracting the frame, a trailer 110b to load, unload, and transport a container 115 is positioned about the container as a single unit by rotation of a rear frame member about a horizontal axis. Trailer 110b includes a frame 120b having two vertical members 355, 360, and a rear frame member 310. Rear frame member 310 pivots about a horizontal axis, X, such that with the rear frame member 310 in the vertical position of FIG. 5A the frame 120b is in position for transport, and with the rear frame member 310 in the horizontal position of FIG. 5B the frame 120b is in position to be advanced around the container 115. The frame 120b includes two longitudinal members 315 and 320 connecting the members

355, 360, and 310, and a support member 336 that supports the frame 120b when the rear frame member 310 is raised off the ground.

The support member 336 is pivotably coupled to the longitudinal members 315 and 320, and includes castor wheels 350 on which the frame 120b is movable. The rear
5 frame member 310 includes two struts 305, 306 to which road wheels 322, 324, 326, and 328 are mounted to permit the tractor 105 to haul the trailer 110b, and contact wheels 366 that rest against the top of the container when the frame is advanced about the container. To pivot the rear frame member 310 such that the road wheels 322, 324, 326 and 328 clear the top surface of the container 115, the frame 120 includes hydraulic pistons 352 attached
10 between the longitudinal members 315 and 320 and the rear frame member 310.

To position the frame 120b as a unit about the container 115, the user aligns the back end of the frame 120b adjacent the front face of the container 115, and pivots the rear frame member 310 to the horizontal position of FIG. 5B. The user then backs the trailer 110b so that the rear frame member 310 is positioned over the top of the container 115. The
15 trailer 110b moves on the castor wheels 350 attached to the support member 336. Referring to FIG. 5C, as the user backs up, the contact wheels 366 engage the top of the container 115 to support the rear frame member 310 followed by the container 115 contacting the support member 336 to pivot the support member up and out of the way. The user backs up the trailer 110b to position illustrated in FIG. 5D, lowers the rear support frame 310 so that frame
20 120b rests on the road wheels, and loads the container 115 onto the frame 120b using cables and pulleys, as discussed above, to secure the container 115 to the frame 120b.

The user unloads the container 115 by lowering the container to the ground using the cables, raising the rear frame member 310, and driving forward. As the frame moves forward, wheels 366 initially roll over the top surface of the container 115, while the
25 supporting member 336 pivots downward such that the castor wheels 350 make contact with the ground to provide support to the frame 120b. Once the frame 120b clears the container, the rear frame member 310 is lowered. The supporting member 336 can be, for example, biased toward the downward position by a spring mechanism, not shown.

Referring to FIGS. 6A-6C, in another implementation, rather than a rear frame
30 member that pivots about a horizontal axis, a trailer 110c includes a frame 120c having two rear vertical members 415, 420 that each pivot about a vertical axis, Y, Z, respectively. To

load and unload the container 115, the members 415, 420 are pivoted outward using hydraulic pistons 448, 450 so that the trailer 110c clears the container. To support the frame 120c during pivoting of the members 415, 420, the members each include castor wheels 462 that can be extended into ground contact using actuators 466 to raise the road wheels 422 off the ground. For transport, the rear vertical members 415, 420 are pivoted inward on the castor wheels 462, the castor wheels are raised so the frame sits on the road wheels, and the container is secured to the frame as described above.

In an alternative implementation illustrated in FIGS. 7A-7C, a suspension mechanism 600 by which each road wheel 215 is attached to longitudinal member 205 of the frame 120a to permit the road wheels 215 to be raised and lowered relative to the frame 120a includes a support element in the form of a swing arm 505 pivotally connected to the longitudinal member 205 via a hanger 602 and frame extension 604. Housed within the hanger 602 is a pivot tube 606 to which the swing arm 505 is mounted. The pivot tube 606 is, for example, two feet long, and is supported for rotation, for example, by two six inch long bushings. The frame extension 604 is attached to the longitudinal member 205 by, for example, welding.

Mounted to the swing arm 505 are a wheel axle 515, an airbag 525 and an actuator 510. The actuator 510 is also attached to the longitudinal member 205 via the hanger 602 and frame extension 604. The airbag 525 and actuator 510 act as shock absorbers. The wheel axle 515 is coupled to a wheel hub 520 of the road wheel 215. The wheel axle 515 is mounted to the swing arm 505 using two U-bolts 610. A break assembly 612 is also illustrated.

Attached to the hanger 602 is a standard lift kit 608, as is known in the art, which acts on the swing arm 505 to pivot the swing arm 505 to raise or lower the wheel axle 515, thereby raising or lowering the wheel hub 520 and the attached road wheel 215. Thus, to lower the frame 120a onto castor wheels 240 and 242, the lift kit 608 raises the road wheels 215 out of ground contact; and to raise the frame 120a onto the road wheels 215, the lift kit 608 lowers the road wheels 215.

Because the wheel axle 515 is a stub axle, which does not extend completely across the frame from side to side to permit the trailer to straddle a container and to allow each side of the trailer to be lifted independently, a larger moment is seen by the swing arm

505 than in typically trailers. The lateral extension of the pivot tube 606 outward of the longitudinal member 205 along with the lateral extension of the frame extension 604 outward of the longitudinal member 205 limit deflection of the wheel axle 515 and transmit the moment to the longitudinal member 205, using the rigidity of the trailer structure to maintain axle alignment. Furthermore, the upper surface 614 of the frame extension 604 is mounted level with the upper surface 616 of the longitudinal member 205 such that the container sits on both the frame extension 604 and the longitudinal member 205, with the longitudinal member completely under the container 115 and the majority of the frame extension 604 under the container 115, as illustrated in FIG. 8. This configuration utilizes the weight of the container 115 on the frame extension 604 to further stabilize the suspension mechanism 600.

Other embodiments are within the scope of the following claims. For example, the first implementation of the trailer 110 can include a different number of road wheels attached to the frame 120 than illustrated. The transverse members need not be connected to the ends of the longitudinal members. Instead, the transverse members can be connected near the ends of the longitudinal members. Additional or fewer castor wheels can be attached to the frame to facilitate lateral expansion and retraction. Pulleys that are coupled with the cables to lift the container can be attached at any location on the vertical members. Alternatively, the pulleys can be coupled to any member of the frame. The frame 120 can include fewer transverse members. Alternatively, the frame can include additional vertical members connected by additional transverse members to load and unload the container, and to facilitate lateral expansion and retraction. The container can be larger or smaller than an ISO container. The dimensions of the members of the frame can be selected based on the dimensions of the container to be transported. The hooks or other fasteners at the ends of the cables can be attached to regions of the bottom surface of the container such that the container can be adequately supported. Such regions need not include the corner regions alone. Alternatively, or in addition, the cables can be attached to regions near the corners. The longitudinal members can include a lip on a top surface of the frame on which the container can rest.

With respect to the second implementation of the trailer 110, the upper ends of the vertical members need not be coupled to the back ends of the longitudinal members for pivoting. Alternatively, regions near the upper ends of the vertical members can be coupled

to regions near the back ends. The frame 120 can include multiple support members based on the length of the longitudinal members, each support member including a corresponding castor wheel to facilitate trailer movement. Additional hydraulics can be coupled to the longitudinal member and attached to the support member to pivot the support member.

5 Although FIGS. 5A – 5D illustrate “H” shaped third and fourth vertical members, these vertical members can be of any shape. Further, the third and fourth vertical members can be shorter than the first and second vertical members. In such scenarios, to move the trailer, the road wheels of the tractor can be used. When the frame is lowered and the road wheels of the first and second vertical member are raised from the ground, the tractor can be moved away
10 from the trailer to place the third and fourth vertical members on the ground.

In some scenarios, the first and second vertical members included in the frame of the third implementation of the trailer can have members attached to the upper end to provide an “L” shape or a “T” shape. These additional members can be coupled to the longitudinal members to facilitate pivoting.

15 In some scenarios, instead of or in addition to using cables to lift the container, electric and/or hydraulic winches can be used. The container can be lifted using four cylinders rather than cylinders with cables. In this implementation, one end of the cylinder is attached to the top frame and the other end of the cylinder has a hook that inserts into one of the lower corner post of the container. The top cylinder mount is fully articulated and the
20 lower hook is attached to the cylinder by a short piece of chain to facilitate attaching the hook to the container.

Various features of the separate embodiments can be implemented in combination.

What is claimed is:

25

CLAIMS

1. A trailer frame, comprising:

two longitudinal members extending generally from a front end region to a back end
5 region of the trailer frame, and a third member connecting the two longitudinal members, the
trailer frame being actuatable between a first configuration permitting advancement of the
trailer frame relative to a container and a second configuration, the trailer frame being
positionable as a single unit about the container when in the first configuration, and being
capable of supporting the container in the second configuration when the trailer frame has
10 lifted the container off the ground;

road wheels for long-haul transportation of the trailer over conventional road systems,
the road wheels being supported by stub axles; and

supporting wheels configured to support the frame when the road wheels are off the
ground.

15

2. The trailer frame of claim 1 further comprising frame extensions, each frame
extension extending laterally outward of one of the longitudinal members, each stub axle
being coupled to one of the frame extensions.

20

3. The trailer frame of claim 2 further comprising pivotable swing arms, each swing
arm coupling one of the stub axles to a respective frame extension.

4. The trailer frame of claim 3 further comprising hangers, each hanger coupling one
of the swing arms to a respective frame extension.

25

5. A trailer, comprising:

a coupling configured and arranged to attach a front end region of the trailer to a
tractor by a fifth wheel;

a frame attached to the coupling, the frame including two longitudinal members
30 extending generally from a front end region to a back end region of the frame, the frame
being positionable as a single unit about a container such that the frame can be attached to

the container in regions of four corners of the container to lift corresponding front and back ends of the container; and

road wheels for long-haul transportation of the trailer over conventional road systems, the road wheels being supported by stub axles.

5

6. A method comprising:

positioning a trailer as a single unit about a container;

attaching the trailer to regions of four lower corners of the container;

lifting the container off the ground using the trailer; and

10 attaching the trailer to a tractor, the trailer having road wheels mounted to stub axles for long-haul transportation of the trailer over conventional road systems.

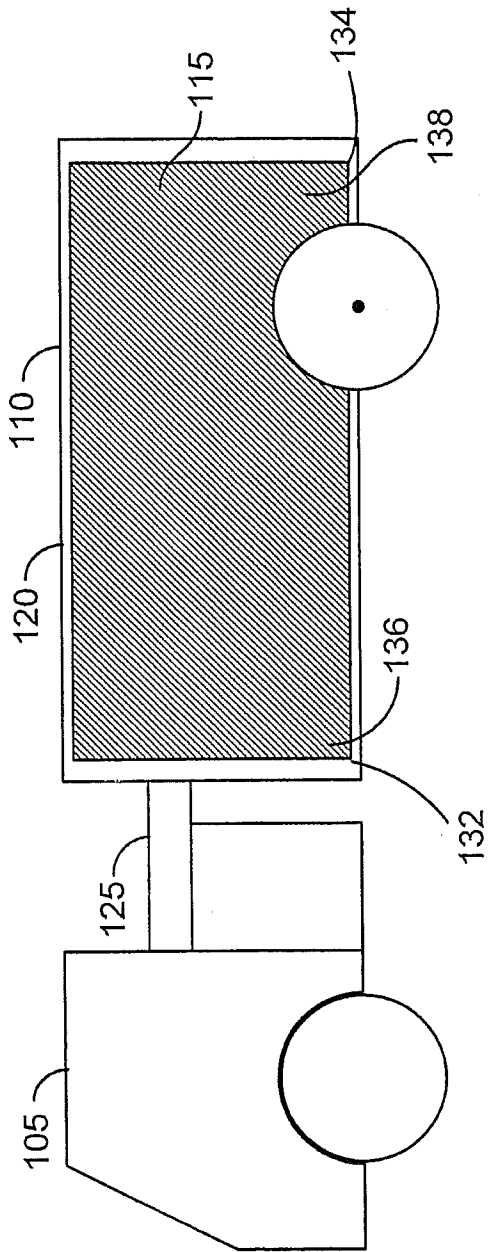


FIG. 1

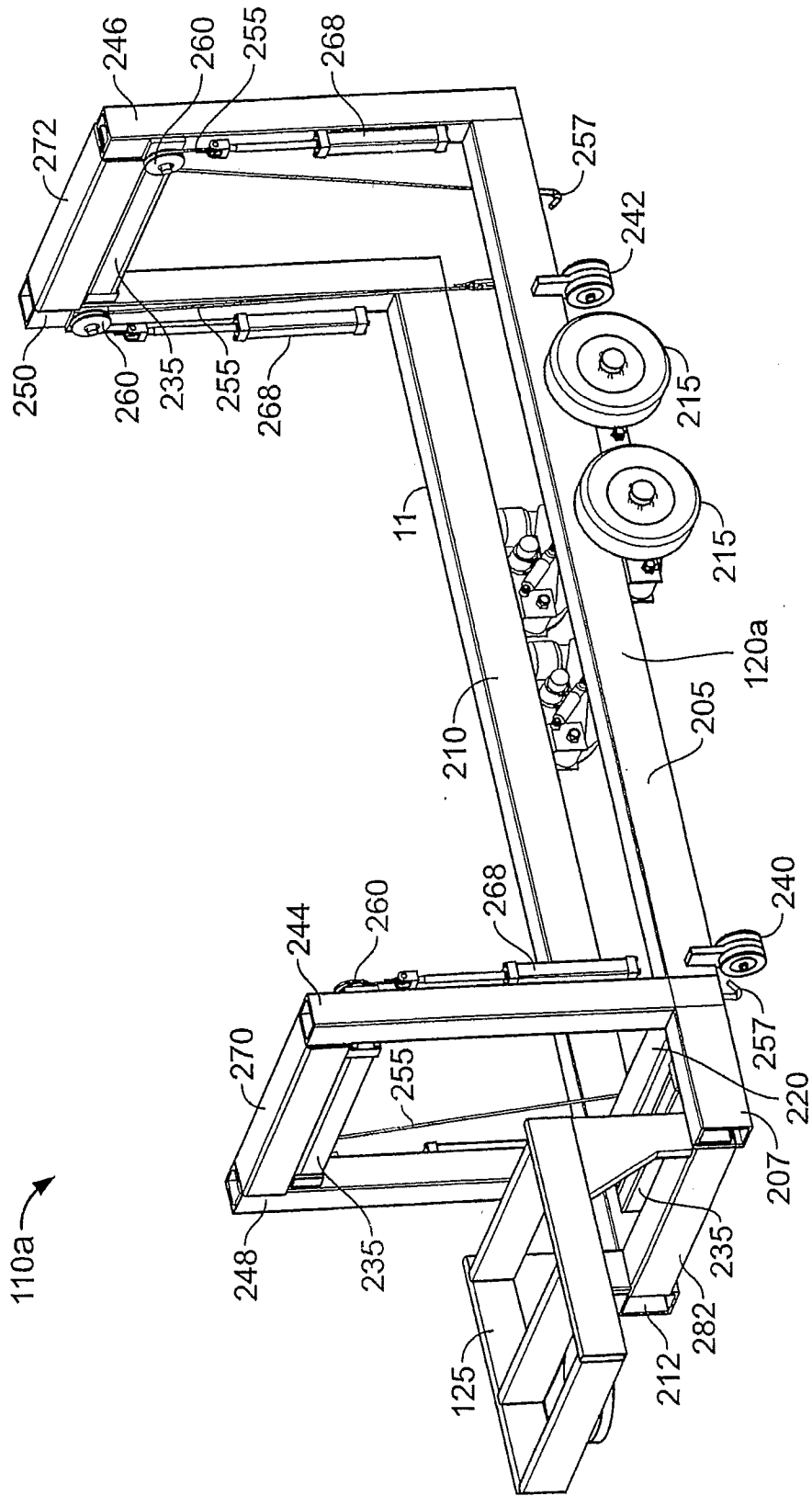


FIG. 2A

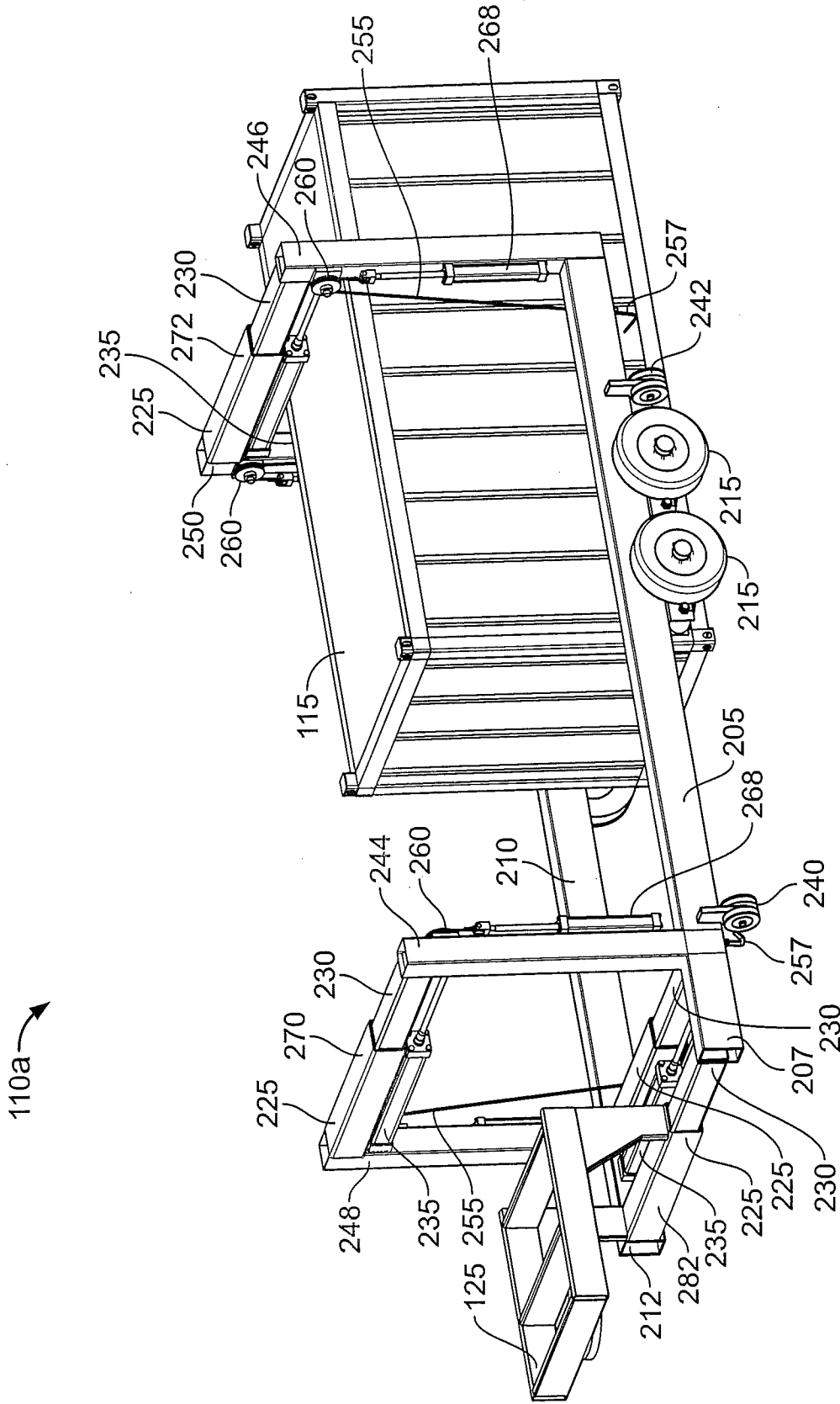


FIG. 2B

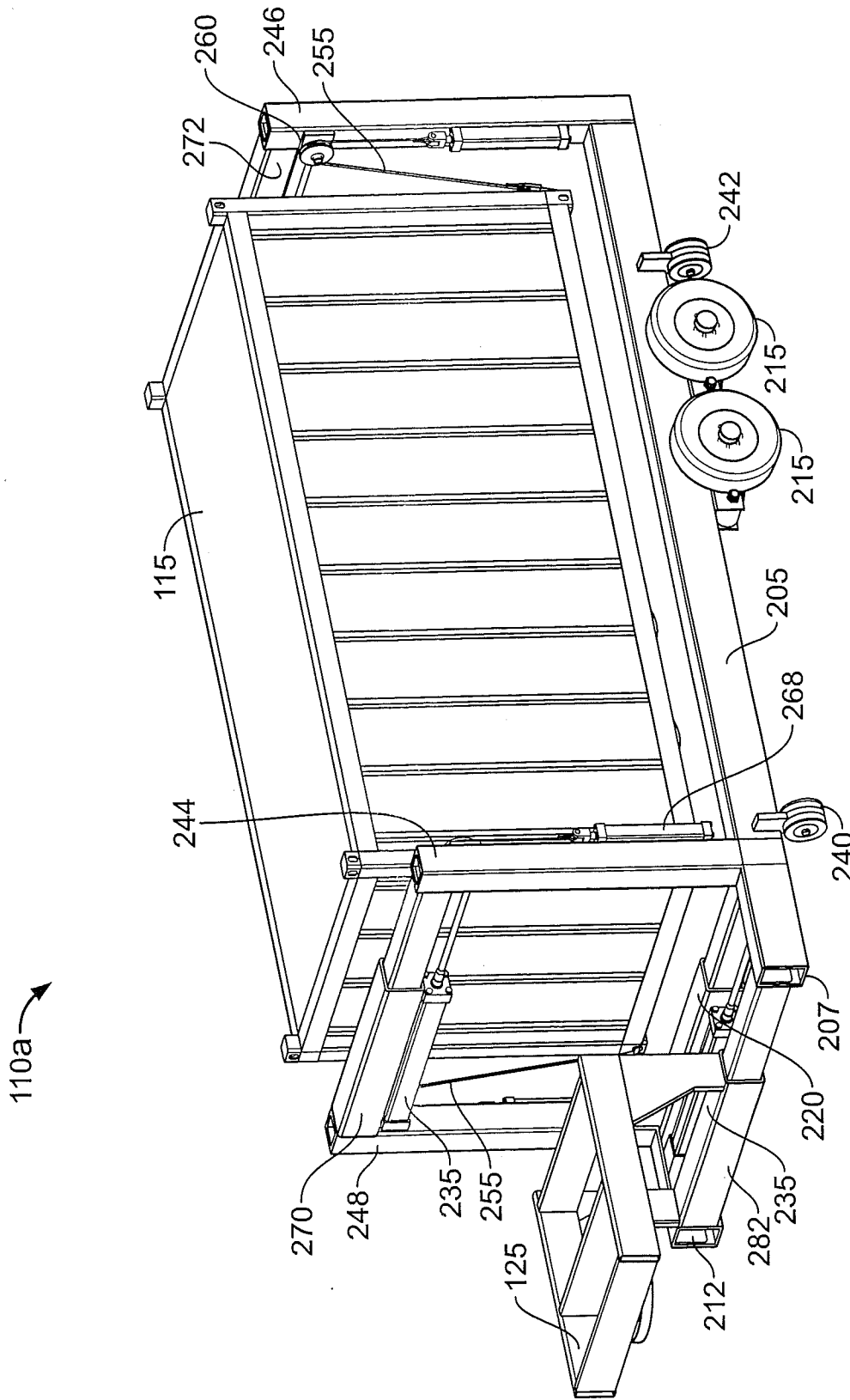


FIG. 2C

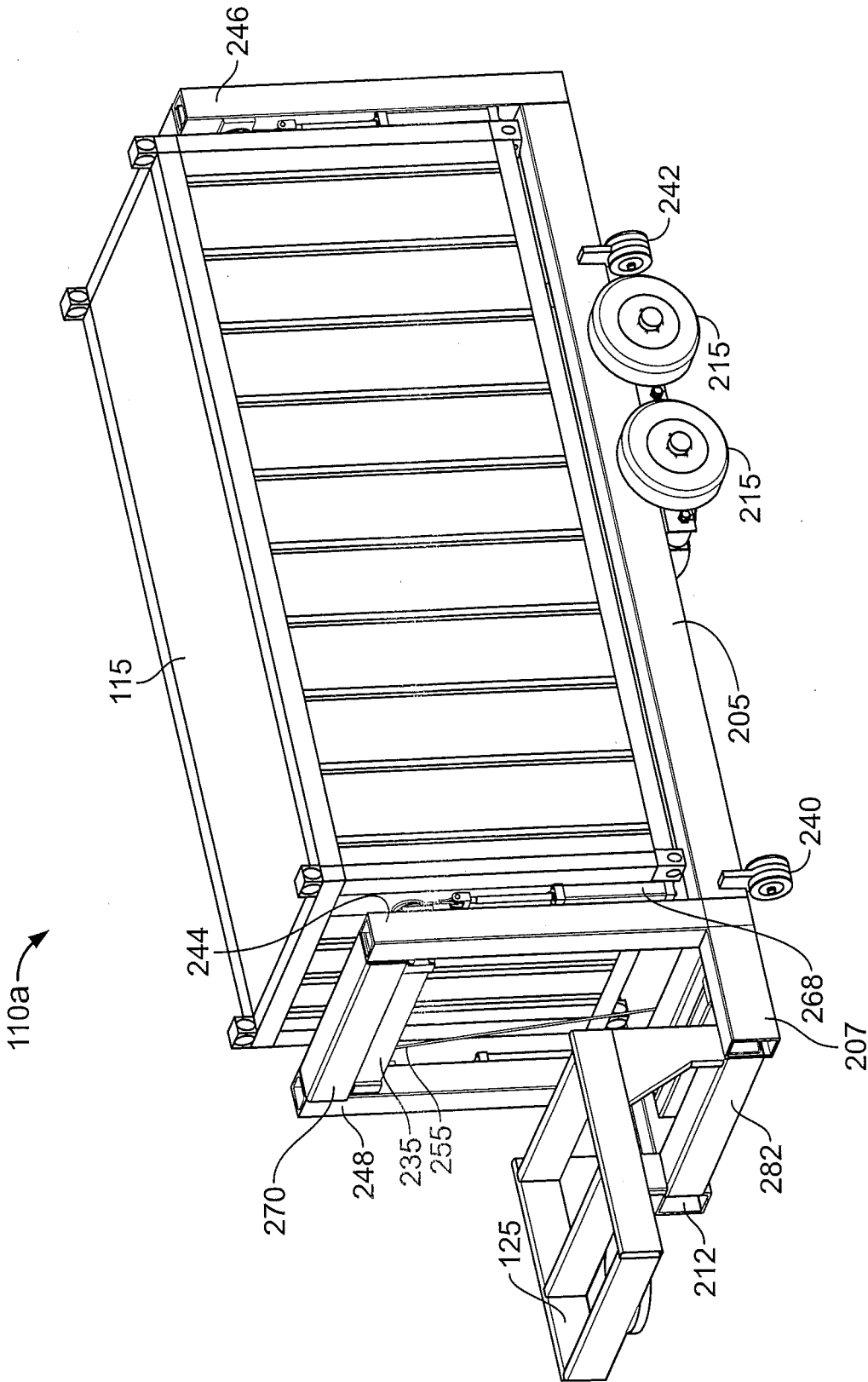


FIG. 2D

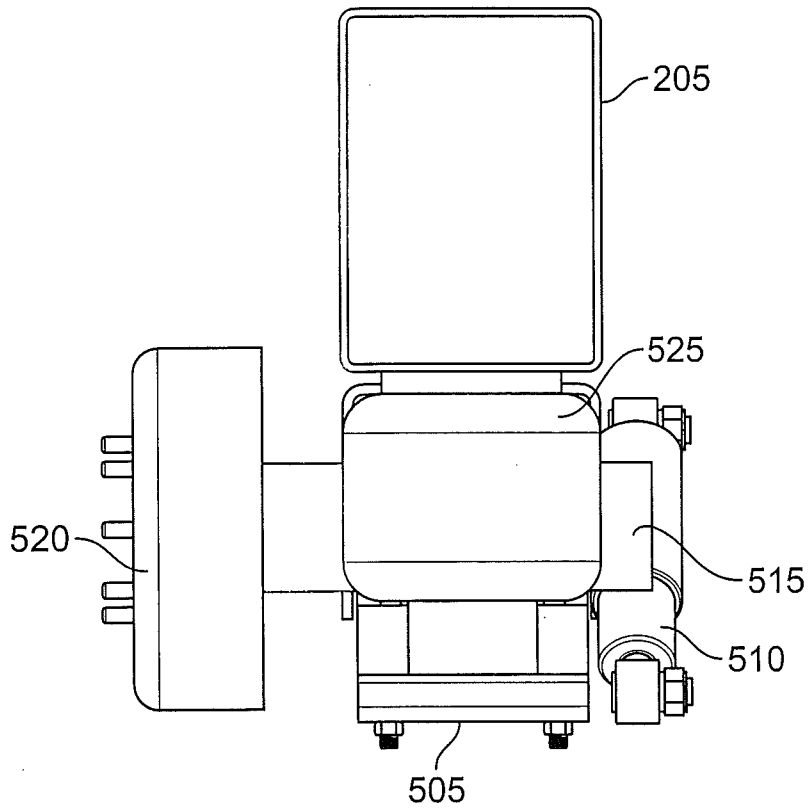


FIG. 3A

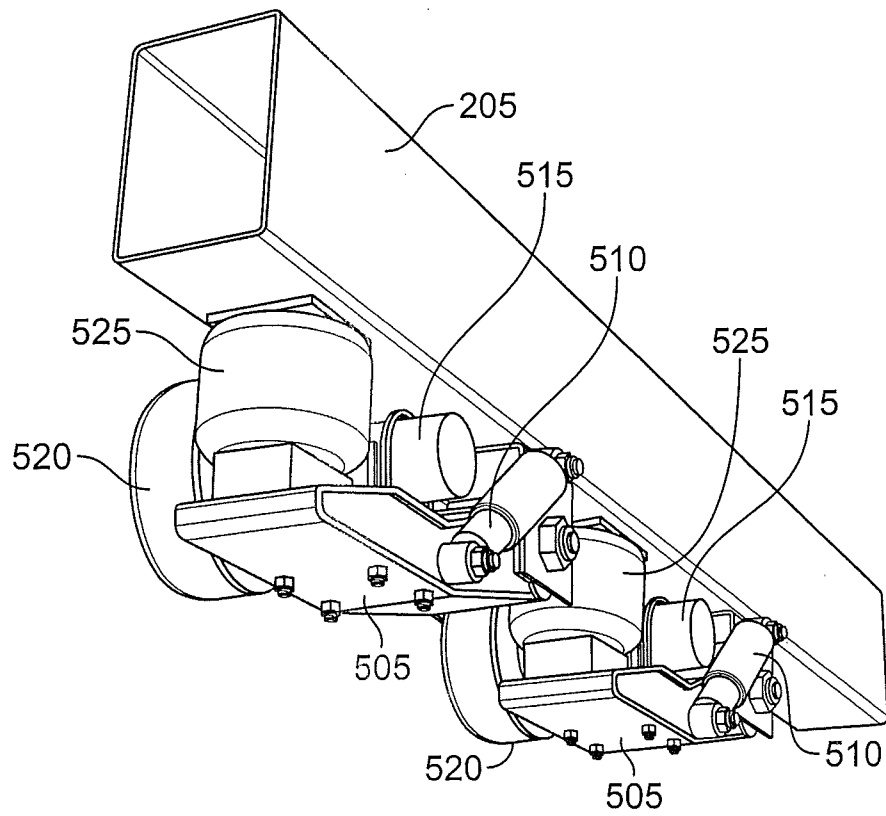


FIG. 3B

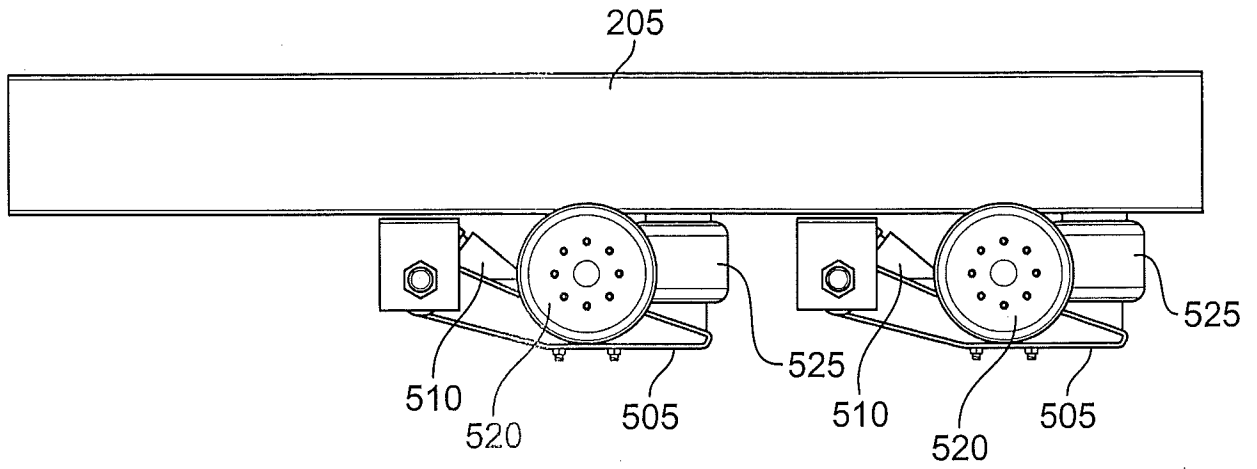


FIG. 3C

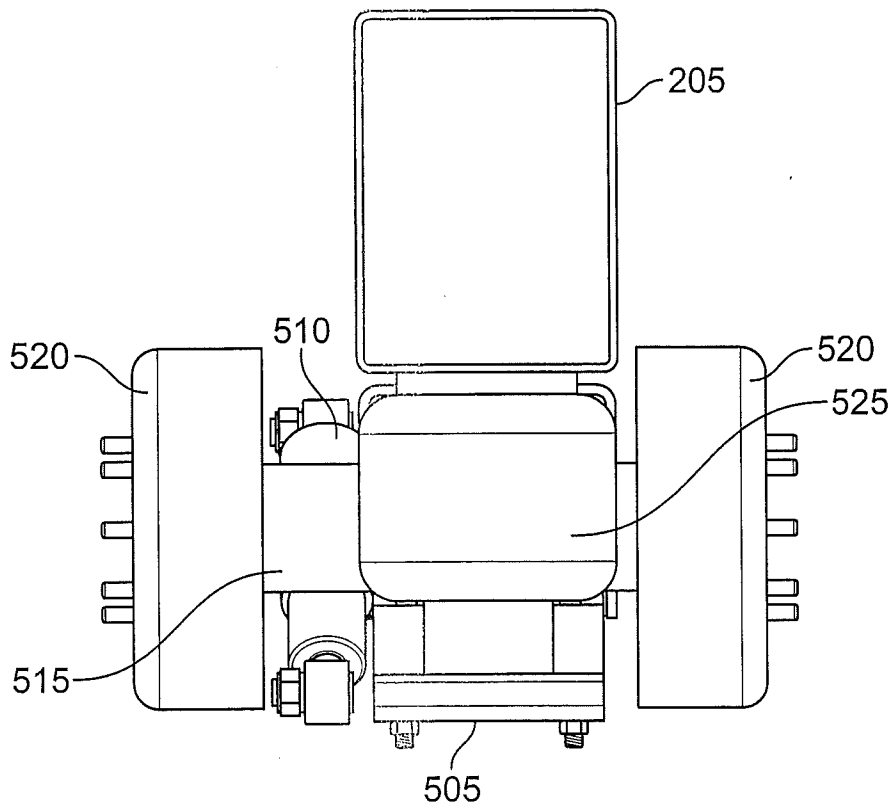


FIG. 4A

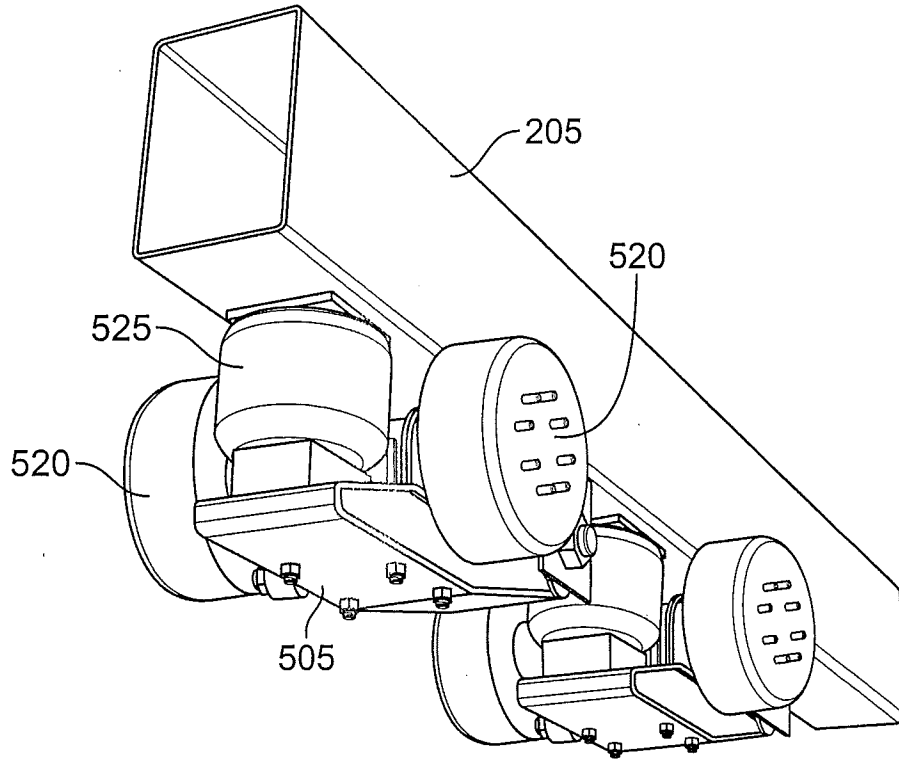


FIG. 4B

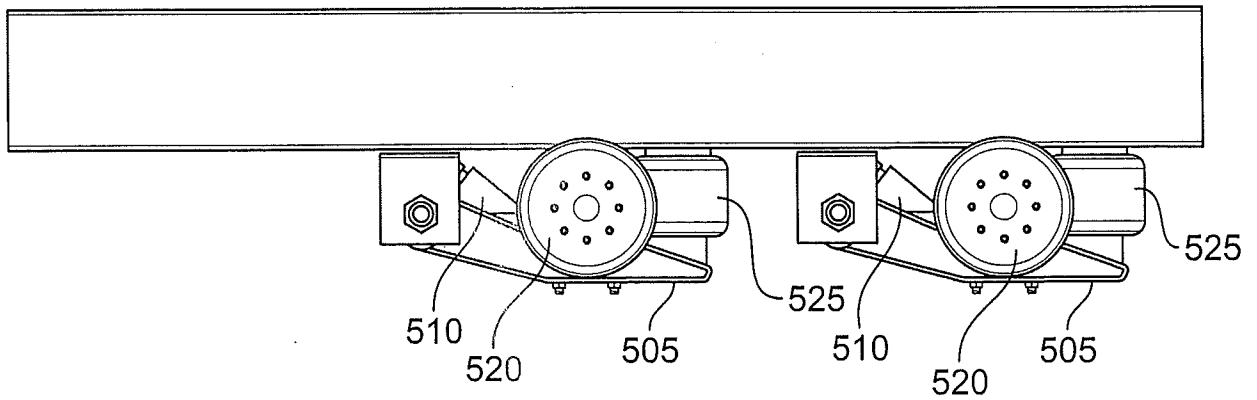


FIG. 4C

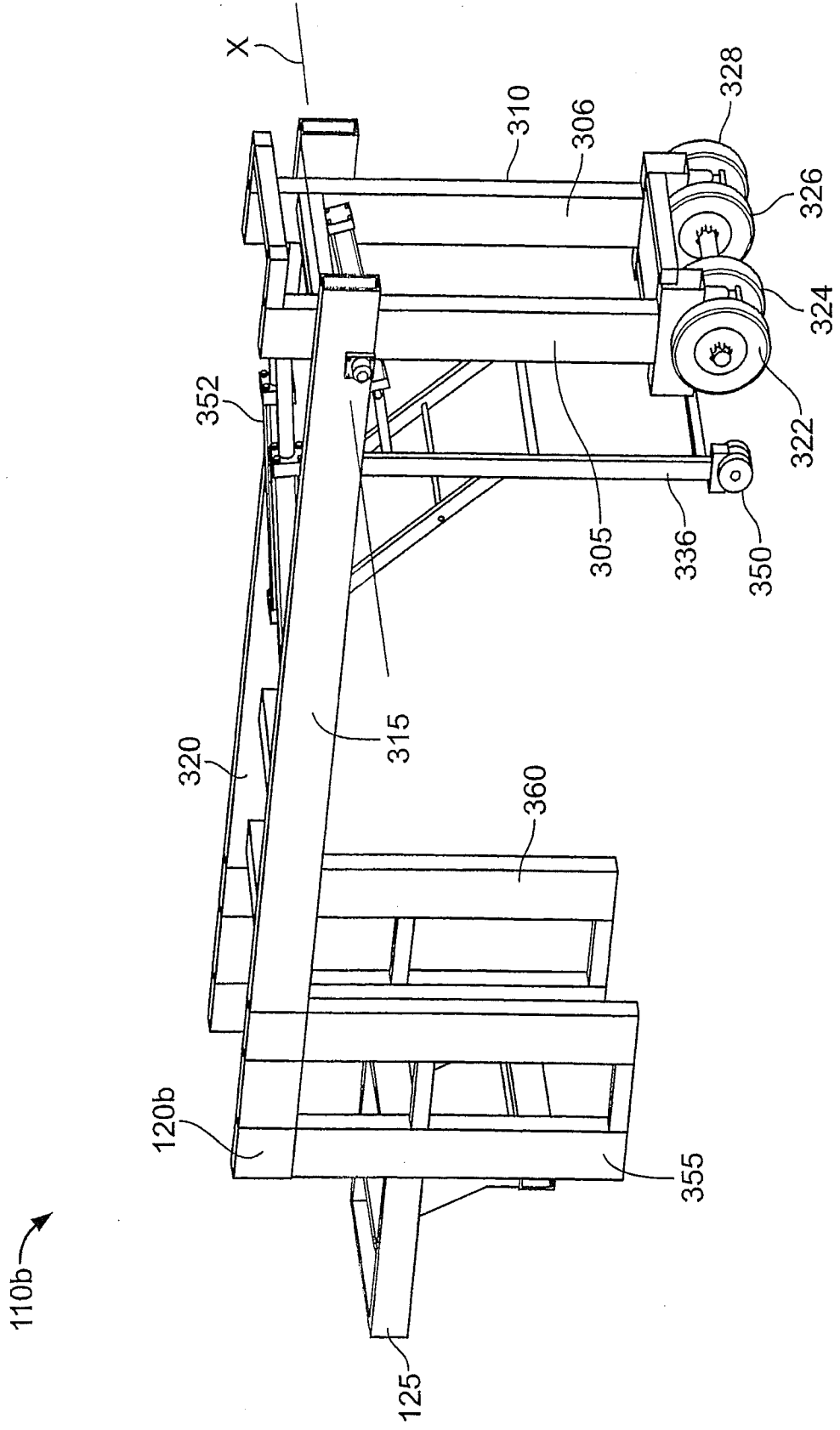


FIG. 5A

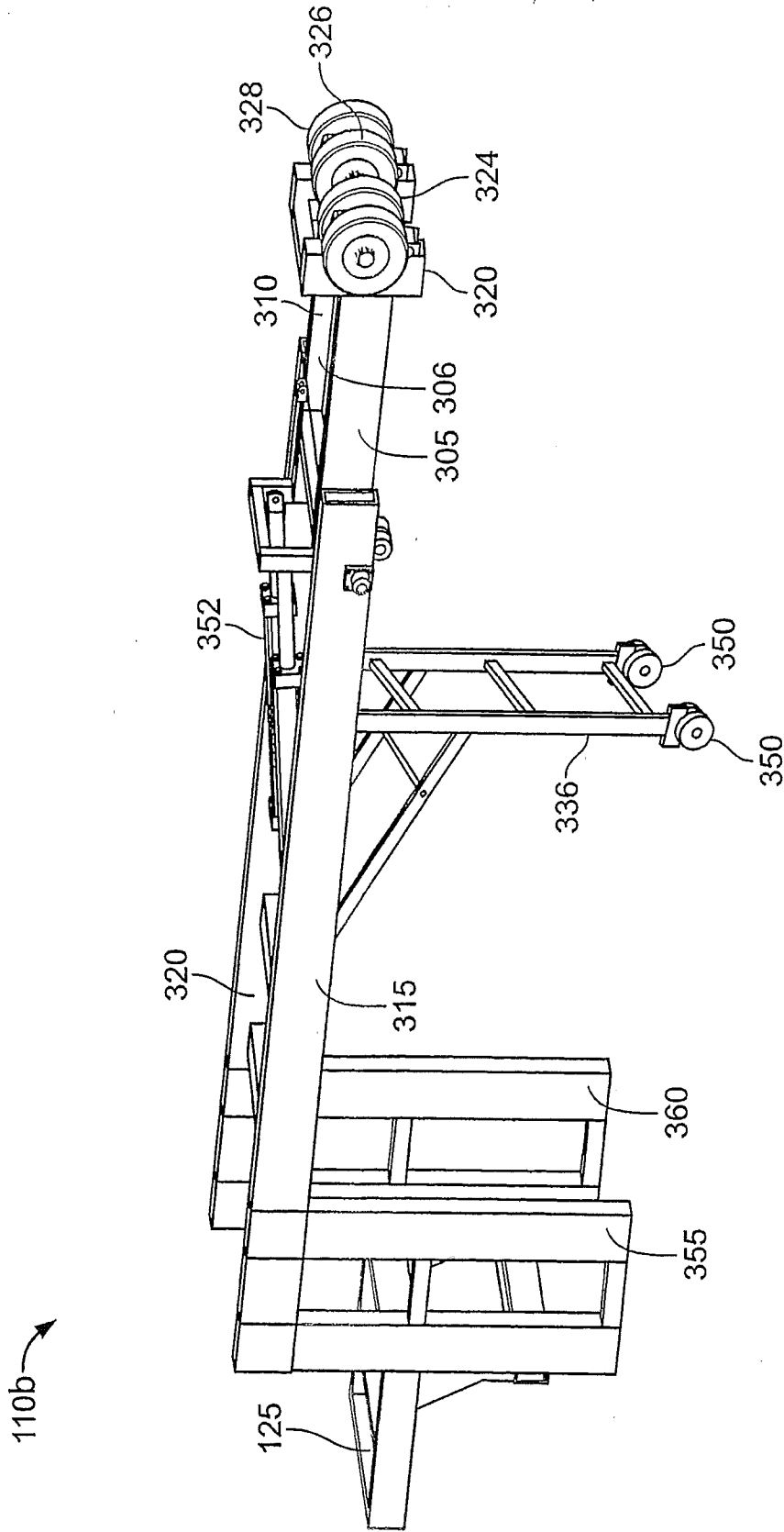


FIG. 5B

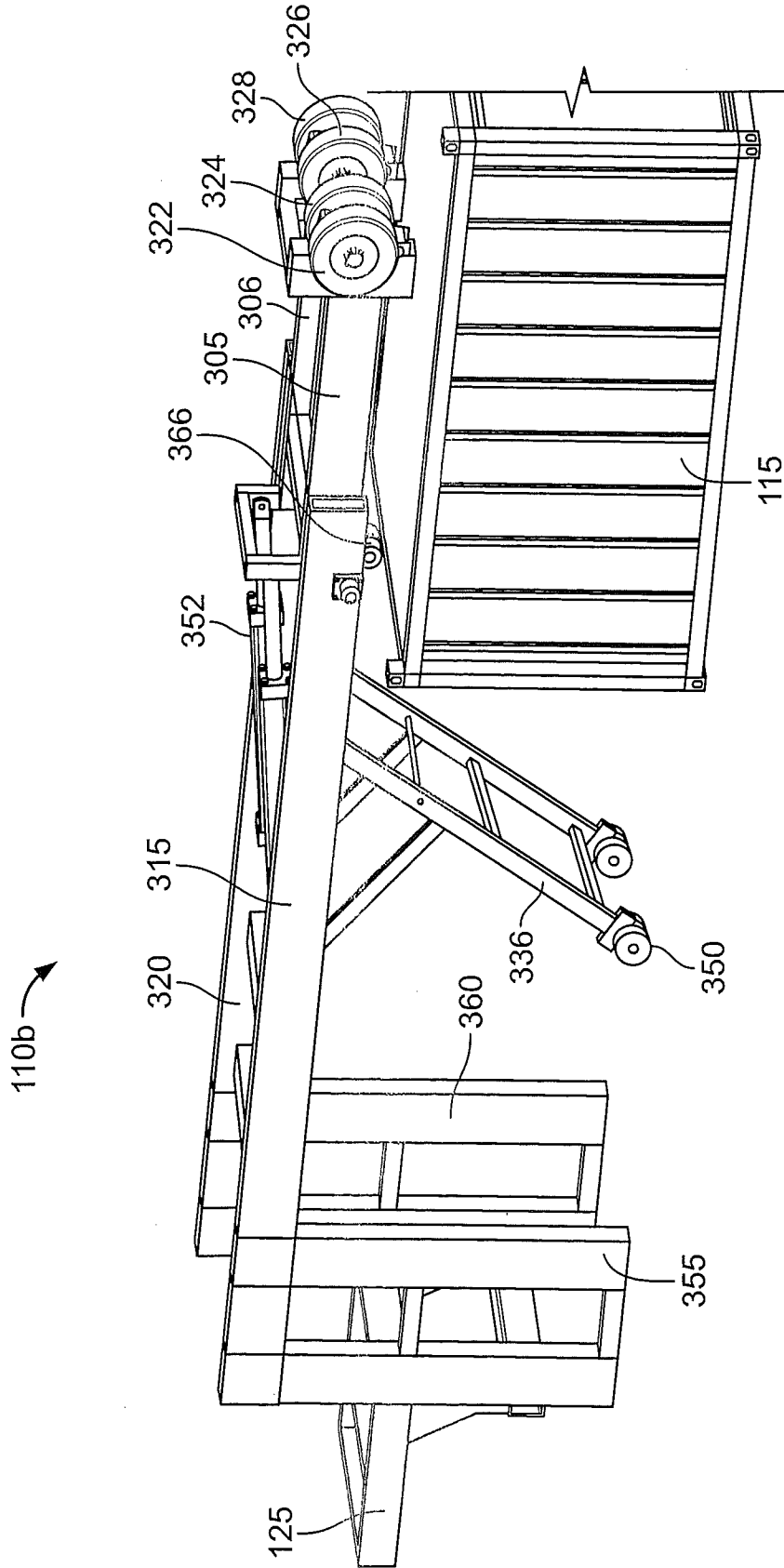


FIG. 5C

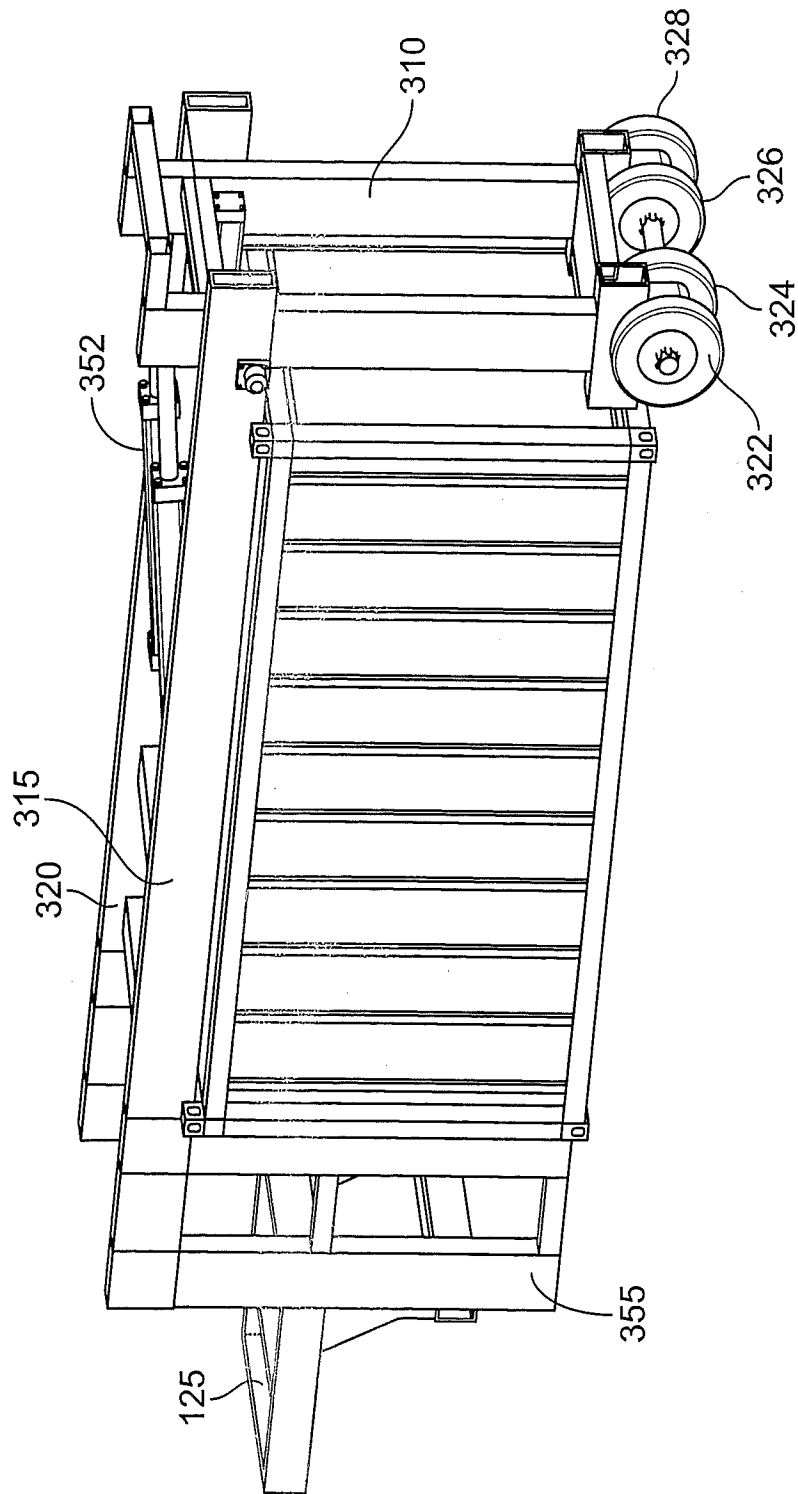


FIG. 5D

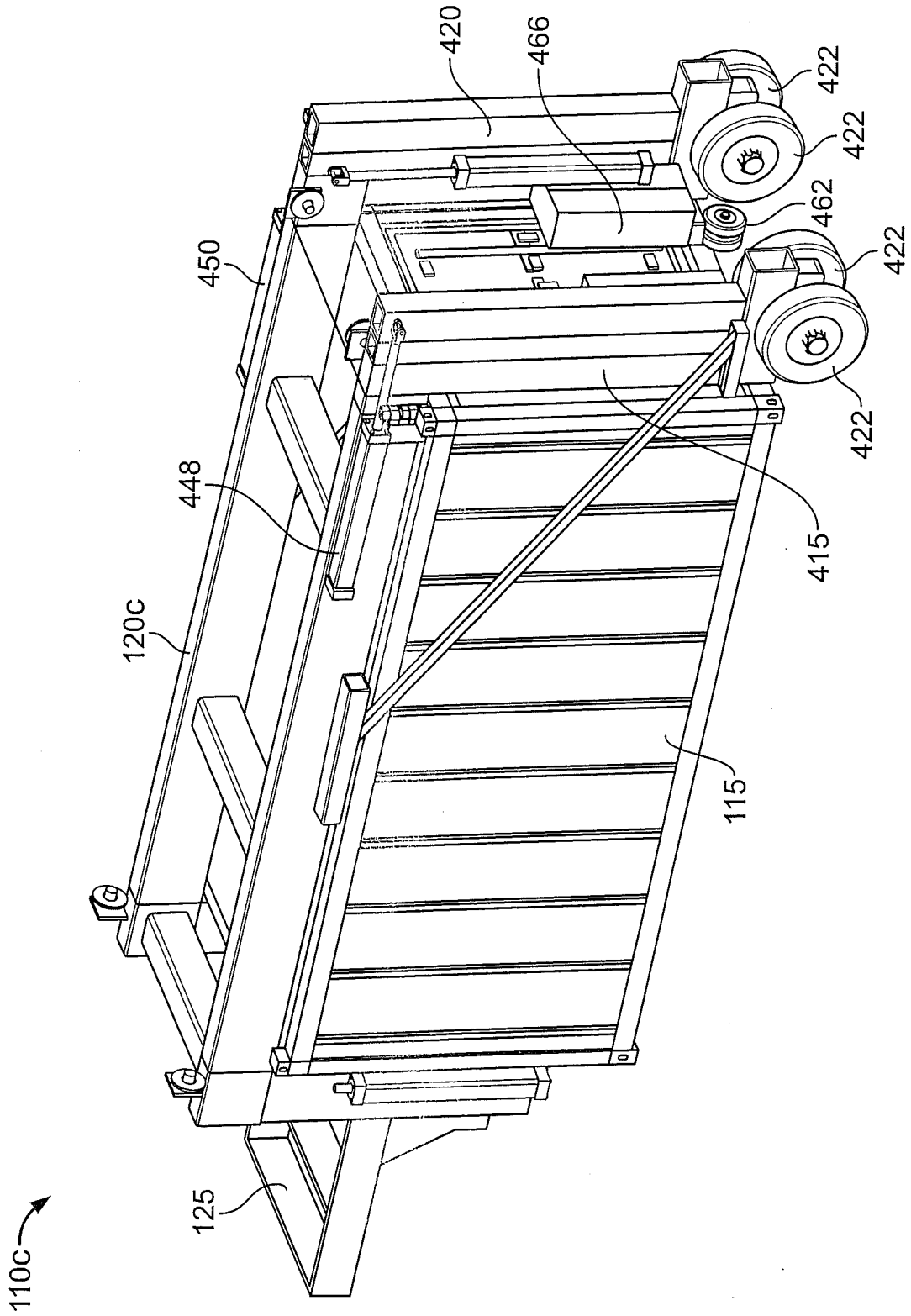
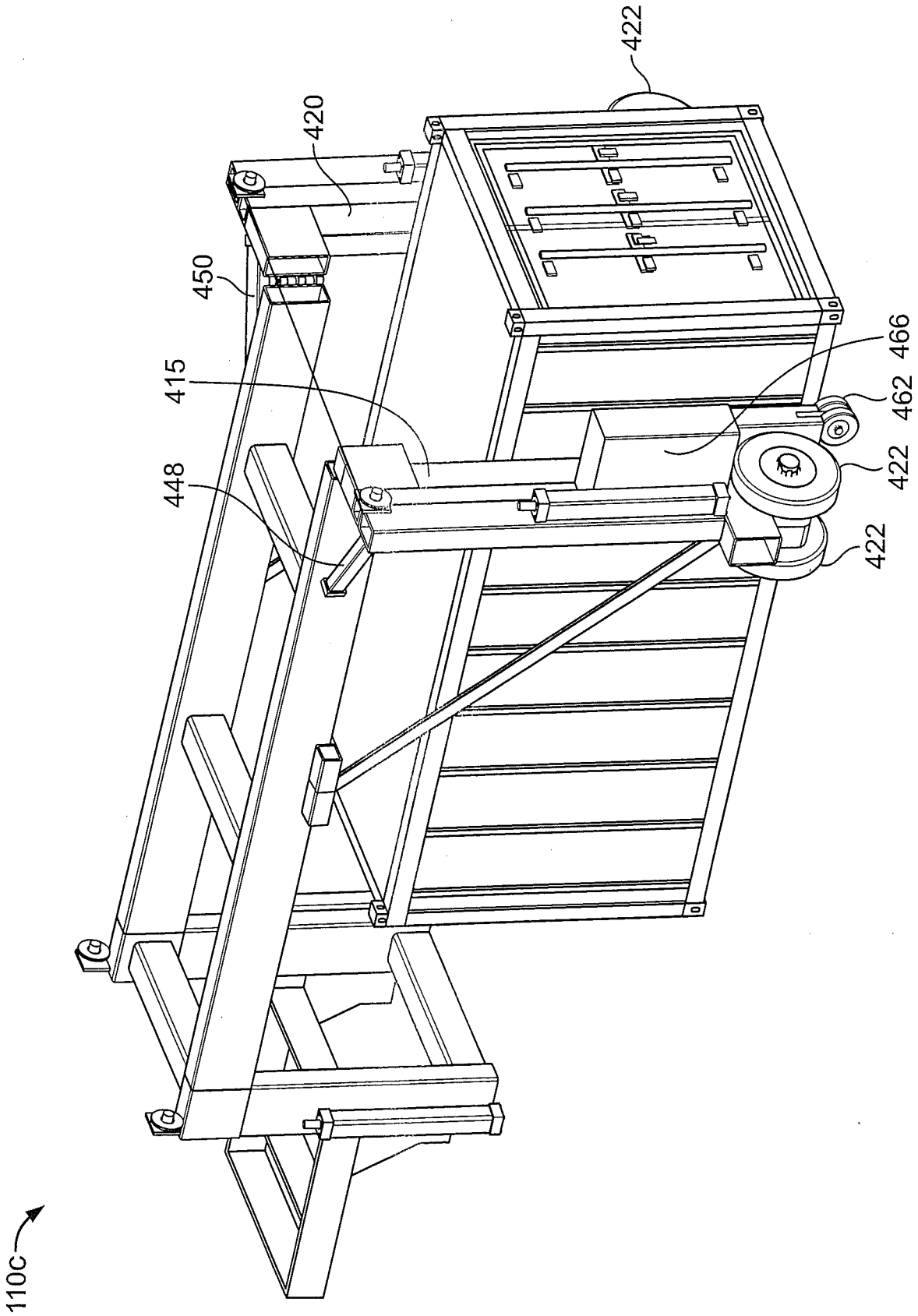


FIG. 6B



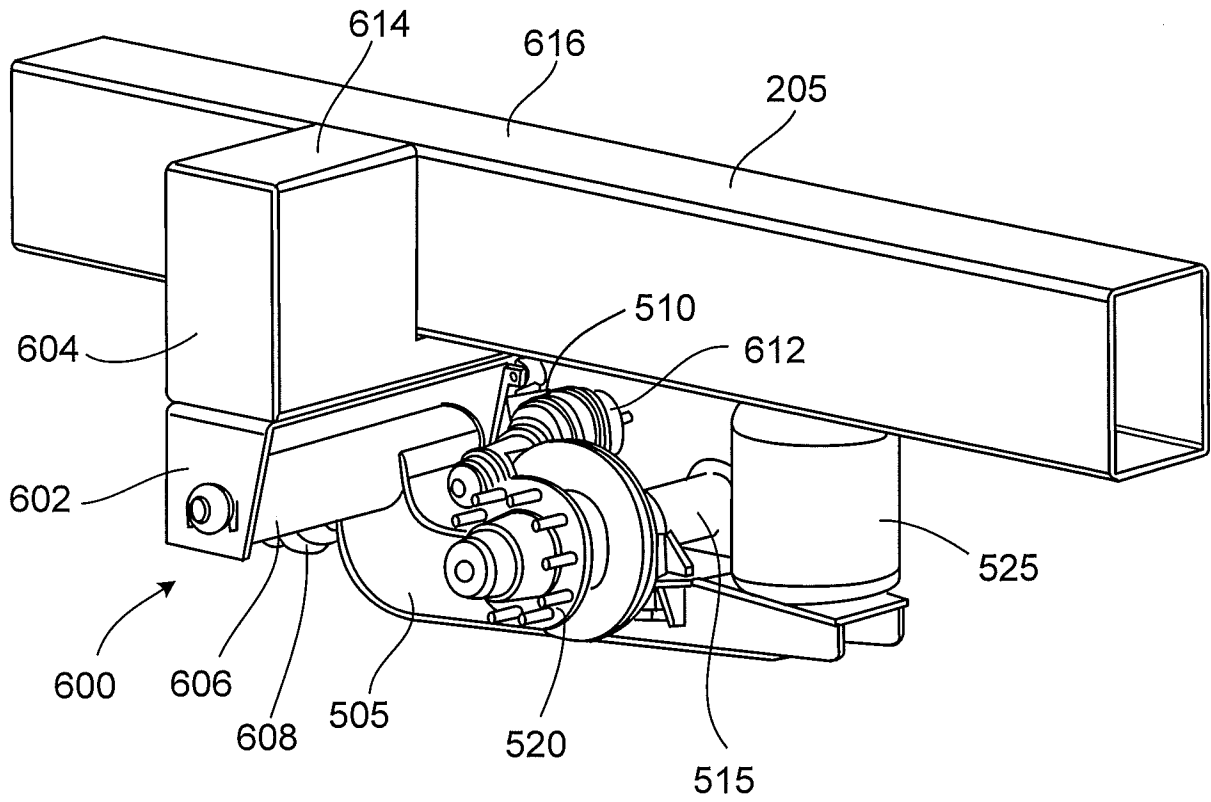


FIG. 7A

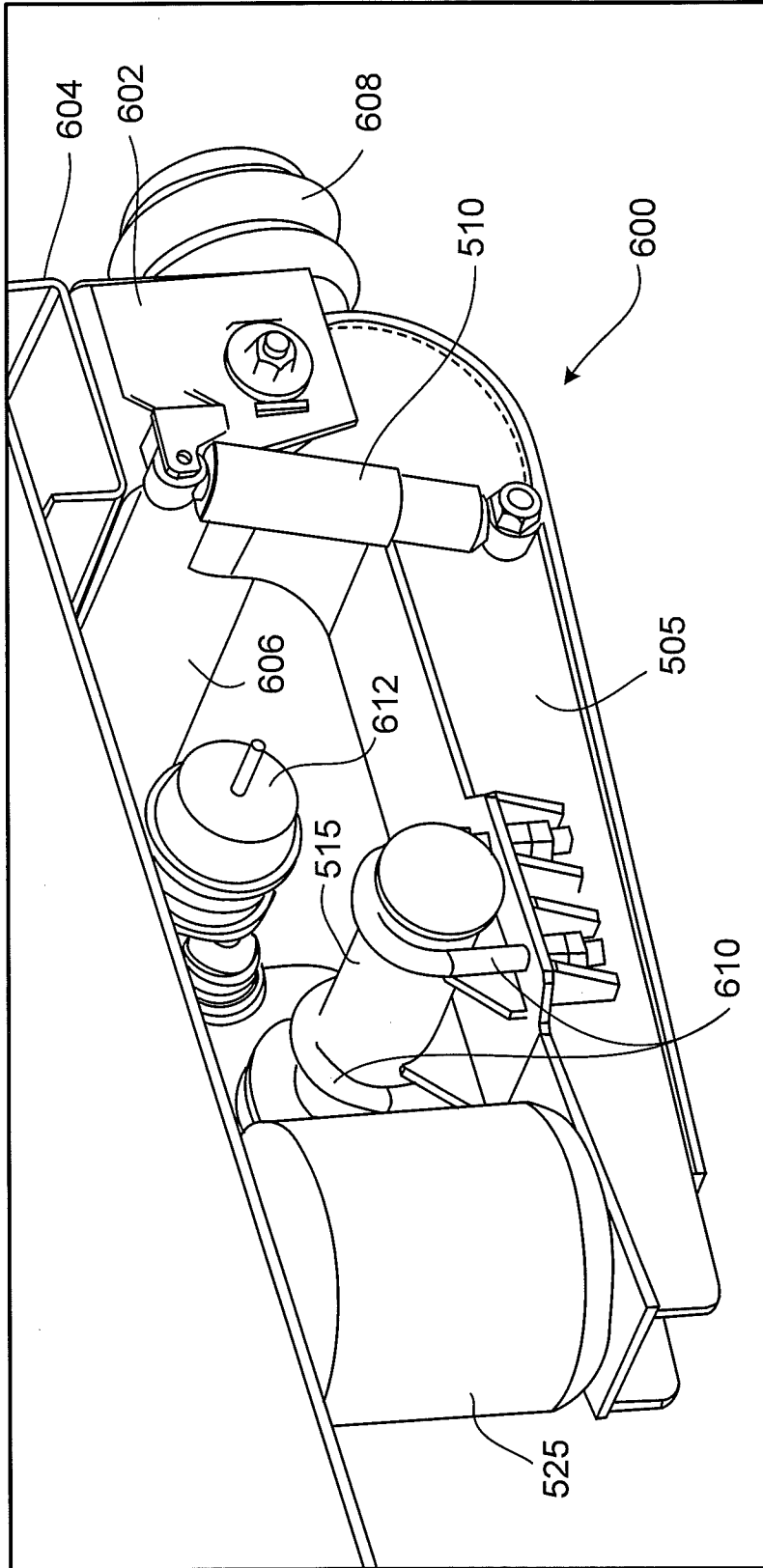


FIG. 7B

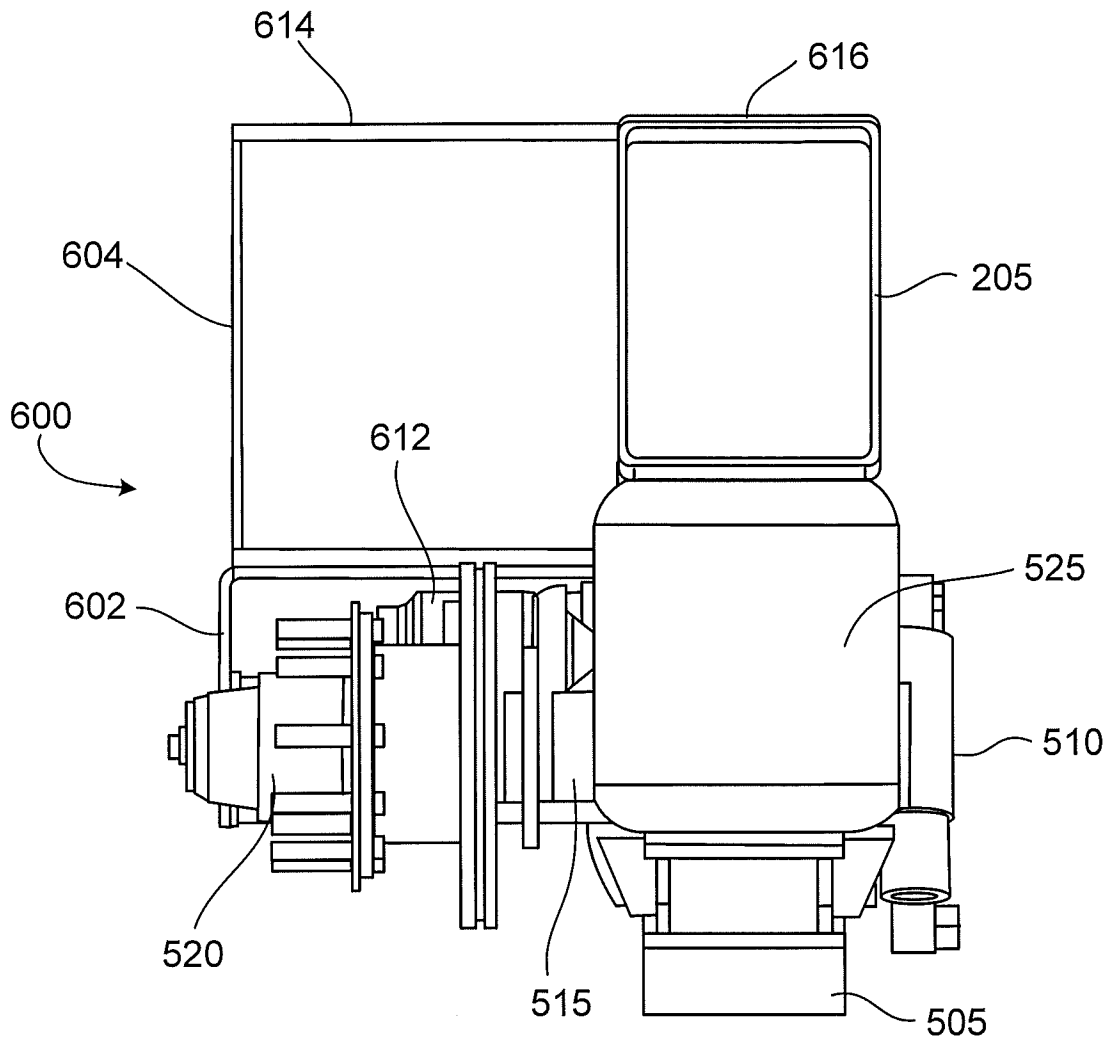


FIG. 7C

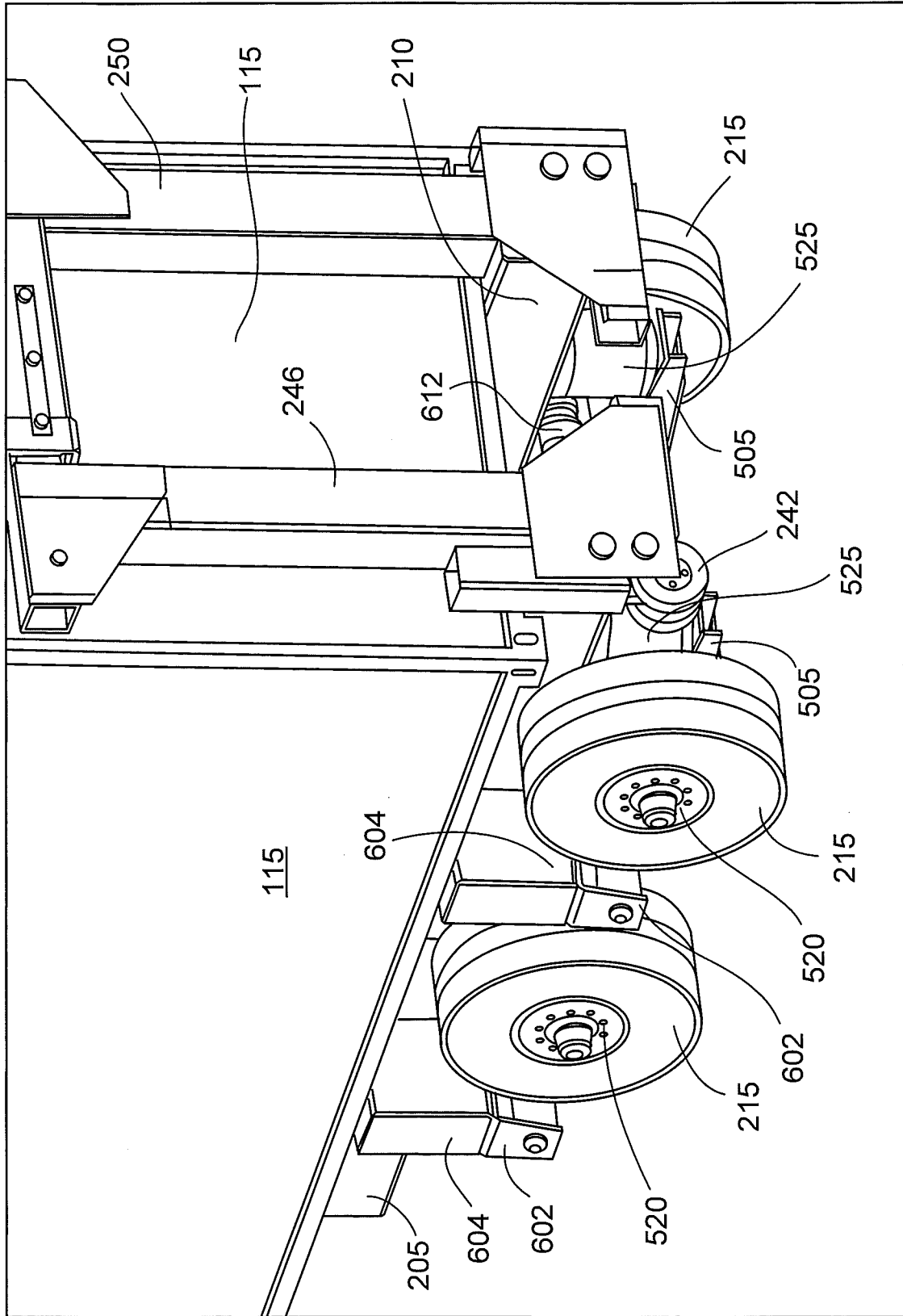


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No PCT/US2012/039583

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B60P1/64
 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)
 B60P

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/104408 A1 (GAUDET JOEL [CA] GAUDET JOEL [CA] ET AL) 29 April 2010 (2010-04-29) figures 1-17	5,6
X	-----	
X	WO 2010/094935 A1 (DEAKIN TERRY [GB]) 26 August 2010 (2010-08-26) figures 1-20	5,6
A	-----	
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A	-----	
A	US 6 155 770 A (WARHURST PETER S [US]) 5 December 2000 (2000-12-05) claims 1-5; figures 1-5,17	1-6

	-/--	

Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search

27 August 2012

Date of mailing of the international search report

03/09/2012

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Szaip, András

INTERNATIONAL SEARCH REPORT

International application No PCT/US2012/039583

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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