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12/074,264 29 February 2008 (29.02.2008) US(71) Applicant (for all designated States except US): **NATIONAL OILWELL VARCO, L.P.** [US/US]; 7909 Parkwood Circle Drive, Houston, Texas 77036 (US).(71) Applicant (for SM only): **LUCAS, Brian Ronald** [GB/GB]; Lucas & Co., 135 Westhall Road, Warlingham Surrey CR6 9HJ (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **DONNALLY, Robert Benjamin** [US/CN]; 2-87 Forest Manor, 588 Jinfeng Road, Shanghai 201107 (CN). **REN, Chungqiao** [CN/CN]; Room 403, No 51, Dan Ba Rd 1500 Nong, Pu Tuo, Shanghai 200333 (CN). **MCCURDY, Stuart Arthur Lyall** [CA/CA]; 12422 28A Avenue, Edmonton, Alberta T6j 4e1 (CA). **LIU, XiLin** [CN/CN]; Room 10, The 2nd Unit, Building 21, Jianye Living Area, No.12 Daqing Road, Hualong District, Puyang City, Henan Prov. (CN). **SHENG, Hui Chun** [CN/CN]; Room 401, No.22, Huinan Residential Quarter, Zhuang hang Town,Feng xian District, Shanghai 201402 (CN). **YU, Yan** [CN/CN]; No.220 Anshun Road, Changning, Shanghai 200051 (CN). **CHEN, He Hui** [CN/CN]; Room 601, Unit 18, Qifang of Yingyuan Community, Jiading District, Shanghai (CN).(74) Agent: **LUCAS, Phillip, Brian**; Lucas & Co., 135 Westhall Road, Warlingham Surrey CR6 9HJ (GB).

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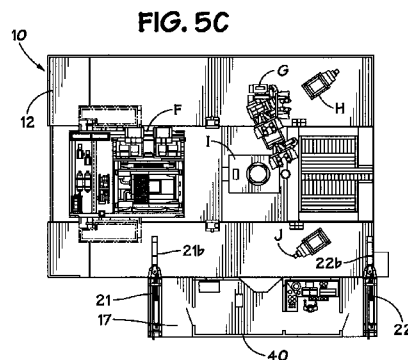
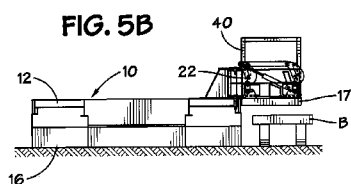
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(54) Title: METHOD AND APPARATUS FOR FACILITATING ASSEMBLY AND ERECTION OF A DRILLING RIG



(57) **Abstract:** A method for facilitating assembly and erection of a drilling rig, the drilling rig comprising a drill floor (12,112) and a substructure (16,116), the method comprising the steps of positioning a rig structure (17,40,140) adjacent the drill floor (12,112) with a vehicle (T), attaching said rig structure (40,140) to a movement apparatus (23p,26s,26t,27s,27t) of a support apparatus (21,22) of said drill floor (12,112) and activating said movement apparatus (23p,26s,26t,27s,27t) to move the rig structure (17,40,140) from the vehicle (T) sufficient to allow said vehicle to move away, and activating drill floor raising apparatus (16a) to raise the drill floor (12,112) and rig structure (17,117,40,140) to an operating height. A drilling rig comprising a drill floor (12,112) and a rig structure (17,117,40,140), characterised in that said drill floor (12,112) further comprises a support apparatus (21,22) comprising movement apparatus (23p,25,26), the support apparatus (21,22) for supporting the rig structure (17,117,40,140) from a side of the drill floor (12,112) and the movement apparatus (23p,26s,26t,27s,27t) for moving the rig structure (17,117,40,140), the support apparatus (17,117,40,140) further comprising locking apparatus (Ps) for locking the rig structure (17,117,40,140) relative to the rig floor (12,112).



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METHOD AND APPARATUS FOR FACILITATING ASSEMBLY AND
ERECTION OF A DRILLING RIG

The present invention relates to a method and apparatus for facilitating assembly and erection of a drilling rig and particularly, but not exclusively, to a method and apparatus for facilitating assembly and erection of a drill floor, doghouse, driller's cabin, building, and electrical control house of a mobile land rig.

The prior art discloses a variety of rigs used in drilling and various wellbore operations; for example, and not by way of limitation, U.S. Patents 3,340,938; 3,807,109; 3,922,825; 3,942,593; 4,269,395; 4,290,495; 4,368,602; 4,489,526; 4,569,168; 4,837,992; 6,634,436; 6,523,319 and 7,306,055 and the references cited in these patents - all these patents incorporated fully herein for all purposes. The prior art discloses a variety of systems and methods for assembling and raising components of a drilling rig; for example, and not by way of limitation nor as an exhaustive listing, the disclosures in U.S. Patents: 2,993,570; 3,201,091; 3,262,237; 3,749,183; 4,221,088; 4,269,009; 4,292,772; 4,305,237; 4,478,015; 4,587,778; 4,630,425; and 4,932,175.

Often drilling rigs and related systems, structures, equipment, and apparatuses are delivered to a site, assembled, raised, disassembled, and transported to a new site. It is important that drilling rigs and their components be easily transported and assembled.

Many components and structures used with a rig are raised by a crane and positioned on a rig's drill floor. Various problems and disadvantages are associated with installing structure, for example a doghouse, on a rig using a crane. A crane is typically a large apparatus

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which is transported to a drilling site where it is assembled and/or made ready for lifting and locating rig components.

5 The inventors have noted that it would be beneficial to assemble and erect a drilling rig without the use of a crane, of a mobile crane, and a external crane. Thus there would be no potentially dangerous winching and crane cables. The inventors have also noted that it would be beneficial not to use the drawworks, which would
10 eventually be used on the drilling rig for tripping drill strings.

In accordance with the present invention, there is provided a method for facilitating assembly and erection of a drilling rig, the drilling rig comprising a drill
15 floor and a substructure, the method comprising the steps of positioning a rig structure adjacent the drill floor with a vehicle, attaching the rig structure to a movement apparatus of a support apparatus of the drill floor and activating the movement apparatus to move the rig
20 structure from the vehicle sufficient to allow the vehicle to move away, and activating drill floor raising apparatus to raise the drill floor and rig structure to an operating height. It is within the scope of the invention to raise the drill floor to an operating height
25 before the rig structure is positioned adjacent the drill floor. However, it is preferable to raise the drill floor after the rig structure is attached to the movement apparatus and activated to move the rig structure from the vehicle sufficient to allow the vehicle to move away.
30 The vehicle may be a truck with a trailer, a flat bed truck, a train boggy, a barge, boat or other suitable vehicle.

Preferably, the rig structure comprises a structure

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on a skid, the method further comprising the step of attaching the movement apparatus to the skid.

Advantageously, the movement apparatus comprises a telescopic member, the method further comprising the step
5 of operating the telescopic member to lift the rig structure from the vehicle sufficient to allow the vehicle to move away. Preferably, the telescopic member is activated by hydraulic or pneumatic fluid, or comprises a rack and pinion mechanism or sliding
10 mechanism. Advantageously, the movement apparatus comprises at least one link, such that upon operation of the telescopic member, the at least one link moves to lift the rig structure from the vehicle sufficient to allow the vehicle to move away.

15 Preferably, the rig structure is secured to the support apparatus and supports the rig structure during and after the drill floor is raised to the operating height. The rig structure may be secured to the support apparatus by using a pin through a lug on the rig structure and a
20 linkage depending from the support apparatus. Once the rig structure is secured to the support apparatus, part of the movement apparatus, such as a piston and cylinder, may be removed from the support apparatus. Preferably, the method further comprises the step of removing at
25 least part of the movement apparatus from the drilling rig. Advantageously, the rig structure is located to one side of the drill floor.

Preferably, the support apparatus comprises an arm rotatable about a base fixed to the drill floor, the
30 method further comprising the steps of rotating the arm to a position to enable the positioning of the rig structure adjacent the drill floor and rotating the arm about the base to position the arm across at least a

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portion of the rig structure.

Advantageously, the drilling rig comprises a drill floor raising apparatus arranged between the drill floor and the substructure to raise the drill floor to an
5 operating height.

Preferably, the drill floor comprises a supporting structure, the support apparatus fixed to the supporting structure.

Advantageously, the rig structure comprises one of:
10 a house ; doghouse ; cabin ; driller cabin; and electrical control house.

The present invention also provides a drilling rig comprising a drill floor and a rig structure, characterised in that the drill floor further comprises a
15 support apparatus comprising movement apparatus, the support apparatus for supporting the rig structure from a side of the drill floor and the movement apparatus for moving the rig structure, the support apparatus further comprising locking apparatus for locking the rig
20 structure relative to the rig floor.

Preferably, the support apparatus further comprises an arm rotatable about a base.

The present invention also provides a method for facilitating assembly and erection of a drilling rig, the
25 drilling rig comprising a drill floor, a substructure and a raising apparatus the method comprising the steps of attaching a structure to a drill floor and activating the raising apparatus to raise the drill floor to a height at which the drilling rig can operate to drill or service a
30 well.

In certain aspects, the present invention discloses a system including lifting apparatus on a rig for engaging a structure (building, house, cabin, doghouse)

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on a trailer (or other similar support), lifting the structure from the trailer, and moving the structure onto the drill floor. In this method the structure is installed without using a crane, cables, or a drawworks.

5 The present invention discloses, in certain aspects, handling systems for securing a rig structure to a drilling rig, the handling systems including: movement apparatus for initially supporting a rig structure and for moving on ground adjacent a drilling rig to position
10 the rig structure with respect to the drilling rig, the drilling rig having a substructure with a drill floor; support apparatus movably connected to the drill floor for selectively supporting the rig structure, the support apparatus movable out of the way to facilitate
15 positioning of the rig structure with respect to the drill floor and the support apparatus movable adjacent the rig structure for connection thereto; and raising apparatus connected to the support apparatus, the raising apparatus for selectively raising the rig structure with
20 respect to the drill floor. In certain aspects, the rig structure is a house, doghouse, cabin, driller cabin, and electrical control house.

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For a better understanding of the present invention, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1A is a side view of part of a drilling rig
5 in accordance with the present invention, prior to erection with rig equipment not shown;

Figure 1B is an end view of the part of the drilling rig shown in Figure 1A;

Figure 1C is a top view of the drilling rig shown in
10 Figure 1A with rig equipment shown;

Figure 1D is a top view of part of a drilling rig shown in Figures 1A and 2A, shown with rig equipment and drill floor panels removed;

Figure 1E is a side view showing a connection of
15 parts of the drilling rig shown in Figure 1D after installation;

Figure 1F is a side view showing a connection of parts of the drilling rig shown in Figure 1D before installation;

Figure 1G is a side view showing a connection of
20 parts of the drilling rig shown in Figure 1D after installation;

Figure 1H is a side view showing a connection of parts of the drilling rig shown in Figure 1D before
25 installation;

Figure 1I is a side view showing a connection of parts of the rig of Figure 1D after installation;

Figure 1J is a side view showing a connection of parts of the drilling rig shown in Figure 1D before
30 installation;

Figure 1K is a side view showing a connection of parts of the rig of Figure 1D after installation;

Figure 1L is a side view showing a connection of

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parts of the rig of Figure 1D before installation;

Figure 2A is an enlarged top view of part of the drilling rig shown in Figure 1A;

Figure 2B is an enlarged side view of part of the
5 drilling rig shown in Figure 1A;

Figure 3A is a side view of the part of the drilling rig shown in Figure 1A and a structure on a trailer of a truck illustrating a first step of a method for facilitating assembly and erection of a drilling rig in
10 accordance with the present invention;

Figure 3B is an end view of the part of the drilling rig and the structure on the trailer of a truck in the first step shown in Figure 3A;

Figure 3C is a top view of the part of the drilling rig and the structure on a trailer of the truck in the first step shown in Figure 3A, shown with the rig
15 equipment;

Figure 4A is a side view of the part of the drilling rig shown in Figure 1A, with the structure being removed from the trailer of the truck illustrating a second step of a method for facilitating assembly and erection of a drilling rig in accordance with the present invention subsequent to the first step shown in Figure 3A;
20

Figure 4B is an end view of the part of the drilling rig with the structure being removed from the trailer of the truck in the second step shown in Figure 4A;
25

Figure 4C is a top view of the part of the drilling rig with the structure being removed from the trailer of the truck in the second step shown in Figure 4A, shown
30 with the rig equipment;

Figure 5A is a side view of the part of the drilling rig with the structure being removed from the trailer of the truck illustrating a third step of a method for

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facilitating assembly and erection of a drilling rig in accordance with the present invention subsequent to the second step shown in Figure 4A;

5 Figure 5B is an end view of the part of the drilling rig with the structure being removed from the trailer of the truck in the third step shown in Figure 5A;

10 Figure 5C is a top view of the part of the drilling rig with the structure being removed from the trailer of the truck in the third step shown in Figure 5A, shown with the rig equipment;

Figure 5D is an enlarged view of a portion of the drilling rig shown Figure 5A;

15 Figure 6A is a side view of the part of the drilling rig with the structure illustrating a fourth step in the method in accordance with the present invention following the step of Figure 5A;

Figure 6B is an end view of the part of the drilling rig with the structure in the fourth step shown in Figure 6A;

20 Figure 6C is a top view of the part of the drilling rig with the structure in the fourth step shown in Figure 6A, shown with the rig equipment;

Figure 6D is an enlarged view of a portion of the drilling rig shown Figure 6A;

25 Figure 7A is a side view of the part of the drilling rig with the structure illustrating a fifth step in the method in accordance with the present invention following the step of Figure 6A;

30 Figure 7B is an end view of the part of the drilling rig with the structure in the fifth step shown in Figure 7A;

Figure 7C is a top view of the part of the drilling rig with the structure in the fourth step shown in Figure

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7A, shown with the rig equipment;

Figure 8A is a side view of part of a drilling rig in accordance with the present invention, prior to erection with rig equipment not shown;

5 Figure 8B is an end view of the part of the drilling rig shown in Figure 8A;

Figure 8C is a top view of the part of the drilling rig shown in Figure 8A with rig equipment shown;

10 Figure 8D is an enlarged side view of part of the drilling rig as shown in Figure 8A;

Figure 8E is a side view of the part of the drilling rig shown in Figure 8A with a structure to be assembled therewith illustrating a step in the method in accordance with the present invention;

15 Figure 8F is a side view of the part of the drilling rig shown in Figure 8A with the structure to be assembled therewith illustrating a step in the method in accordance with the present invention subsequent to the step shown in Figure 8E;

20 Figure 8G is a top view of part of the drilling rig shown in Figure 8E and in the same step in the method as shown in Figure 8E;

25 Figure 8H is a top view of part of the drilling rig shown in Figure 8F and in the same step in the method as shown in Figure 8F;

30 Figure 9A is a side view of the part of the drilling rig shown in Figure 8A, with the structure being removed from a trailer of a truck illustrating a step of a method for facilitating assembly and erection of a drilling rig in accordance with the present invention;

Figure 9B is an end view of the part of the drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 9A;

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Figure 9C is a top view of the part of the drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 4A, shown with the rig equipment;

5 Figure 10A is a side view of the part of the drilling rig shown in Figure 8A, with the structure being removed from the trailer of the truck illustrating a step of a method for facilitating assembly and erection of a drilling rig in accordance with the present invention
10 subsequent to the step shown in Figure 9A;

Figure 10B is an end view of the part of the drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 10A;

15 Figure 10C is a top view of the part of the drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 10A, shown with the rig equipment;

20 Figure 11A is a side view of the part of the drilling rig shown in Figure 8A, with the structure being removed from the trailer of the truck illustrating a step of a method for facilitating assembly and erection of a drilling rig in accordance with the present invention
subsequent to the step shown in Figure 10A;

25 Figure 11B is an end view of the part of the drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 11A;

30 Figure 11C is a top view of the part of the drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 11A, shown with the rig equipment;

Figure 12A is a side view of the part of the drilling rig shown in Figure 8A, with the structure being removed from the trailer of the truck illustrating a

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second step of a method for facilitating assembly and erection of a drilling rig in accordance with the present invention subsequent to the step shown in Figure 11A;

Figure 12B is an end view of the part of the
5 drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 12A;

Figure 12C is a top view of the part of the drilling rig with the structure being removed from the trailer of the truck in the step shown in Figure 4A, shown with the
10 rig equipment;

Figure 13A is a side view of the part of the drilling rig shown in Figure 8A, with the structure being removed from the trailer of the truck illustrating a second step of a method for facilitating assembly and
15 erection of a drilling rig in accordance with the present invention subsequent to the first step shown in Figure 12A;

Figure 13B is an end view of the part of the drilling rig with the structure being removed from the
20 trailer of the truck in the second step shown in Figure 13A;

Figure 13C is a top view of the part of the drilling rig with the structure being removed from the trailer of the truck in the second step shown in Figure 13A, shown
25 with the rig equipment;

Figures 1A, 1B and 1C show a drilling rig 10 with rig equipment F, G, H, I, J on a drill floor 12. The rig equipment comprises a drawworks apparatus F, an iron roughneck G, well centre I. The drill floor 12 is raised
30 by lifting and movement apparatus of a substructure 16 to which the drill floor 12 is connected. The lifting and movement apparatus includes a left suspending arm 21 and a right suspending arm 22.

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Each suspending arm 21, 22 (see Figures 2A, 2B) has support beams (see beams 21l, 21m, Figure 2B) and is pivotably connected with pins (for example see pins 21c, 21d for the arm 21) to a base 21b, 22b, which are secured or formed integrally with the drill floor 12. The suspending arms 21, 22 can pivot 180 degrees in a horizontal plane on their bases from a stowed position, shown in Figure 1C to a position shown in Figure 4C. Each suspending arm 21, 22 has a linkage assembly raised moved by a hydraulic cylinder apparatus 23 (one arm at each end of the skid 17 of the structure 40). A piston 23p of each apparatus 23 movable in a cylinder 23h is connected to a first top link 24t. A pin 23z pivotably connects a lower end of the cylinder 23h to the arm 21. A crosslink 24c is interconnected between the first top link 24t and a second top link 24s so that when the first top link 24t is moved up by extending the movable piston 23p of the apparatus 23, the second top link 24s is also moved up. An end of each top link 24s is pinned with a pin 25 to the suspension arm 21 so that the upper ends of the first top link 24t and of the second top link 24s are free to pivot up when raised by the movable piston 23p.

First and second intermediate links 26s, 26t are connected to the top links. A top of a first intermediate link 26t is pivotably connected to the top link 24t and the top of a second intermediate link 26s is pivotably connected to the second top link 24s. When the top links are raised, the intermediate links are raised with them.

Figures 1D to 1L illustrate structure for connection of various parts of a drilling rig 10a like the drilling rig 10; shown with the rig equipment deleted and floor panels of the drill floor removed. The rig 10a has two arms like the arms 21, 22, Figure 1C; but only one arm

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21a is shown.

Figures 1E to 1L illustrate various connection structures both before a centre floor CF is installed and after a centre floor CF are installed.

5 Figures 1E and 1F illustrate the connection of beams B1 and B2 with pins Pa.

Figures 1G and 1H illustrate the connection of parts P1 and P2.

10 Figures 1I and 1L illustrate the connection of parts P3 and P4.

Figures 1K and 1L illustrate the connection of parts P5 and P6.

15 First and second lower links 27t,27s releasably and pivotably connect the first and second 276t,26s intermediate link to first and second lugs 42s,42t respectively on a skid 17 supporting a structure 40, for example a doghouse. The skid 17 may be mounted on a trailer B of a truck T. For example, as shown in Figure 2B, a first lower link 27t has a top end pivotably
20 connected to a lower end of the first intermediate link 26t and a bottom end releasably connected, for example, with an insertable/removable pin 28t, to a lug 42t; and a second lower link 27s has a top end pivotably connected to a lower end of the second intermediate link 26s and a
25 bottom end releasably connected, for example with an insertable/removable pin 28s to a lug 42s. Similar links and supports are associated with the other suspension arm and the other end of the structure 40, for example as referred to below, the doghouse 40.

30 As shown in Figure 2A, the movable piston 23p is initially in a retracted position. Hydraulic power fluid is supplied to the cylinder apparatus 23 from a hydraulic power unit HPU controlled by a control-system CS (shown

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schematically in Figure 2B).

The truck T approaches the rig 10, with the doghouse 40 supported on a trailer B. The left (as viewed in Figure 1C) suspending arm 22 is turned 180 degrees in a horizontal plane (from its initial position as shown in Figure 1C). With the left suspending arm 22 out of the way, the truck T is driven to position the doghouse 40 as shown in Figures 3A to 3C.

As shown in Figures 4A to 4C, the arms 21, 22 are then turned 90 degrees to a position substantially perpendicular to the edge of the drill floor 12, so the first and second lower linkages 27t, 27s can be connected to the lugs 42t, 42s of the skid 17. The linkage assemblies are initially held in a fixed position for transport. The pins 28t and 28s are used to releasably connect the lower links 27t, 27s to the lugs 42t, 42s.

As shown in Figures 5A to 5D, the movable piston 23p is then extended resulting in the rotation of the first and second upper and intermediate links 24t, 24s, 26t, and 26s to align the doghouse 40 parallel to the drill floor 12 and to raise the doghouse 40 off the trailer B. The skid 17 with the doghouse 40 is raised to a level flush with the drill floor 12.

The skid 17 with the doghouse 40 is locked in place (see Figure 5D) by inserting removable pins 29t, 29s through holes in the lugs 42t, 42s into corresponding holes in the arms 21, 22. The movable pistons 23p of both apparatuses 23 can be disconnected and retracted and the truck T with the trailer B driven away (see Figures 6A to 6C).

As shown in Figures 7A to 7C, the raising apparatus 16a, such as telescoping extendible members, which may be hydraulically actuated piston and cylinders 16a, of the

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substructure 16 raises the drill floor 12 with the skid 17 and the doghouse 40. Since using the arms 21, 22 aligns the doghouse 40, it is not necessary for the skid 17 with the doghouse 40 to be perfectly parallel to the substructure 16 prior to lifting, and there can be a gap GP (see Figure 3C) between the drill floor 12 and the doghouse 40.

Figures 8A to 13C illustrate another system and method in accordance with the present invention for installing a rig structure such as, but not limited to, a doghouse on a drilling rig without a crane, cables, or drawworks. Instead of the linkage assemblies of the system as shown in Figure 2B, a plurality of powered hydraulic cylinder assemblies are used to raise and move a skid with a doghouse.

Figures 8A, 8B, and 8C show a drilling rig 100 with a drill floor 112 on a substructure 116 with rig equipment like the rig of Figure 1A. Pivotably connected to the drill floor 112 are a left suspending arm 121 and a right suspending arm 122 on bases 121b, 122b, respectively. The bases are connected to the drill floor 112. Figure 8D shows the left suspending arm 121. The right suspending arm 122 is like the left suspending arm. As shown in Figure 8C the two suspending arms 121, 122 are directed toward each other, for example, for travel.

The suspending arm 121, Figure 8D, is pivotably connected to the base 121b which is secured to or formed integrally of the substructure 116. The arm 121 can pivot 180 degrees on the base 121b. Each suspending arm 121 has two hydraulically-powered raising cylinder apparatuses 123a and 123b with housings 123c, 123d and extendable pistons 123e, 123f, respectively. A top end of each housing is pivotably connected to the arm 121 and

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a lower end of each piston is pivotably connected to a lug 142 on a skid 117 to which is secured a doghouse 140. Initially the doghouse 140 is supported on a trailer L of a truck R.

5 Figures 8E to 8H illustrate the connection of the skid 117 to the suspending arms. The apparatuses 123a, 123b raise the skid 117 (and whatever is on the skid 117, for example a doghouse 140) so that the holes Ha of the arm are aligned with holes Hb of the lugs 142. Locking
10 pins PS are then inserted through the holes to secure the skid 117 to the arm.

A hydraulically-powered cylinder apparatus 123k has a housing 123m pivotably connected to the arm 121 and an end of an extendable piston 123p pivotably connected with
15 pins 123l to a lug 143 on the skid 117. Hydraulic power fluid is supplied to the three cylinder apparatuses from a hydraulic power unit HPU controlled by a control system CS (shown schematically).

Figures 9A to 13C illustrate steps in a method in
20 accordance with the present invention for installing the doghouse 140 on the rig 100.

As shown in Figures 9A to 9C, the arms 121, 122 are turned out 180 (as compared to their position in Figure 8C). The cylinders 123k connected to the arms 121, 122
25 (used for removing the doghouse) are pinned in place when rotating the arms. The truck R is driven so the doghouse 140 is located between the arms 121, 122.

As shown in Figures 10A to 10C, the arms 121, 122 are turned 90 as shown and the lower ends of the pistons
30 123e, 123f are pivotably pinned to the lugs 142. The lower end of the piston 123p is pivotably pinned to the lug 143.

As shown in Figure 11A to 11C, the pistons 123p are

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retracted, controlling movement of the skid 117 with the doghouse 140 until it is between the arms 121, 122 and then the raising cylinder apparatuses 123a, 123b retract their pistons 123e, 123f to raise the doghouse 140 so
5 that the top of the skid 117 is flush with the drill floor 112. An initial gap GA between the skid 117 with the doghouse 140 and the drill floor 112, if present, is eliminated as the doghouse 140 moves to the drill floor 112.

10 The skid 117 with the doghouse 140 is locked in place as shown in Figures 12A to 12C by inserting pins through holes 128 in the lugs 142 into corresponding holes in the arms 121, 122. For storage, power to the cylinders is turned off. Once the skid 117 with the
15 doghouse 140 is connected to the arms 121, 122, the truck R with the trailer A is driven away.

Figures 13A to 13C show the drill floor 112 with the doghouse 140 installed thereon raised by the substructure 116.

20 The present invention, therefore, provides in some, but not in necessarily all, embodiments a method for installing a rig structure on a drilling rig, the method including: positioning a rig structure on a movement apparatus adjacent a support apparatus, the support
25 apparatus connected to a substructure of a drilling rig, the support apparatus movably connected to the substructure, the substructure supporting a drilling floor, said positioning effected by moving the movement apparatus on ground adjacent the substructure; moving the
30 support apparatus into a connecting orientation with respect to the rig structure, the support apparatus having raising apparatus connected thereto; connecting the raising apparatus to the rig structure; and raising

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the rig structure with the raising apparatus. Such a method may one or some, in any possible combination, of the following: wherein the rig structure is one of house, doghouse, cabin, driller cabin, and electrical control house; raising the rig structure up to the drill floor and securing the rig structure to the support apparatus; wherein the support apparatus includes dual opposed support arms, each arm pivotably connected to a corresponding base connected to the drilling floor, the method further including positioning each of the dual opposed support arms at an angle to its respective base to facilitate positioning of the rig structure adjacent the drilling floor; moving the dual opposed support arms toward the rig structure for connection thereto, and connecting the dual opposed support arms to the rig structure; aligning the rig structure with respect to the support apparatus, and with the raising apparatus, raising the rig structure above the movement apparatus; removing the movement apparatus away from the drilling rig; raising, with the substructure, the drilling floor with the rig structure thereon; the raising apparatus including linkage apparatus connectible between the dual opposed support arms and the rig structure, and hydraulic cylinder apparatus interconnected between the dual support arms and the linkage apparatus for raising the linkage apparatus to raise the rig structure; the linkage apparatus including two spaced-apart linkages each with multiple links, each with a lowermost link connectible to the rig structure, the two spaced-apart linkages including a first linkage and a second linkage, a common link interconnecting the two linkages, and the hydraulic cylinder apparatus having a first end and a second end, the first end connected to one of the dual opposed

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support arms and the second end connected to the first linkages, the method further including extending the hydraulic cylinder apparatus to raise the first linkage and, via the common link, to thereby raise the second linkage; the raising apparatus including hydraulic cylinder apparatus releasably interconnecting the dual opposed support arms and the rig structure, the method further including raising the rig structure by contacting the hydraulic cylinder apparatus; and/or the raising apparatus including hydraulic cylinder, the hydraulic cylinder apparatus interconnected between the support apparatus and the rig structure, the method further including contracting the hydraulic cylinder apparatus to move the rig structure toward the drilling floor.

15 The present invention, therefore, provides in some, but not in necessarily all, embodiments a method for installing a rig structure on a drilling rig, the method including: positioning a rig structure on a movement apparatus adjacent a support apparatus, the support apparatus connected to a substructure of a drilling rig, the support apparatus movably connected to the substructure, the substructure supporting a drilling floor, said positioning effected by moving the movement apparatus on ground adjacent the substructure; moving the support apparatus into a connecting orientation with respect to the rig structure, the support apparatus having raising apparatus connected thereto; connecting the raising apparatus to the rig structure; raising the rig structure with the raising apparatus up to the drill floor; wherein the rig structure is one of house, doghouse, cabin, driller cabin, and electrical control house; wherein the support apparatus includes dual opposed support arms, each arm pivotably connected to a

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corresponding base connected to the drilling floor, the method further including positioning each of the dual opposed support arms at an angle to its respective base to facilitate positioning of the rig structure adjacent the drilling floor; removing the movement apparatus away from the drilling rig; and raising, with the substructure, the drilling floor with the rig structure thereon.

The present invention, therefore, provides in some, but not in necessarily all, embodiments a handling system for securing a rig structure to a drilling rig, the handling system including movement apparatus for initially supporting a rig structure and for moving on ground adjacent a drilling rig to position the rig structure with respect to the drilling rig, the drilling rig having a substructure with a drill floor; support apparatus movably connected to the drill floor for selectively supporting the rig structure, the support apparatus movable out of the way to facilitate positioning of the rig structure with respect to the drill floor and the support apparatus movable adjacent the rig structure for connection thereto; and raising apparatus connected to the support apparatus, the raising apparatus for selectively raising the rig structure with respect to the drill floor. Such a system may one or some, in any possible combination, of the following: wherein the rig structure is one of house, doghouse, cabin, driller cabin, and electrical control house; wherein the support apparatus includes dual opposed support arms, each arm pivotably connected to a corresponding base connected to the drilling floor, and each of the dual opposed support arms positionable at an angle to its respective base to facilitate positioning of

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the rig structure adjacent the drilling floor; the raising apparatus including linkage apparatus connectible between the dual opposed support arms and the rig structure, and hydraulic cylinder apparatus interconnected between the dual support arms and the linkage apparatus for raising the linkage apparatus to raise the rig structure; the linkage apparatus including two spaced-apart linkages each with multiple links, each with a lowermost link connectible to the rig structure, the two spaced-apart linkages including a first linkage and a second linkage, a common link interconnecting the two linkages, and the hydraulic cylinder apparatus having a first end and a second end, the first end connected to one of the dual opposed support arms and the second end connected to the first linkage so that extending the hydraulic cylinder apparatus raises the first linkage and, via the common link, thereby raises the second linkage; the raising apparatus including hydraulic cylinder apparatus releasably interconnecting the dual opposed support arms and the rig structure so that by contracting the hydraulic cylinder apparatus raises the rig structure; and/or the raising apparatus including hydraulic cylinder apparatus, the hydraulic cylinder apparatus interconnected between the support apparatus and the rig structure so that contracting the hydraulic cylinder apparatus moves the rig structure toward the drilling floor.

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CLAIMS:

1. A method for facilitating assembly and erection of a drilling rig, the drilling rig comprising a drill floor (12,112) and a substructure (16,116), the method
5 comprising the steps of positioning a rig structure (17,40,140) adjacent the drill floor (12,112) with a vehicle (T), attaching said rig structure (40,140) to a movement apparatus (23p,26s,26t,27s,27t) of a support apparatus (21,22) of said drill floor (12,112) and
10 activating said movement apparatus (23p,26s,26t,27s,27t) to move the rig structure (17,40,140) from the vehicle (T) sufficient to allow said vehicle to move away, and activating drill floor raising apparatus (16a) to raise the drill floor (12,112) and rig structure
15 (17,117,40,140) to an operating height.
2. A method in accordance with Claim 1, wherein said rig structure (17,40,140) comprises a structure (40,140) on a skid (17,117), the method further comprising the step of attaching the movement apparatus
20 (23p,26s,26t,27s,27t) to the skid (17,117).
3. A method in accordance with Claim 1 or 2, wherein said movement apparatus (23p,26s,26t,27s,27t) comprises a telescopic member (23p), the method further comprising the step of operating the telescopic member (23p) to lift
25 the rig structure (40,140) from the vehicle (T) sufficient to allow said vehicle to move away.
4. A method in accordance with Claim 3, wherein said movement apparatus (23p,24,25) comprises at least one link (26,27), such that upon operation of said telescopic member (23p), said at least one link (26,27) moves to
30 lift the rig structure (40,140) from the vehicle (T) sufficient to allow said vehicle to move away.
5. A method in accordance with any preceding claim,

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wherein the rig structure (40,140) is secured to the support apparatus (21,22) and supports the rig structure (40,140) after the drill floor (12,112) is raised to said operating height.

5 6. A method in accordance with any preceding claim, wherein said rig structure (17,117,40,140) is located to one side of the drill floor (12,112).

7. A method in accordance with Claim 6, wherein said support apparatus (21,22) comprises an arm rotatable
10 about a base (21b) fixed to the drill floor (12,112), the method further comprising the steps of rotating the arm to a position to enable the positioning of the rig structure (40,140) adjacent the drill floor (12,112) and rotating the arm about the base (21b) to position the arm
15 across at least a portion of the rig structure (40,140).

8. A method in accordance with any preceding claim, wherein the drilling rig comprises a drill floor raising apparatus (16a) arranged between said drill floor (12,112) and said substructure (16,116) to raise the
20 drill floor (12,112) to an operating height.

9. A method in accordance with any preceding claim, wherein said drill floor (12,112) comprises a supporting structure (P1,P2,P3,P4,P5,P6,B1,B2), said support apparatus (21,22) fixed to said supporting structure.

25 10. A method in accordance with any preceding claim, wherein the rig structure (40,140) comprises one of: a house; doghouse; cabin; driller cabin; and electrical control house.

11. A method in accordance with any preceding claim,
30 wherein further comprising the step of removing the movement apparatus (23p,26s,26t,27s,27t) from the drilling rig.

12. A drilling rig comprising a drill floor (12,112) and

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a rig structure (17,117,40,140) , characterised in that said drill floor (12,112) further comprises a support apparatus (21,22) comprising movement apparatus (23p,25,26), the support apparatus (21,22) for
5 supporting the rig structure (17,117,40,140) from a side of the drill floor (12,112) and the movement apparatus (23p,26s,26t,27s,27t) for moving the rig structure (17,117,40,140), the support apparatus (17,117,40,140) further comprising locking apparatus (Ps) for locking the
10 rig structure (17,117,40,140) relative to the rig floor (12,112) .

13. A drilling rig as claimed in Claim 12, wherein said rig structure (17,117,40,140) comprises one of: a house; doghouse; cabin ; driller cabin; and electrical control
15 house.

14. A drilling rig as claimed in Claim 12 or 13, wherein said support apparatus (21,22) further comprises an arm rotatable about a base (21b) .

15. A method for facilitating assembly and erection of a
20 drilling rig, the drilling rig comprising a drill floor (12,112), a substructure (16,116) and a raising apparatus (16a) the method comprising the steps of attaching a structure (40,140) to a drill floor (12,112) and activating the raising apparatus to raise the drill floor
25 (12,112) to a height at which the drilling rig can operate to drill or service a well.

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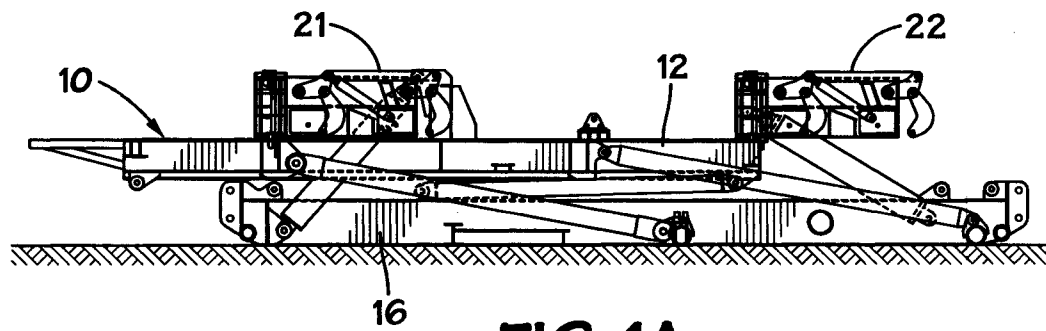


FIG. 1A

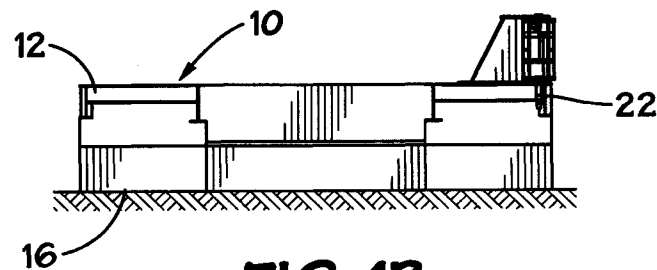


FIG. 1B

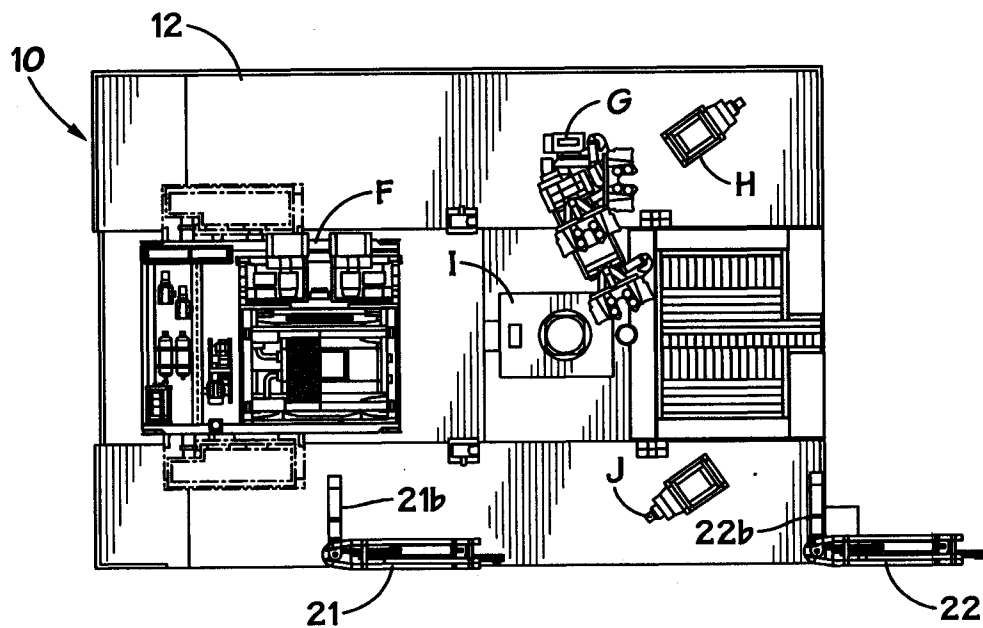


FIG. 1C

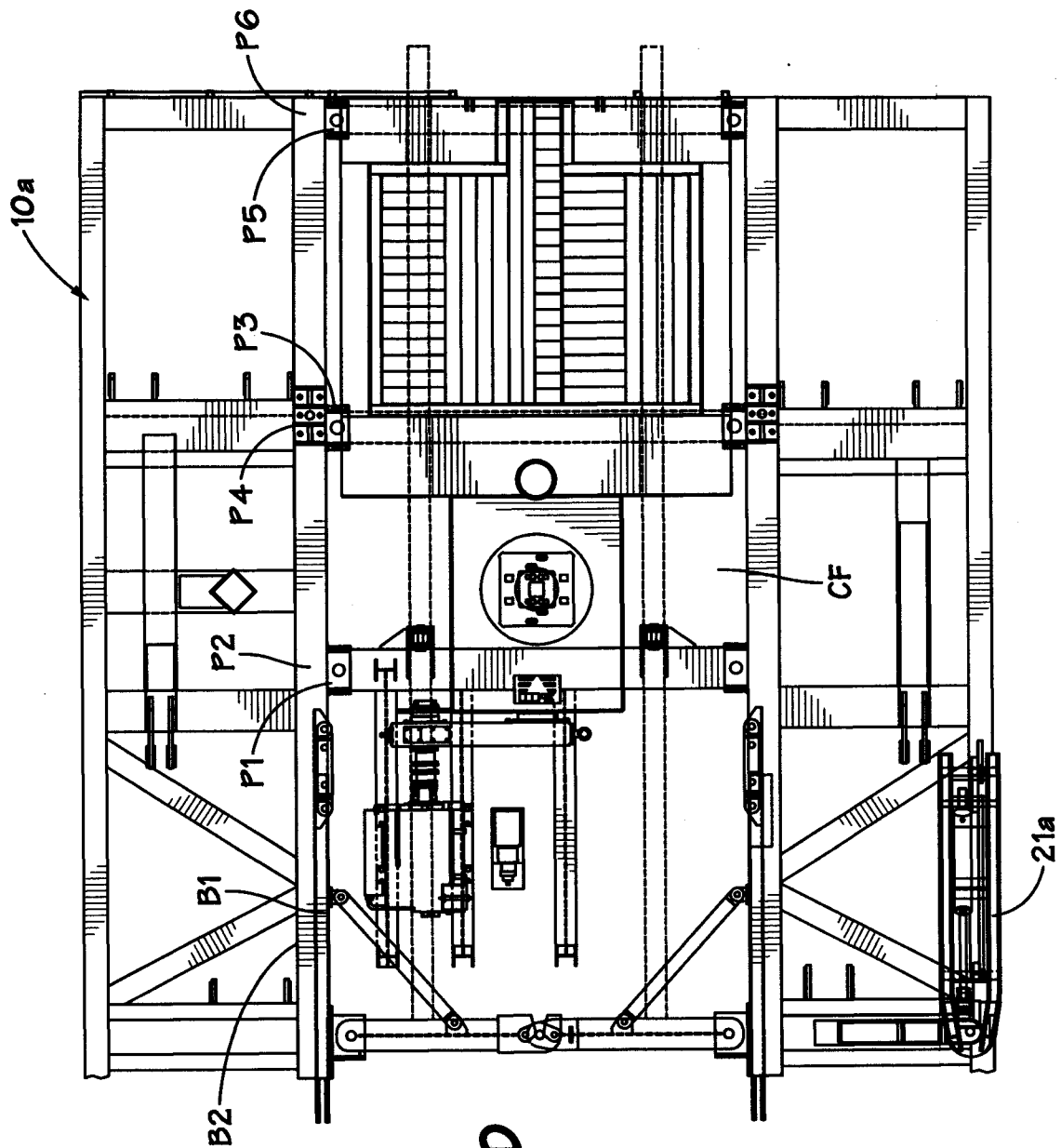


FIG. 1D

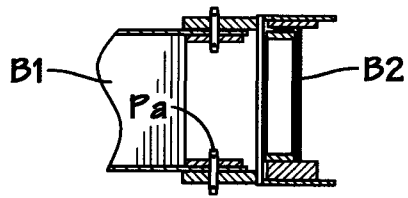


FIG. 1E

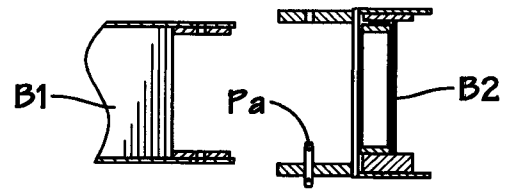


FIG. 1F

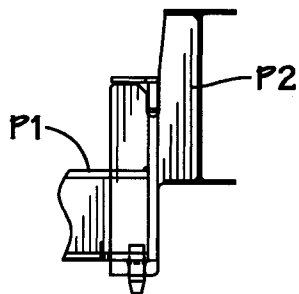


FIG. 1G

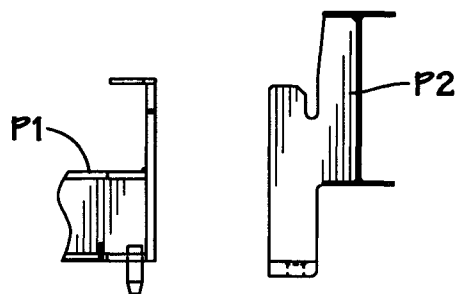


FIG. 1H

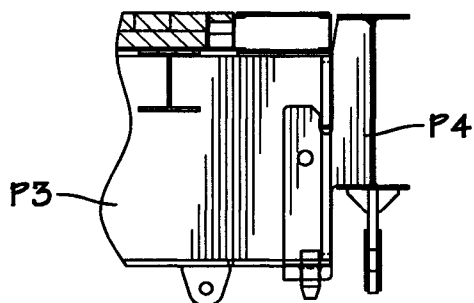


FIG. 1I

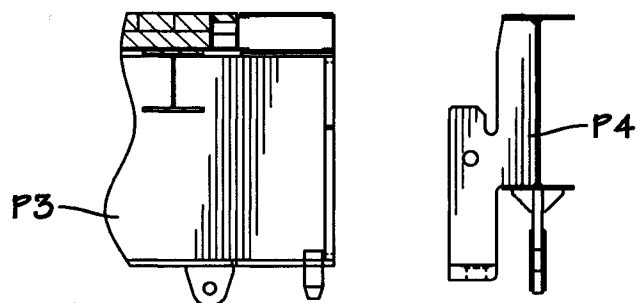


FIG. 1J

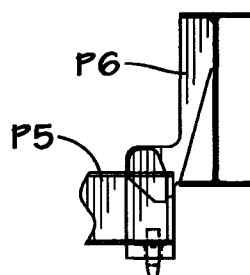


FIG. 1K

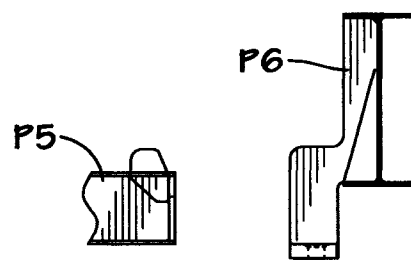
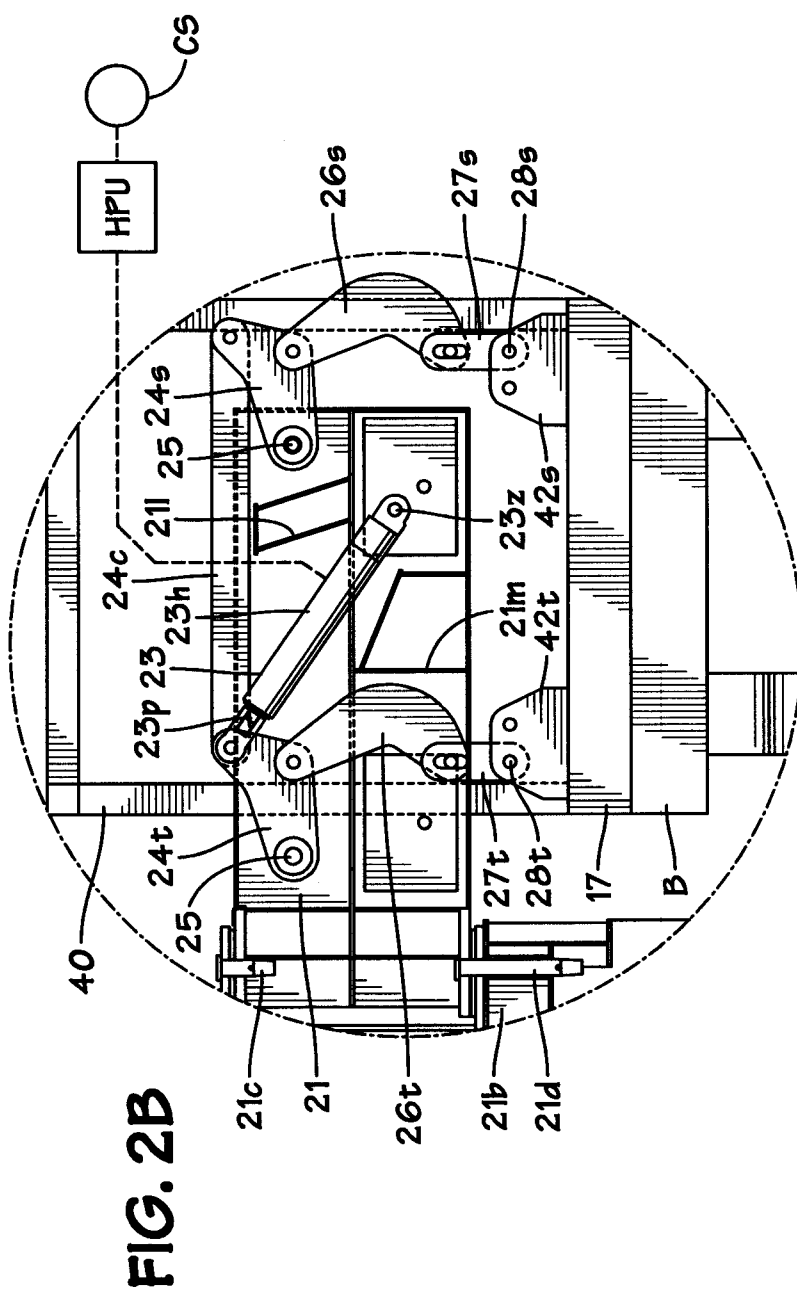
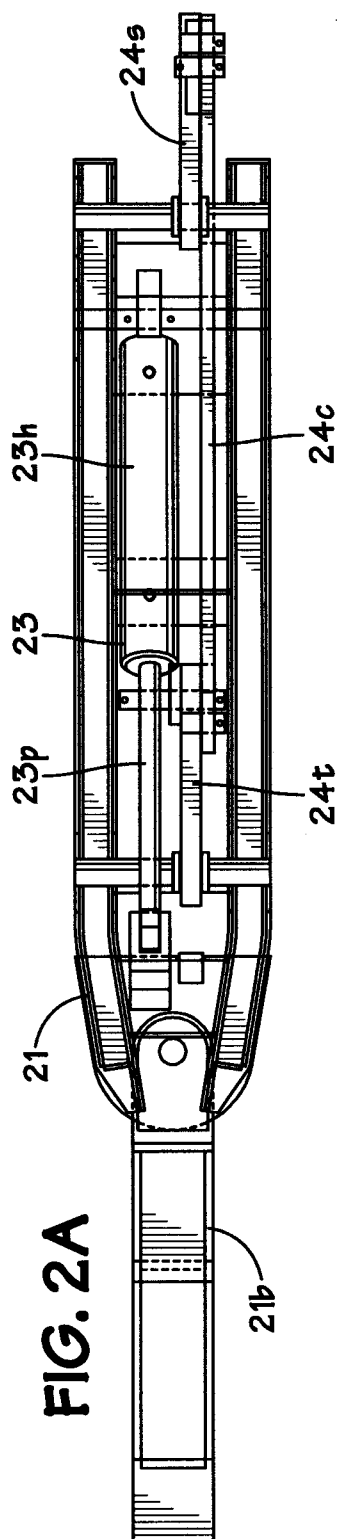
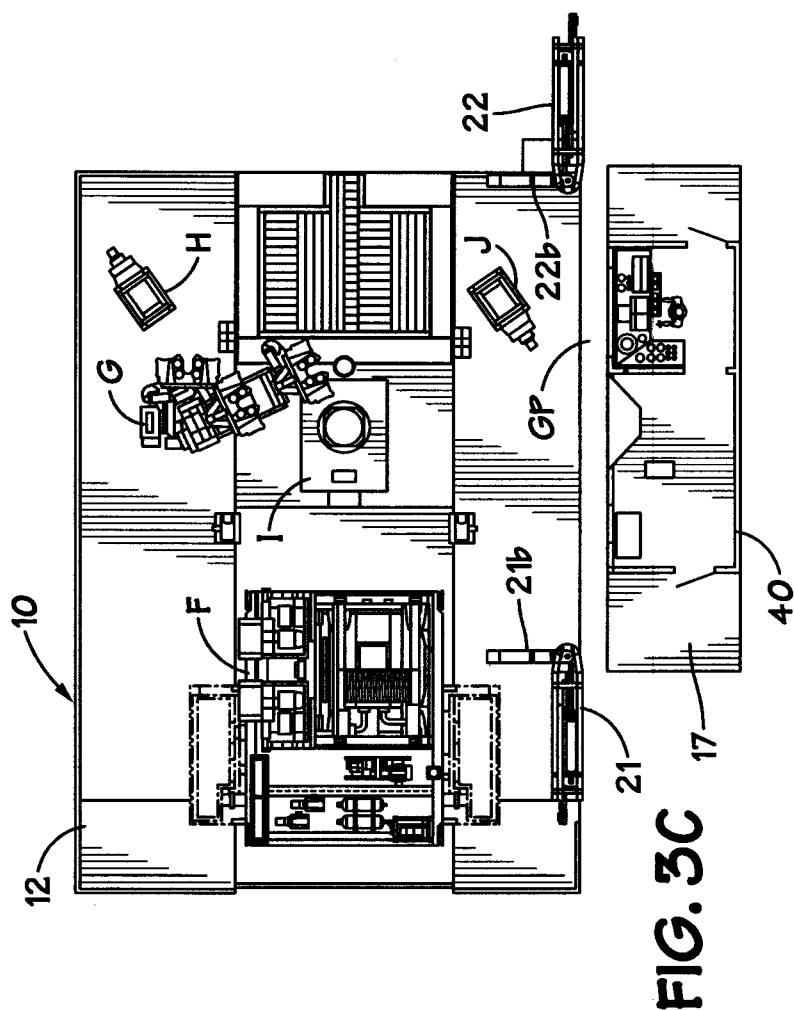
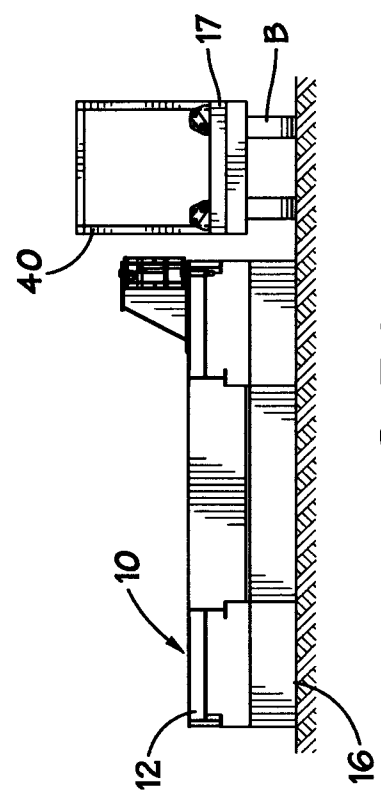
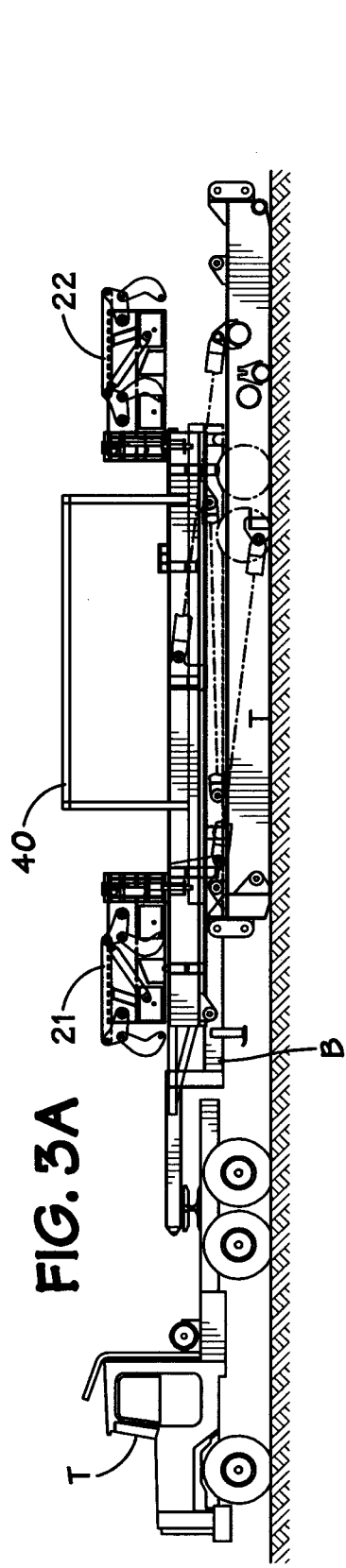


FIG. 1L





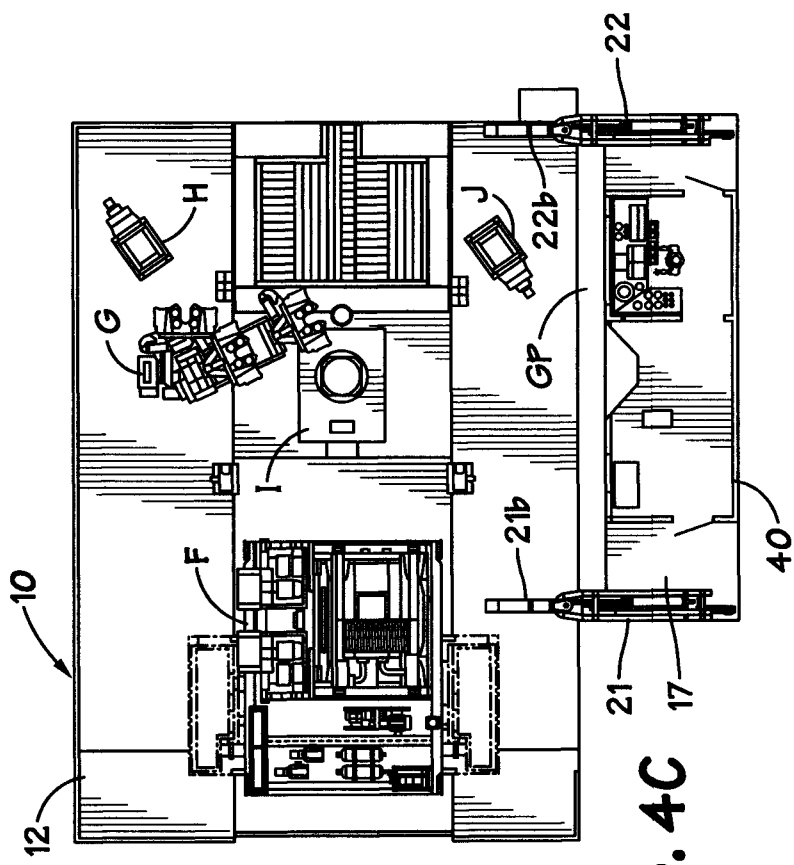
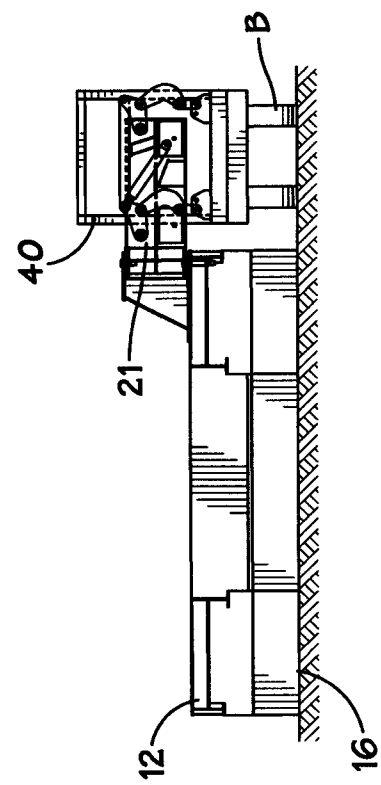
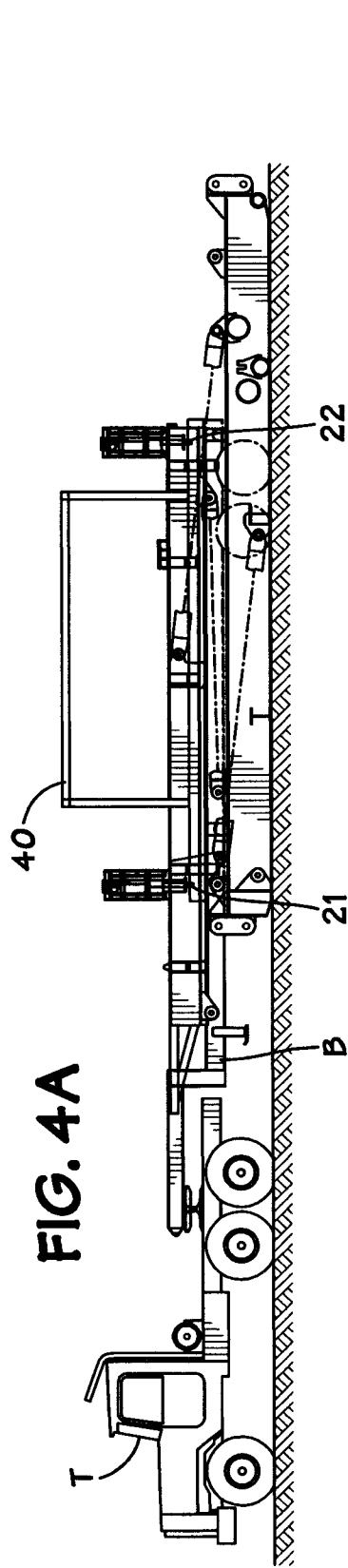


FIG. 5A

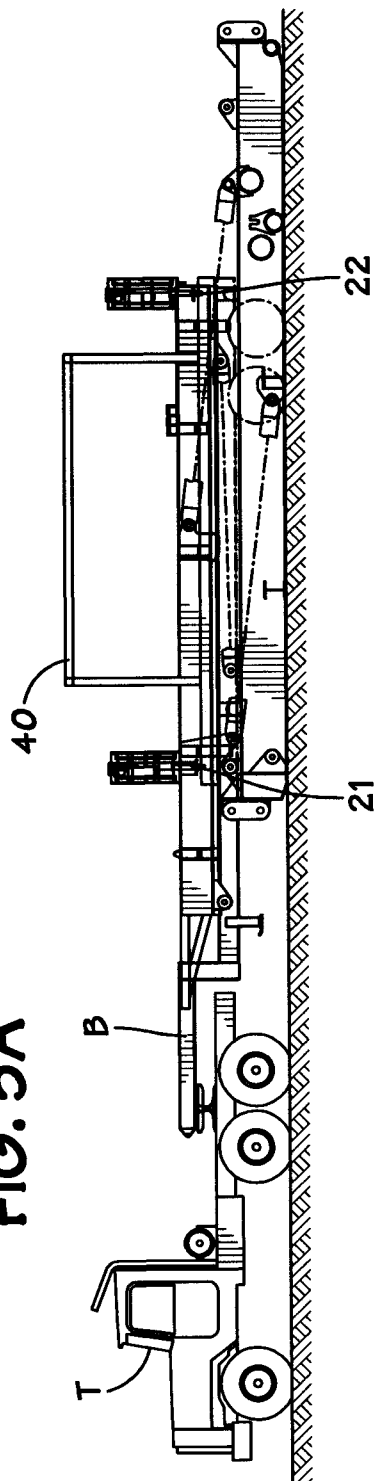


FIG. 5B

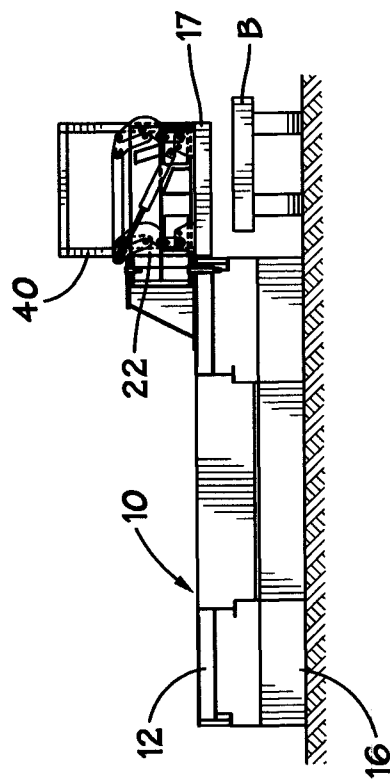


FIG. 5C

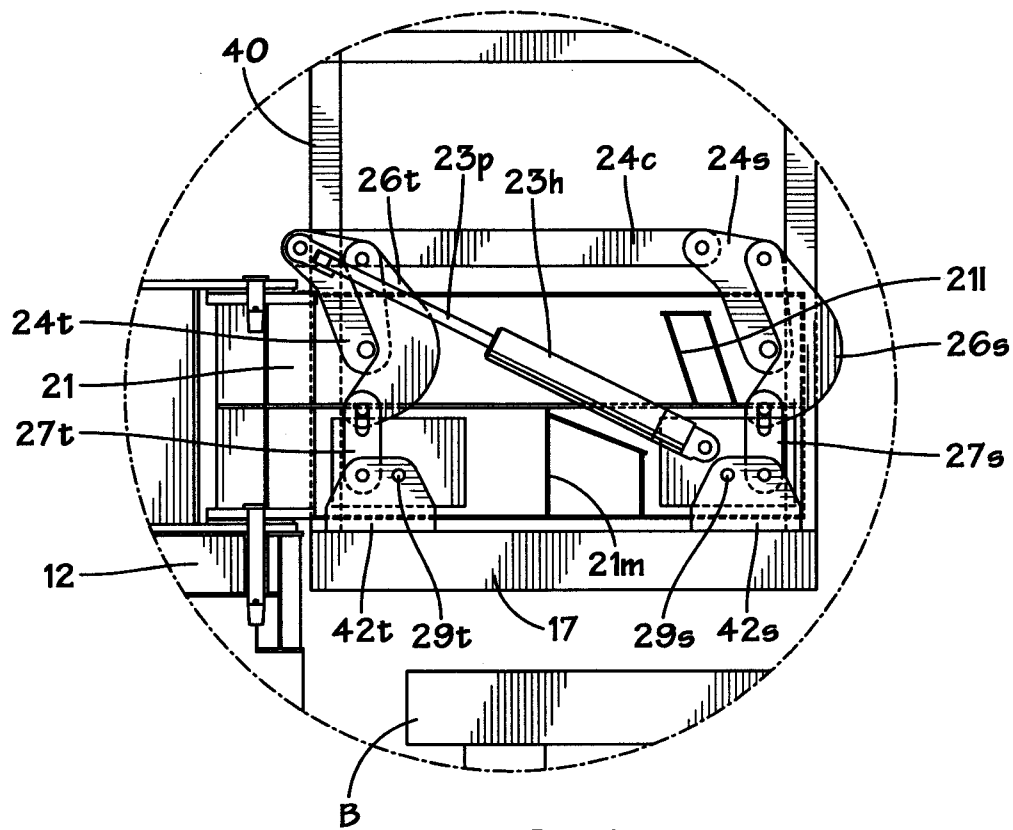
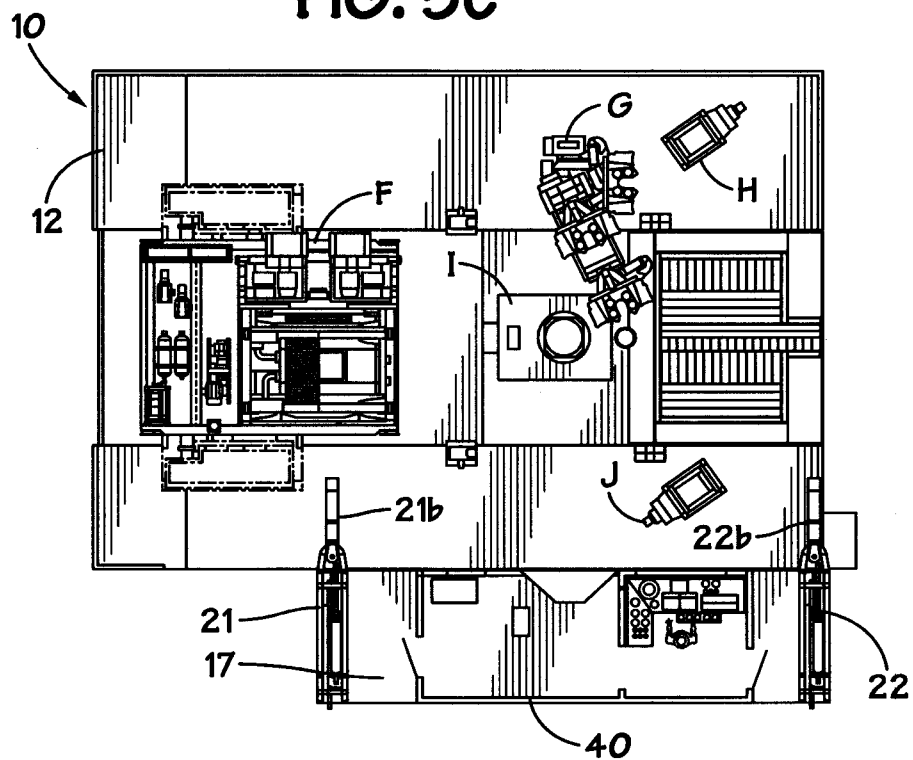


FIG. 5D

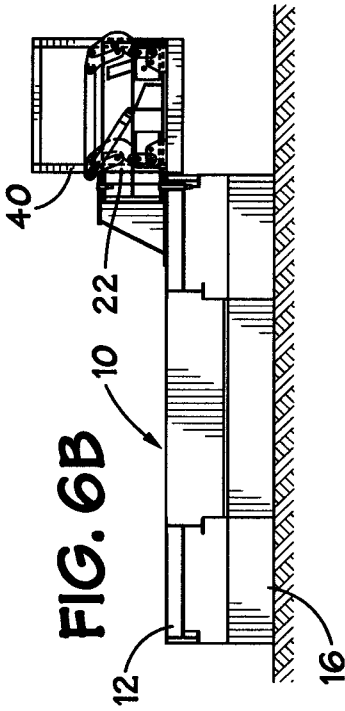
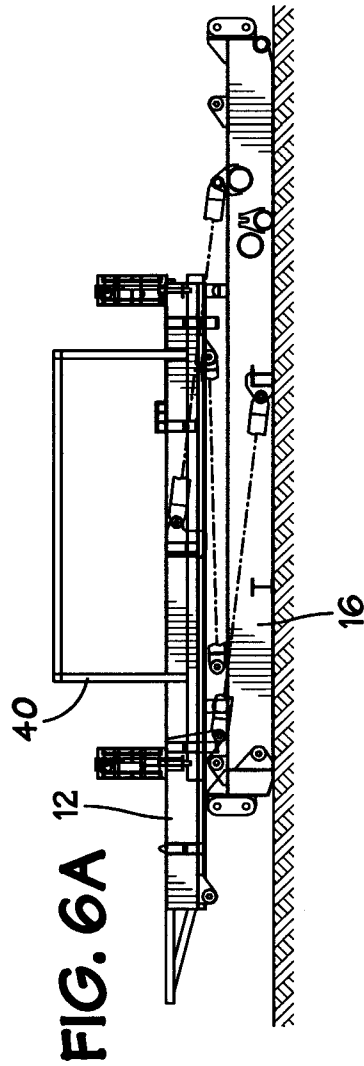


FIG. 6C

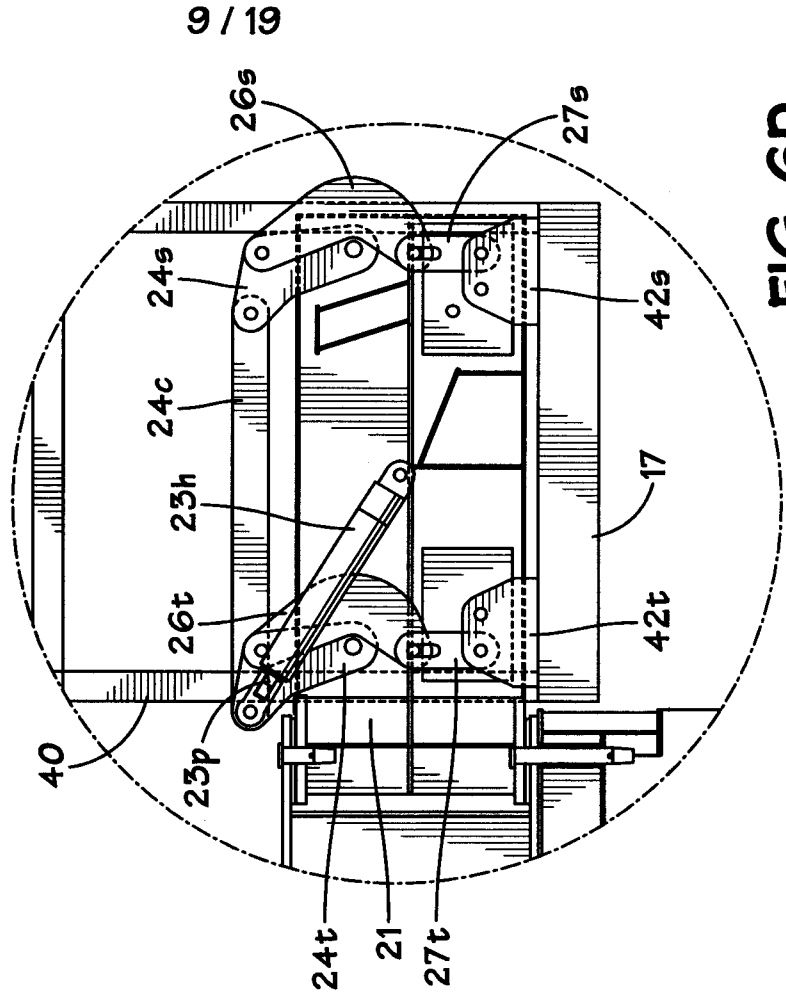
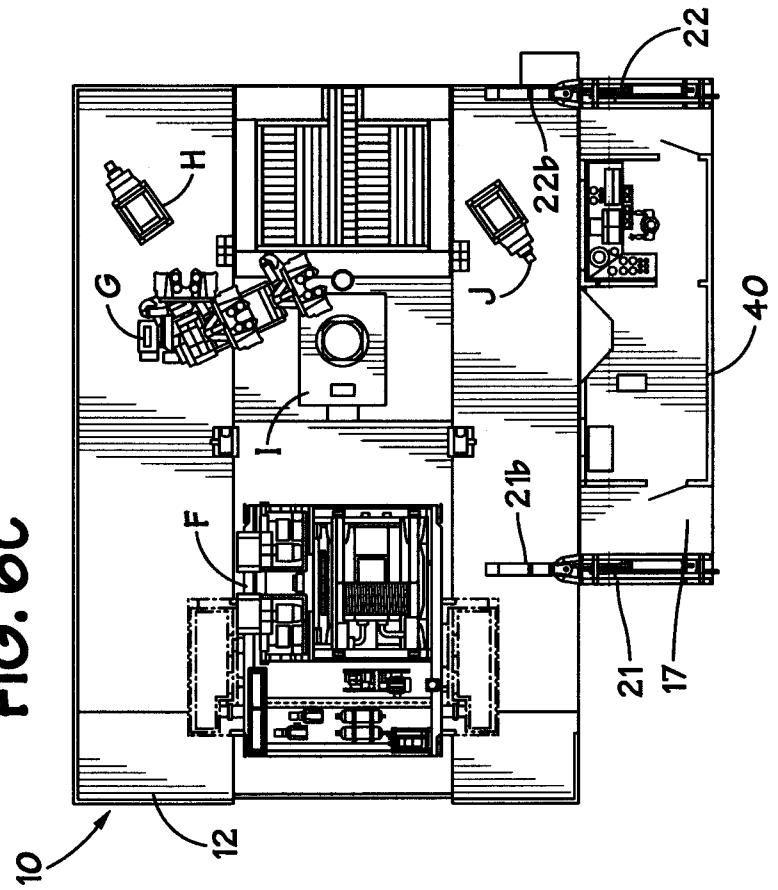


FIG. 6D

FIG. 7A

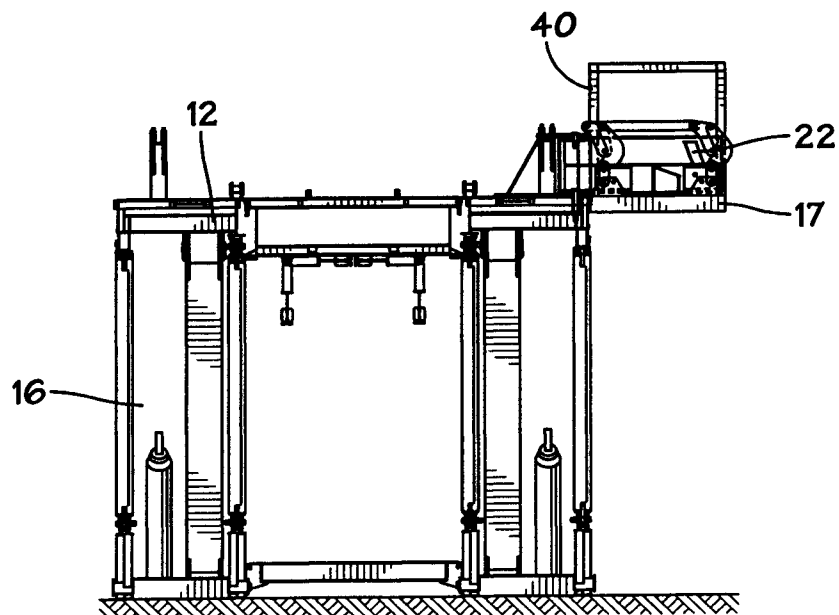
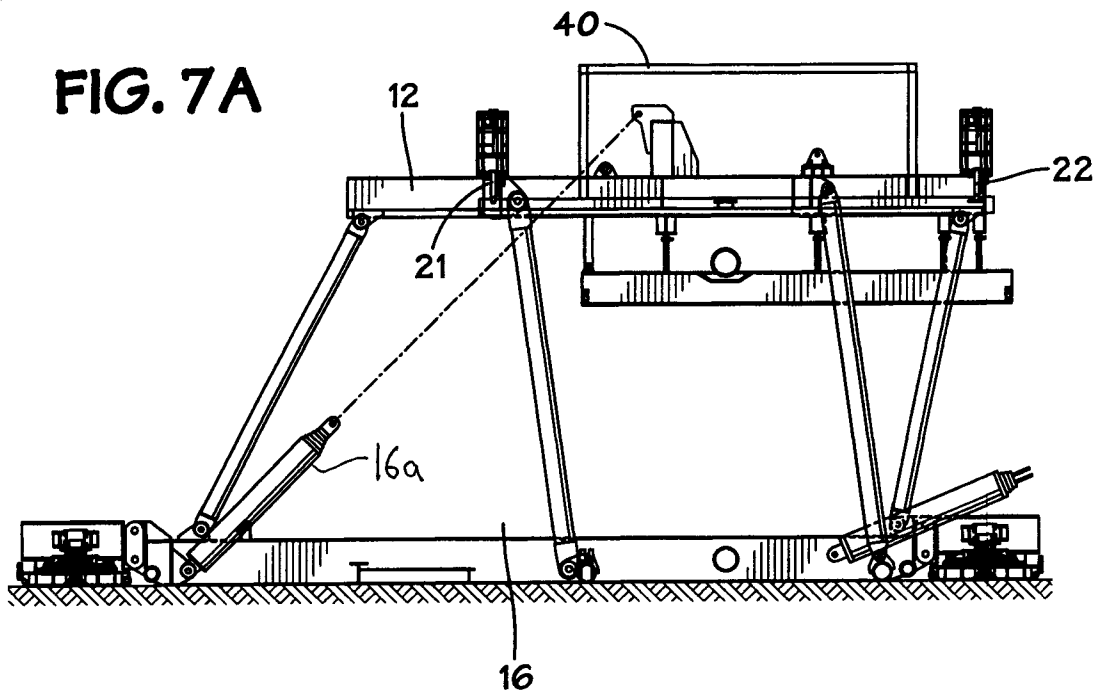


FIG. 7B

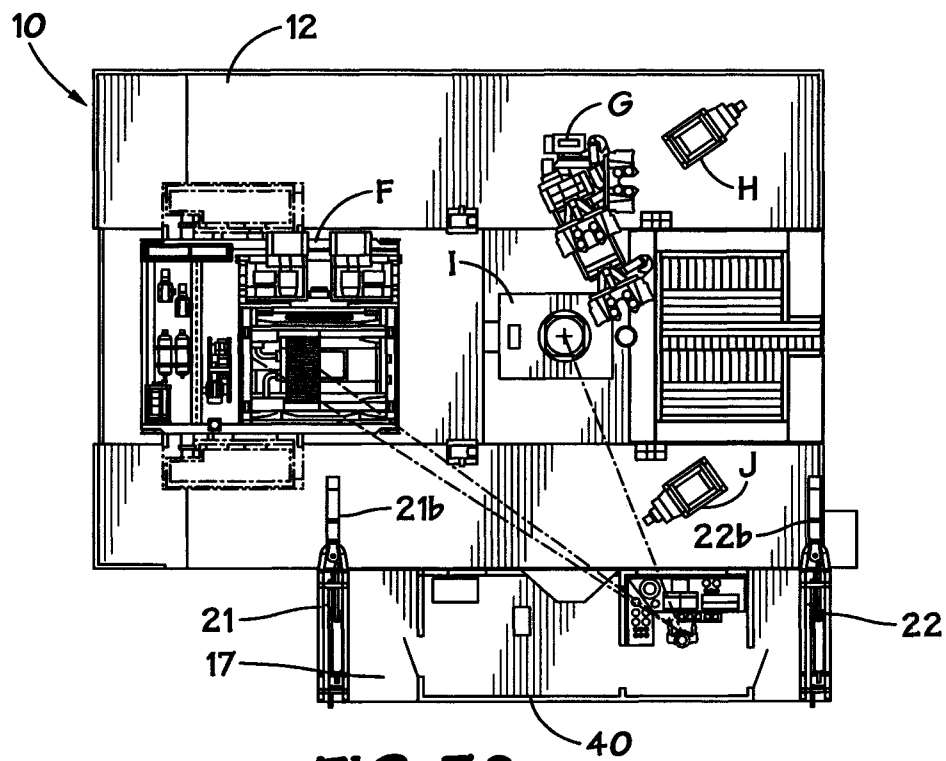


FIG. 7C

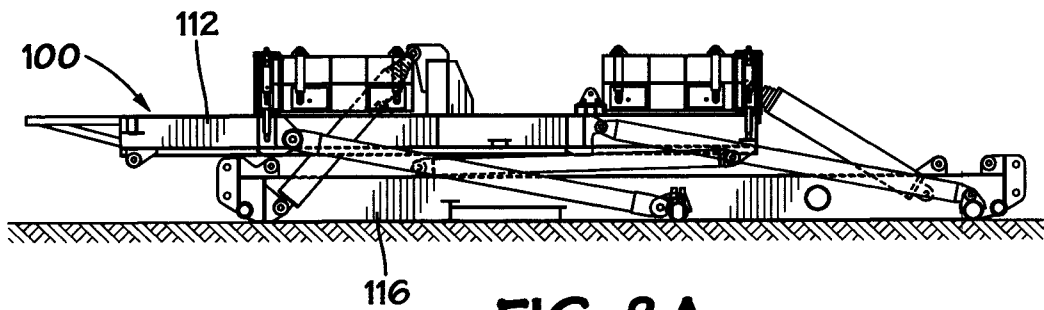


FIG. 8A

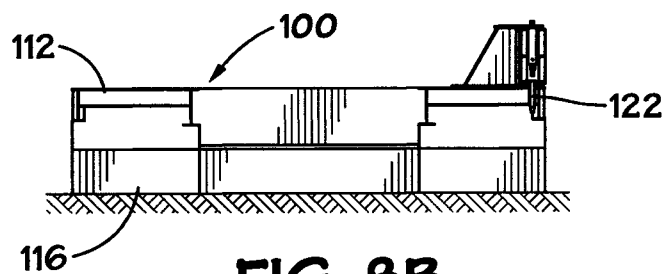


FIG. 8B

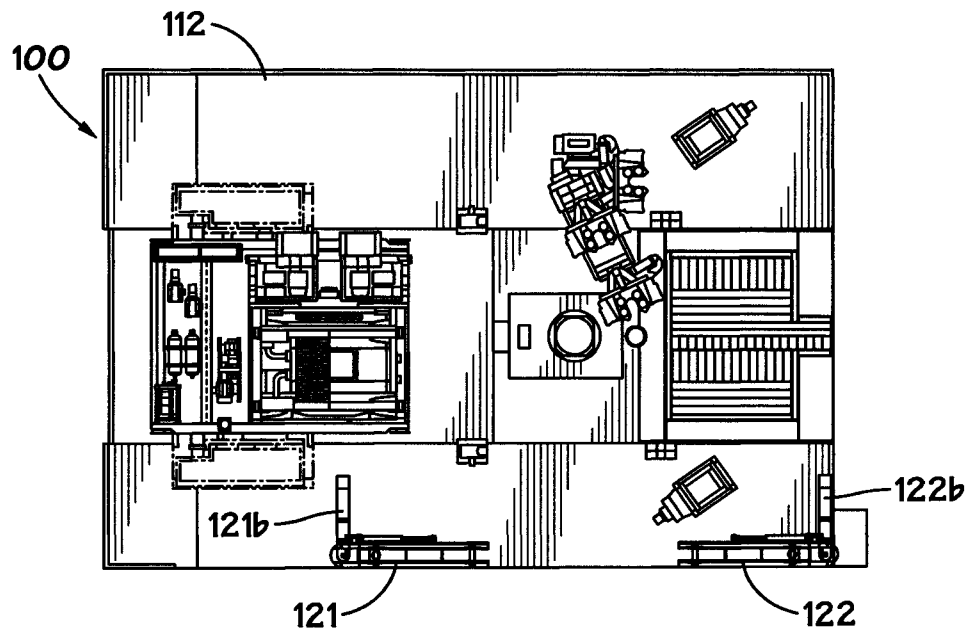


FIG. 8C

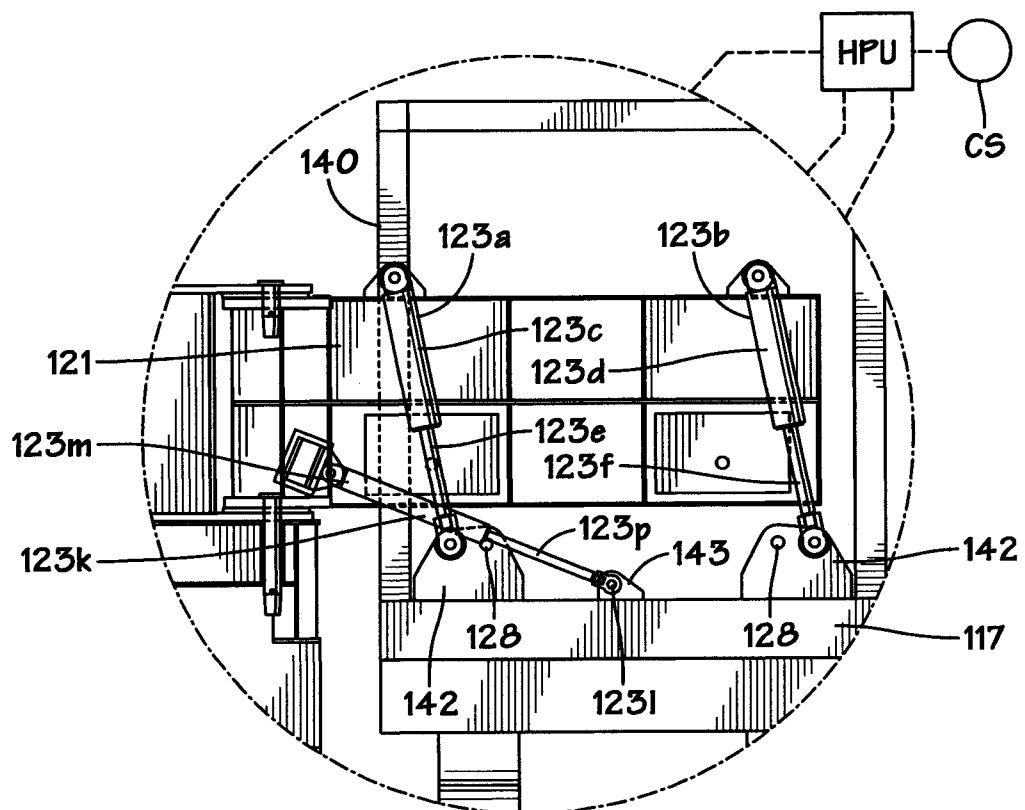
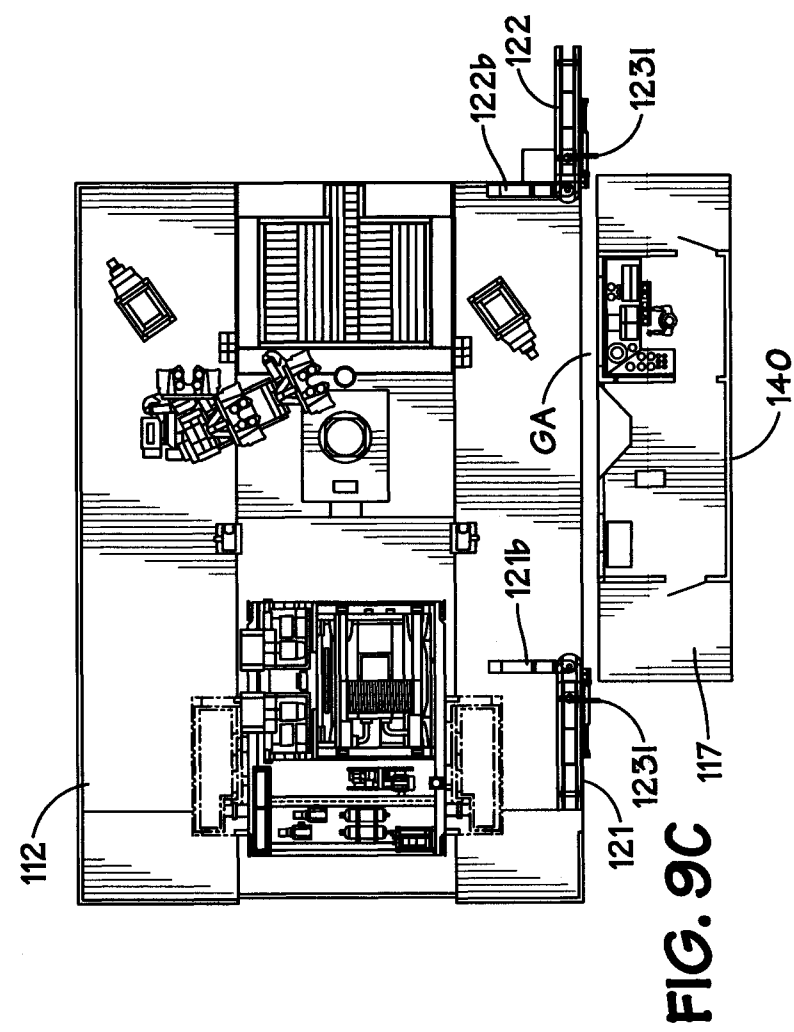
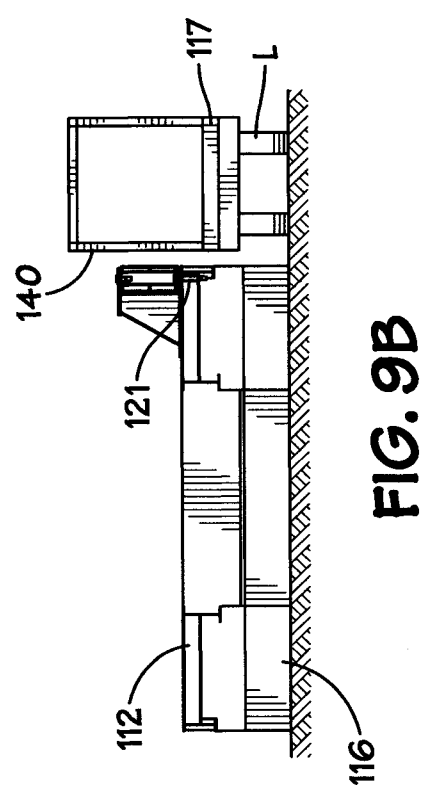
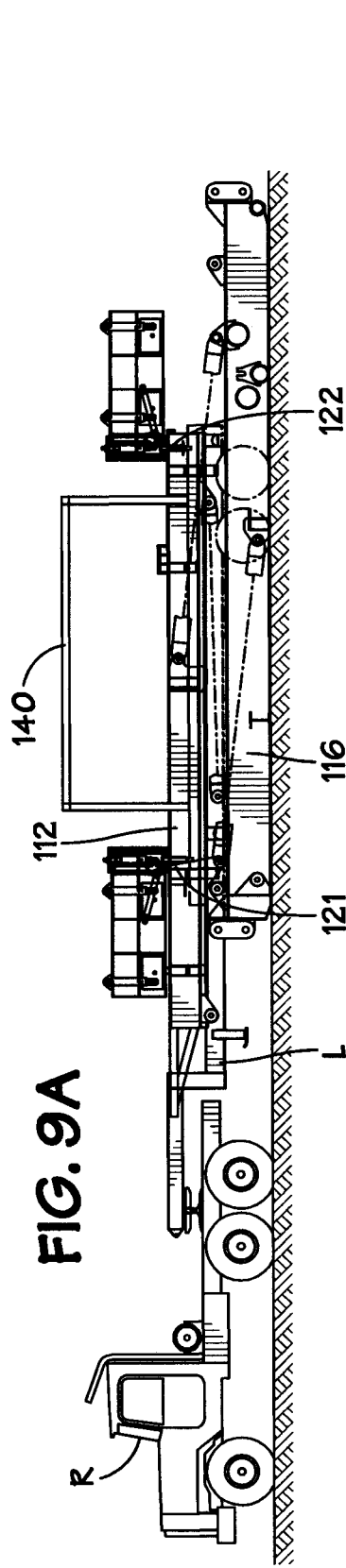
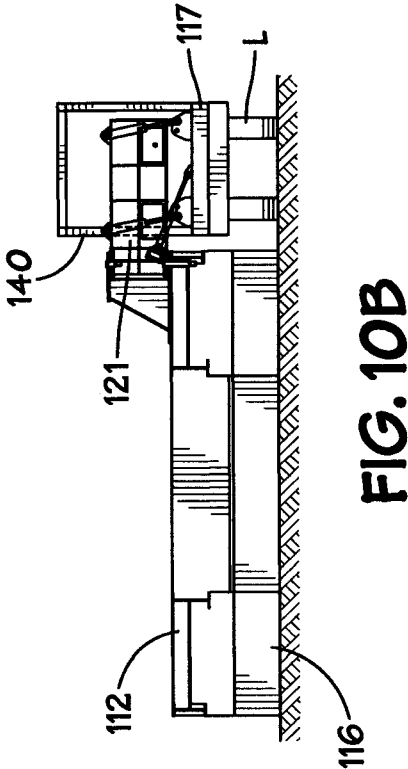
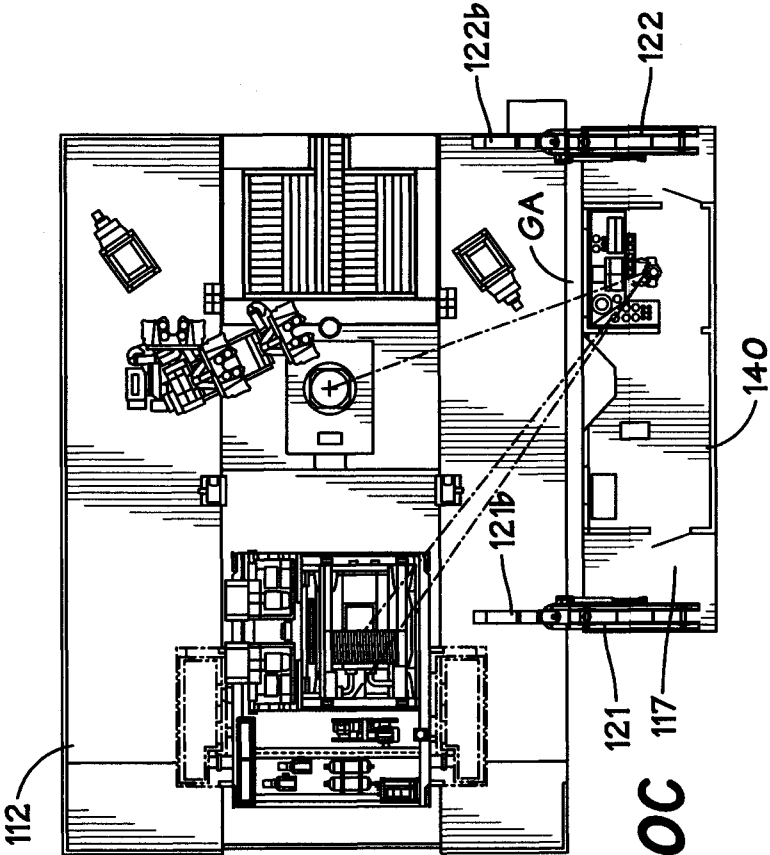
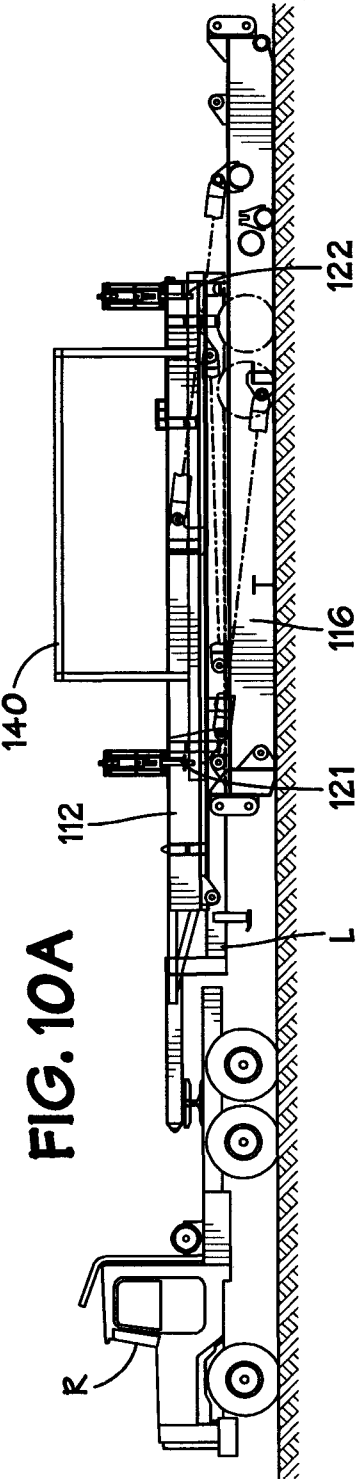
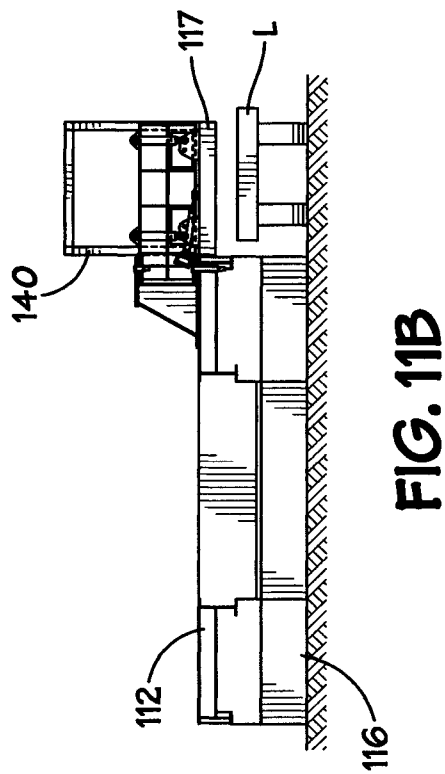
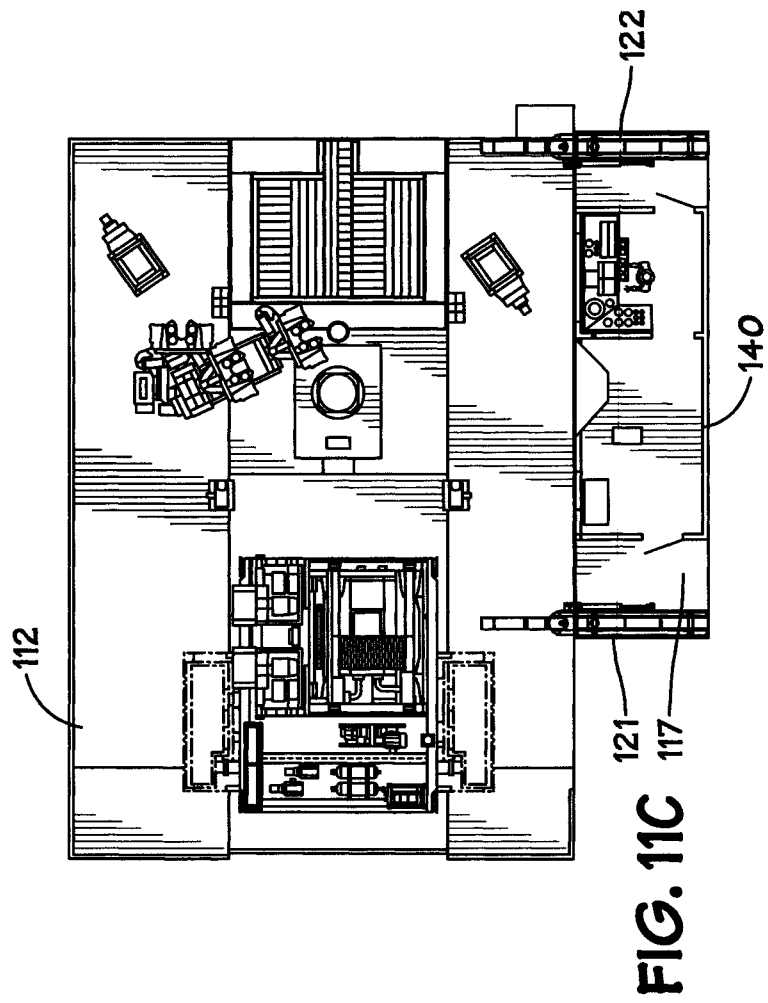
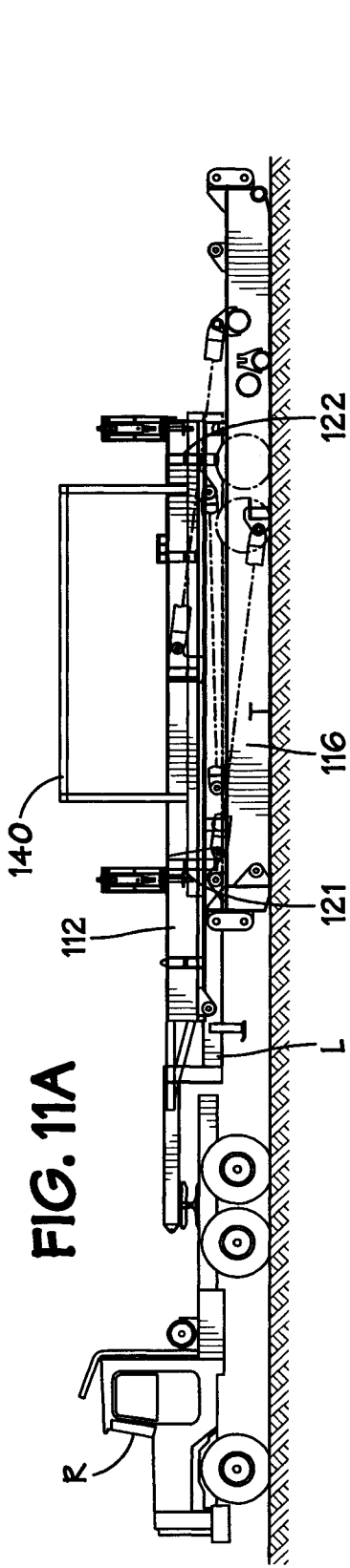


FIG. 8D







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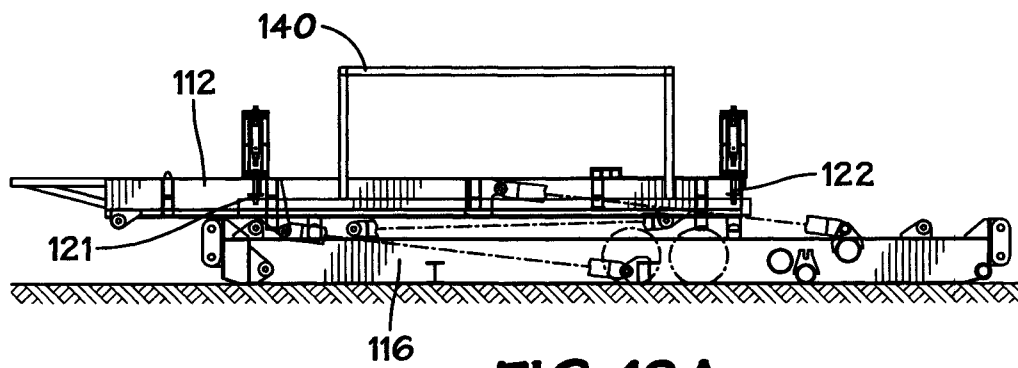


FIG. 12A

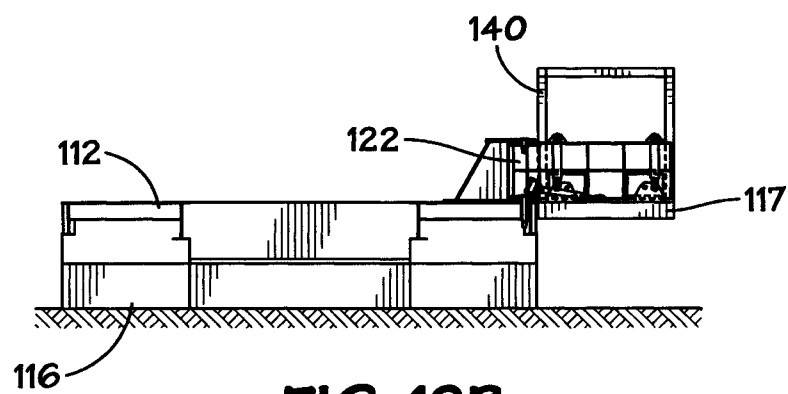


FIG. 12B

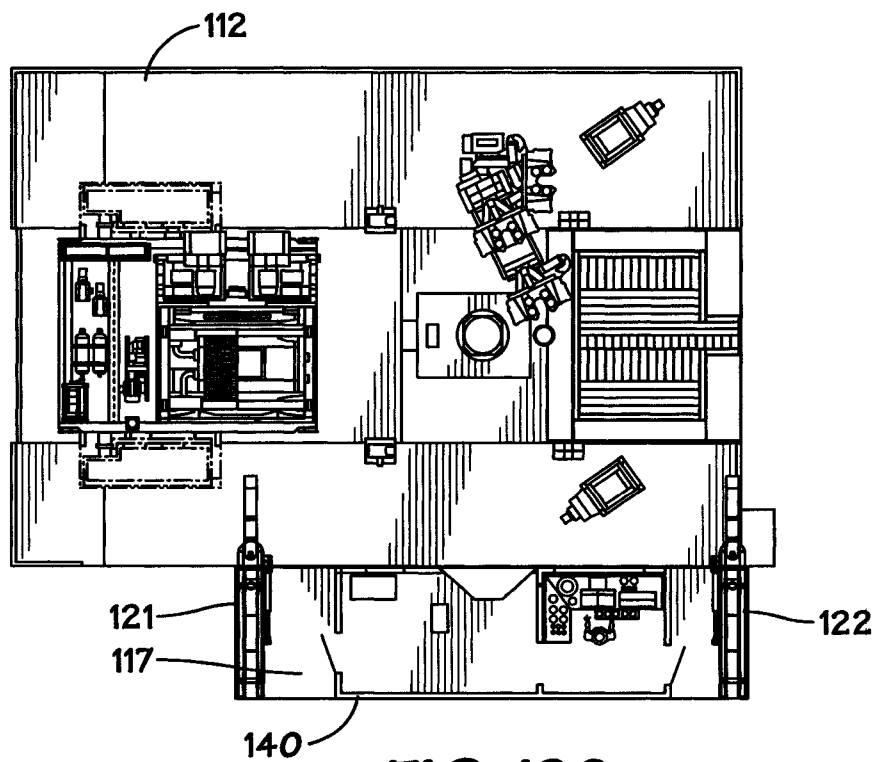


FIG. 12C

FIG. 13A

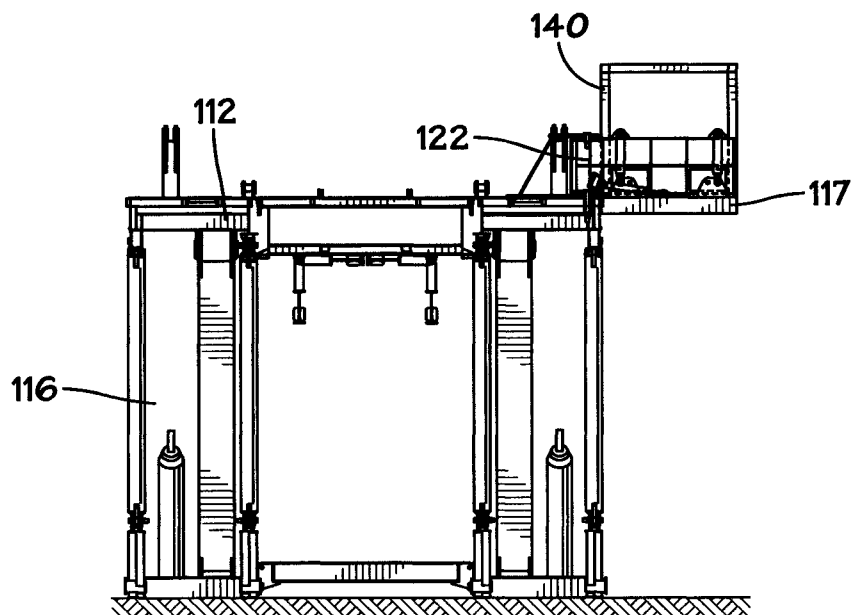
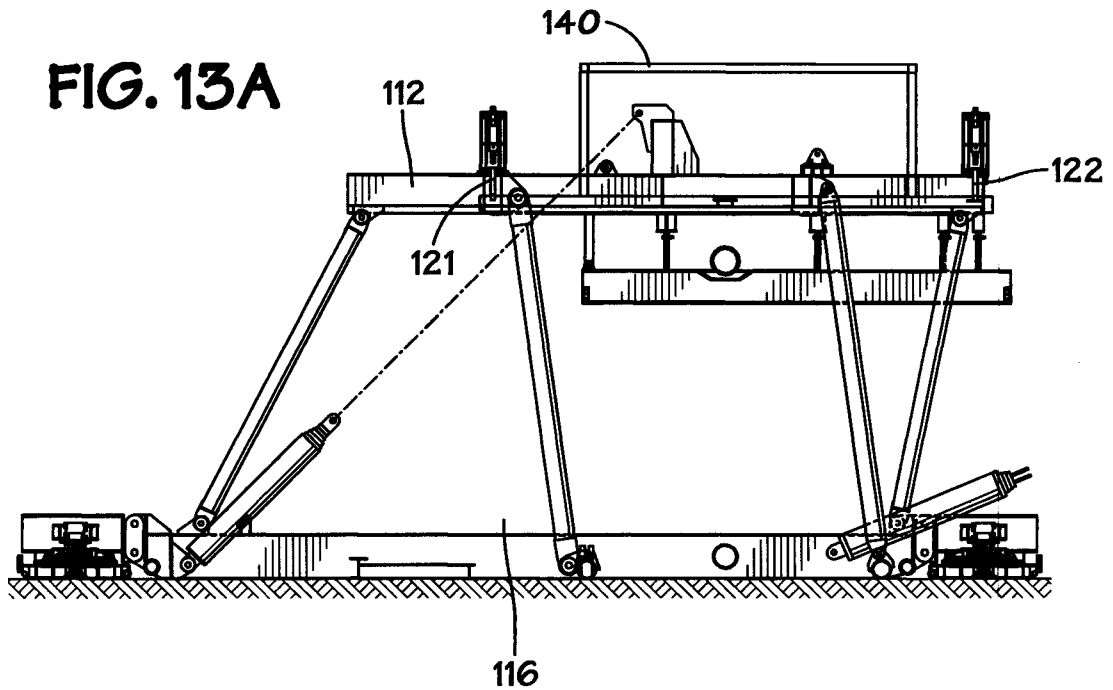


FIG. 13B

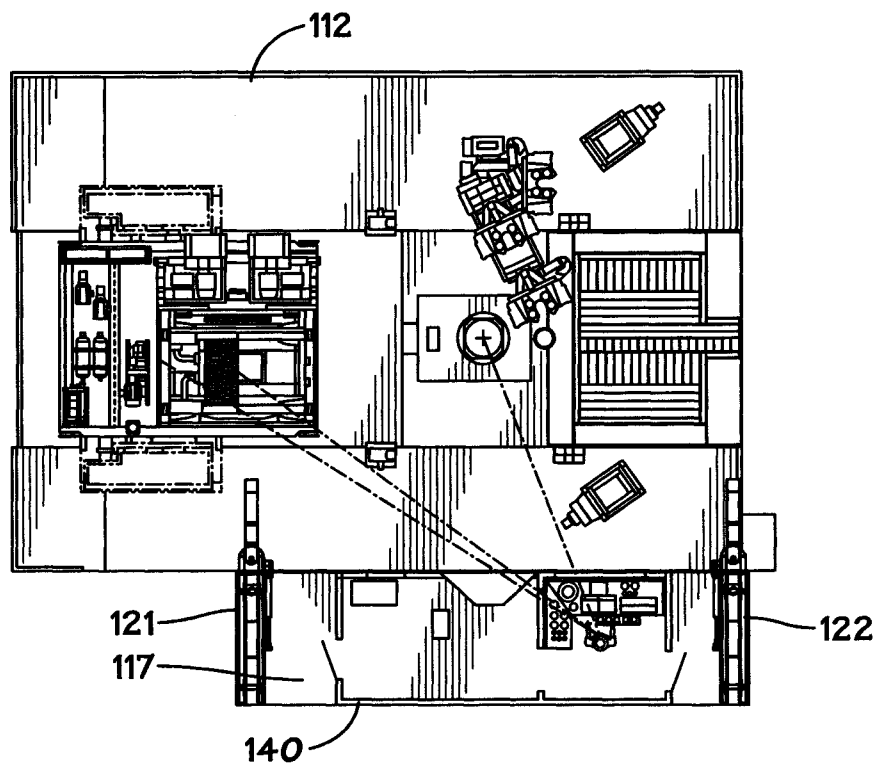


FIG. 13C