US 20020009346A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2002/0009346 A1

HOLT et al. (43) Pub. Date: Jan. 24, 2002

(54) CARGO LASH TO BAR

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(*) Notice: This is a publication of a continued prosecution application (CPA) filed under 37 CFR 1.53(d).

(21) Appl. No.: 09/231,267

(22) Filed: Jan. 15, 1999

Related U.S. Application Data

(63) Non-provisional of provisional application No. 60/071,648, filed on Jan. 16, 1998.

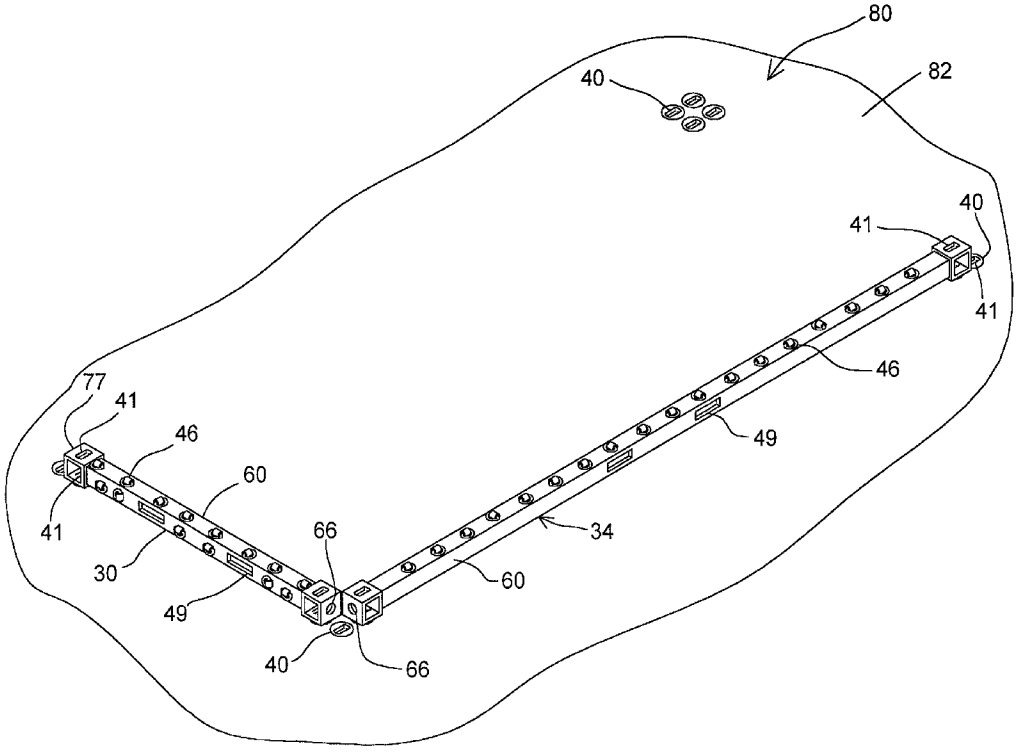
Publication Classification

(51) Int. Cl.[7] B60P 1/64

(52) U.S. Cl. 410/94

(57) ABSTRACT

A beam which is a cargo lash to bar for connecting mobile equipment and other cargo to the deck of a roll on-roll off ship, which is a with multiple D-rings and apertures along its length for lashing to using twist lock connection.



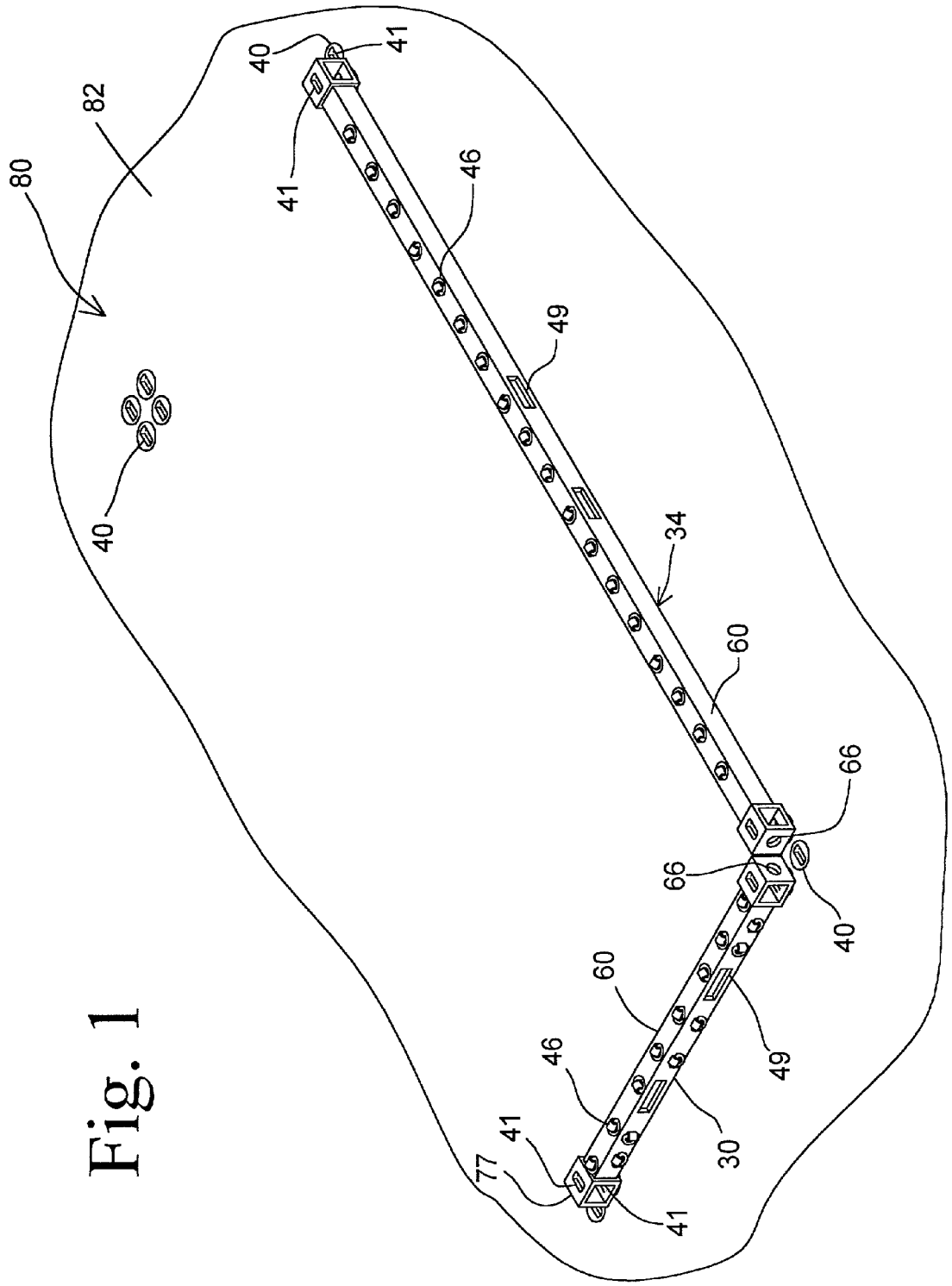


Fig. 1

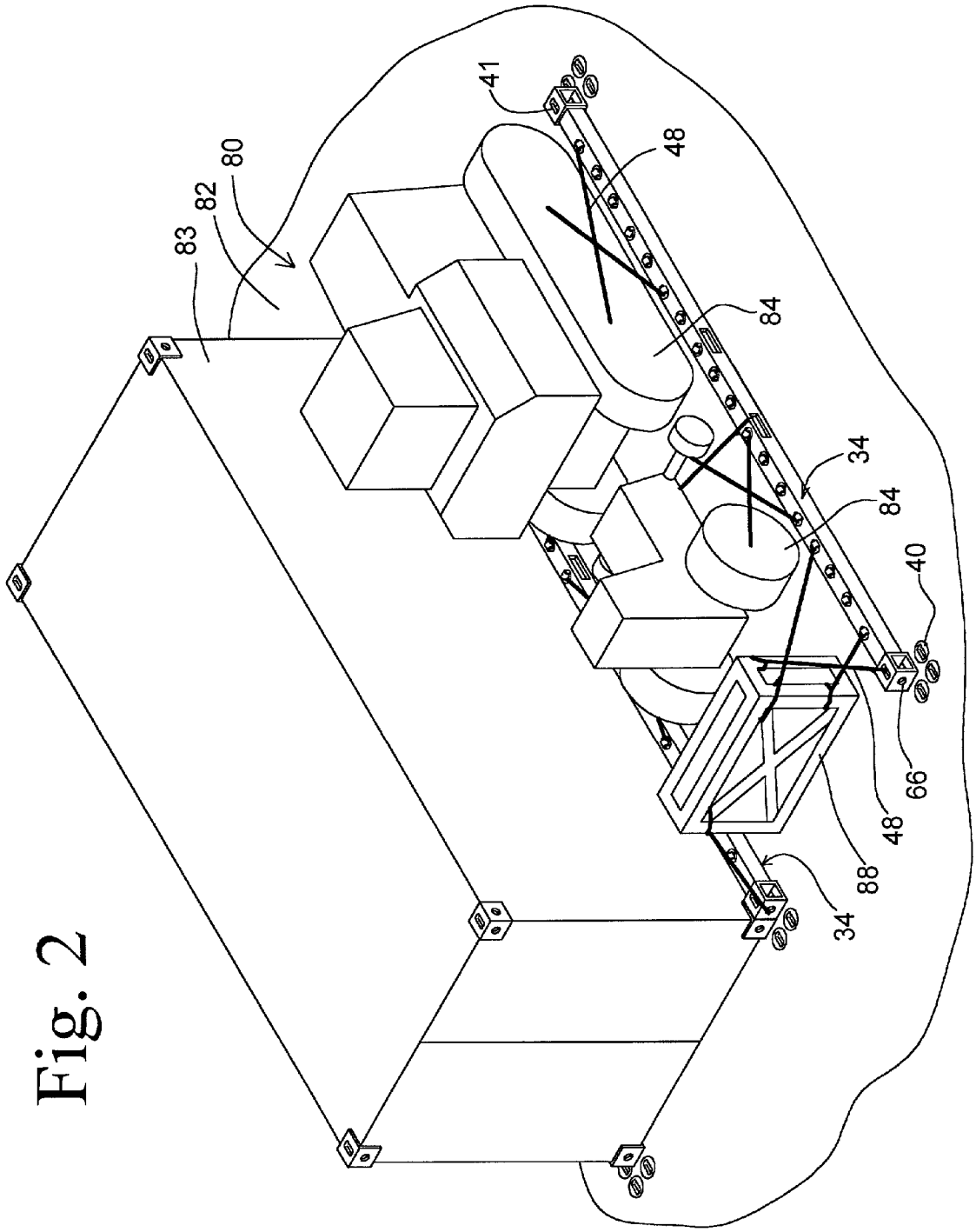


Fig. 2

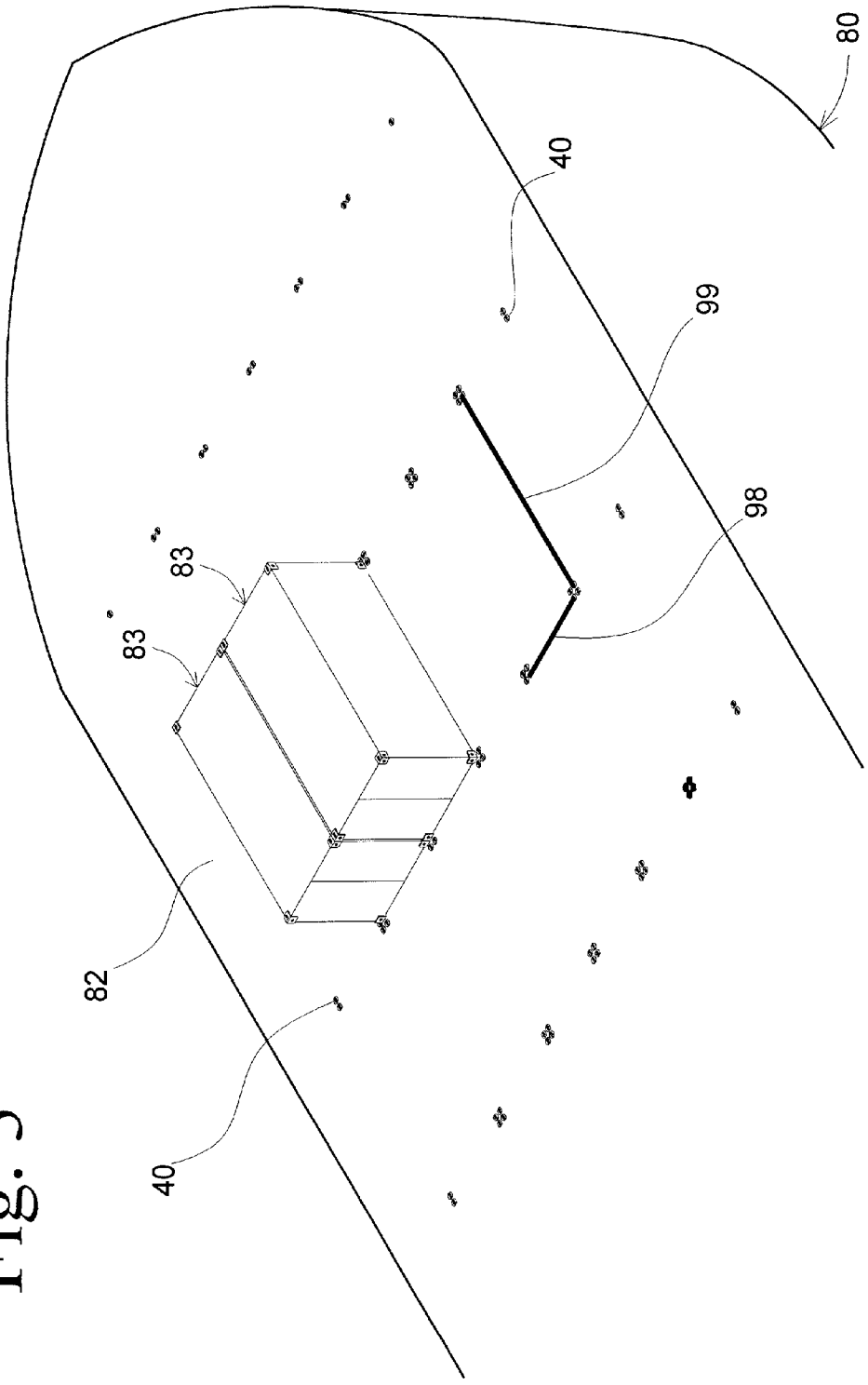


Fig. 3

Fig. 4A

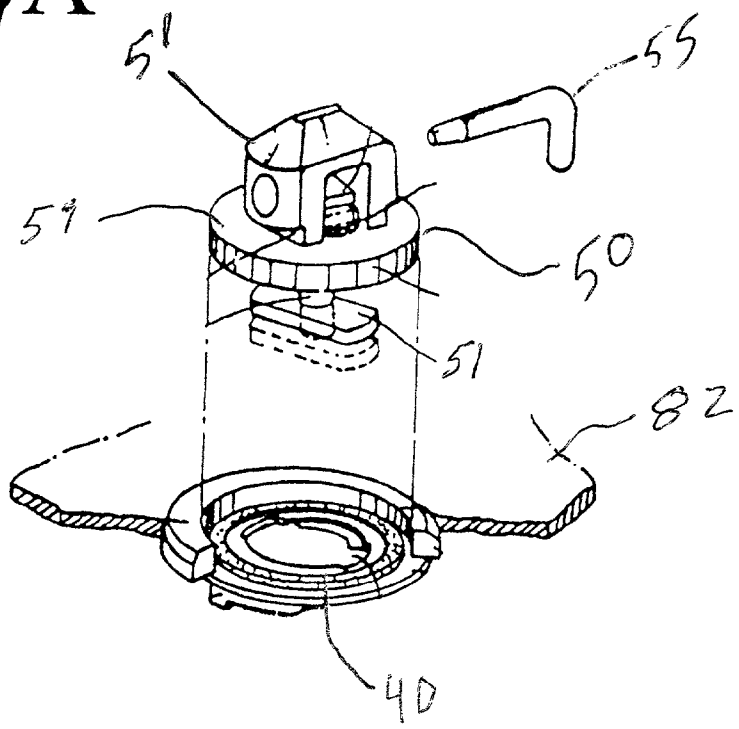


Fig. 4B

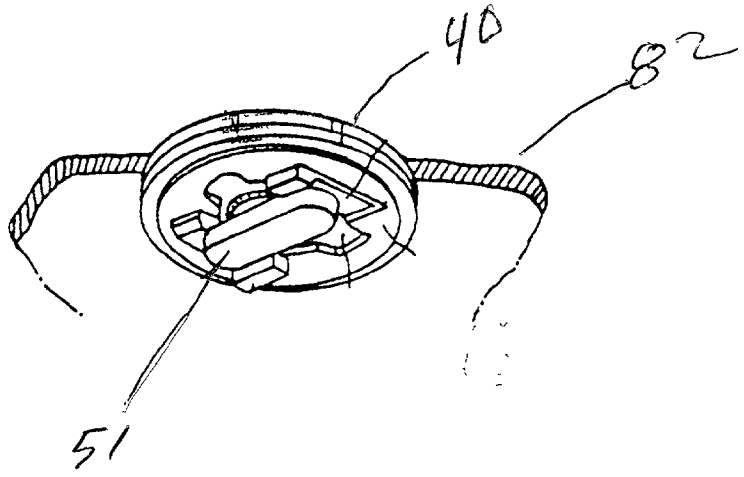


Fig. 5

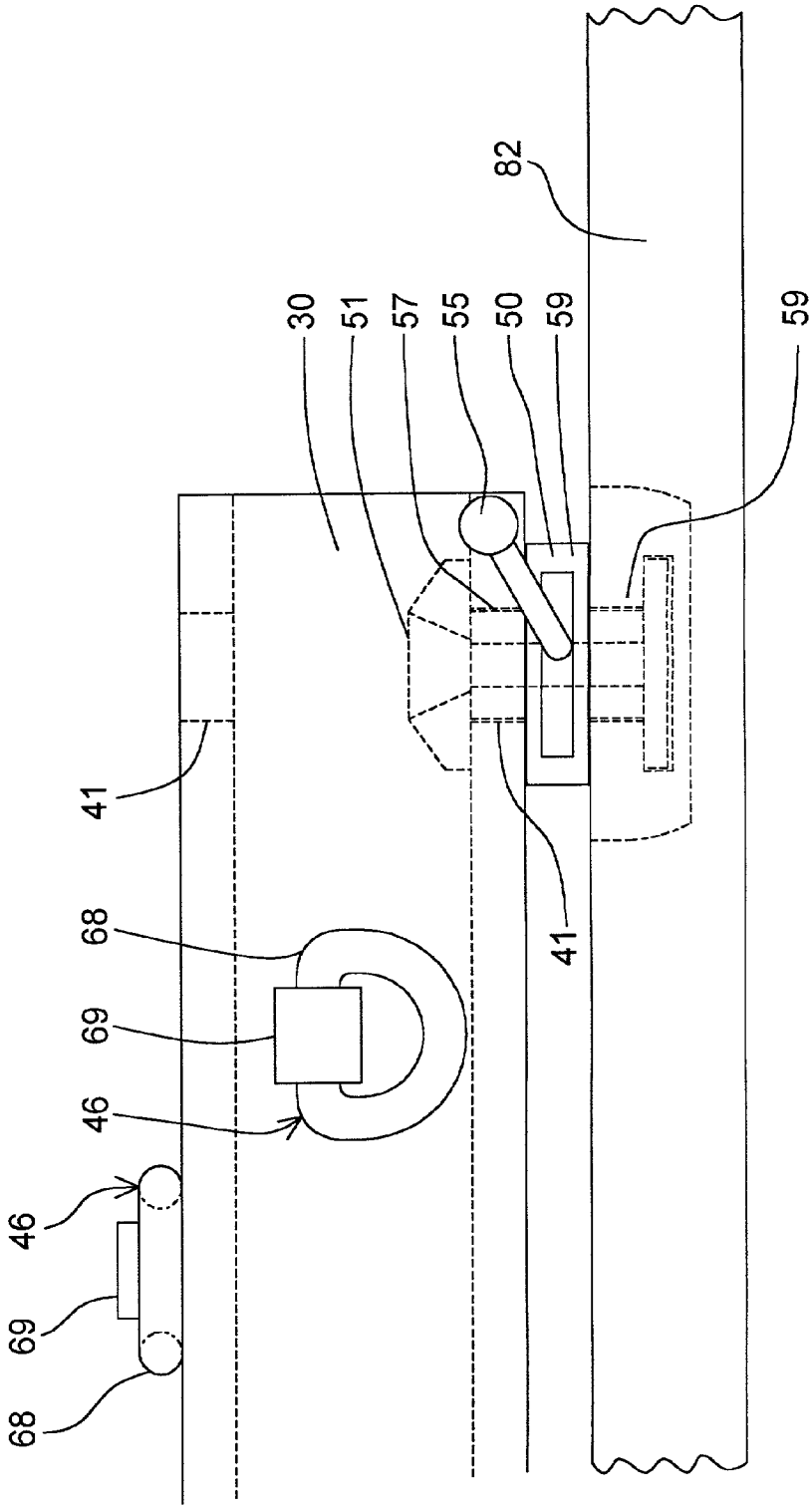
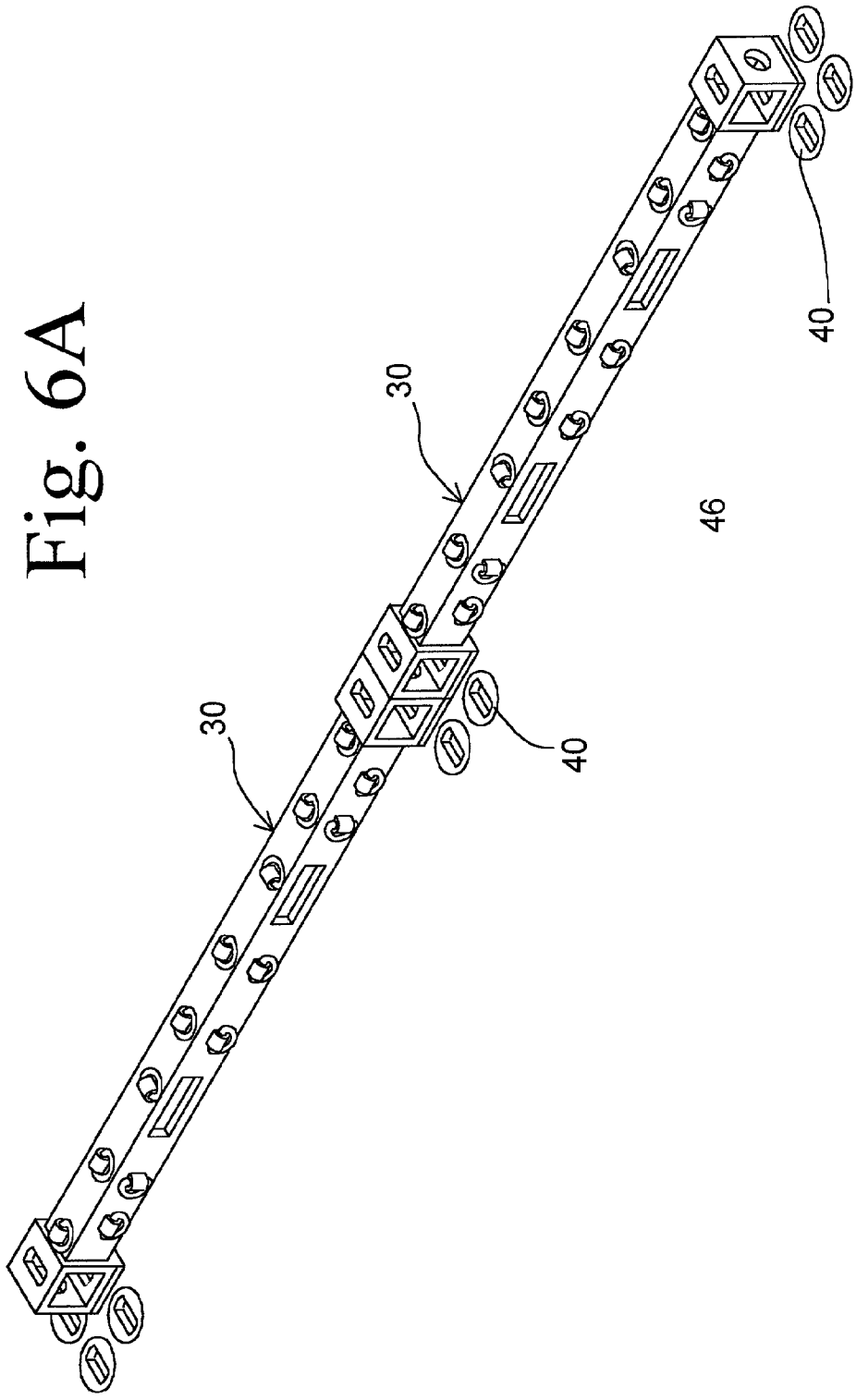


Fig. 6A



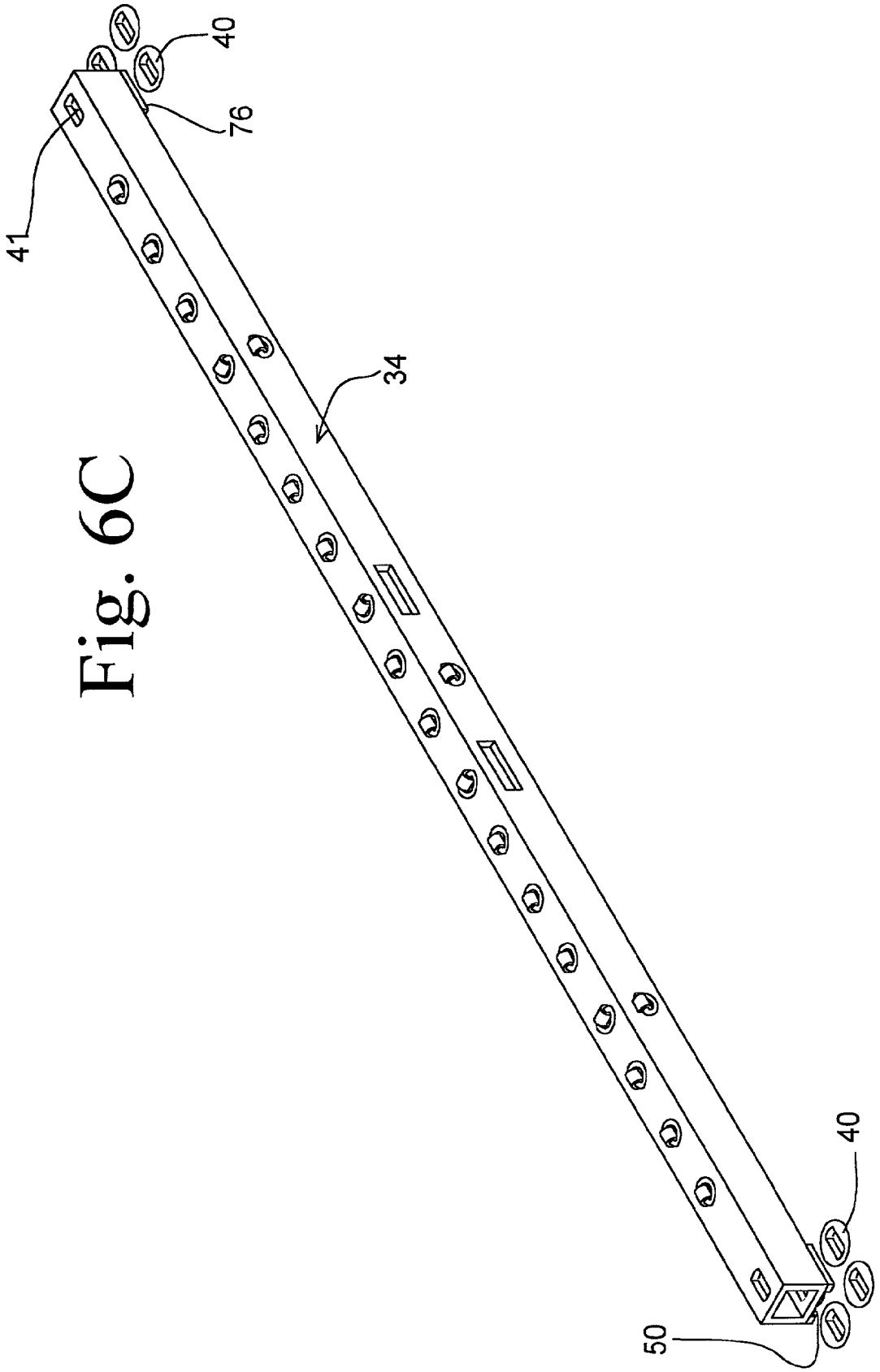


Fig. 6C

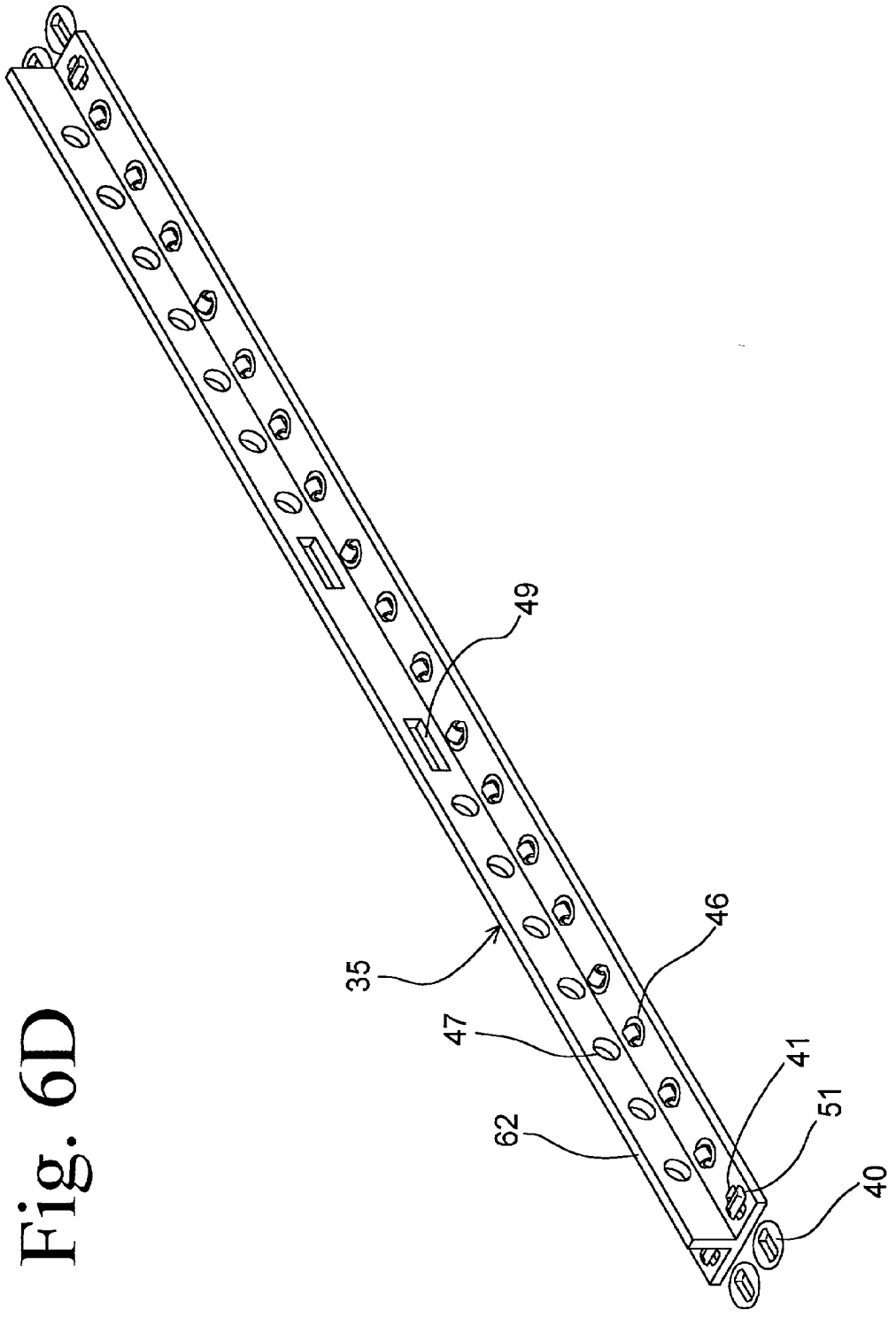
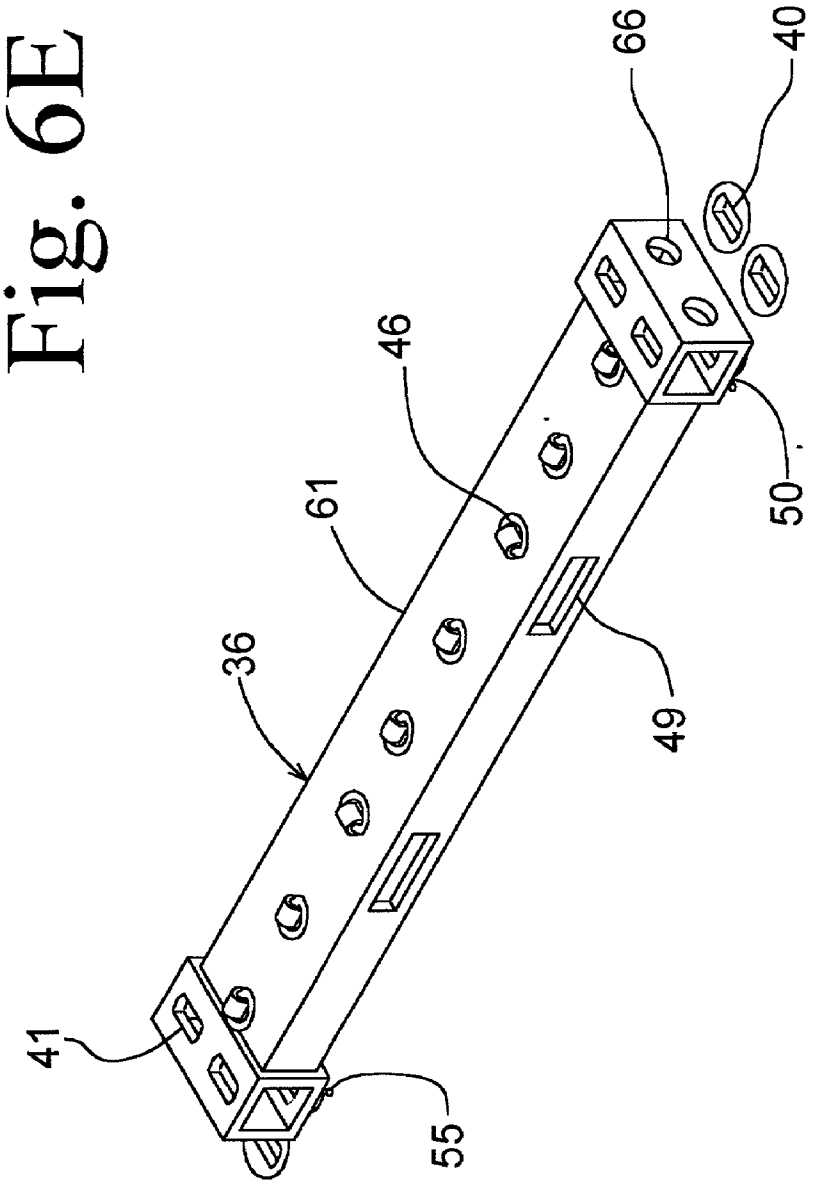


Fig. 6D

Fig. 6E



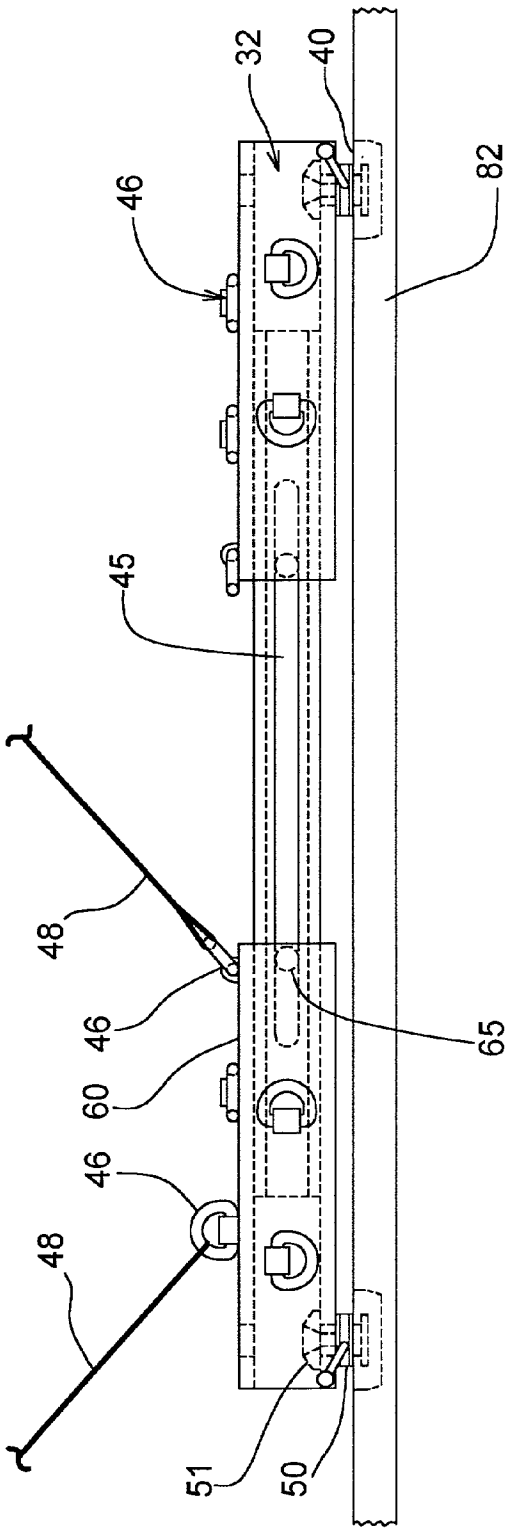


Fig. 6F

Fig. 7A

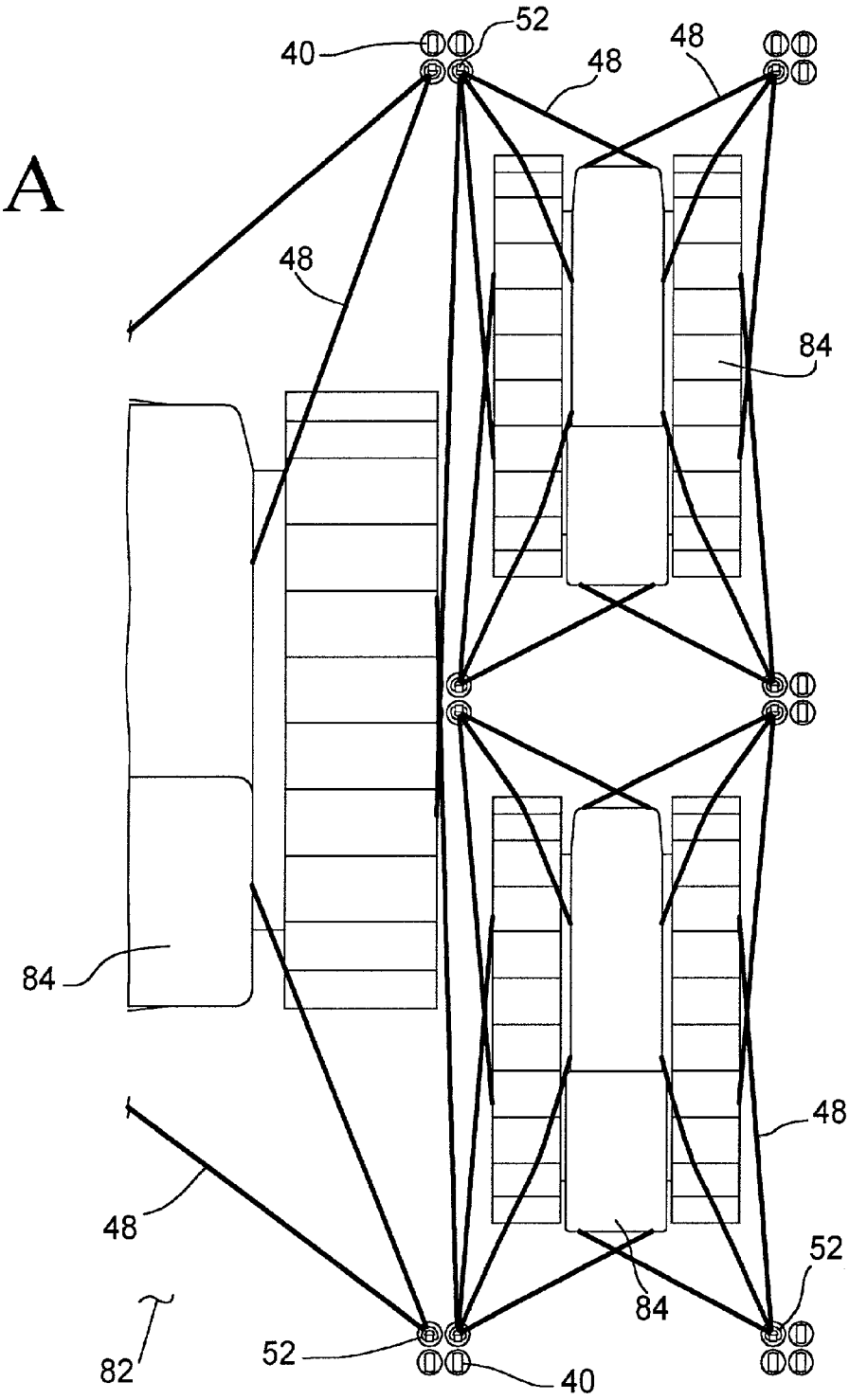
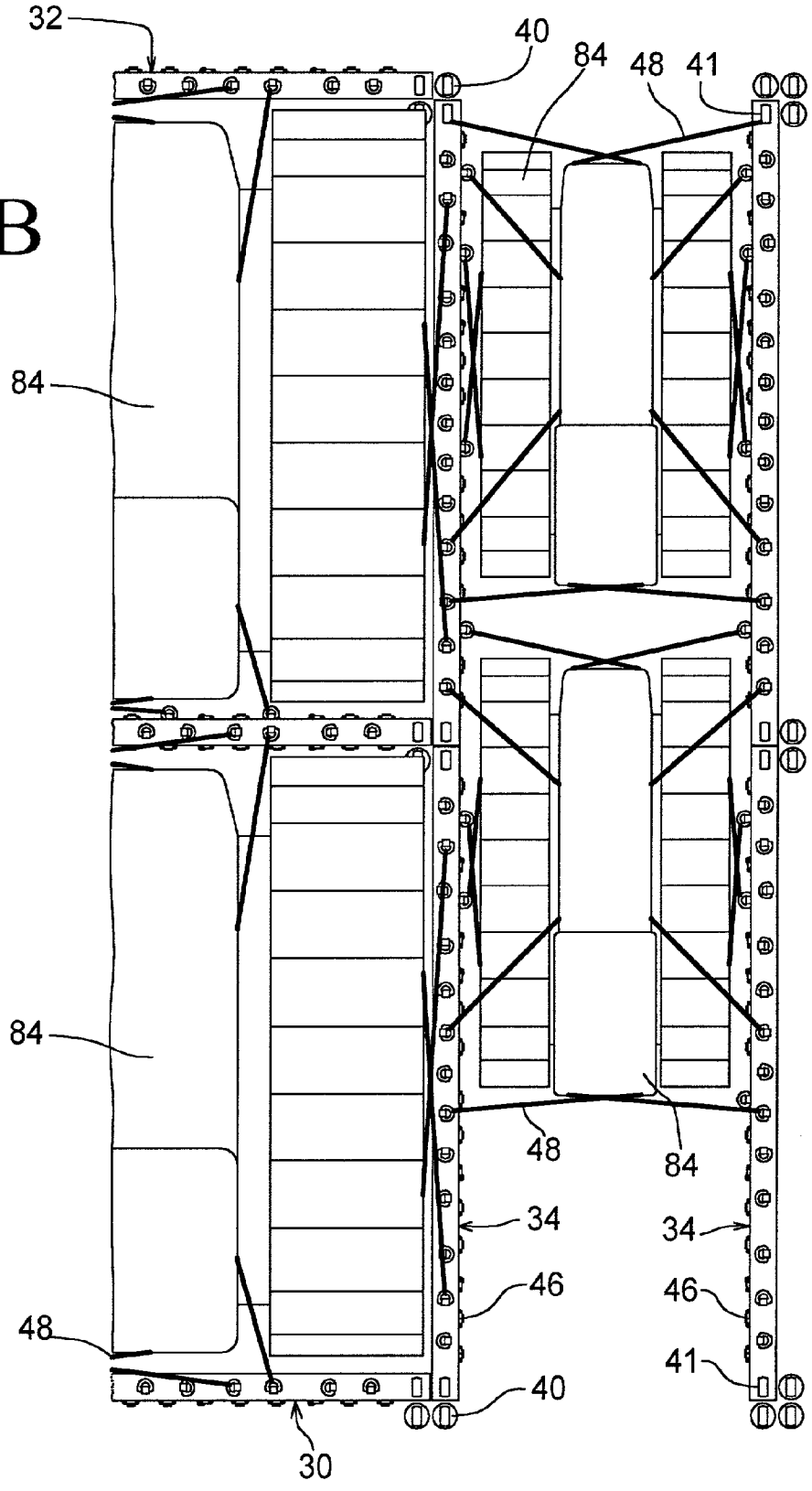


Fig. 7B



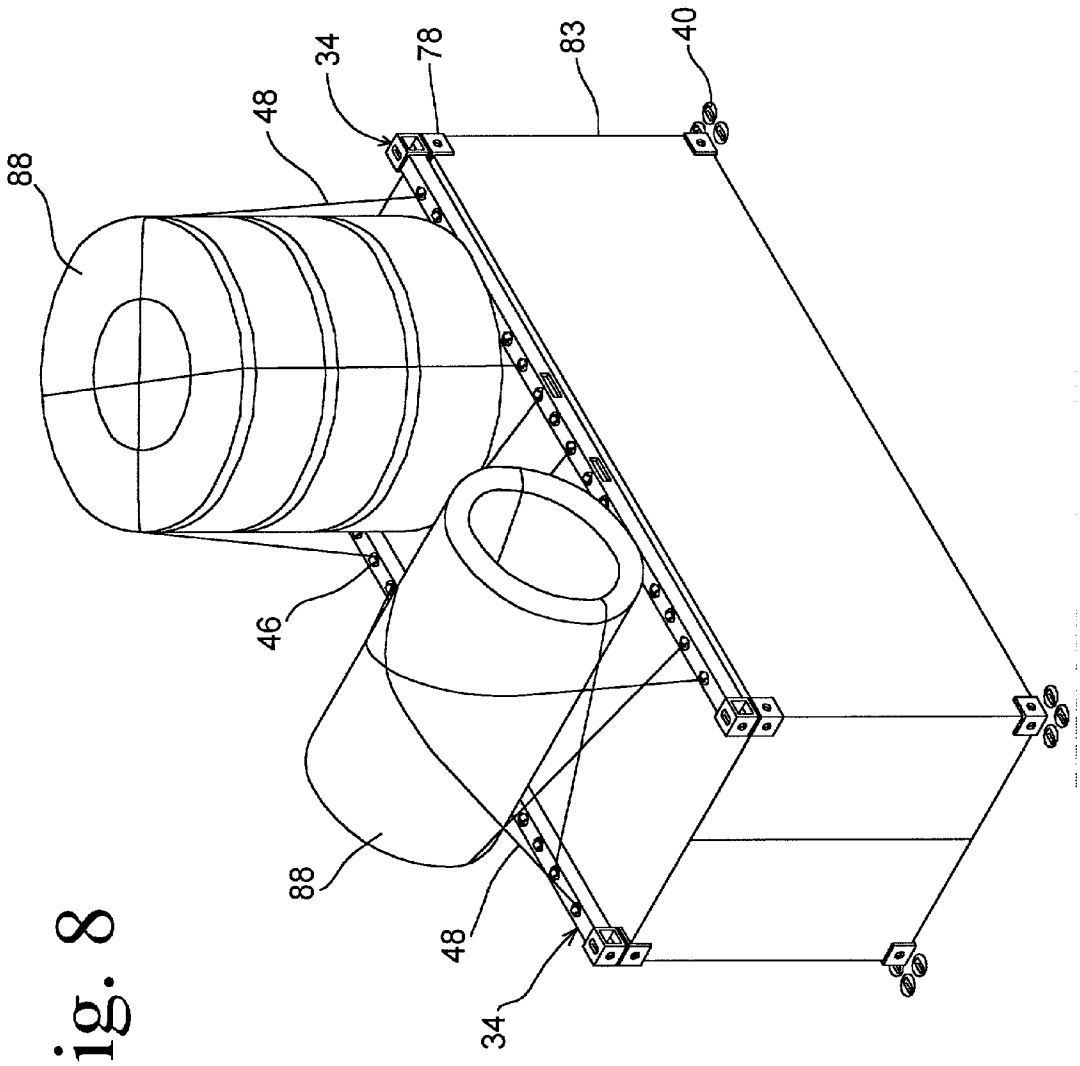


Fig. 8

Fig. 9

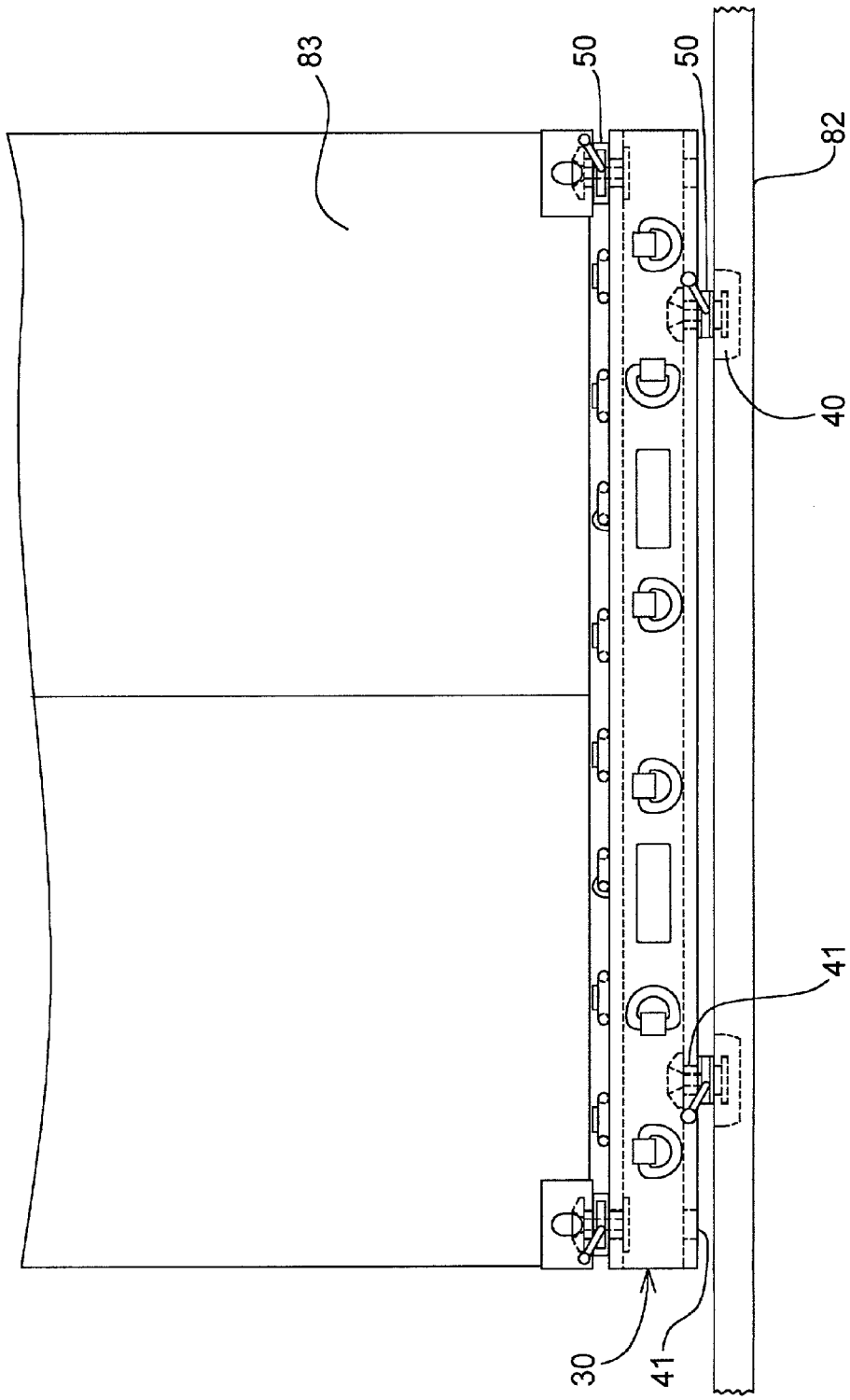


Fig. 10A

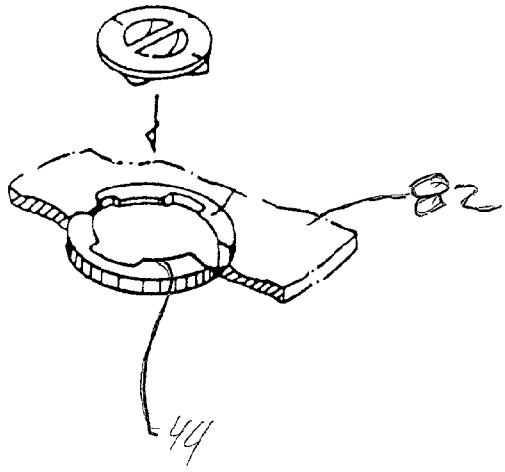
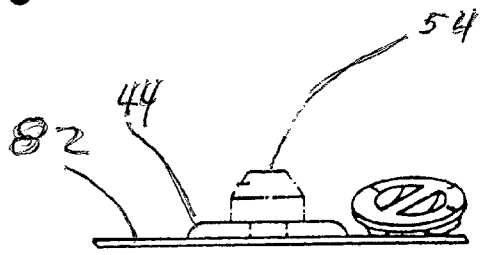


Fig. 10B



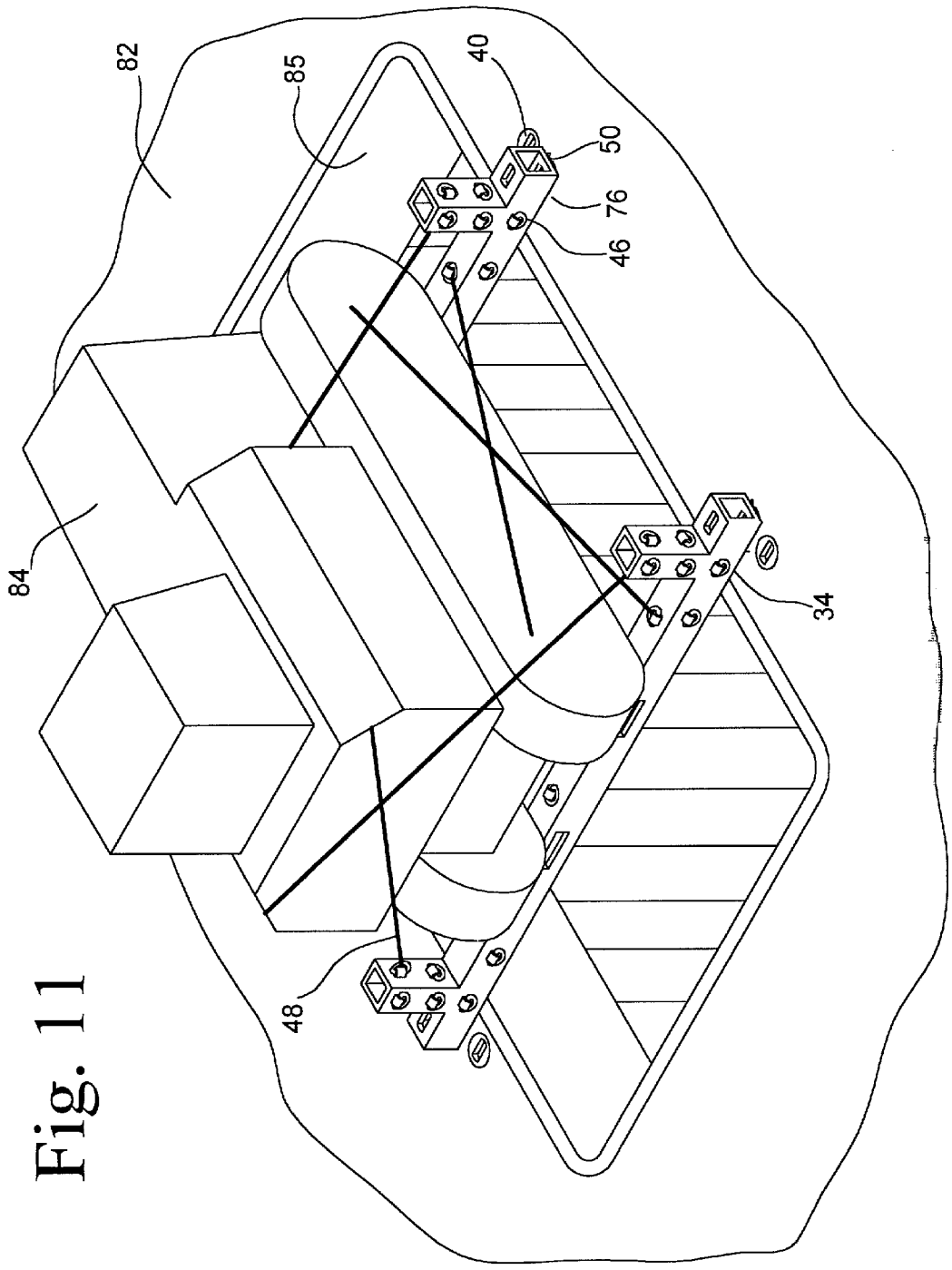


Fig. 11

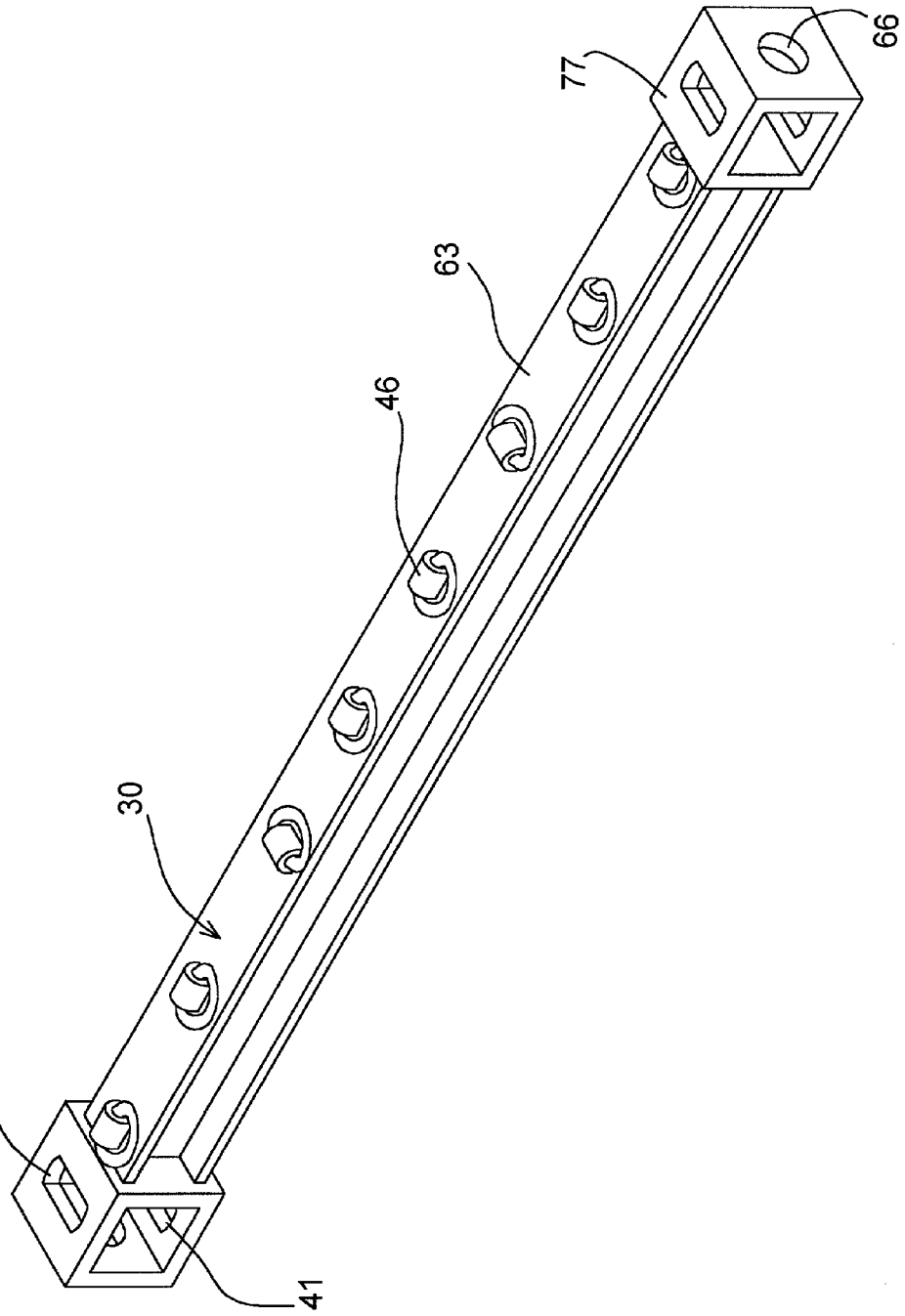


Fig. 12

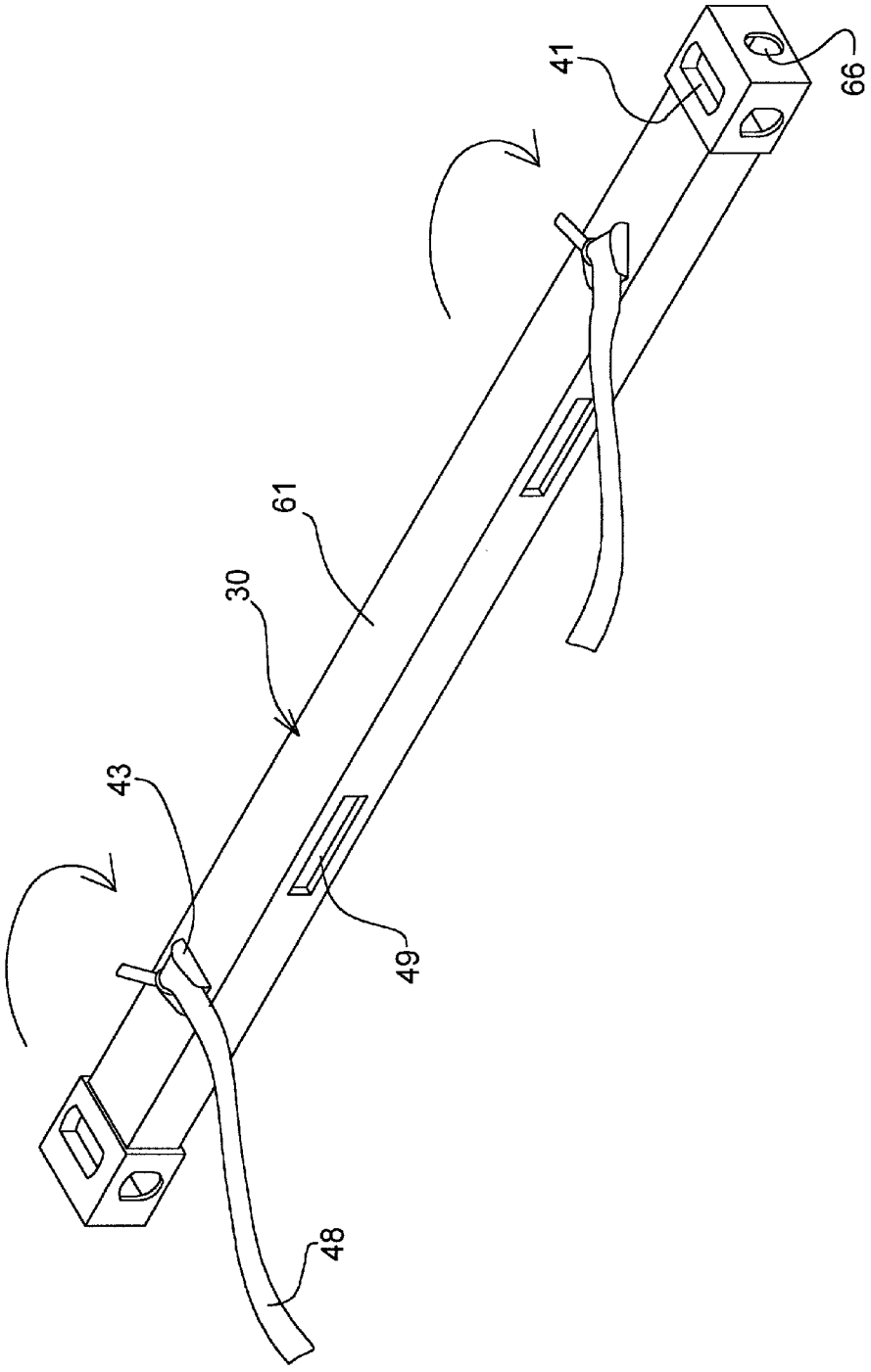


Fig. 13

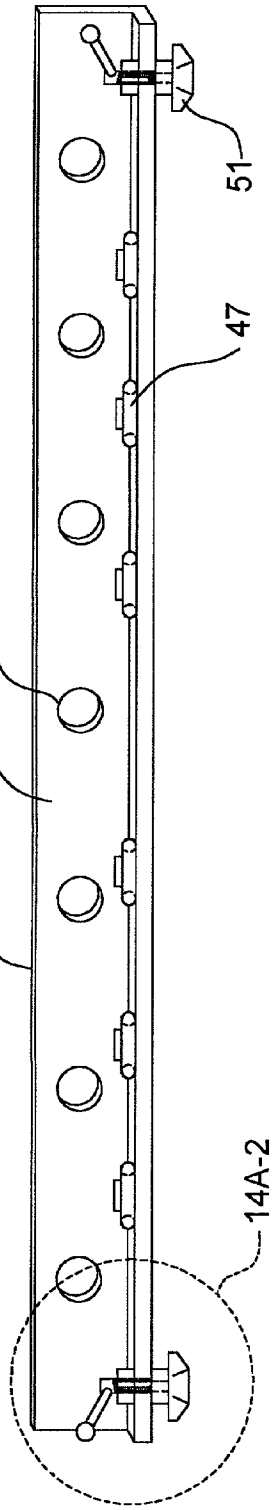


Fig. 14A

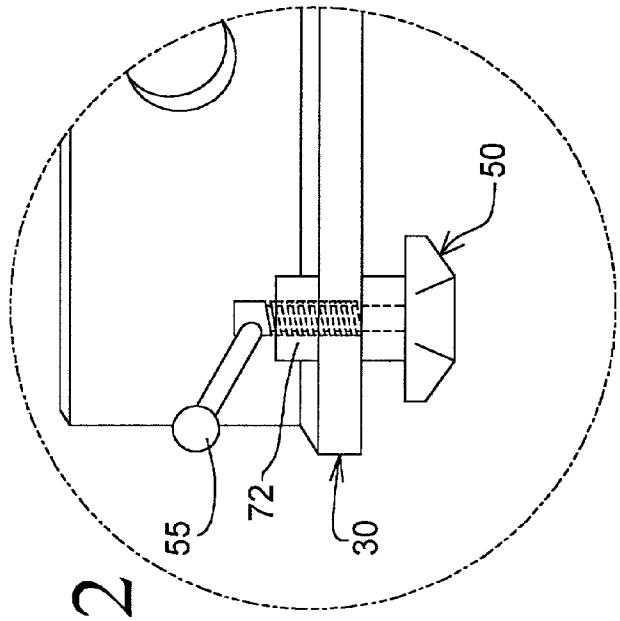


Fig. 14A-2

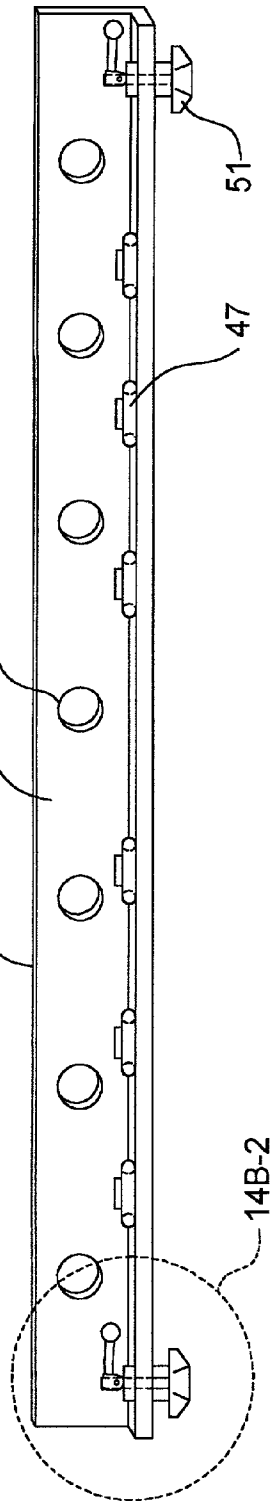


Fig. 14B

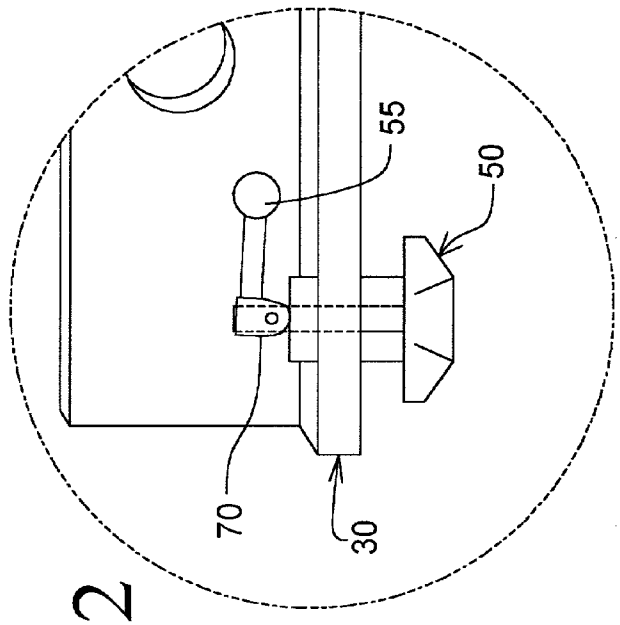


Fig. 14B-2

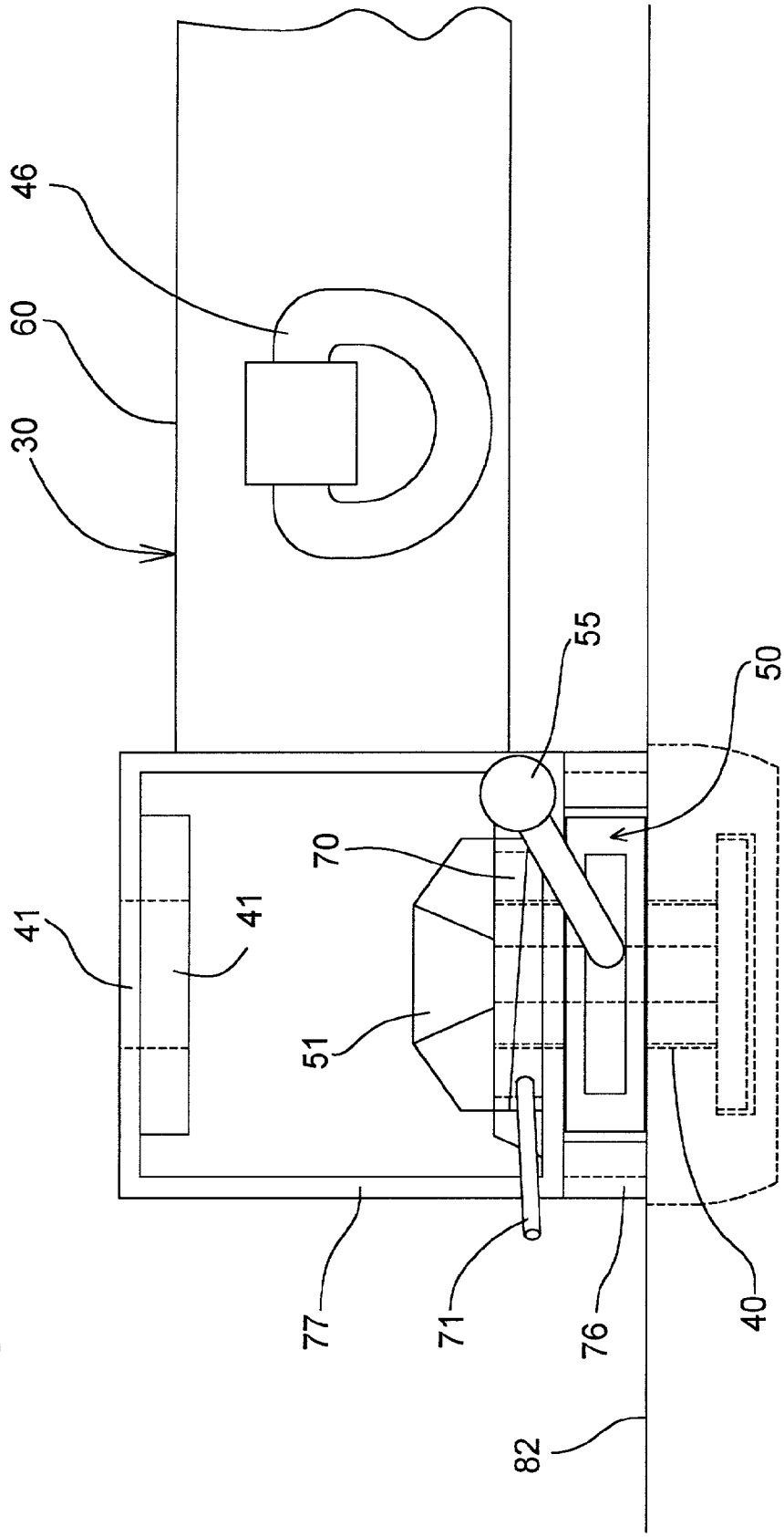


Fig. 15

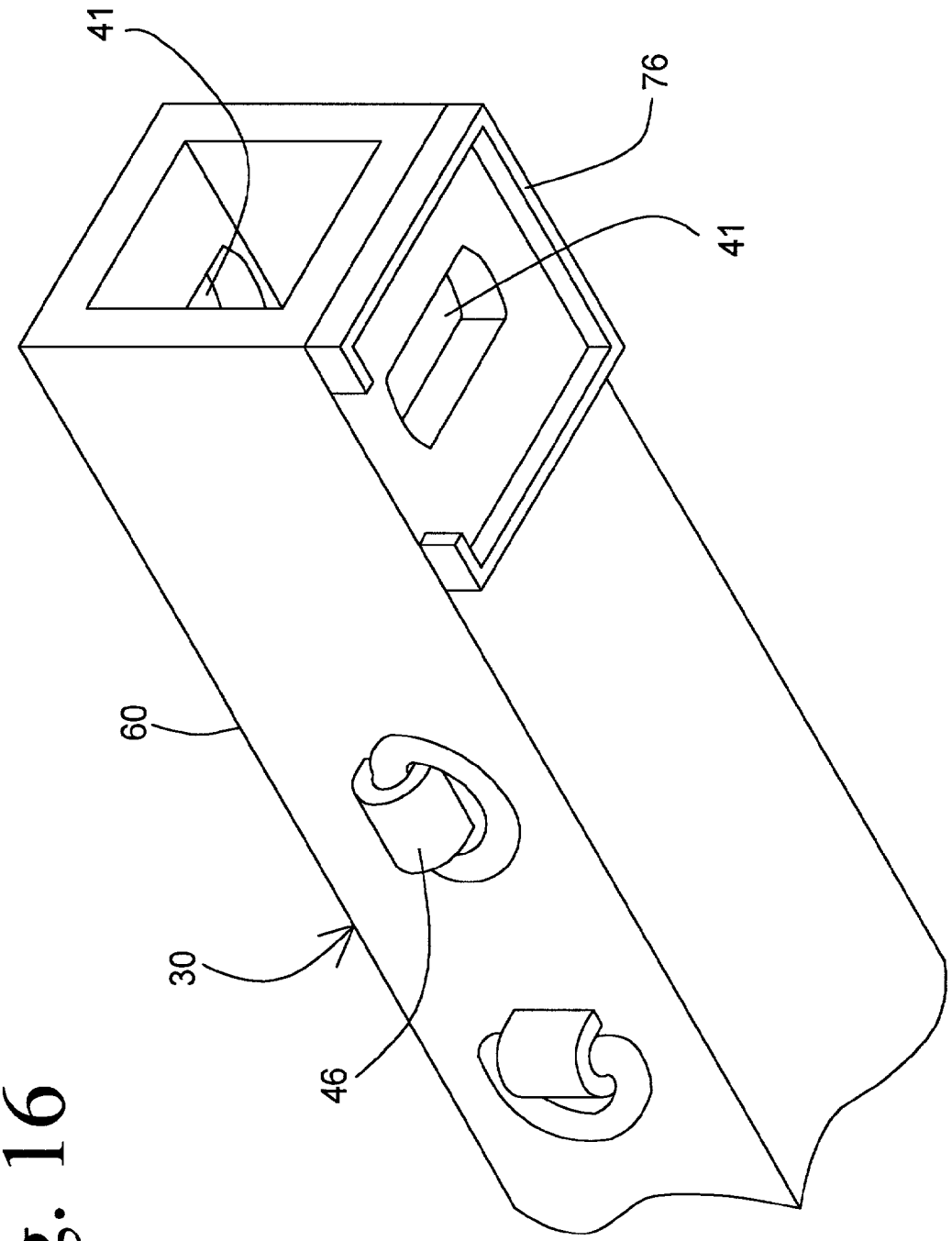


Fig. 16

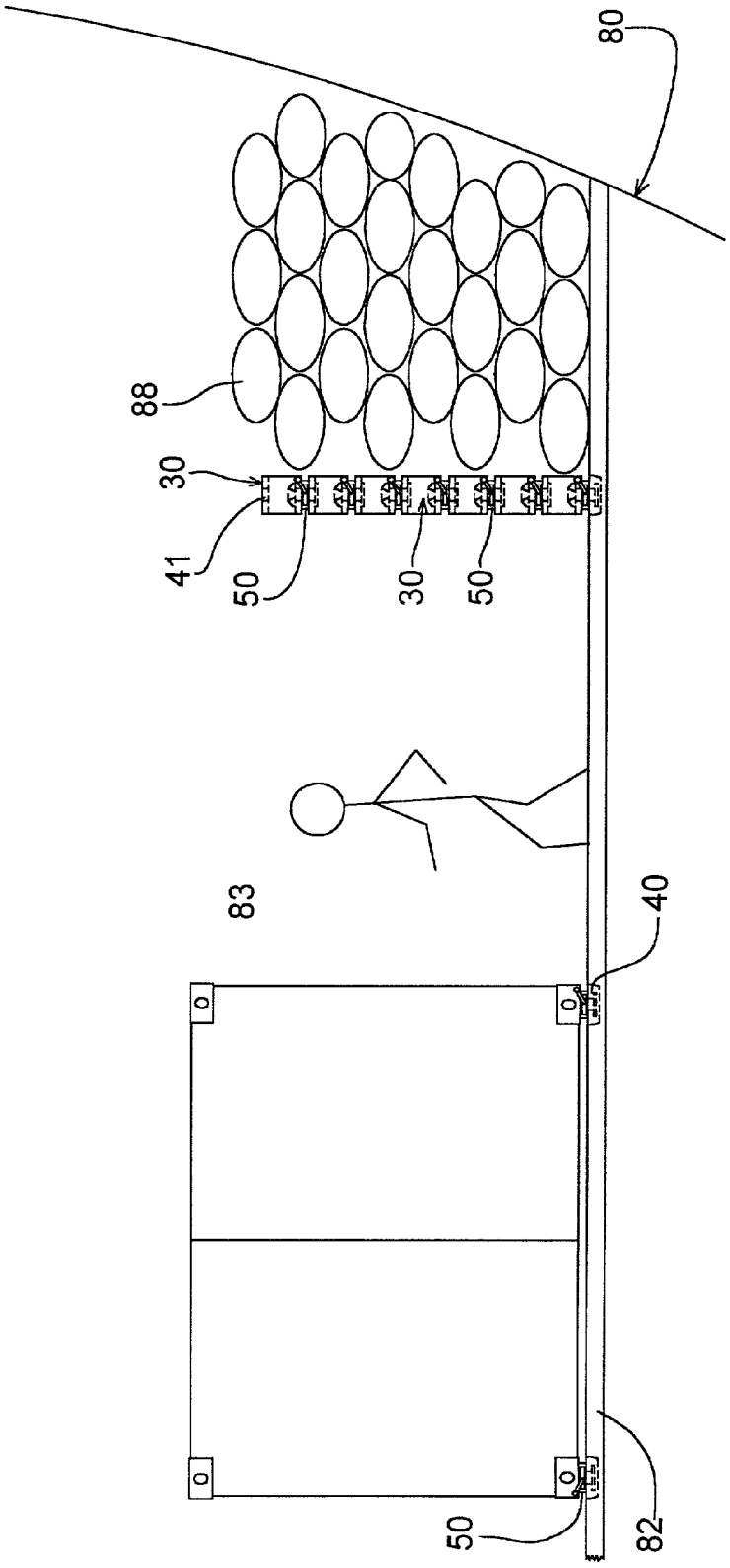


Fig. 17

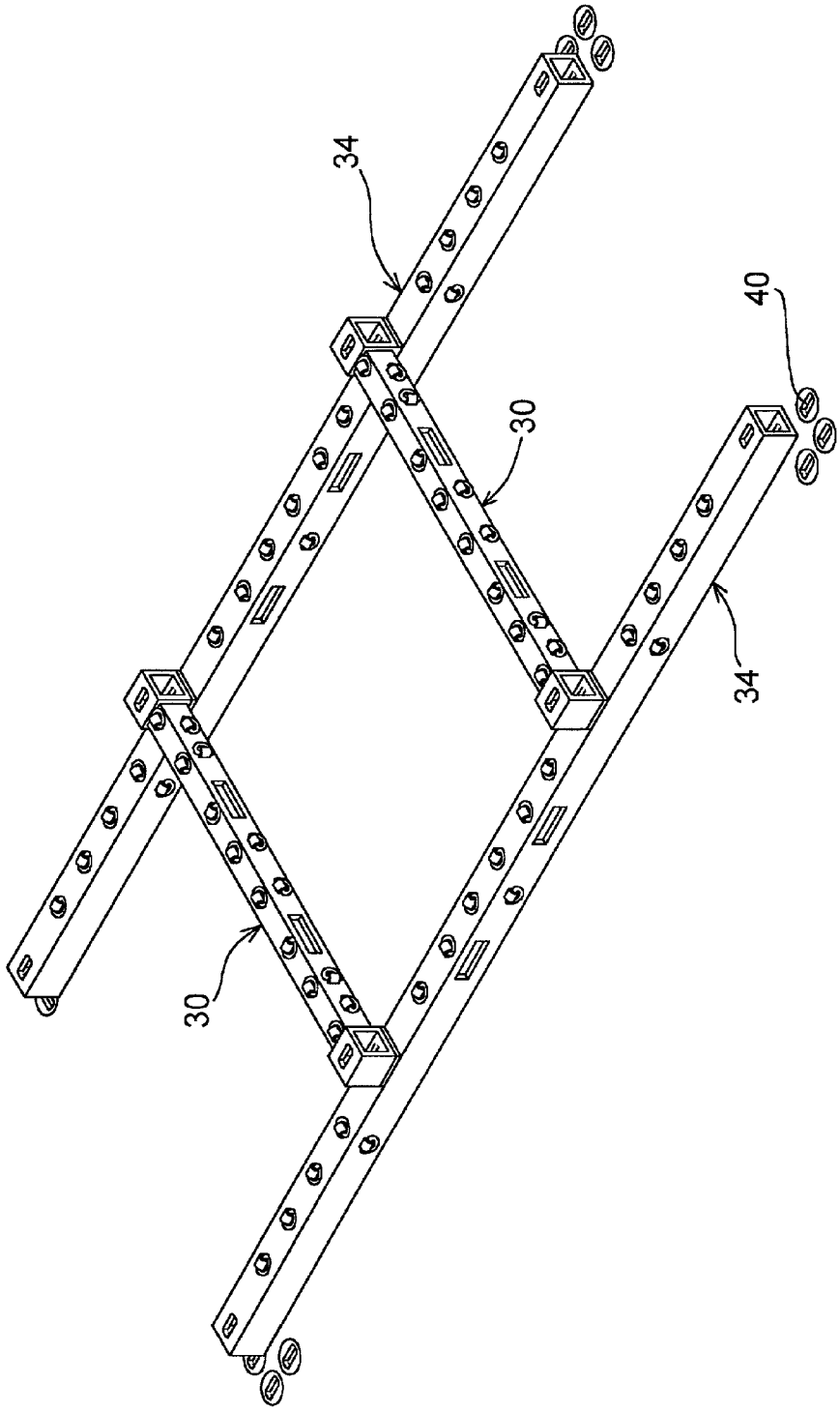


Fig. 18

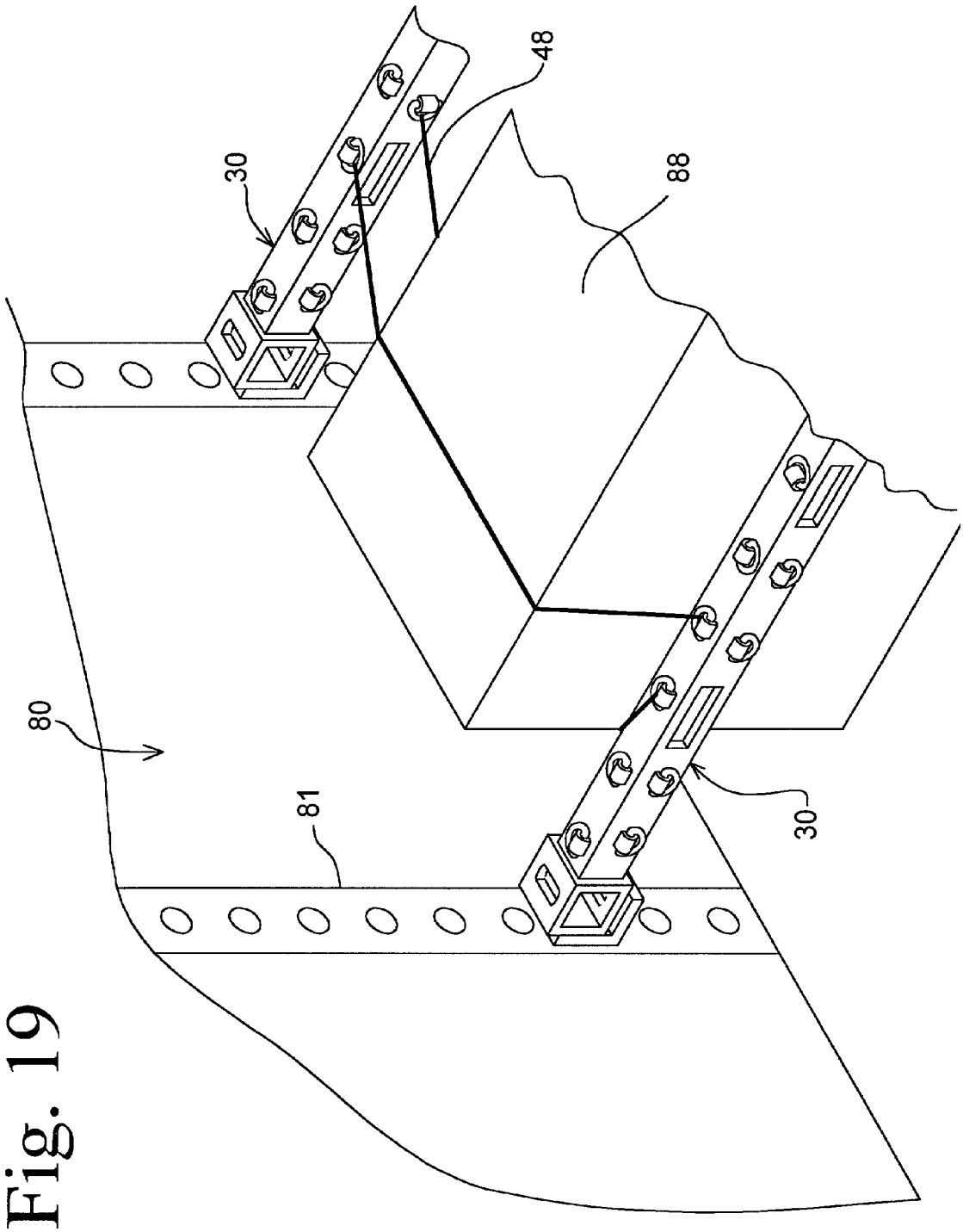


Fig. 19

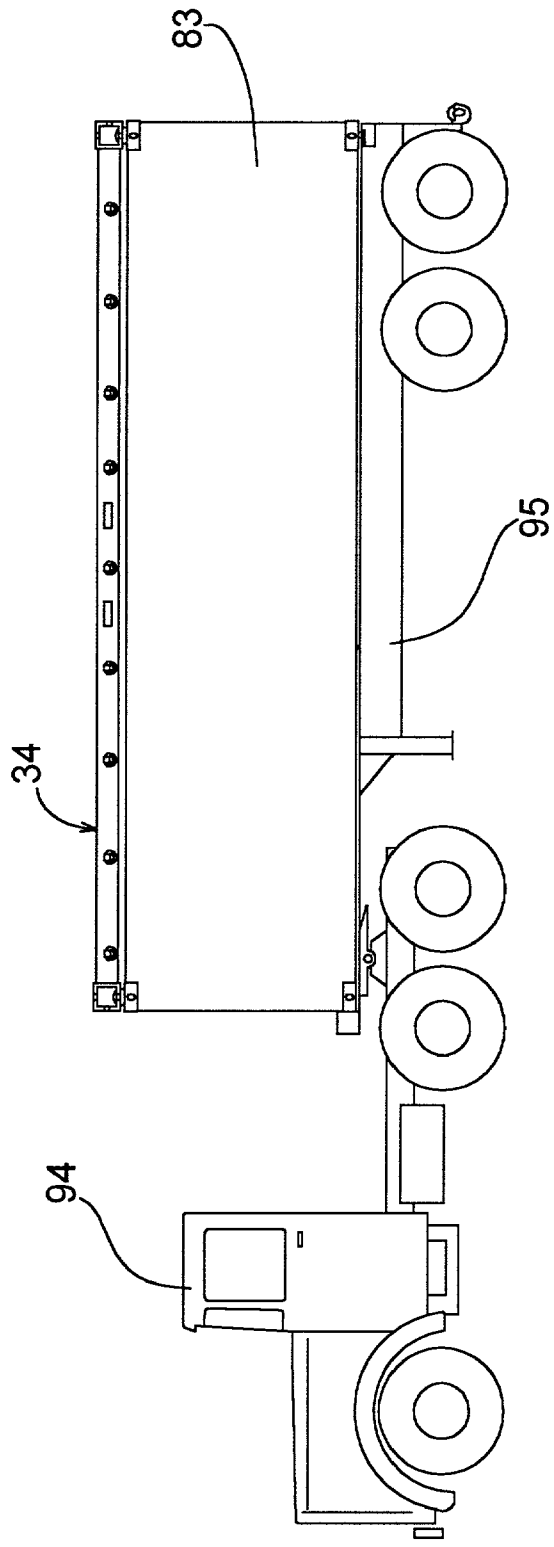


Fig. 20A

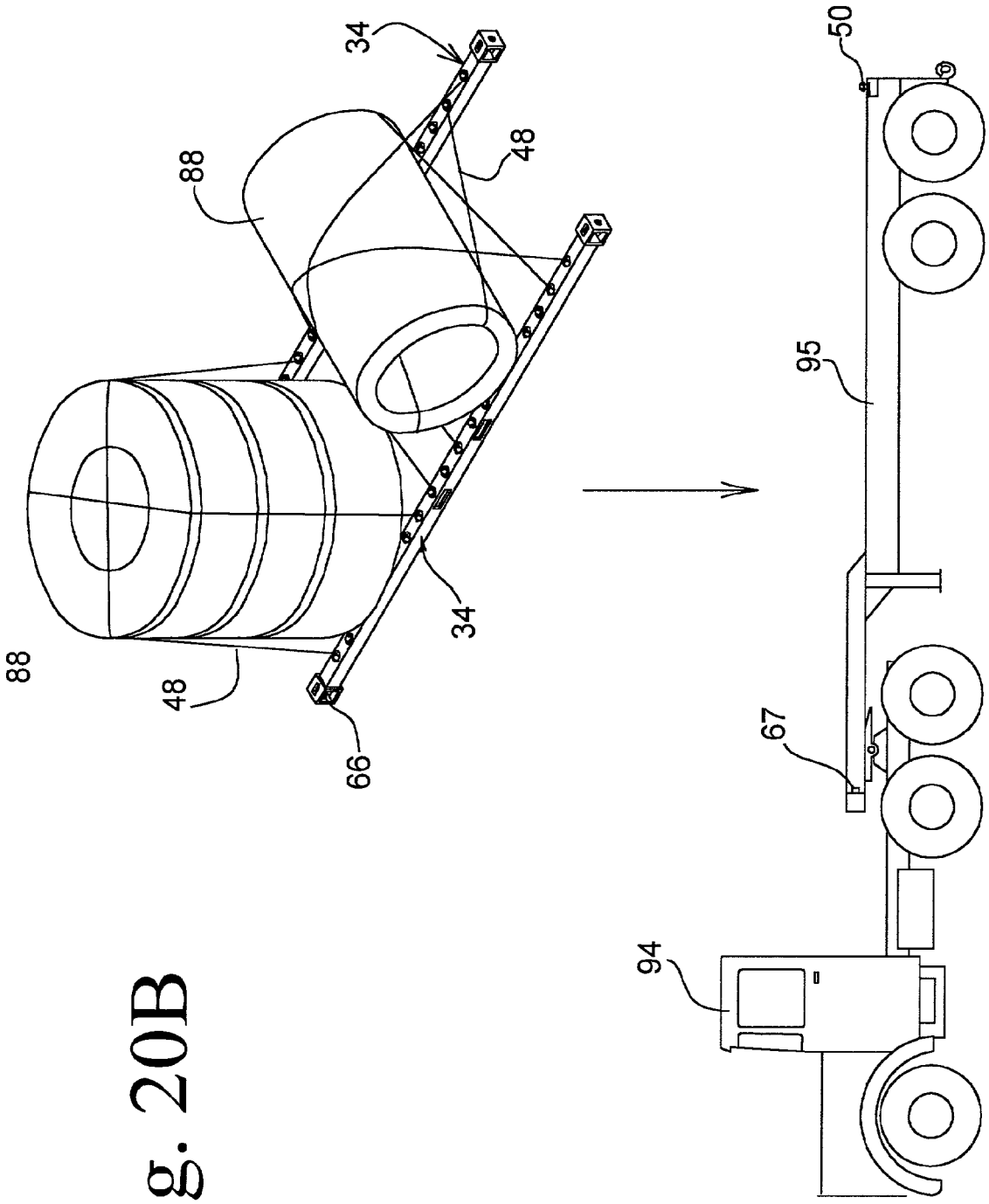


Fig. 20B

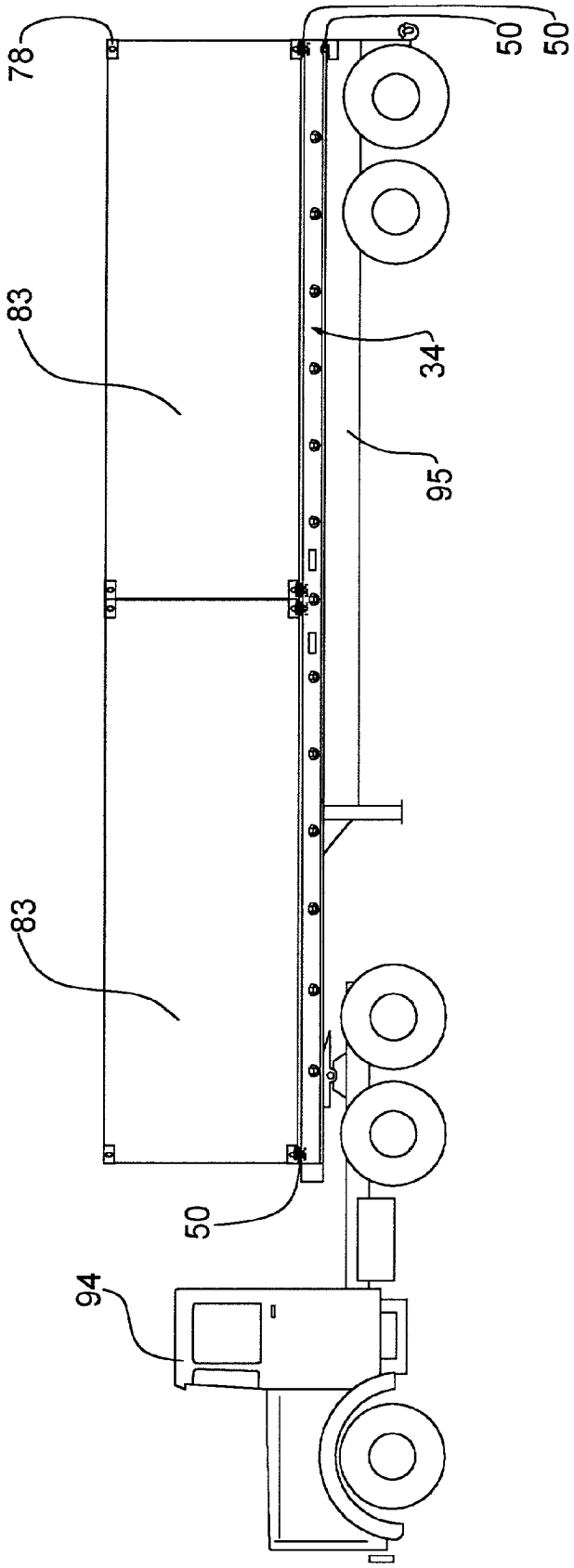


Fig. 20C

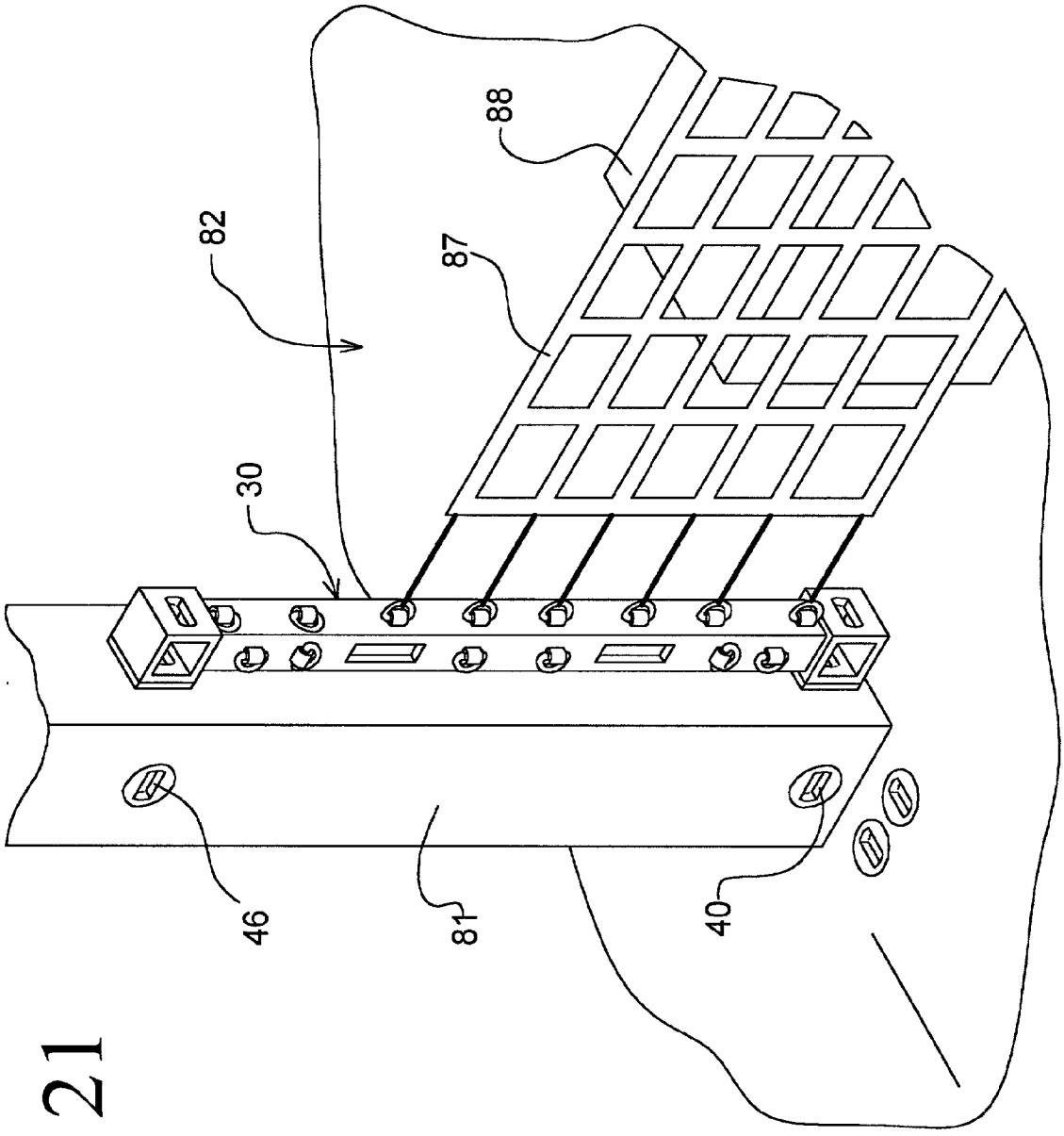


Fig. 21

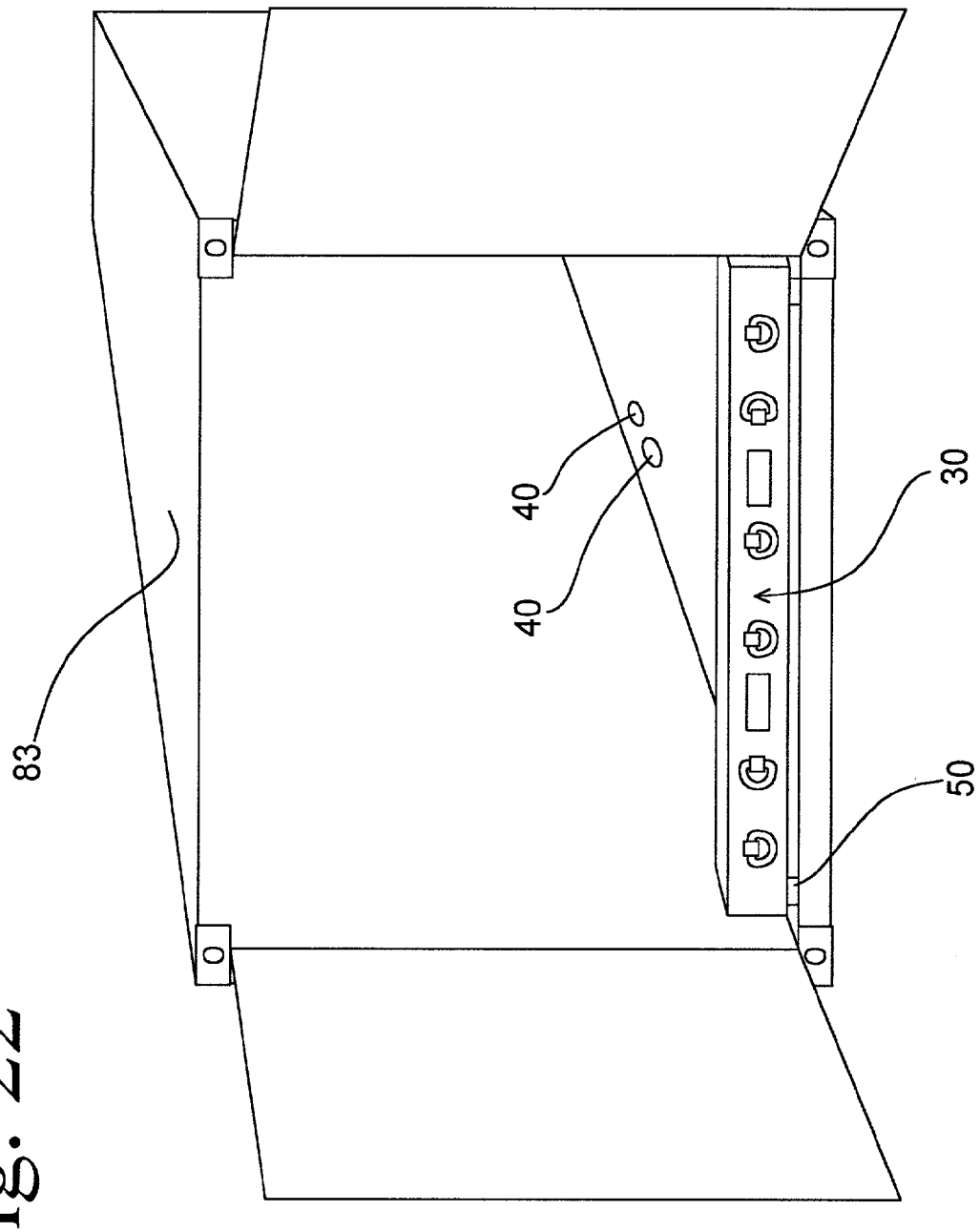
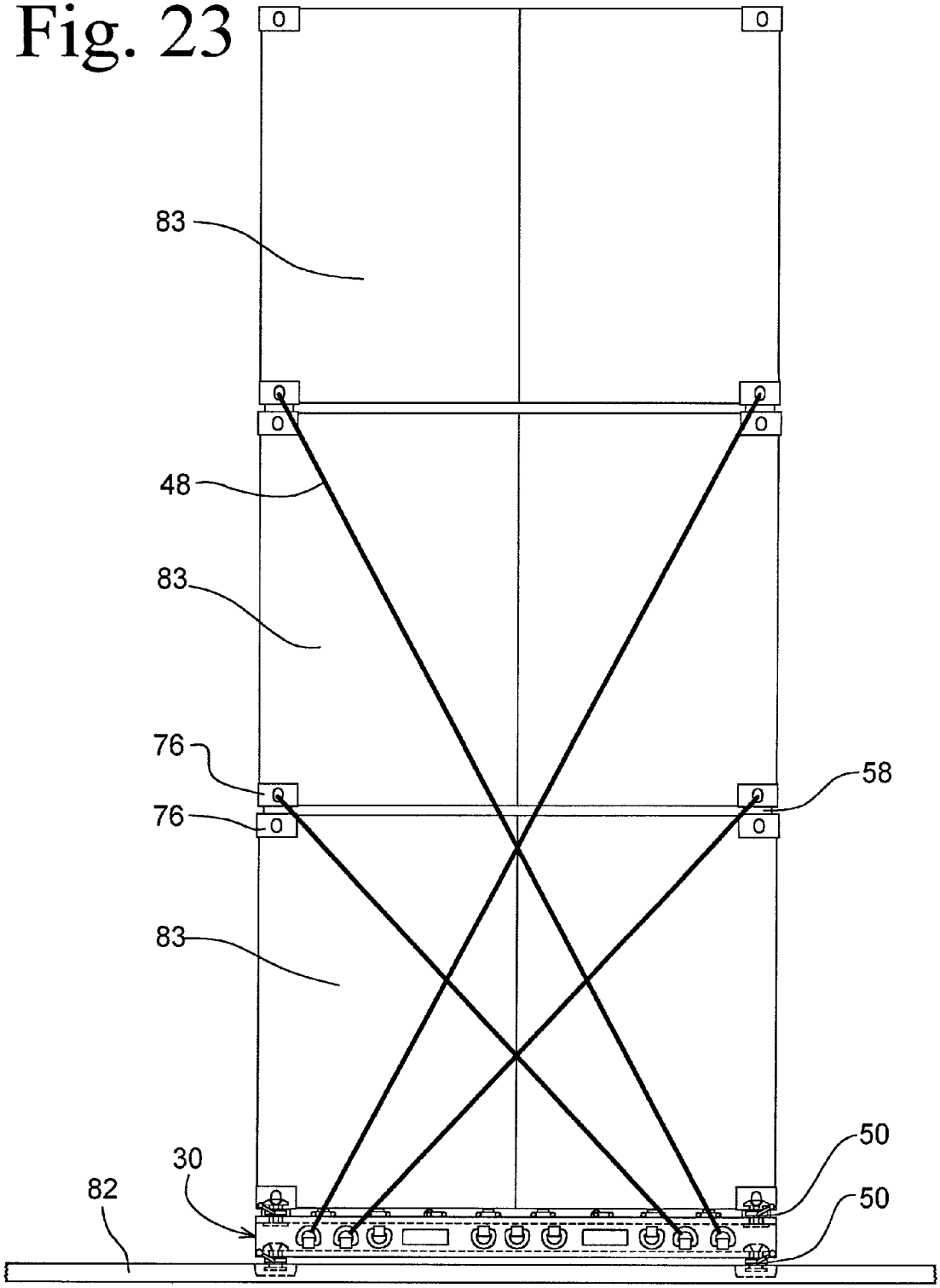


Fig. 22

Fig. 23



CARGO LASH TO BAR

BACKGROUND OF INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a new mechanism, a bar which is a beam to lash cargo to, herein called the cargo lash to bar, for the fastening and restraining cargo to a transport vessel or vehicle, especially as used in lashing down mobile equipment to the deck of an intermodal cargo carrying roll-on/roll-off ocean going ship known as a RoRo, or for fastening to a tanker ship's weather deck. This application claims the benefit of Provisional Patent Application Ser. No. 60/071,648 filed Jan. 16, 1998.

[0003] 2. Description of Prior Art

[0004] The action of the sea imparts seven motions of force in three directions against a ship and its cargo. Where on land cargo lashing frequently encounters loading and unloading of dynamic forces, on the ocean cargo lashing experiences a reversal or combination of dynamic force loading. The consequence of such extreme conditions is that the load must be fastened down very well. Currently when an armored tank or other irregular shaped mobile equipment is loaded on the deck of a ship which is designed for a variety of cargo including intermodal freight containers, the mobile equipment will be chained down tight to D-rings. The D-rings are welded to the deck, or mounted to a breech base which is received and locked into a socket in the deck, or mounted to a twist lock which is received and locked into an socket built into the deck. Spacing of such sockets is substantially twenty feet (or forty feet) apart fore and aft and two adjacent eight feet across athwartship in a configuration reciprocal to the mounting of a freight container. As a result the cargomen who are stevedores, longshoremen, and ship's crew on the ship are frequently faced with the problem of inadequate tie down locations adjacent to the fastening points of most mobile equipment. This results in multiple chains being stretched at odd angles to reach a single mounting location. This agrivates the problems of lashing and can lead to lashing gear, D-ring, or deck sockets and bases breaking or tearing with the equipment dangerously coming loose at sea.

[0005] The transportation of cargo is increasingly geared to intermodal and unitized handling. Most ships are equipped for intermodal shipping that consists primarily of container boxes that are eight feet high, eight feet wide, and twenty feet long. The configuration of the ship's deck is designed to be a mirror of the pattern or footprint of the layout of the standard freight container box. This standard is referred to as a TEU or twenty foot equivalent unit and is particularly evident in the international ISO 668 specification. Many variety of containers have been developed for transport of lumber and liquid tanks, and are just two examples of intermodal freight handling equipment that maintain the TEU although height of specialty containers frequently varies. The intermodal nature of freight containers makes them readily usable without adaptation or modification for transport over sea, over land by trucking, or by rail.

[0006] Many problems are encountered by ships cargomen when they attempt to fasten irregular shaped loads to a ship's deck. Current cargo restraint lashing rigging consists of D-rings welded to a ship's deck and D-rings welded to twist lock bases, breech bases, clover leaf bases, dovetail bases or other proprietary locking mounting bases for mounting to corresponding deck sockets. U.S. Pat. Nos. 4,457,650 and 3,860,209 illustrate the styles of fastening rings, cavities, and sockets and the various bases types which are used to fasten to a ship's deck. All of these embodiments suffer from the same problem, that they mount and seat into the sockets built into the deck that are spaced too far apart for convenient, safe, and secure lashing in all cases at distances usually eight feet apart athwartship and twenty and forty feet apart fore and aft. Often the twist lock sockets or D-rings are covered by cargo or wheels or tracks of a piece of mobile equipment, which must be accommodated by lashing to a farther point and putting extra load on a neighboring D-ring or omitting a lashing entirely. When a twist lock mounted D-ring breaks because multiple pieces of mobile equipment are lashed to a single overloaded point, all the equipment comes loose. The result can be the dramatic loss at sea of adjacently fastened armored tanks or other cargo that break loose their rigging in rough seas.

[0007] When D-rings are welded to a ship's deck problems are incurred. Welding to the deck is a permanent attachment which can be an encumbrance later on and be an obstruction for man and machines that causes a safety hazard. Also, dragging a welder and all of it's equipment around a ship's deck to weld down and retrofit individual D-rings or repair broken D-rings is slow and labor intensive. Welding is a severe optical hazard to ship's crew about the deck. Welding also heats the metal of the deck in excess of 3,000 degrees F., which causes localized changes in the crystal structure of the base metal making it brittle and reducing the strength. A ship's deck cannot be readily annealed. Weld on D-rings are not able to be welded to the lower deck of most ships because the bottom side of the lower deck is the fuel hold or fuel tank. To weld to the lower deck requires the costly procedure of evacuating the space with an inert gas or risking major fire or explosion.

[0008] A shoring beam shown in U.S. Pat. No. 4,464,089 of Allen, can be a highly useful piece of equipment for securing cargo. Quick installing shoring beams are useful for lashing vehicles and irregular cargo to. However the shoring beam system of Allen has a single securing set screw fastener which is too light duty to be of consequence to the heavy shipping industry. The point load of a set screw subject the tubular member to a localized stress concentration that leads to tube deformation. The result is a load that comes loose which is an unacceptable situation, to which the present invention the cargo lash to bar overcomes this shortcoming of the otherwise valuable shoring beam.

[0009] The erectable secondary deck using twist locks and taking advantage of the regular spacing of twist lock mounting apertures in the deck of a ship as shown in U.S. Pat. No. 4,329,935 of Jonasson displays the practicality of the present invention to take advantage of the same regularly ordered twist lock socket apertures.

[0010] The versatility of the twist lock sockets apertures at their respective regular spacing as an erection point as utilized in the present invention, is further evidenced by the novel portable hand rail of Bel, U.S. Pat. No. 4,655,153. As with the previous citation, the preponderance of examples show that the deck sockets can be utilized far beyond simple

freight containers. All these however fail to grasp the enormity of the advantage to be gained in cargo fastening, restraining, and securing of the present invention.

[0011] People in the mobile equipment shipping industry are clear, there is a whole lot of money being spent shoreside for load preplanning and logistical processes to make efficient stowage but when mobile equipment cargo gets to the ship it is not loaded according to the plan because of the impediments of the use of old style lashing gear exacerbating the problems of inadequate deck tie down lashing points. That serious difficulty of consistent, safe, and secure lashing of mobile equipment cargo is clearly enunciated in U.S. MTMCTEA Ref 97-55-22 Marine Lifting and Lashing Handbook.

SUMMARY OF THE INVENTION

[0012] The cargo lash to bar is a beam which is a continuous structural member that can be fastened and unfastened to a ship's deck and quickly handled aboard a ship to facilitated multiple convenient and accessible lashing point apertures along the length of the span of the member to ensure secure cargo lashing and restraining especially of irregular shaped loads. The key to the application of the present invention is the use of standard twist lock bolt connections. Such twist locks are commerciallialy available in a variety of mounting base configurations. Each cargo lash to bar is constructed to use the standard twist lock rotating locking bolt connections for releasable locking to its underlying structure. These twist locks are an integral part of a RoRo ship's current inventory of lashing gear. The cargo lash to bar comes with the mounting apertures in it, that receive the twist lock body and rotating locking bolt. Where tight fastening of the cargo lash to bar to the deck is desired the twist lock bolt is tightened into place or is built in to the structural member of the beam.

[0013] The result is a versatile new piece of cargo lashing gear. Accordingly, several objects and advantages of the present invention are: a) the primary object of the cargo lash to bar invention is to provide to ships and other cargo transport vehicles or handlers a device that speeds up the loading and deployment of irregular shaped cargo and mobile equipment by aiding their task of securing a load by providing a structural member to attach to with lashing aperture locations heretofore unavailable along the entire length between typical deck mounting sockets, b) a further object of the cargo lash to bar is the provision of more lashing apertures to prevent breakage of overloaded D-rings especially by optimizing the lashing angle of the rigging, c) a further advantage to the use of the cargo lash to bar is that more D-rings and aperture holes for lashing makes for less overloaded rings which provides security from losing multiple pieces of mobile equipment at sea adding a safety benefit to the crew tasked with resecuring a loose load, d) a further advantage of the lash to bar is that if the lashings break loose on a piece of mobile equipment cargo by fraying or other means, the beam will act as dunnage to restrict movement reducing potential damage to a ship and adjacent cargo, e) a further advantage of the cargo lash to bar is the extensive use of D-rings which have a smooth contoured surface that can be used with chains, cable, hemp rope, or especially light weight and high strength nylon and kevlar synthetic fibrous straps or webbing, f) a further advantage to the use of the cargo lash to bar is the provision of more variation to cargo stowing schemes, g) a further advantage to the use of the cargo lash to bar is that it allows the stevedores to make a more systematic approach to the deck location of mobile equipment, h) a further advantage to the use of the cargo lash to bar is the ability to actually position equipment according to the shoreside prestowage plan, i) a further advantage is the simplification of load positioning for consistent lashing of mobile equipment j) a further advantage is reclamation of deck space previously occupied by flailed lashings allowing a ship to carry more cargo, k) a further object is the elimination of the need to use a slip hook of a lashing chain directly into an ISO base twist lock deck socket which is an improper but common practice, l) a further advantage to the use of the cargo lash to bar when it lays fore to aft across the twenty foot span of a ships deck spanning deck fastening twist lock sockets, mobile equipment can readily be loaded in between a pair of cargo lash to bars like driving a car into a stall in a striped asphalt parking lot since most mobile equipment is loaded on a RoRo fore and aft in the same orientation as a container, m) a further object is to use the cargo lash to bar as an adapter especially as a standardized platform to bring typical twist lock deck socket spacing and twist lock aperture sockets onto the deck of an older ship equipped with breech base or other style connections for temporary or permanent adaptation, n) a further object of the cargo lash to bar is to provide a standardized platform to be used as an adapter mounting for ships that carry cargo of differing unitized dimensions, o) a further object of the cargo lash-to bar is a slide adjustable width structural member for non standard deck socket spacing and decks with irregular twist lock spacing, p) a further object of the cargo lash-to bar is a member with a built in twist lock to screw or cam the twist lock bolt for removing the gap under the structural member, where it is desirable to tighten the cargo lash bar to the deck, q) a further object is to use the cargo lash to bar as an adapter to facilitate intermodal trucking of two TEU containers or a single forty five foot long container on a trailer chassis designed to carry a single forty foot long container, r) a further object of the cargo lash to bar is to provide a new means to assist the ordinary lashing of standard containers attached one on top of another by placing a cargo lash to bar under the end of a bottom container to lash the upper containers to, freeing up the valuable deck space previously required using heavy and cumbersome lashing bars and associated lashing gear, s) a further advantage is to remove the hazard of welding on a ship's deck and facilitate welding repairs at a safe location, even by off-ship contractors, t) a further advantage is the ability to use the cargo lash to bar as a safe article on which to weld fasteners for restraining irregular cargo to the lower deck of a ship immediately above a fuel tank or a fuel soaked wooden deck, u) a further advantage of the cargo lash to bar is use as a shoring beam by itself or with multiple lash to bars stacked on top of the other, v) a further object of the cargo lash to bar is affixing it for use to the verticle walls of a cargo hold, w) a further advantage of the cargo lash to bar is to use it for supporting or securing cargo to above a clear span over a hatch or damaged portion of a ships deck, x) a further advantage is the ability to utilize space on top of a container, or stack of containers, or stowage flat rack even while the container is being drawn by a semi truck, or rail car, y) a further object is the ability to apply a cargo lash to bar across the top of adjacent stacks of containers to act as a stiffener or bridge

fitting and join the tops of the containers together using twist locks or alignment dowels, z) a further object is the development of new applications for the standard twist lock bolt and socket removable fastener especially inside the nominal dimensions of a portable deck flat rack or inside of a shipping container, aa) a further object of the cargo lash to bar is a beam that can be readily stacked one on top of another for unitized storage when this is a desirable feature, bb) a further object of the cargo lash to bar is a member that can be manipulated and moved securely and quickly by a fork lift truck, cc) a further advantage of the lash to bar is the ability to keep mobile equipment cargo seperated far enough apart for a person to walk between the mobile cargo especially during the stevedoring loading process to allow access from front to back of a ship to tend to cargo while a ship is at sea to access the distant areas of a loaded cargo hold in case of medical emergency or fire.

[0014] Further objects and advantages of the present invention will become apparent from a consideration of the drawings and ensuing description.

DRAWING FIGURES

[0015] In the drawings, closely related figures have the same number but different alphebetic suffixes.

[0016] **FIG. 1** is a perspective view of a section of a structure that is a ship's deck with two embodiments of the present invention arrayed as if in use.

[0017] **FIG. 2** is a perspective view of the present invention with cargo restrained and secured acordingly alongside a container.

[0018] **FIG. 3** is a partial perspective view of the bow of a ship showing the layout of deck sockets.

[0019] **FIG. 4A** is a perspective view of a twist lock and a correcponding deck mount socket, while **FIG. 4B** is a perspective view of the bottom of a deck and socket.

[0020] **FIG. 5** front elevation view of the present invention attached to a structure.

[0021] **FIGS. 6A through 6E** are perspective views of embodiments of the present invention, and **FIG. 6F** is a front elevation view of the adjustable embodiment of the present invention shown with lashing lines attached.

[0022] **FIG. 7A** is a top elevation view of crawler tractor type mobile equipment lashed to a ship's deck using previous lashing schemes, and **FIG. 7B** is a top elevation view of crawler tractor type mobile equipment lashed to a ship's deck using the present invention.

[0023] **FIG. 8** is a perspective view of a container mounted to a ship's deck with the present invention installed on top of the container and cargo lashed to the present invention.

[0024] **FIG. 9** is a front elevation view of the present invention used as an adapter for mounting a container to a structure below the present invention.

[0025] **FIG. 10A** is a perspective view of a breech base deck socket in the structure of a ship's deck, and **FIG. 10B** is an front elevation view of a breech base twist lock mounted in a breech base socket.

[0026] **FIG. 11** is a perspective view of a piece of mobile equipment cargo secured to the present invention which spans above a cargo hold opening of a ship's deck.

[0027] **FIGS. 12, 13, 14**A, and **14**B are perspective views of alternate embodiments of the present invention. FIGS. **14A-2** and **14B-2** are enlargemente of a section of **FIGS. 14A and 14B** respectively.

[0028] **FIG. 15** is a front elevation view an alternate embodiment of the present invention with a tightening wedging mechanism.

[0029] **FIG. 16** is a bottom perspective view of the present invention showing a support collar properly installed.

[0030] **FIG. 17** is an elevation view of a section of a ship showing the present invention, a container, cargo, and the approximate scale relative to a person.

[0031] **FIG. 18** is a perspective view of the present invention in a configuration for shoring and support for irregular cargo.

[0032] **FIG. 19** is a perspective view of the present invention used for shoring and lashing with adapter end fittings and mounted to the walls of a vehicle above a floor surface.

[0033] **FIG. 20A** is an elevation view of the present invention mounted atop a container in an over the road application. **FIG. 20B** shows an elevation view of the present invention and cargo as it would be attached if the cargo and the present invention were attached to the container chassis, and a truck and container chassis in the unloaded and empty configuration, wherein the arrow indicates that the load must be attached to the chassis indicated below for the cargo and lashings to actually be oriented in the manner shown. **FIG. 20C** is an elevation view of a truck, container chassis, the present invention, and two containers installed.

[0034] **FIG. 21** is a perspective view of the present invention installed vertically onto a bulkhead and a cargo net attached to the present invention.

[0035] **FIG. 22** is a perspective view of a container showing the present invention installed inside of the container.

[0036] **FIG. 23** is an elevation view of three containers stacked on top of the present invention and the assembly attached to a ship's deck.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0037] Referring to the drawings, the preferred embodiment of the present invention, cargo lash to bar assembly **30** and also lash to bar assembly **34** shown in **FIG. 1**, is a beam which is a structural steel tubing member **60** that spans from one twist lock **50** to another twist lock **50**, for mounting athwartship or fore to aft on a ship's deck **82**, having locking bolt mounting apertures **41** in the bottom surface of structural member **60** toward each end to receive the insertion of twist locks **50** in member **60**, that match the spacing of a commercially available freight container **83**, to facilitate removable connection of lash to bar **30** and **34** to a pair of ISO type twist lock mounting sockets **40** attached a ship's deck **82**. The cargo lash to bar **30** and **34** has several D-rings

46 attached to member 60 along the length through which a strap, cable, or chain herein called a lashing 48 may pass for lashing or restraining cargo to. A D-rings 46 consist of any lashing ring 68 and a lashing ring restraining mounting saddle 69 wherein lashing ring 68 is free to pivot, or pivot and rotate, or may be rigidly fastened especially by welding. The lashing ring 68 preferably has a smooth contoured surface to prevent abrasion of the web strap lashings 48 and wire rope lashings 48. The lash to bar 30 and 34 has slot 49 or a plurality of slots 49 thought the member 60 to facilitate lifting with lift truck's forks. Fork slots 49 are also a hole through which a lashing 48 may be strung for securing and restraining cargo as shown in FIG. 2. There are additional mounting apertures 41 in the top of member 60 like those in the bottom of member 60 in a substantially parallel arrangement that allow multiple cargo lash to bars 30 or 34 to be mounted and removably connected on top of one another for stacking with twist locks 50 for storage, shoring, or bridging as shown in FIGS. 11, 17, 18, and 19. Mounting aperture 41 is also a hole for lashing through as shown in FIG. 2. Aperture 66 located in the end of the member 60 of the lash to bar 30 and 34 is a load bearing and alignment aperture for carrying lash to bar 34 on semi trailer container chassis 95 shown in FIG. 20, and a lifting point for shipboard and dockside container lifting and handling equipment for lash to bar 30 and 34. The secondary use of the aperture 66 is as a hole for lashing through when the lash to bar 30 and 34 is fastened to the ships deck 82 as shown in FIG. 2.

[0038] For description purposes the mounting points of each end of container 83 are herein referred to as an end cell or side cell. FIG. 3 illustrates ship 80 and deck 82 laid out with ISO type twist lock mounting sockets 40. Container 83 is also illustrated. A single athwartship end cell is represented by a line labeled 98, and a single transverse side cell is represented by a line labeled 99.

[0039] Twist lock 50 is a commonly known commercially available locking bolt devise used in all branches of intermodal shipping. FIG. 4A show twist lock 50 and FIG. 4B shows deck mounting socket 40 that can receives the insertion of twist lock 50. The twist lock 50 has a rotary bolt 51 on one end or both that operates turning rotary locking bolt 51 by means of a hand operated lever 55 ninety degrees relative to an annular abutment 57 which is a rigid part of the twist lock body 59 from an unlocked to a locked position. Lash to bar 30 in FIG. 5 secured to deck 82 removably connected and locked by twist lock 50. This elevation view indicates the contiguous relationship of twist lock 50 resting on deck 82 which is a rigid structure, and inserted and removably connected into twist lock deck socket 40 with lash to bar 30 resting on the twist lock 50 which is inserted in mounting aperture 41 in the lower planar surface of lash to bar 30 and locking bolt 51 of twist lock 50 rotated to the locked position, lash to bar 30 now being held fast to ship's deck 82. Likewise cargo lash to bar 30 and 34, just as a shipping container 83, is unlocked and released by turning hand lever 55 and returning rotary bolt 51 back in alignment with annular abutment 57 to the unlocked and free position. Twist locks 50 are versatile and easy to use and come in a variety deck and bottom base mounting configurations including ISO type base mounting socket 40 of the preferred embodiment, a breech base 44, and a dove tail base. On semi trailer chassis 95 shown in FIG. 20, twist locks 50 are a part of the weldment built into the rear of chassis 95.

[0040] Single end cell 98 cargo lash to bars 30 described above are compact and fit adjacent another lash to bar 30 or 34, shown in FIG. 7B, and are used end to end on ship's deck 82 occupying two adjacent cells athwartship shown in FIG. 6A, or mounted adjacent fore and aft shown in FIG. 6B also occupying two end cells 98. End cell cargo lash to bars 30 generally mount athwartship starboard to port on ships 80 with the deck 82 built for twist locks 50 and containers 83. Single side cell 99 cargo lash to bar 34 shown in FIG. 6C in twenty foot length configuration is adjacent container 83 in FIG. 2. Double side cell 99 cargo lash to bar 35 shown in FIG. 6D removably fastens to four mounting sockets 40 on deck 82 increasing the load transferred to deck 82. Double end cell 98 cargo lash to bar 36 in FIG. 6E removably fastens to four mounting sockets 40 on deck 82 increasing the load transferred to deck 82. Apertures 47 in lash to bar 35FIG. 6D are lashing holes. Special deck cell displacement 98 and 99 lash to bars 30 and 34 are for large and unique cargo and other special configurations, in FIG. 11 lash to bars 34 removably fastened with twist locks 50 to deck 82 supports mobile equipment cargo 84 above a cargo hatch 85.

[0041] Lash to bar 30 and 34 gives the shipper more cargo room per square foot of deck space by allowing a tighter pack of mobile equipment cargo 84, and cargo 88 in FIG. 2. FIG. 7B shows the gain of deck space from closer cargo 84 proximity using lash to bars 30 and 34 contrasted with problematic traditional lashing scenario shown in FIG. 7A having D-ring twist locks 52 for lashing to deck 82. With lash to bars 30 and 34 each lashing line 48 fastens to an individual D-ring 46 or mounting aperture 41.

[0042] The preferred embodiment of lash to bar 34 in side cell mounting 99 orientation, lays fore to aft along the twenty or forty foot span of ships deck 82 between deck twist lock mounting sockets 40 in FIG. 6C. With a pair of cargo lash to bars 34 in FIG. 2 in this orientation, mobile equipment 84 is readily loaded in between a pair of cargo lash to bars 34 like driving a car into a line in a striped asphalt parking lot. This configuration supports irregular cargo 88 on top of container 83 in FIG. 8, especially on top of a stack of containers 83 loaded in a container ship.

[0043] With the addition of one or more twist lock mounting aperture 41 in the preferred embodiment, lash to bar 30 and 34 is used as a valuable adapter to convert a ship deck 82 with non standard dimensional layout of deck sockets or apertures to regular spacing cell displacement 98 and 99 for carrying container 83 on top of the lash to bar 30 shown in FIG. 9. In this way an older ship 83 can now carry a standard container 83 removably fastened to deck 82 that was originally built with breech base deck sockets 44 or other base type without permanent modification to ship 80 using existing deck lashing gear.

[0044] An alternate embodiment is adjustable width lash to bar 32FIG. 6F. As above, older ships, break bulk ships, and the RoRo ship 80 on lower decks have some non standard spacing of deck mountings of various types including ISO type mounting socket 40, breech base 44, dovetail base, and clover leaf base. The adjustable tubular member 60 will fit into a standard end cell 98 or telescopically distend or contract in length for releasable fastening of tubular member 60 with twist locks 50 to fit between deck mounting socket 40 at dimensions longer or shorter than typical end

cell length **98**. Adjustable member **60** is comprised of lengths of structural steel tubing fitted one inside the other and greased to provide ease of relative sliding motion between the contiguous pieces of structural member **60**. In an adjustment slot **45**, a stop pin **65** is affixed to the weldment of structural member **60** to keep the contiguous interrelation in tact. Adjustment slot **45** also serves an aperture to receive lift truck forks for lifting just as lift truck fork slots **49** are used in fixed length lash to bar **30**.

[**0045**] The structural steel members **60**, **61**, **62**, **63**, and **64** comprising lash to bars **30**, **32**, **34**, **35**, and **36** are fabricated using shapes of square and rectangular tubing, I, T, or angle steel as per customer preference and as the application dictates. The strongest lash to bars are fabricated from high tensile steel plate and formed or welded into the aforesaid shapes. T shaped member **62** is used above deck and does not fill up with rain water or sea water that comes over the deck **82** in rough seas. Structural member **60**, **62**, and **64** is a continuous beam or weldment of steel or other metal that is fitted with several D-rings **46**, and apertures **41**, **47**, **49**, and **66** or just D-rings **46** or just the aforesaid apertures on or through lash to bar **30**, **32**, **34**, **35**, or **36**. Lash to bars **30** and **34** are fabricated from a continuous member of square structural steel tubing **60** in **FIGS. 6C and 9**, apertures **41** are cut into the aforesaid tube, and is the same for lash to bar **35** in **FIG. 6D**. Structural member **63** of a lash to bar **30** in **FIG. 12** is a weldment comprised of a length of I beam oriented longitudinally along the axis of the lash to bar **30** and a section of structural tubing **77** from which the apertures **41** are cut out of the top and bottom, that is welded perpendicular to the longitudinal axis of lash to bar **30**. The same procedure using a rectangular tubing member **61** longitudinally along the axis of the lash to bar **30**, is welded to commercially available container corner castings **78** shown on lash to bar **30** in **FIG. 13**. It is foreseen that alternate materials and metals could be employed for satisfactory performance especially extrusions of odd shapes. The present invention foresees any such utilization.

[**0046**] Hand winches **43** are shown in **FIG. 13** and are pivoting apertures for lashing to using web strap type lashing lines **48**.

[**0047**] In the preferred embodiment, some applications of cargo lash to bar **30** require tight removable connection between the ship deck **82** and lash to bar **30** that eliminates the slop or clearances inherent to the loose dimensional tolerances of twist lock **50** between lash to bar **30** and deck **82** in **FIG. 5**. Twist lock **50FIGS. 14A and 14B** is built into structural member **64** of lash to bar **30**, with locking bolt **51** oriented downward for insertion and removable coupling mounting to mounting base aperture **40**. Three mechanisms are used to tighten or clamp down lash to bar **30** by means of camming or wedging dependent on the geometry of the structural member used and the desire of the customer. In **FIG. 14A** is an elevating screw turning and tightening mechanism **72** which is a part of the weldment of structural member **64** wherein hand lever **55** is rotated by forcing, causing a locking bolt **51** to rotate and the surface of locking bolt **51** to be drawn closer to the parallel planar surface of the bottom of lash to bar **30**. **FIG. 14B** shows overcenter cam lock mechanism **74** wherein twist lock bolt **51** is rotated ninety degrees form the orientation required for insertion into mounting socket **40** in deck **82**. Rotating the locking bolt **51** is done by means of turning hand lever **55** and releasably locking overcenter cam lock mechanism **74**. In **FIG. 15** twist lock **50** removably connects lash to bar **30** to deck **82** wherein wedging mechanism **70** is rotated and tightened by forcing by means of a secondary handle providing an upward thrust on the bottom face of the twist lock bolt **51** resulting in tight securement of lash to bar **40** to deck **82**.

[**0048**] The bottom of cargo lash to bar **30** and **34** is equipped with optional load transfer brace **76** in **FIG. 16** which partially encapsulates twist lock **50** to restrain and inhibit rocking of lash to bar **30**, transferring the imposed load into deck **82** rather a rocking a reversing load on the iron twist lock center pin. **FIG. 16** shows a bottom perspective view of lash to bar **30** with load transfer brace **76** installed. Load transfer brace **76** is a collar that is welded to end piece **77** which is a part of the weldment of structural member **60**. **FIG. 5** shows cargo lash to bar **30** equipped with support brace **76** installed, removably connected by means of twist lock **50** to ship's deck **82** wherein load transfer brace **76** impedes rocking action of lash to bar **30** while providing adequate clearance for the use of twist lock **50** and provides room for the locking and releasing hand lever **55** tightening means to function.

[**0049**] Use of the preferred embodiment in the trucking side of the intermodal shipping industry is shown in **FIG. 20A** where lash to bar **34** is carried on top of container **83** to a customer's destination, then mounted to container chassis **95** so that truck **94** and bare chassis **95** can be used for back haul loads further expanding the economic potential for truck **94**, trucker, and chassis **95** and makes semi trailer chassis **95** now available to haul irregular shaped cargo **88** loads **FIG. 20B**. Two of container **83** at twenty foot length each are removably connected on top of a pair of lash to bars **34** in **FIG. 20**C, which when containers **83** are unloaded, lash to bars **34** are used for lashing valuable back haul cargo described above, or one forty five foot container **83** (not shown) is removably connected to lash to bar **34** by means of twist locks **50** which is removably connected to a forty foot chassis **95**. Lash to bar **34** is removably connected to chassis **95** at the front on holding pins **67** into load bearing holes **66** and at the rear by means of chassis mounted twist lock **50** on the bottom planar surface of lash to bar **34**. Aboard ship **80** cargo lash to bar **30** is shown under the end of containers **83** in **FIG. 23** where containers **83** are held in place by stacking cones **58**, twist locks **50** and restrained and secured with lashings **48** from the bottom of each container **83** in an X pattern for secure lashing resulting in the reclamation of deck space for hauling more containers **83**, mobile equipment **84**, or cargo **88** over the older lashing schemes.

[**0050**] An alternate use of the preferred embodiment is to use the lash to bar **30** or **34** as a shoring beam in **FIGS. 17**, **18**, and **19**, and stacked one on top of another in **FIG. 17** near the area of the sloping side of a ship. **FIG. 21** is the application of the present invention mounted vertically with twist lock mounting socket apertures **40** mounted into the vertical beam structure **81** of ship **80**, and used for lashing a cargo restraining net **21**.

[**0051**] What is mentioned for lash to bars **30** and **34** is not intended to be exclusive and may be applicable to alternate forms of the preferred embodiments **34**, **35**, and **36**.

[**0052**] New embodiments and sizes of twist lock or rotating locking bolt fastener or dimensional standards may be

developed. The present invention is applicable to all similar locking bolt means and sockets configurations and all dimensional arrangements whether currently standardized or unique to a particular application or industry, and shall not be limited to one dimensional or geometrical configuration as indicated by the new use of lash to bar **30**, twist lock **50**, and mounting sockets **40** inside container **82** in **FIG. 22**.

[**0053**] The foregoing description of the preferred embodiments of the invention has been presented for the purpose of illustration and description. It is not intended to be exhaustive or to limit the invention. Many modifications and variations are possible in light of the above description. It is intended that the scope of the invention not be limited by this detailed description, but rather by the claims appended hereto.

What is claimed is:

1. A beam of the type comprising:

a) a structural member that spans from one mounting socket to at least one other mounting socket,

b) a plurality of lashing apertures selected from a group consisting of holes and D-rings along the length of said structural member,

c) and a plurality of mounting apertures in said structural member characterized in that said beam removably connects to a structure by means of a plurality of twist locks.

2. The beam in claim 1 wherein said structure to which said beam removably connects is a ship.

3. The beam in claim 1 wherein said structure to which said beam removably connects is a vehicle.

4. The beam in claim 1 wherein said structural member has adjustable means wherein longitudinal movement is effected.

5. The beam in claim 1 wherein said structural member is removably fastened tightly to said structure by means of a tightening twist lock.

6. The beam in claim 1 wherein said structure is another of said beam of claim 1.

7. The beam in claim 1 wherein winches are attached to said structural member.

8. A beam of the type comprising:

a) a structural member that spans from one mounting aperture to at least one other mounting aperture,

b) a plurality of lashing apertures selected from a group consisting of holes and D-rings along the length of said structural member,

c) and a plurality of the aforesaid mounting apertures in said structural member for insertion of twist lock removable connection means in a configuration reciprocal to the mounting of a freight container.

9. The beam in claim 8 wherein said structure to which said beam removably connects is a ship.

10. The beam in claim 8 wherein said structure to which said beam removably connects is a vehicle.

11. The beam in claim 8 wherein said structural member has adjustable means wherein longitudinal movement is effected.

12. The beam in claim 8 wherein said structural member is removably fastened tightly to said structure by means of a tightening twist lock.

13. The beam in claim 8 wherein said structure is another of said beam of claim 8.

14. The beam in claim 8 wherein winches are attached to said structural member.

15. A cargo restraining system comprising removably connecting locking bolt securing means wherein a plurality of said locking bolt are inserted in apertures in a structural member, having a plurality of lashing apertures selected from a group consisting of holes and D-rings along the length of said structural member, said lashing apertures available for the purpose of threading lashings through for the purpose of tightly securing a load to said structural member along the length of said structural member that spans from one securing point to at least one other securing point, for securing said load to a vehicle.

16. The cargo restraining system in claim 15 wherein said vehicle is a ship.

17. The beam in claim 1 wherein siad structural member has a load transfer brace.

18. The beam in claim 8 wherein siad structural member has a load transfer brace.

19. A beam of the type comprising:

a) a structural member that spans from one mounting socket to at least twist lock to at least one other twist lock,

b) a plurality of lashing apertures selected from a group consisting of holes and D-rings along the length of said structural member,

c) and a plurality of twist locks in said structural member characterized in that said beam removably connects to a structure.

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