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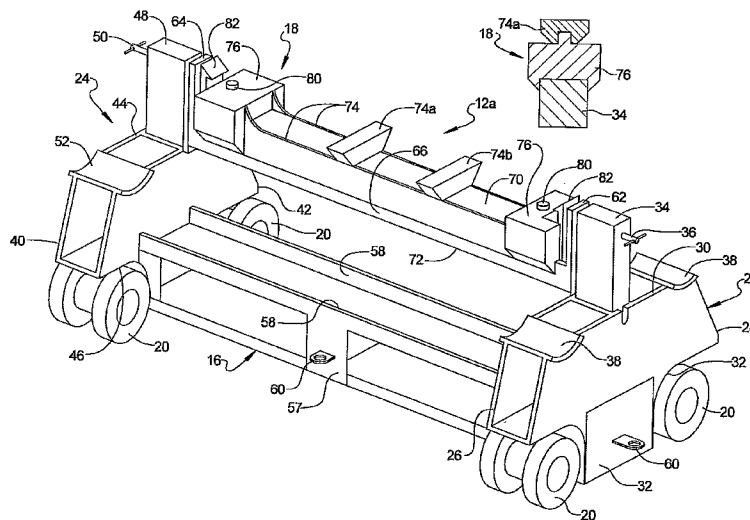
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- (71) Applicant (for all designated States except US): **THE BOEING COMPANY** [US/US]; 100 N. Riverside Plaza, Chicago, IL 60606-2016 (US).

- B. [US/US]; 2321 Mesquite, Corona, CA 92882 (US). **HARBER, Benjamin, A.** [US/US]; 3125 Kerry Ln., Costa Mesa, CA 92626 (US).
- (74) Agents: **POOLE, James, M.** et al.; The Boeing Company, MC 110-SD54, P.O. Box 2515, Seal Beach, CA 90740-1515 (US).
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- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **ROHRLICK, Myles, A.** [US/US]; 1501 India Street, Unit 408, San Diego, CA 92101 (US). **WELLS, James, S.** [US/US]; 9119 Crocus Ave., Fountain Valley, CA 92708-1434 (US). **GARCIA, Anibal, J.** [US/US]; 12686 Verdugo Ave., Chino, CA 91710-3741 (US). **SIMMONS, John,**

[Continued on next page]

(54) Title: DIRECT LOADING APPARATUS FOR PALLET RELATED SYSTEMS



(57) Abstract: An apparatus for transporting and handling a cargo platform is provided. The apparatus includes a frame (16) having a cradle beam (18) that receives the cargo platform. The cradle beam (18) supports a lower surface of the cargo platform. The apparatus further includes a locking mechanism (30) operably associated with the cradle beam (18) and actuates to securely fasten the cargo platform to the frame when the cargo platform is rested upon the cradle beam (18). The apparatus also includes a plurality of wheel assemblies (20) for wheeling the frame along a ground surface.

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## DIRECT LOADING APPARATUS FOR PALLET RELATED SYSTEMS

### FIELD OF THE INVENTION

**[0001]** The present invention relates to cargo handling equipment and, more  
5 specifically, to cargo apparatuses for transport aircraft.

### BACKGROUND OF THE INVENTION

**[0002]** An aircraft requires special cargo handling equipment for loading and  
unloading cargo platforms. In military airlift applications and similar uses of large cargo  
10 aircrafts, where little or no ground-based cargo loading equipment is available, there  
has been a need for loading and unloading cargo platform related systems without the  
use of a conventional K-loader or an overhead crane.

**[0003]** Today, cargo platforms are not directly loaded from a load handling  
system (LHS) vehicle to an aircraft because there is insufficient overhead clearance to  
15 permit the operation of the LHS vehicle loading arm. This makes direct loading  
impossible. A cargo platform must be demounted from the LHS vehicle at some  
distance from the aircraft. Afterwards, the cargo platform is placed on a K-loader by an  
overhead crane for loading onto an aircraft. This, however, requires a large amount of  
material handling equipment to be available at an onload and offload site. Additionally,  
20 this requires multiple aircraft loads of material handling equipment (e.g. forklift  
equipment, K-loader, and/or an overhead crane) to be flown to the onload/offload site  
and set up prior to the arrival of the aircraft transporting the cargo platforms.

**[0004]** Therefore, a need exists for a means to load and unload cargo  
platforms to and from an aircraft without the need for large material handling equipment.  
25

### SUMMARY OF THE INVENTION

**[0005]** In accordance with the present invention, an apparatus for transporting  
and handling a cargo platform is provided. In one preferred form, the apparatus  
30 includes a frame having a cradle beam adapted to receive a cargo platform. The cradle  
beam supports the cargo platform from underneath. The apparatus further includes a  
locking mechanism coupled to the cradle beam and adapted to actuate as the cargo  
platform is rested upon the cradle beam, wherein the locking mechanism secures the

cargo platform to the frame. Additionally, the apparatus includes a plurality of wheel assemblies coupled to the frame for transporting the frame along the ground.

**[0006]** In an alternative embodiment, the apparatus includes a first arm assembly adapted to couple to a first forklift slot of the cargo platform. Additionally, the apparatus comprises a leg assembly coupled to the arm assembly and adapted to support the cargo platform in a vertical position. The apparatus also includes a second arm assembly coupled to the leg assembly and adapted to couple to a second forklift slot of the cargo platform. The second arm assembly is further adapted to adjust the leg assembly to a plurality of height levels.

**[0007]** The present invention provides the advantage of enabling a cargo platform to be loaded and unloaded from an aircraft without the use and need for various forms of material handling equipment. Additionally, the present invention decreases the need for material handling equipment to be separately flown to the onload/offload sites. Another advantage of the present invention is that it allows cargo platforms to be stowed away at ground level until needed between being loaded and unloaded from an aircraft.

**[0008]** Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating various preferred embodiments of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

**[0010]** Figure 1 is a perspective view of one preferred embodiment including a direct loading apparatus transporting and handling a cargo platform in accordance with the present invention;

**[0011]** Figure 2 is a perspective view of a cargo transportation apparatus of the direct loading apparatus in accordance with the present invention;

**[0012]** Figure 2A is a cross-sectional view of a cradle beam of the cargo transportation apparatus;

[0013] Figure 3 is a perspective view of the direct loading apparatus in a stowaway position in accordance with the present invention;

[0014] Figure 4 is a partial perspective view of the cargo transportation apparatus locking mechanism in accordance with the present invention;

5 [0015] Figure 4A is a cross-sectional view of Figure 4 taken along line 4A of the locking mechanism having a locking actuator in an unlocked position;

[0016] Figure 4B is a cross-sectional view of Figure 4A of the locking mechanism having the locking actuator in a locked position;

10 [0017] Figure 5 is a perspective overhead view of the cargo transportation apparatus in accordance with the present invention;

[0018] Figure 6 is a perspective overhead view of the direct loading apparatus handling a cargo platform being loaded or unloaded in accordance with the present invention;

15 [0019] Figure 7 is a perspective overhead view of an alternative embodiment of the direct loading apparatus in accordance with the present invention;

[0020] Figure 8 is a perspective overhead view of the direct loading apparatus being loaded or unloaded with the cargo platform in accordance with the present invention;

20 [0021] Figure 9 is a perspective overhead view of the direct loading apparatus loaded with the cargo platform and placing the cargo platform in a stowaway position, in accordance with the present invention;

[0022] Figure 10 is a perspective overhead view of the direct loading apparatus of Figure 9 resting on a ground surface in accordance with the present invention; and,

25 [0023] Figure 11 is a side elevation view of the direct loading apparatus loaded with the cargo platform and placed in an extended position to load or unload the cargo platform.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 [0024] The following description of various preferred embodiments is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0025] Referring particularly to Figures 1 through 6, one preferred embodiment of a direct loading system 10 is illustrated. As shown in Figure 1, the direct loading system 10 comprises a first and second cargo transportation apparatuses 12a, 12b for transporting and handling a cargo platform 14. The cargo platform 14 may  
5 comprise, for example, a container roll in/out platform (CROP), modular inter-modal platform (MIP) or an enhanced aerial delivery system (EADS) platform. Additionally, cargo transportation apparatuses 12a and 12b are identical in physical structure and functionality.

[0026] As shown in Figure 2, the first cargo transportation apparatus 12a  
10 includes a frame 16, a receiving bar or a cradle beam 18, and four wheel assemblies 20. The frame 16 is coupled to the cradle beam 18. Additionally, the wheel assemblies 20 are coupled to the frame 16 to support the apparatus 12a for rolling movement on a surface.

[0027] Referring to Figures 1 and 2, the frame 16 includes a first side unit 22  
15 and a second side unit 24. The first side unit 22 comprises a first front portion 26, a first rear portion 28, a first top portion 30, and a first bottom portion 32. The first side unit 22 may also include a first elevator unit 34. The cradle beam 18 is pivotally secured to the first elevator unit 34. The first elevator unit 34 adjusts to a plurality of positions to achieve a desired height. More specifically, the first elevator unit 34 raises and lowers  
20 the cradle beam 18 in a vertical direction to the desired height. The first elevator unit 34 may adjust the cradle beam 18 to the desired height in order to position the cargo platform 14 for loading or unloading to a ramp of an aircraft (not shown) or another location. Although, the first elevator unit 34 may be operated manually or powered by various methods (e.g. electrically, hydraulically or pneumatically), the first elevator unit  
25 34 may include a hydraulic pump (not shown) to adjust the cradle beam 18 in the vertical direction. Additionally, the first elevator unit 34 includes a securing pin 36 that secures the cradle beam 18 in a desired position including from a horizontal level position, or a angled (i.e., non-horizontal) position in order to accommodate a loading or unloading angle of the cargo platform 14. The cradle beam 18 will be further discussed  
30 in the following paragraphs.

[0028] As shown in Figures 2 and 3, the first top portion 30 of the first side unit 22 may include a plurality of first recesses 38. Each first recess 38 is configured to allow the first unit 39 of the second cargo transportation apparatus 12b to nest upon the

first side unit 22 of the first cargo transportation apparatus 12a. More specifically, each first recess 38 fits and accommodates a curvature of a wheel of a wheel assembly 20 of the second cargo transportation apparatus 12b. This means that the first side unit 39 of the second cargo transportation apparatus 12b is stacked upon the first unit 22 of the first cargo transportation apparatus 12a. More specifically, the second wheel assemblies 55 of the first side unit 39 of the second cargo transportation apparatus 12b rests within the first recesses 38 of the first cargo transportation apparatus 12a (Figure 3). While only two cargo transportation apparatuses 12a, 12b are shown stacked together, a greater number of apparatuses 12 may be stacked on top of one another.

**[0029]** Referring to Figure 2, the second side unit 24 comprises a second front portion 40, a second rear portion 42, a second top portion 44, and a second bottom portion 46. Additionally, the second side unit 24 may include a second elevator unit 48. The second elevator unit 48 is identical in construction to the first elevator unit 34 and raises and lowers the cradle beam 18 in a vertical direction to a desired height. Additionally, the second elevator unit 48 is adapted to adjust the cradle beam 18 to the desired height level in order to transport the cargo platform 14 (see Figure 1) for loading or unloading to the ramp of the aircraft or another location. Although the second elevator unit 48 may be operated manually or powered by various methods (e.g. electrically, pneumatically, or hydraulically), the second elevator unit 48 preferably includes a hydraulic pump (not shown) to adjust the position of the cradle beam 18 in the vertical direction. The second elevator unit 48 includes a second securing pin 50 that pivots and secures the cradle beam 18 in a desired position including a horizontal level position to an angled position in order to accommodate a loading or unloading angle of the cargo platform 14.

**[0030]** Referring to Figures 2 and 3, the second top portion 44 of the second side unit 24 includes a plurality of second recesses 52 identical in shape and spacing to recesses 38 (only one being visible in Figure 2). Each second recess 52 is configured to allow a second unit 54 of the second cargo transportation apparatus 12b to nest upon the second unit 24 of the first cargo transportation apparatus 12a. Referring to Figures 2 and 3, each second recess 52 is configured to fit and accommodate a wheel assembly 55 of the second cargo transportation apparatus 12b. This allows the second unit 54 of the second cargo transportation apparatus 12b to be stacked upon the second side unit 24 of the first cargo transportation apparatus 12a. More specifically,

the wheel assemblies 55 of the second cargo transportation apparatus 12b rest within the second recesses 52 of the first cargo transportation apparatus 12a (Figure 3).

[0031] Although the first side unit 22 and the second side unit 24 are identical in Figures 1-4 regarding structures and functions, a person of ordinary skill in the art could observe the benefit of having the first side unit 22 and the second side unit 24 designed having different structures and functions, whereas the second side unit 24 includes some, but not all, of the structures and functions of the first side unit 22.

[0032] As shown in Figure 1, each cargo transportation apparatus 12a, 12b may also include a controller 59. The controller 59 may be coupled to the first elevator unit 34 and the second elevator unit 48. The controller 59 controls the vertical direction of each elevator unit 34, 48. More specifically, the first and second elevator units 34, 48 of the first side unit 22 and the second side unit 24 may be lowered individually such that the first elevator unit 34 of the first side unit 22 is positioned at a different height from the second elevator unit 48 of the second side unit 24. Additionally, the controller may synchronize the movement of the elevator units 34, 48 so that the elevator units 34, 48 are maintained at the same height.

[0033] Referring further to Figure 2, the first side unit 22 and the second side unit 24 are coupled together via an attachment unit 57. The attachment unit 57 may comprise a plurality of tract rails 58 that are configured for use as a storage unit. Additionally, the attachment unit 57 may include one or more bridle rings 60. Bridle rings 60 may also be coupled to the first side unit 22 and the second side unit 24. Bridle rings 60 allow a user to attach a coupling device (not shown), for example, a rope, a chain, or strap, thereto to tow or pull the cargo transportation apparatus 12 from one location to another location. Additionally, the bridle rings 60 may be used with the coupling device to secure the cargo transportation apparatus 12 within an aircraft or vehicle during transport.

[0034] Referring to Figure 2, the cradle beam 18 is coupled to the elevator units 34, 48 via the securing pins 36, 50. The cradle beam 18 includes a pair of oppositely disposed end surfaces 62, 64, a pair of oppositely disposed side surfaces 66, a top longitudinal extending surface 70, and a bottom longitudinal extending surface 72. The cradle beam 18 receives and supports the cargo platform 14 during loading and unloading operations.



**[0035]** Additionally, the cradle beam 18 includes a plurality of rails 74 coupled to the top longitudinal extending surface 70 and extending less than the length of the top longitudinal extending surface 70. The plurality of rails 74 is configured with a plurality of dividers 74a and 74b to receive and support an undersurface of the cargo platform 14. The plurality of rails 74 supports and guides the cargo platform 14 such that the cargo platform 14 is securely seated onto the cradle beam 18. Additionally, the plurality of rails 74 slides along a longitudinal direction for a predetermined distance (e.g. less than or about one or two inches) on the top longitudinal extending surface 70 in order to align with an aircraft ramp for an unloading operation.

**[0036]** Referring to Figures 2, 4, 4a and 4b, the cradle beam 18 includes a plurality of locking mechanisms 76. The locking mechanisms 76 are provided at opposite ends of the rails 74. Each locking mechanism 76 includes a base 77, a lock actuator assembly 80 and a lock key assembly 82. The lock actuator assembly 80 and the lock key assembly 82 are coupled to the base 77.

**[0037]** As shown in Figures 4a and 4b, the lock actuator assembly 80 includes a lock actuator 150 and a first spring 152. The lock actuator 150 rests on the first spring 152. More specifically, one end of the first spring 152 is coupled to a bottom 150a of the lock actuator 150; and, the opposite end of the first spring 152 is coupled to a bottom 152a of a recess 77a. The lock actuator 150 can be moved between a fully extended position (Figure 4A) and a retracted position (Figure 4B). Additionally, the lock actuator 150 and the first spring 152 are nested within the recess 77a of the base 77. The lock actuator 150 automatically activates the lock key assembly 82 to securely fasten and lock the cargo platform 14 to the cradle beam 18 when the cargo platform 14 is properly seated on the cradle beam 18.

**[0038]** The lock key assembly 82 can assume a locked position or an unlocked second position. The lock key assembly 82 includes a lock key portion 82a that latches the cargo platform 14 to the cradle beam 18. The lock key assembly 82 further includes a tongue portion 82b that extends through a first channel 77b of the base 77 to a side surface 150c of the lock actuator 150. Additionally, a plunger 82c of the lock key assembly 82 extends through a second channel 77c of the base 77. The plunger 82c is coupled to a second spring 83 that biases the lock key assembly 82 toward the lock actuator 150. The second spring 83 abuts an outer side surface 77d of the base 77 and a head of the plunger 82c, such that, as the second spring 83

compresses against the outer side surface 77d, the second spring 83 stores energy to extend the plunger 82c from a first position to a second position.

**[0039]** Additionally, the locking mechanism 76 may include a release mechanism (not shown) for releasing the lock key portion 82a from the cargo platform 14. The release mechanism is used by an operator to disengage the lock key portion 82a from the cargo platform 14, such that the lock key assembly 82 travels from the lock position to the unlock position. The release mechanism may include a rope, a handle, a C-clamp device or any other mechanism capable of latching onto lock key portion 82a and holding it away from the edge of the cargo platform 14.

**[0040]** In a locking operation, as the cargo platform 14 is placed upon the cradle beam 18, the lock actuator 150 and the first spring 152 are pressed downward from the extended position to the retracted position. As the lock actuator 150 travels downward, a guide notch 150b located on one side of the lock actuator 150 travels along a guiding track 77e to maintain the lock actuator 150 in a substantially straight line. Additionally, the guide notch 150d aids an open slot 150b of the lock actuator 150 to maintain a current orientation, such that as the open slot 150b is substantially aligned with the first channel 77b, the tongue portion 82b travels forward through the first channel 77b and into the open slot 150b of the lock actuator 150. This occurs because the plunger portion 82c of the lock key assembly 82 is biased by the second spring 83 to pull the lock key assembly 82 in a forward direction. Additionally, as the tongue portion 82b is moved forward, the lock key portion 82a advances forward and secures the cargo platform 14 to the cradle beam 18. When the cargo platform 14 includes a plurality of cutout notches (not shown) on a lower edge of the cargo platform 14, such as included within an Enhanced Aerial Delivery System (EADS) Platform, manufactured by the Boeing Company, Chicago, IL, the lock key portion 82a of the lock key assembly 82 extends into one of the cutout notches of the cargo platform 14. If the cargo platform 14 does not include the plurality of cutout notches, the lock key portion 82a may attach to the lower edge of the cargo platform 14.

**[0041]** During an unlocking operation, the releasing mechanism pulls the lock key assembly 82 into the unlock position. As the cargo platform 14 is removed from the cradle beam 18, the open slot 150b of the lock actuator 150 is extended upward due to

biasing of the first spring 152. When the releasing mechanism disengages the lock key assembly 82, the lock key assembly 82 is maintained in the unlock position as the tongue portion 82b rests on the one side of the lock actuator 150. This also causes the second spring 83 to compress and store energy in order to transition the lock key assembly 82 from the unlock position to the lock position as needed.

**[0042]** Additionally, provided on the first side unit 22 and the second side unit 24 of the frame 16 is the plurality of wheel assemblies 20 (Figure 2). The wheel assemblies 20 are coupled to the bottom portion 32 of the first unit 22 and the bottom portion 46 of the second unit 24. Each wheel assembly 20 swivels in any direction in order for the frame 16 to travel along a surface. Additionally, each wheel assembly 20 includes a locking device (not shown) that locks and focuses the directional movement of the wheel assembly 20 in a desired direction.

**[0043]** Referring to Figures 5 and 6, in an unloading operation of the cargo platform 14, two cargo transportation apparatuses 12a and 12b are combined to form the direct loading system 10 (Figure 1). The first cargo transportation apparatus 12a is placed in position behind a load handling system vehicle (LHS) 90 that is carrying the cargo platform 14 (Figure 5) via a bale arm assembly 93. The LHS vehicle 90 is backed into position over the first cargo transportation apparatus 12a. The LHS vehicle 90 is then backed up until an aft end of the LHS vehicle 90 is closely adjacent to the first cargo transportation apparatus 12a to prevent the first cargo transportation apparatus 12a from moving forward. The cradle beam 18 of the first cargo transportation apparatus 12a rocks to coincide with an angle of the cargo platform 14 during this offloading process. Using the securing pin 36, the cradle beam 18 is then locked in position once the cargo platform 14 is fully loaded onto the cradle beam 18. As the unloading process continues, the locking mechanism 76 of the first cargo transportation apparatus 12a is triggered by the lock actuator 80 located on the cradle beam 18 and secures the cargo platform 14 to the cradle beam 18 at approximately one-third the distance from the end of the cargo platform 14.

**[0044]** Once the cargo platform 14 is secured to the first cargo transportation apparatus 12a, the first cargo transportation apparatus 12a is moved, via the wheel assemblies 20, away from the LHS vehicle 90. Referring to Figure 6, when there is sufficient separation between the first cargo transportation apparatus 12a and the LHS vehicle 90, the second cargo transportation apparatus 12b is moved into position.

Afterwards, the wheel assemblies 55 are then manually turned to align them with the wheel assemblies 20 of the first cargo transportation apparatus 12a. Using an LHS vehicle arm 92, the cargo platform 14 is then lowered farther onto the second cargo transportation apparatus 12b. Using the locking mechanism 76 (not shown) of the second cargo transportation apparatus 12b, the cargo platform 14 is secured in position as the second lock actuator 80 (not shown) located on the cradle beam 18 is depressed to lock the cargo platform 14 to the second cargo transportation apparatus 12b (Figure 1).

**[0045]** The cargo platform 14 is positioned on the direct loading system 10 at a height that permits the cargo platform 14 to extend over an aft end of an aircraft ramp (not shown) when the ramp is in a co-planar position. Thus, if necessary, the cradle beam 18 may be lowered or increased in height to accommodate the height of the aircraft ramp. The cargo platform 14 is then pushed or winched towards the aircraft to provide as much overlap as possible before one end of the cargo platform 14 is lowered onto the aircraft's ramp. If lateral alignment is necessary, the rails 74 of the cradle beam 18 for the first cargo transportation apparatus 12a and/or the second cargo transportation apparatus 12b may be moved sideways along the cradle beam 18 as needed to laterally align the cargo platform 14 with the aircraft ramp within the predetermined distance. Once the end of the cargo platform 14 is sufficiently on the ramp of the aircraft and secured, the first cargo transportation apparatus 12a is lowered, the locking mechanisms 76 are released, the wheel assemblies 20 are turned approximately 90 degrees, and the first cargo transportation apparatus 12a is removed from under the cargo platform 14. The cargo platform 14 is then moved forward up the aircraft's ramp until the second cargo transportation apparatus 12b is near the aft end of the aircraft ramp. Its locking mechanisms 76 are then unlocked, and the cargo platform 14 is moved further upwardly onto the ramp, and subsequently secured into position on the aircraft.

**[0046]** Referring to Figures 7 thru 11, an alternative preferred embodiment 100 of the direct loading system 10 for transporting and handling the cargo platform 14 is provided. The direct loading system 100 comprises a plurality of cargo transportation apparatuses 110a, 110b, 110c, and 110d (Figure 9), such as four cargo transportation apparatuses. Referring to Figure 7, a cargo transportation apparatus or apparatus 110 includes a first arm assembly 112, a leg assembly 114, a second arm assembly 118,

and a wheel assembly 116. The arm assembly 112 is coupled to the leg assembly 114 and the leg assembly 114 is coupled to the wheel assembly 116. Additionally, the second arm assembly is also coupled to the leg assembly 114.

5       **[0047]**     The arm assembly 112 forms a first forklift pocket beam, and couples to a first forklift slot 113 of the cargo platform 14 (Figure 11). The first arm assembly 112 is configured to fit into the first forklift slot 113 of the cargo platform 14. The leg assembly 114 supports the cargo platform 14 off the ground. Additionally, the wheel assembly 116 is adapted to swivel to enable the leg assembly 114 to be moved in various directions. The wheel assembly 116 comprises a locking device (not shown) to  
10     lock and focus movement of the wheel assembly 116 in a particular direction. Additionally, the locking device may lock the wheel assembly 116 such that the wheel assembly 116 is prevented from rolling.

**[0048]**     The second arm assembly 118 comprises a linear hydraulic piston and cylinder 120 and a second forklift pocket beam 122. The linear hydraulic piston and  
15     cylinder 120 is pivotally coupled to the leg assembly 114 via a pin 123. The second forklift pocket beam 122 engages a second forklift slot 124 of the cargo platform 14 (Figure 11). A valve (not shown) located on the leg assembly 114 actuates the linear hydraulic piston and cylinder 120. The linear hydraulic piston and cylinder 120 extends and retracts the leg assembly 114 between first and second positions.

20       **[0049]**     Referring to figures 7 and 10, when the linear hydraulic piston and cylinder 120 positions the leg assembly 114 in the first position, the leg assembly 114 is retracted into a folded position which enables the leg assembly 114 to lower the cargo platform 14 to ground level. As shown in Figure 11, when the linear hydraulic piston and cylinder 120 positions the leg assembly 114 in the second position, the leg  
25     assembly 114 is extended to allow the cargo platform 14 to be loaded or unloaded to/from an aircraft loading ramp.

**[0050]**     Referring to Figures 9-11, in an offloading operation of the cargo platform 14 using the direct loading system 100, the direct loading system 100 comprises four individual cargo transportation apparatuses 110a, 110b, 110c, 110d. To  
30     unload the cargo platform 14, a first pair of the cargo transportation apparatuses 110a, 110b is placed in a first set of forklift slots 113, 124 on opposite sides of the cargo platform 14 as the height of the cargo platform 14 reaches a receiving level (Figure 8). This first pair of cargo transportation apparatuses 110a, 110b supports an aft end of the

cargo platform 14 until a second pair of cargo transportation apparatuses 110c, 110d is placed into a second set of forklift slots 115, 125 on opposite sides of the cargo platform 14 (Figure 10). The height of each cargo transportation apparatus 110 is adjustable to insure that the cargo platform 14 remains uniform. The direct loading system 100  
5 permits the cargo platform 14 to be easily transferred to and from the LHS vehicle 90 (Figure 9). Additionally, using the direct loading system 100 allows the user to place or lower the cargo platform 14 close to the ground for storage (Figure 10).

**[0051]** Referring to Figure 11, during the loading of the cargo platform 14 onto an aircraft, the cargo platform 14 is held at a height to permit an end of the cargo  
10 platform 14 to extend over and be lowered onto an aircraft ramp 126. Once the end of the cargo platform 14 is lowered onto the aircraft ramp 126, the first set of cargo transportation apparatuses 110a, 110b (apparatus 110b being hidden from view in Figure 11) is removed. The cargo platform 14 is then pushed or winched onto the aircraft. Next, the second set of cargo transportation apparatuses 110c, 110d  
15 (apparatus 110d being hidden from view in Figure 11) is removed; and, the cargo platform 14 is then rolled further onto the aircraft ramp 126. Additionally, if aligning the cargo platform 14 with the aircraft ramp 126 is necessary, each cargo transportation apparatus 110 is capable of being rolled in a direction perpendicular to the longitudinal axis of the aircraft ramp 126 to provide proper alignment before beginning to load the  
20 cargo platform onto the aircraft ramp 126.

**[0052]** The above mentioned embodiments are advantageous because each allows a cargo platform to be directly loaded and unloaded to/from an aircraft or an LHS vehicle without the use and need for large and expensive material handling equipment. Additionally, each embodiment diminishes the need for separately transporting various  
25 material handling equipment to the onload or offload sites. Another advantage of at least one aspect of the present invention is that it allows a cargo platform to be lowered to ground level and stowed away when not in use.

**[0053]** While various preferred embodiments have been described, those skilled in the art will recognize modifications or variations which might be made without  
30 departing from the inventive concept. The examples illustrate the invention and are not intended to limit it. Therefore, the description and claims should be interpreted liberally with only such limitation as is necessary in view of the pertinent prior art.

## CLAIMS

What is claimed is:

- 5                   1.       An apparatus for use in transporting and handling a cargo platform  
comprising:  
                    a frame having a cradle beam adapted to receive the cargo  
platform, wherein the cradle beam supports a lower surface of the cargo platform;  
                    a locking mechanism operably associated with the cradle beam and  
adapted to actuate as the cargo platform is rested upon the cradle beam, wherein the  
10       locking mechanism secures the cargo platform to the frame; and  
                    a plurality of wheel assemblies for wheeling the frame along a  
ground surface.
2.       The apparatus of Claim 1, wherein the cradle beam is adapted to  
15       pivot from a horizontal position to a non-horizontal position during an onloading and  
offloading operation of the cargo platform.
3.       The apparatus of Claim 1, wherein the cradle beam is adapted to  
move laterally a distance to align the cargo platform with an aircraft ramp.  
20
4.       The apparatus of Claim 1, wherein the locking mechanism includes  
a lock actuator adapted to automatically activate the locking mechanism to secure the  
cargo platform to the frame when the cargo platform is properly seated on the cradle  
beam.  
25
5.       The apparatus of Claim 1, wherein the frame further comprises at  
least one storage unit.
6.       The apparatus of Claim 1, wherein the frame is further adapted to  
30       adjust the cradle beam to a desired height level from a first position to a second position  
in a vertical direction from the ground.

7. The apparatus of Claim 6, wherein the desired height includes a height level that allows the cargo platform to be loaded and unloaded to and from an aircraft ramp placed in a co-planar position with the cargo platform.

5 8. The apparatus of Claim 7, wherein the frame further comprises an elevator unit adapted to adjust the cradle beam to the desired height level.

9. A direct loading system comprising:  
a first cargo transportation apparatus adapted to receive and  
10 support a first portion of a cargo platform from underneath the cargo platform; and,  
an independent second cargo transportation apparatus adapted to  
receive and support a second portion of the cargo platform.

10. The direct loading system of Claim 9, wherein when the first cargo  
15 transportation apparatus and the second cargo transportation apparatus are not in use,  
the second transportation cargo apparatus is stacked upon the first cargo transportation  
apparatus.

11. The direct loading system of Claim 9, wherein the first cargo  
20 loading apparatus includes a plurality of recesses adapted to allow the second cargo  
loading apparatus to nest upon the first cargo loading apparatus.

12. The direct loading system of Claim 9, wherein the second cargo  
loading apparatus includes a plurality of recesses adapted to allow a third cargo loading  
25 apparatus to nest upon the second cargo loading apparatus.

13. An apparatus for transporting and handling a cargo platform  
comprising:  
a first arm assembly configured to fit into a first forklift pocket of a  
30 cargo platform;  
a leg assembly coupled to the first arm assembly and adapted to  
support the cargo platform in a vertical position at a desired height level from the  
ground; and,



a second arm assembly coupled to the leg assembly and configured to fit into a second forklift pocket of the cargo platform, wherein the second arm assembly is adapted to adjust the leg assembly to a first height level and a second height level.

5

14. The apparatus of Claim 13 further comprising a wheel assembly coupled to the leg assembly and adapted to swivel and direct the leg assembly in a desired direction.

10

15. The apparatus of Claim 13, wherein the first height level allows a user to load and unload the cargo platform onto an aircraft ramp in a co-planar position.

15

16. The apparatus of Claim 13, wherein the second arm assembly includes a hydraulic piston and cylinder to adjust the cargo platform to the first height level and the second height level.

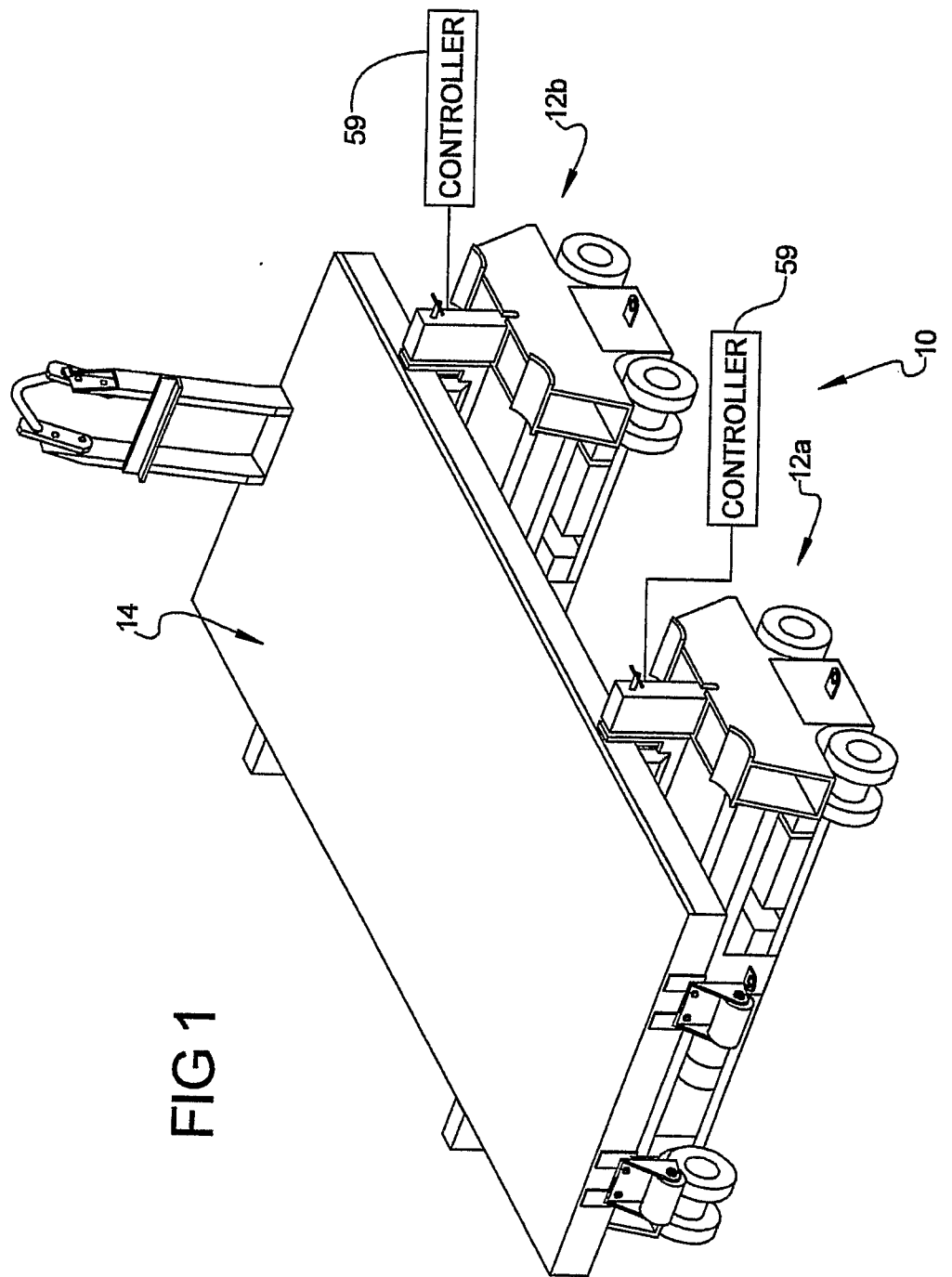
17. The apparatus of Claim 13, wherein the wheel assembly comprises a locking mechanism to lock movement of the wheel assembly in a particular direction.

20

18. The apparatus of Claim 13, wherein the wheel assembly comprises a locking mechanism to prevent the wheel assembly from rotating.

25

19. The apparatus of Claim 13, wherein the second height level allows the leg assembly to retract into a folded position, which enables the leg assembly to lower the cargo platform to ground level.



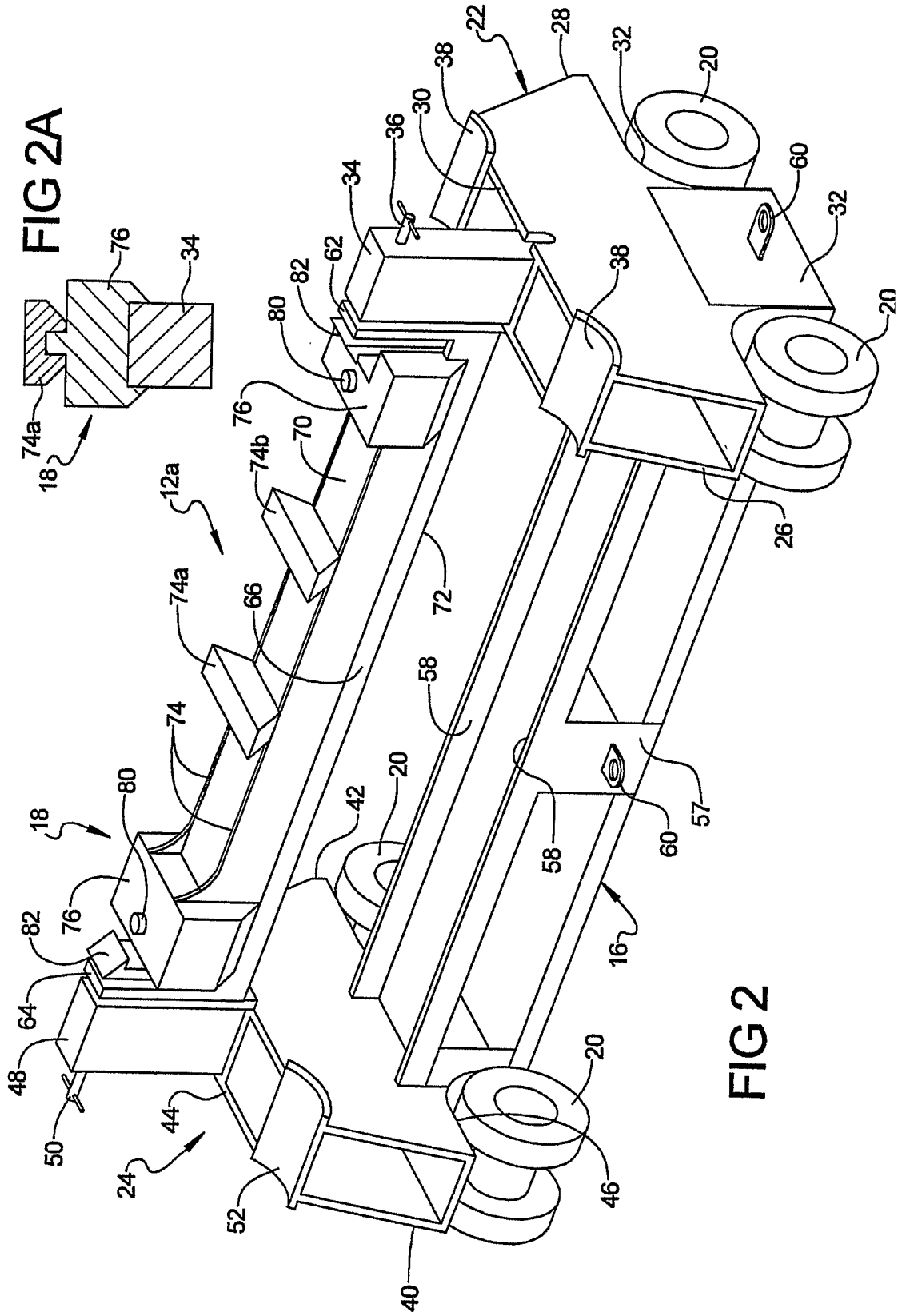


FIG 2

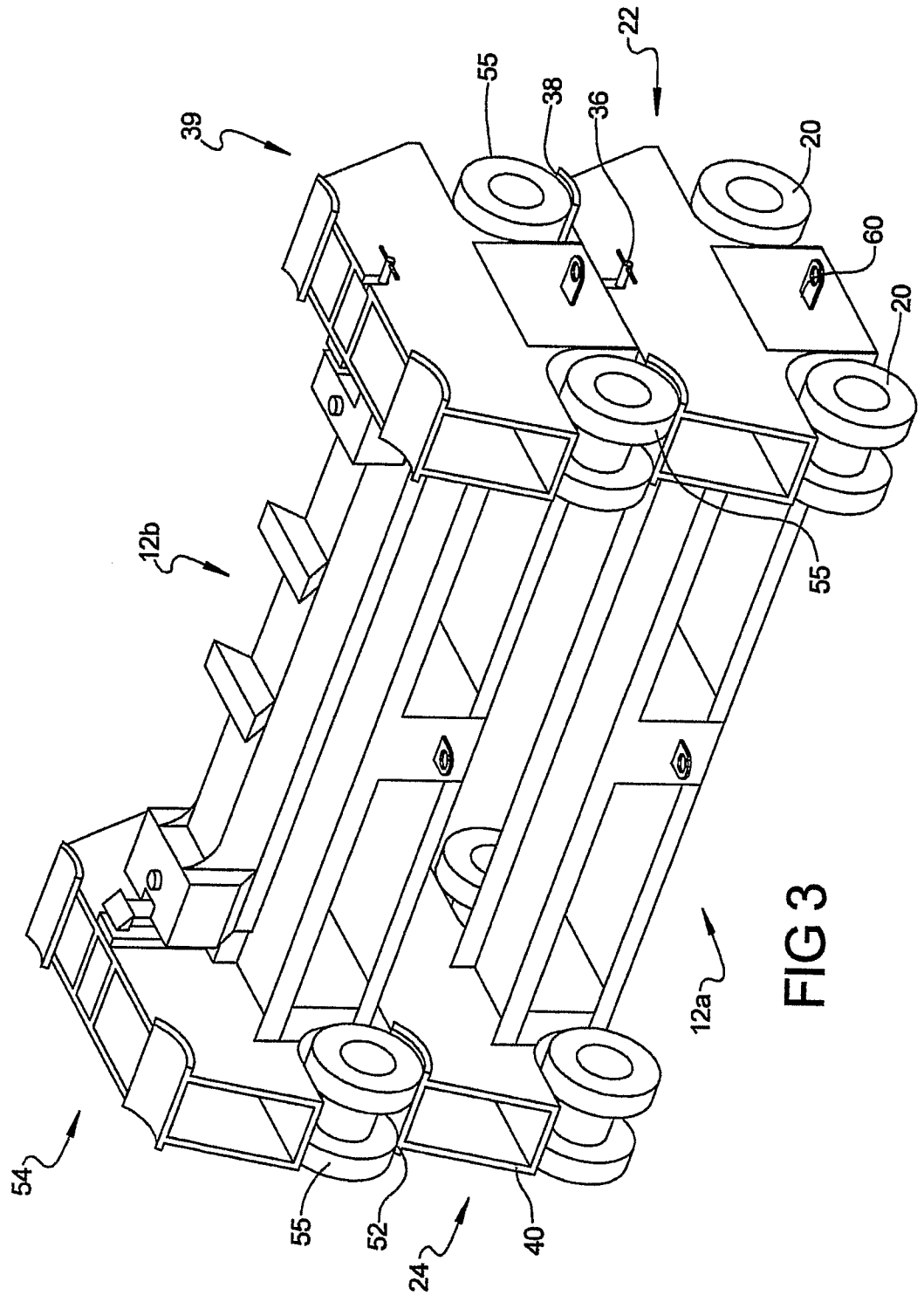
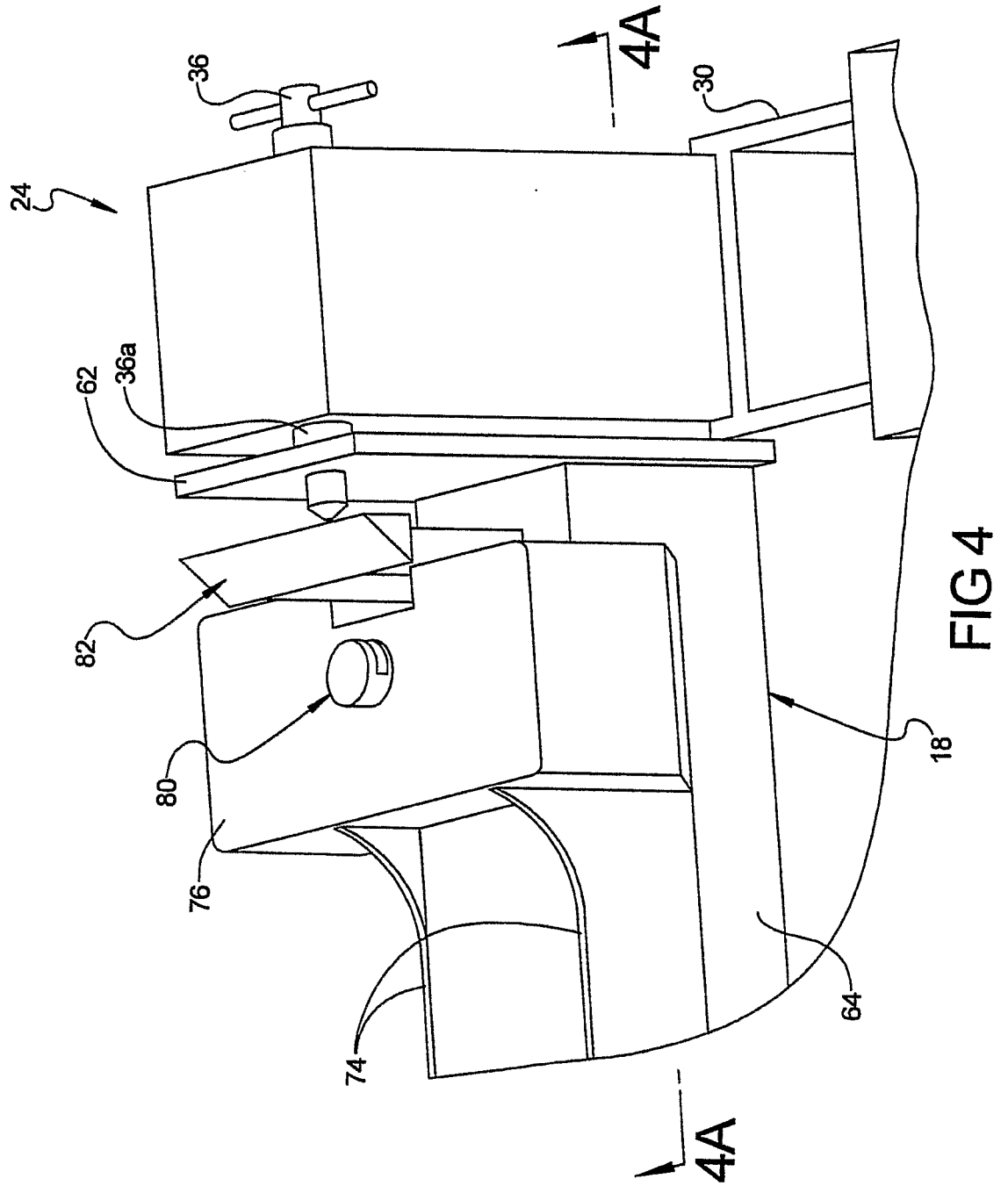


FIG 3



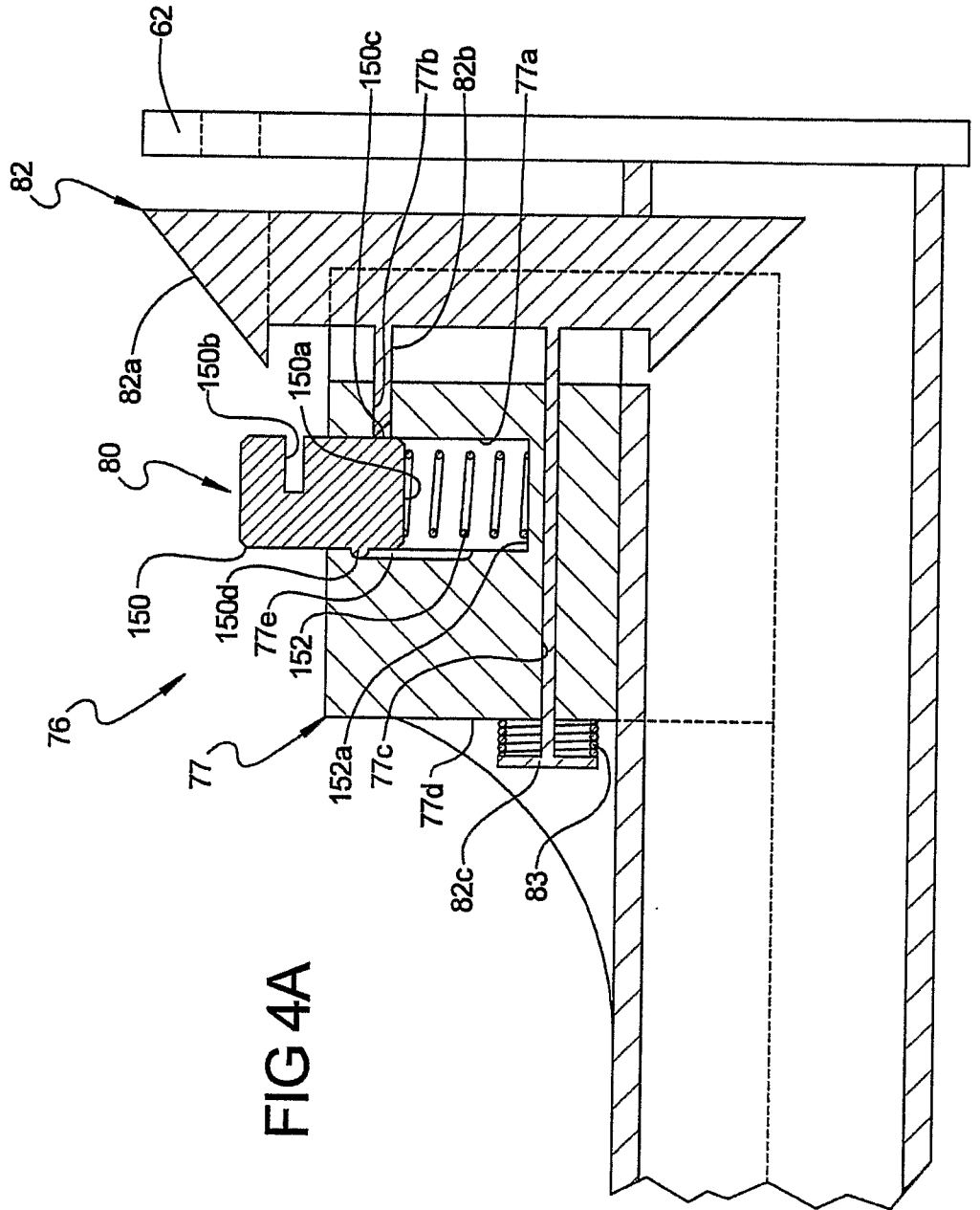


FIG 4A

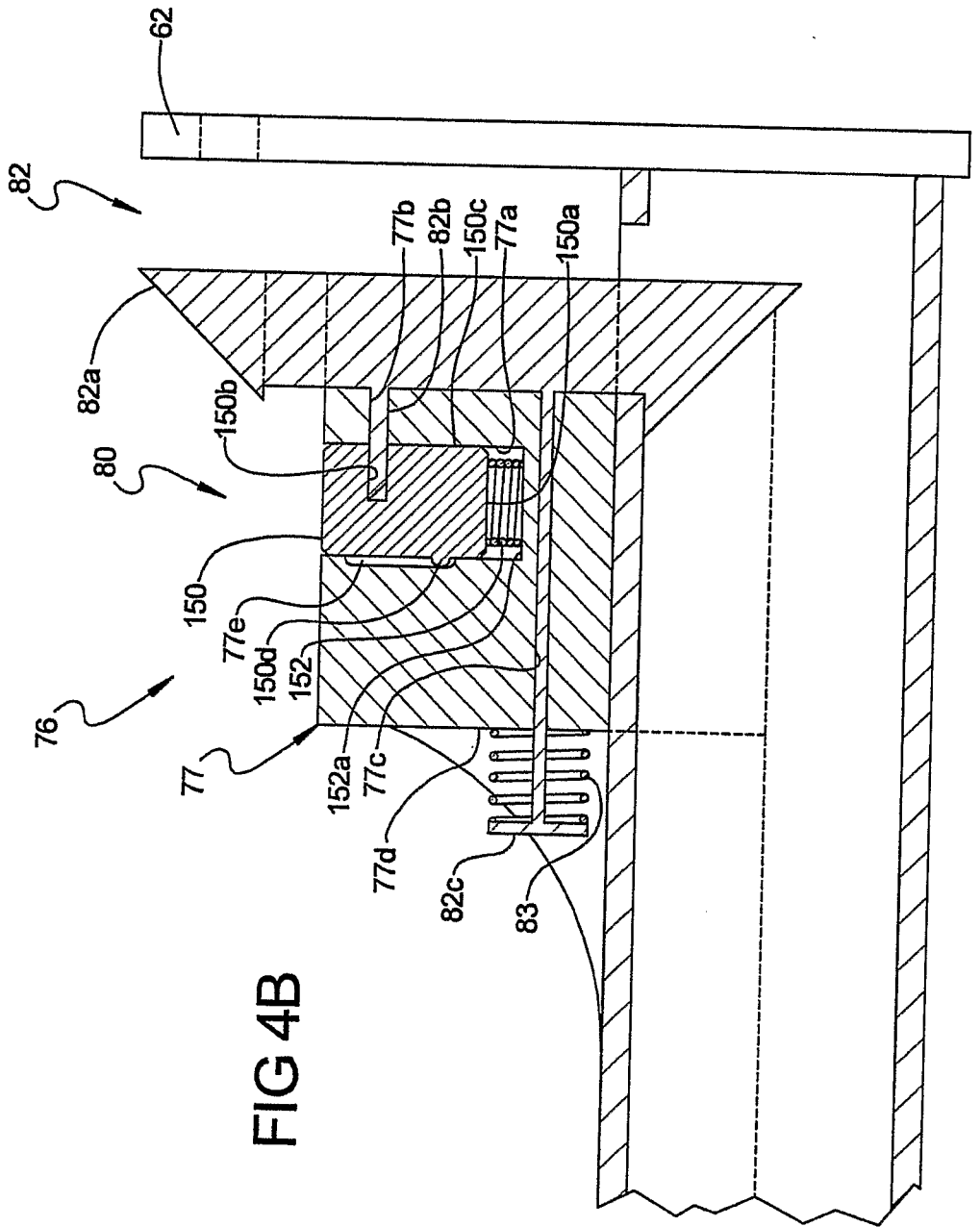


FIG 4B

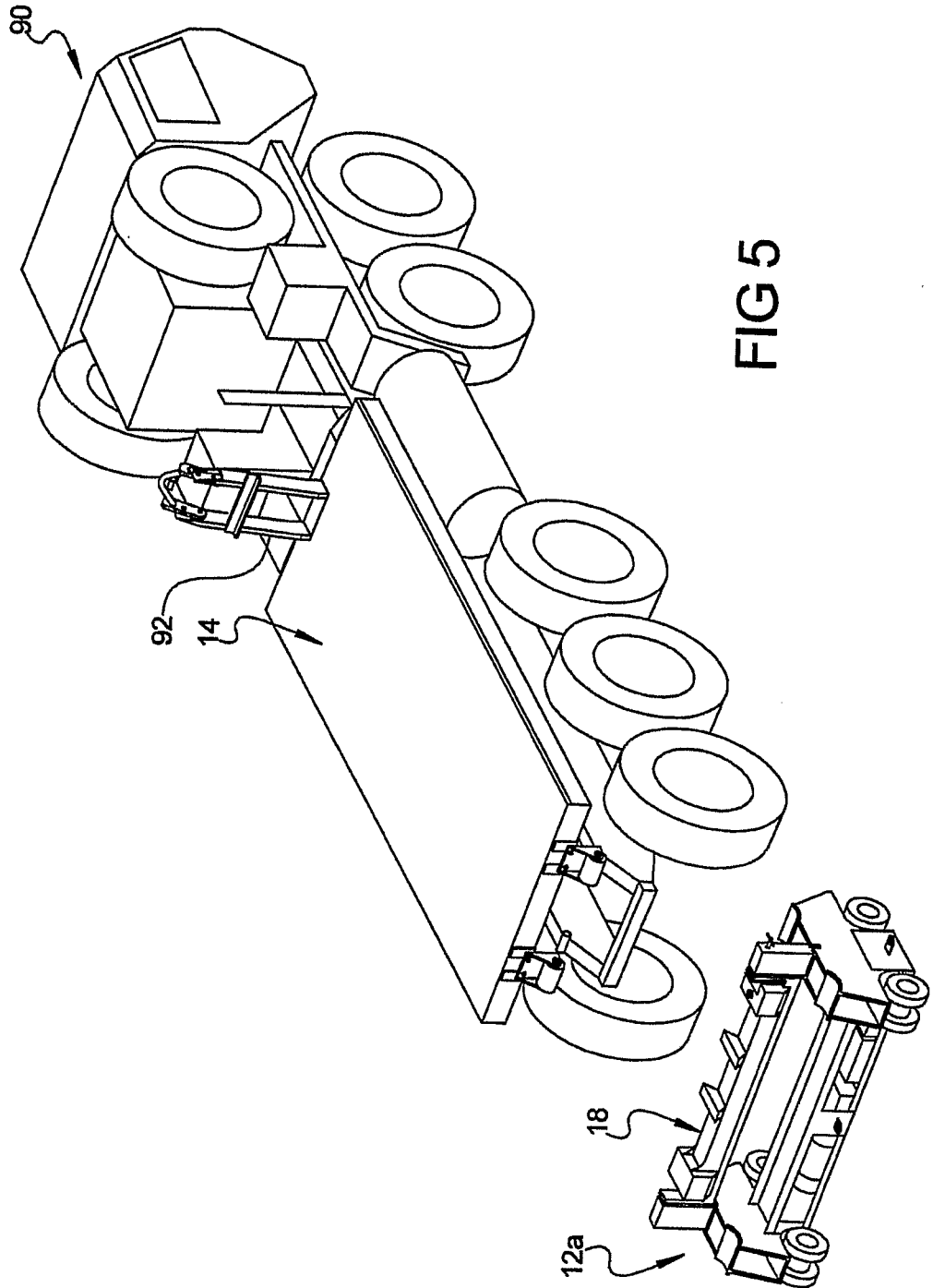


FIG 5



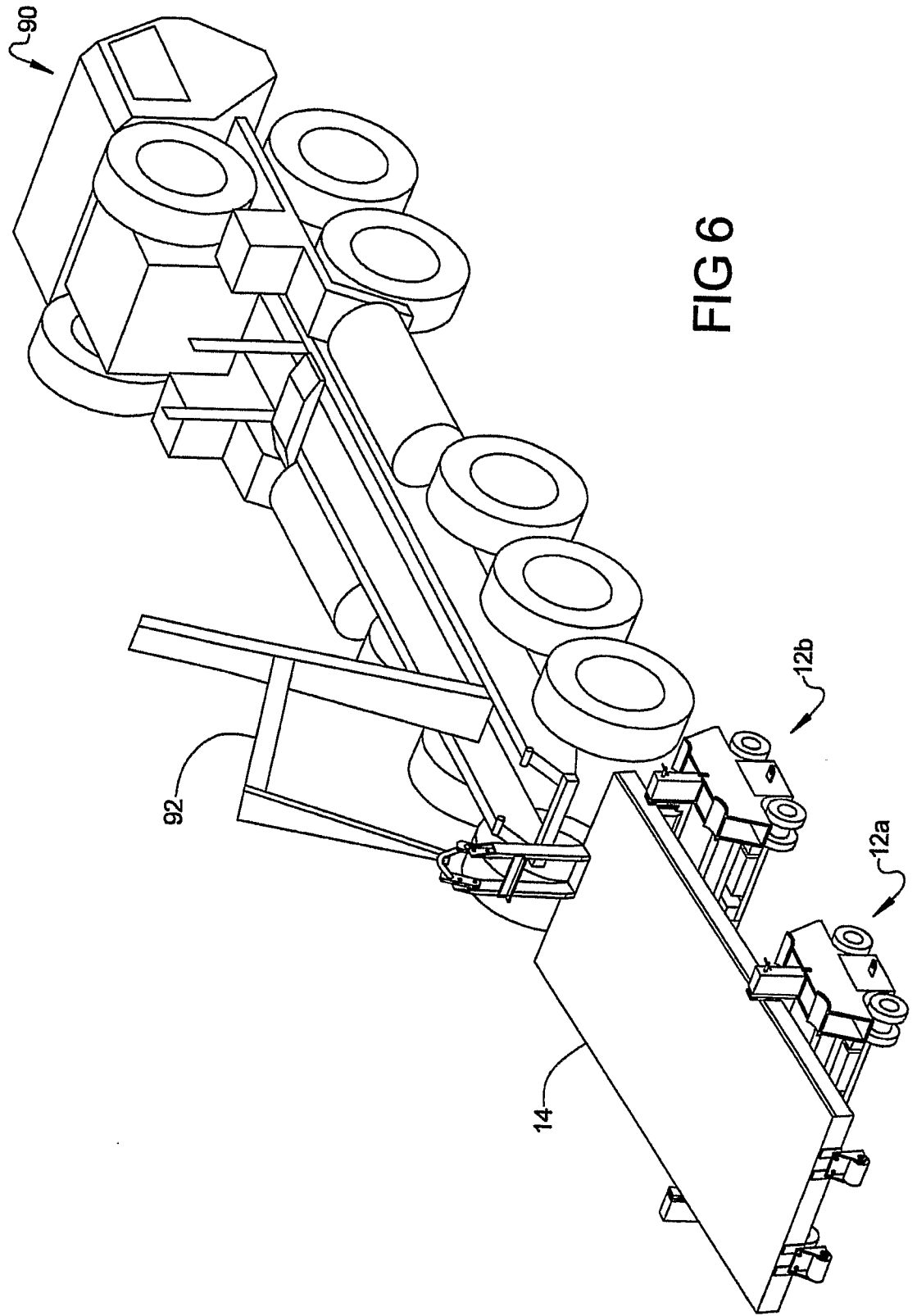
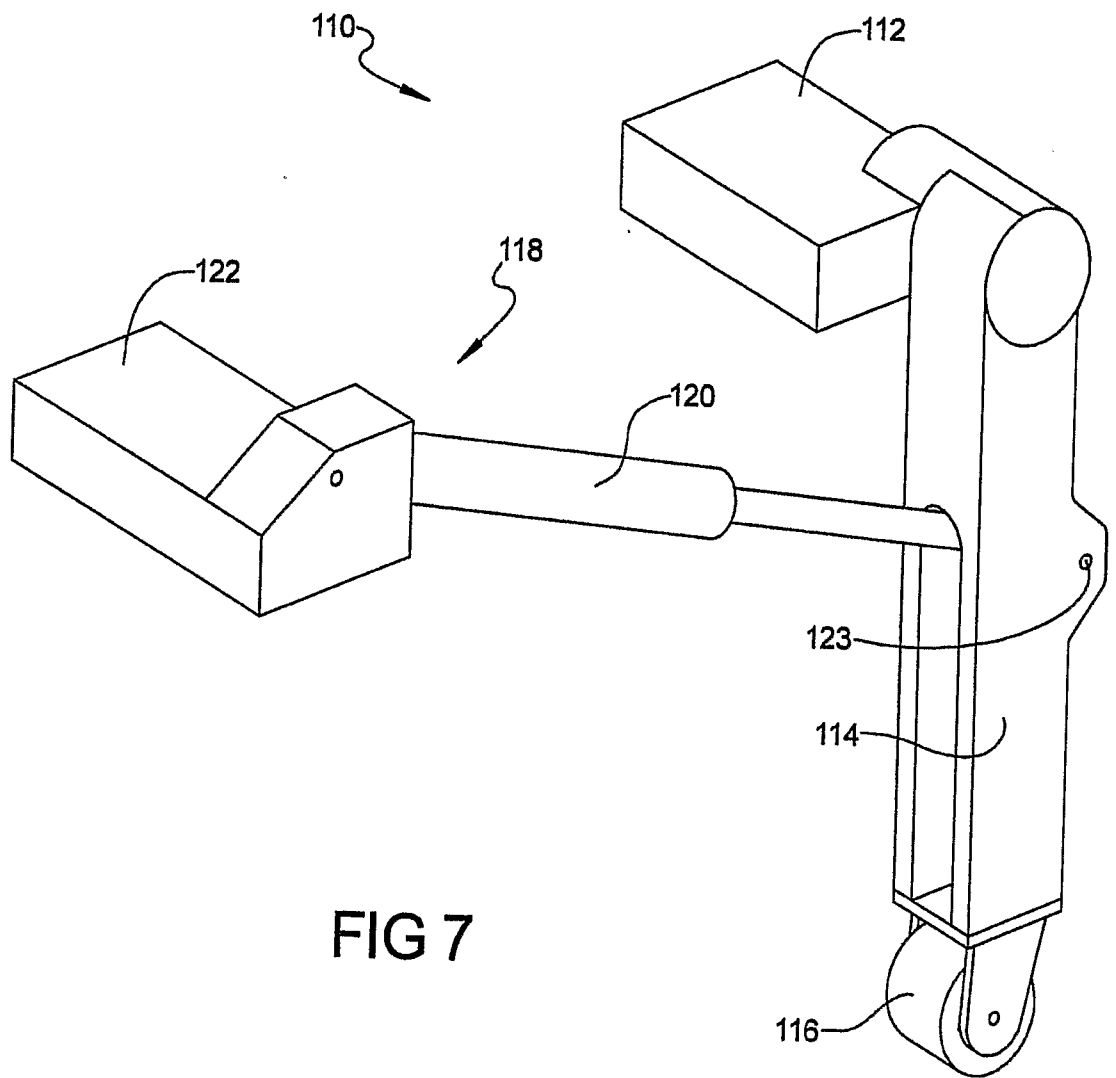


FIG 6



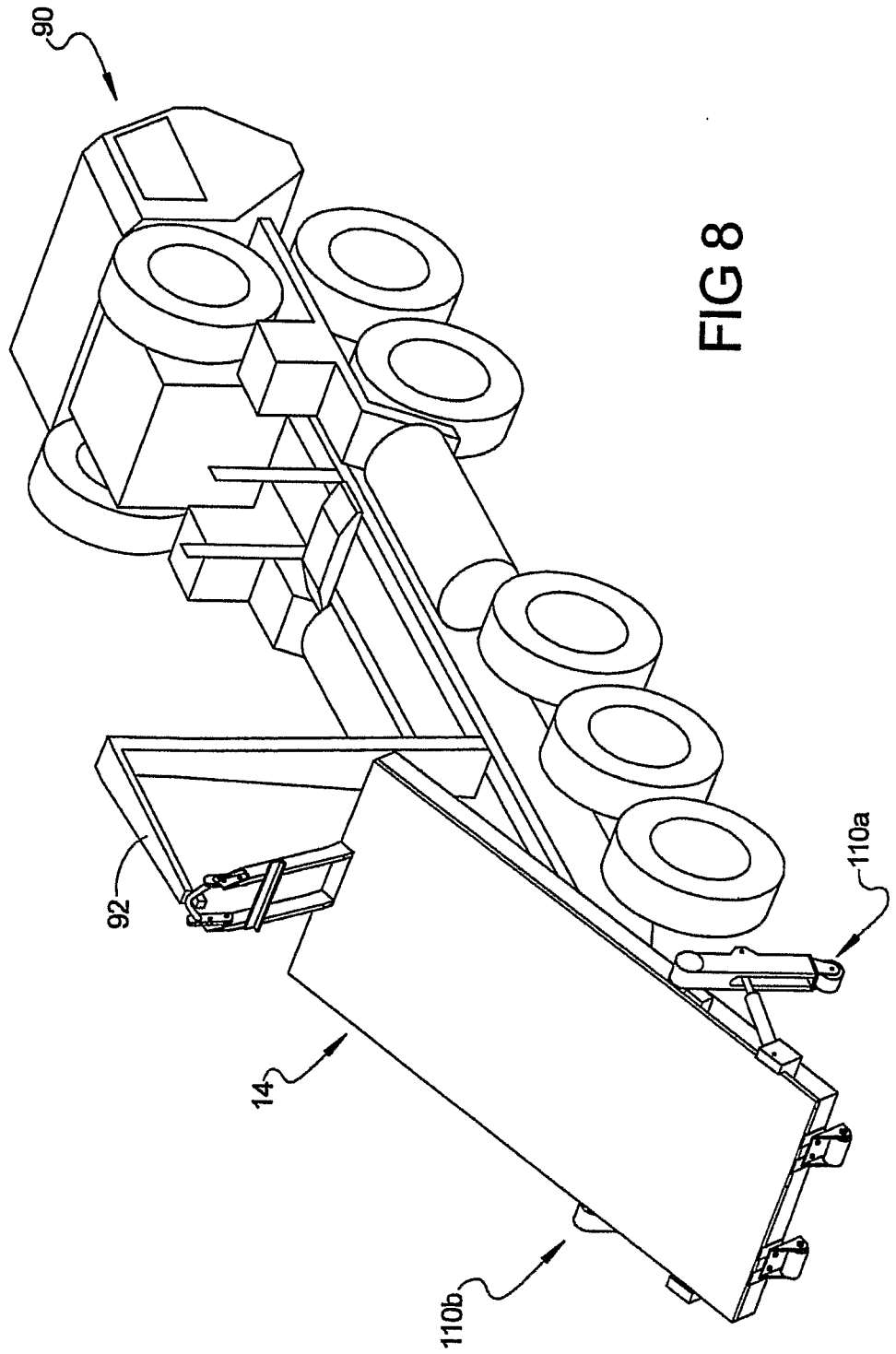
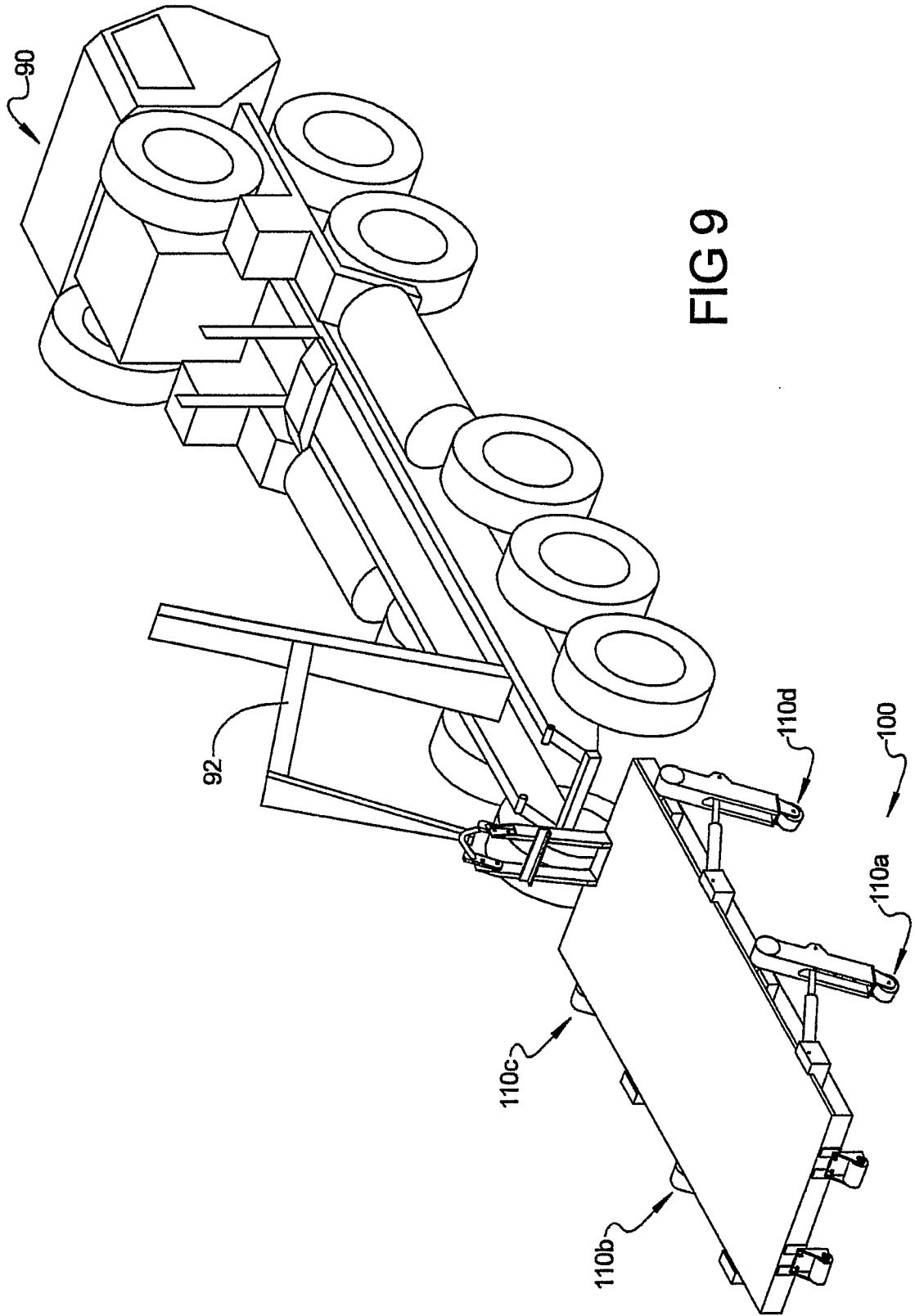
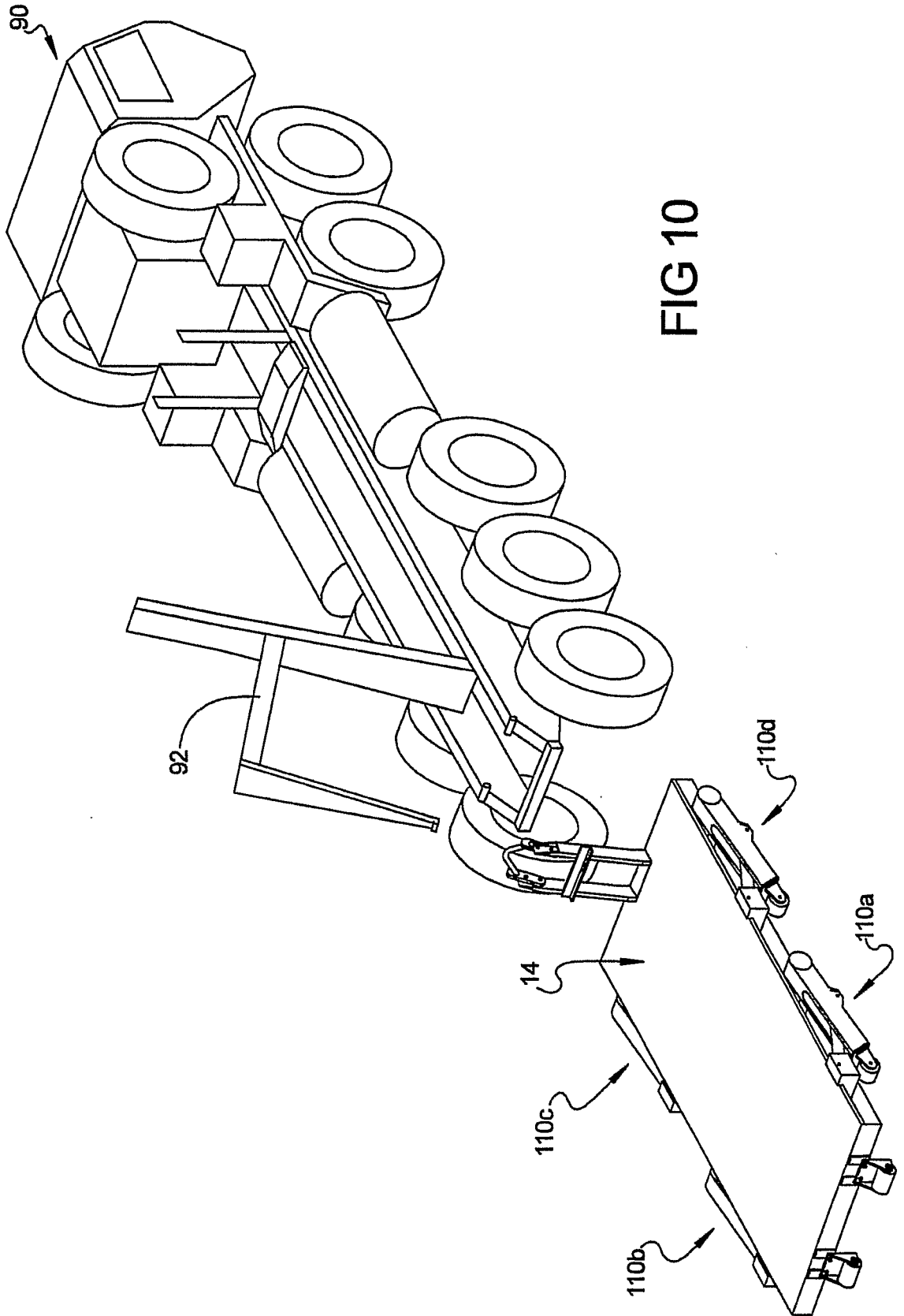
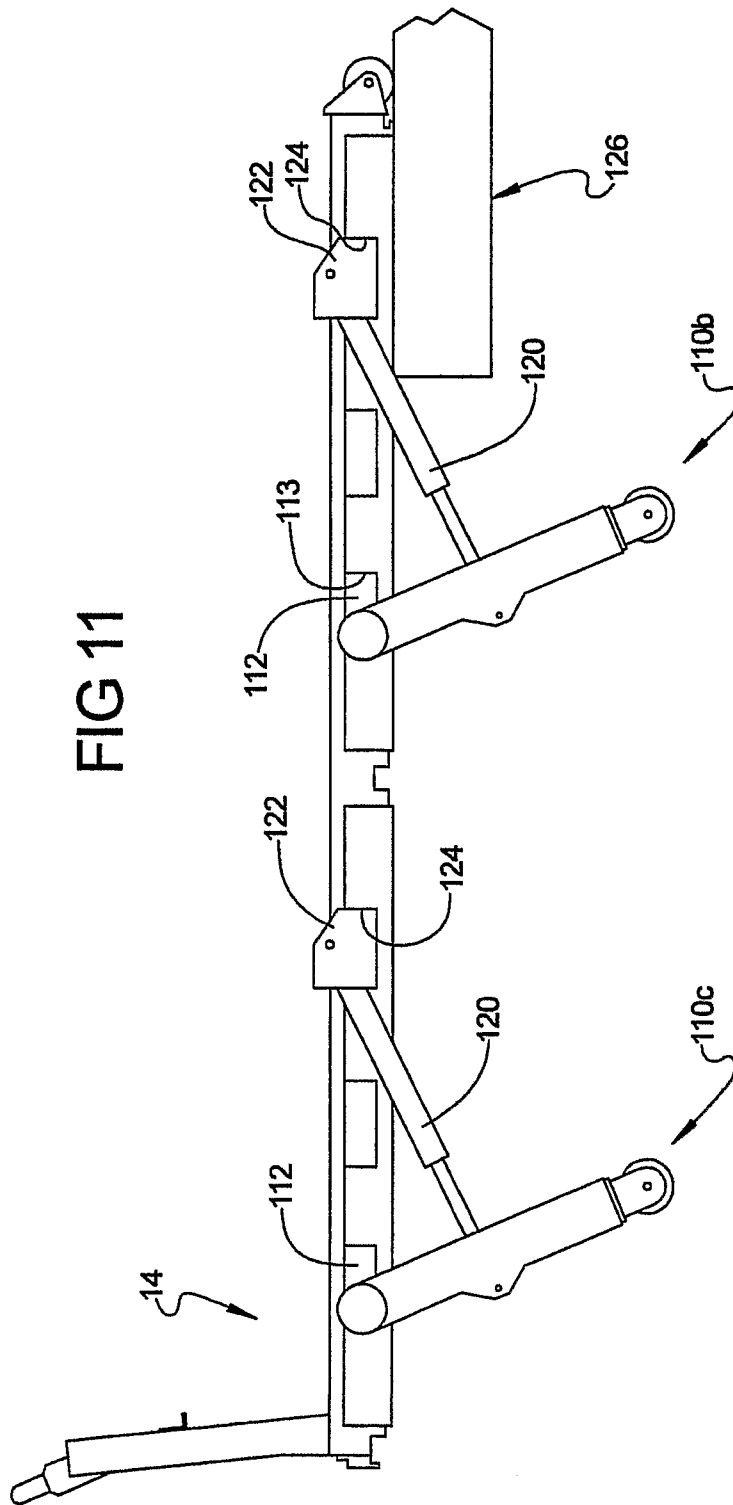


FIG 8







INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2006/029201

A. CLASSIFICATION OF SUBJECT MATTER  
INV. B60P1/64 B65D90/14

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 B65D

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 practical, 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	WO 98/58818 A (TECHNAMICS B V [NL]; BLOKZIJL CORNELIS [NL]) 30 December 1998 (1998-12-30) page 3, line 7 - line 25; figures	1,2
P,X	WO 2006/061508 A (SOFRAME [FR]; DONNARD RENE [FR]; MORIZOT FREDERIC [FR]; MOREL HERVE [F]) 15 June 2006 (2006-06-15) page 4, line 29 - page 5, line 36 page 8, line 14 - page 9, line 11 page 11, line 6 - line 17 page 11, line 32 - page 12, column 1, line 6 page 14, line 11 - line 18 page 15, line 4 - line 17 page 16, line 12 - line 32; figures 1-4,7,10-16	1-7
P,A	----- -/--	8,10-12

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

19 December 2006

Date of mailing of the international search report

28. 02. 2007

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Nordlund, Jan

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2006/029201

(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 88 00 351 U1 (SEVAR ENTSORGUNGSANLAGEN GMBH, 8590 MARKTREDWITZ, DE) 3 March 1988 (1988-03-03) page 5, line 4 - page 6, line 18; figures	9
A		10-12
Y		10-12
Y	----- DE 22 62 094 A1 (GLOGGER ADOLF) 27 June 1974 (1974-06-27) page 4, line 26 - page 5, line 11; figures 1,4	10-12
A	----- DE 24 20 603 A1 (BUESSING & SOHN H) 6 November 1975 (1975-11-06) -----	



# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2006/029201

## Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1 - 12

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12

Apparatus for transporting and handling a cargo platform on the lower side of the cargo platform, including a support cradle, locking means and having a plurality of wheel assemblies.

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2. claims: 13-19

Apparatus for transporting and handling a cargo platform, having a first arm assembly to fit into a first forklift pocket of a cargo platform and having a supporting leg attached to this first arm assembly and having a second arm to fit into a second pocket in the cargo platform. This second arm having means to adjust the height of the cargo platform by manipulating the leg of the first arm assembly.

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2006/029201

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9858818	A	30-12-1998	AU 8133598 A NL 1006381 C2	04-01-1999 12-01-1999
WO 2006061508	A	15-06-2006	FR 2878794 A1	09-06-2006
DE 8800351	U1	03-03-1988	NONE	
DE 2262094	A1	27-06-1974	NONE	
DE 2420603	A1	06-11-1975	AU 8060775 A BR 7501072 A CA 1020537 A1 DD 115616 A5 EG 12083 A ES 433934 A1 HU 177290 B IT 1018658 B JP 50152425 A NO 742127 A TR 18870 A US 3995760 A ZA 7408208 A	04-11-1976 16-11-1976 08-11-1977 12-10-1975 31-03-1979 01-12-1976 28-09-1981 20-10-1977 08-12-1975 28-10-1975 17-10-1977 07-12-1976 28-01-1976