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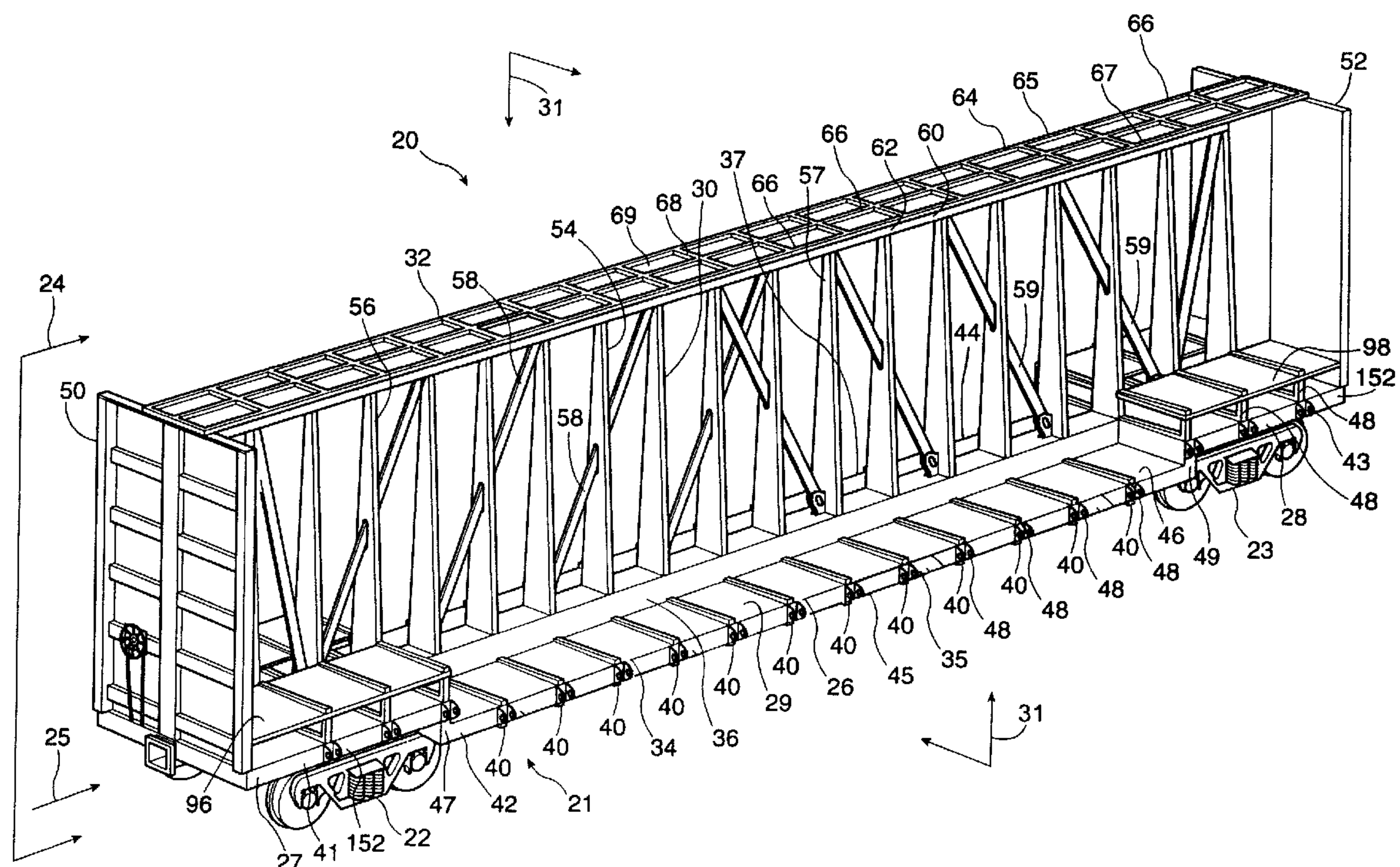
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(54) Titre : WAGON A SUPPORT CENTRAL ET A PLANCHER SURBAISSE

(54) Title: DROPPED DECK CENTER BEAM RAIL ROAD CAR



(57) Abrégé/Abstract:

A center beam car has a main deck structure extending laterally from a main center sill, a laterally extending top truss structure, and a central vertically oriented web work structure for carrying vertical shear loads between the top truss and the center sill and decking. The center beam so formed defines bunks upon in which to carry cargo. The upper region of the web-work structure includes a deep upper beam structure that has downwardly extending skirts. The skirts provide an extended bearing area upon against which bundled loads can be secured. The skirts are inwardly reinforced to discourage deflection between adjacent upright members of the deep upper beam structure.

ABSTRACT

5 A center beam car has a main deck structure extending laterally from a main center sill, a laterally extending top truss structure, and a central vertically oriented web work structure for carrying vertical shear loads between the top truss and the center sill and decking. The center beam so formed defines bunks upon in which to carry cargo. The upper region of the web-work structure includes a deep upper beam structure that has downwardly extending skirts. The skirts provide an extended bearing area upon against which bundled loads can be secured. The skirts are inwardly reinforced to discourage deflection between adjacent upright members of the deep upper beam structure.

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DROPPED DECK CENTER BEAM RAIL ROAD CAR**5 FIELD OF THE INVENTION**

This invention relates generally to center beam rail road cars, and, in particular, to center beam cars having a depressed deck portion between a pair of rail car trucks.

BACKGROUND OF THE INVENTION

10 Center beam rail road cars, in cross-section, generally have a rack-like body, namely a center beam structure in the shape of an I in which the top flange is narrower than the bottom flange. The center beam structure is carried on a pair of rail car trucks. The rack, or center beam structure, has a pair of bulkheads at either longitudinal end that extend transversely to the rolling direction of the car. The lading supporting structure of the beam includes laterally extending decking mounted above, and
15 spanning the space between, the trucks. A center beam web structure, typically in the nature of an open frame truss for carrying vertical shear loads, stands upright from the deck and runs along the longitudinal centerline of the car between the end bulkheads. This kind of web work structure can be constructed from an array of parallel uprights and appropriate diagonal bracing. Most often, a top truss assembly is mounted on top of the vertical web and extends laterally to either side of the
20 centerline of the car. The top truss is part of an upper beam assembly, (that is, the upper or top flange end of the center beam) and is usually manufactured as a wide flange, or wide flange-simulating truss, both to co-operate with the center sill to resist vertical bending, and also to resist bending due to horizontal loading of the car while travelling on a curve. Typically, a center sill extends the length of the car. The center beam thus formed is conceptually a deep girder beam whose bottom flange is
25 the center sill, and whose top flange is the top truss (or analogous structure) of the car.

Center beam cars are commonly used to transport packaged bundles of lumber, although other loads such as pipe, steel, engineered wood products, or other goods can also be carried. The space above the decking and below the lateral wings of the top truss on each side of the vertical web of the center beam forms left and right bunks upon which bundles of wood can be loaded. The base
30 of the bunk generally includes risers that are mounted to slant inward, and the vertical web of the center beam is generally tapered from bottom to top, such that when the bundles are stacked, the overall stack leans inward toward the longitudinal centerline of the car.

Lading is most typically secured in place using straps or cables. Generally, the straps extend from a winch device mounted at deck level, upward outside the bundles, to a top fitting. The top
35 fitting can be located at one of several intermediate heights for partially loaded cars. Most typically, the cars are fully loaded and the strap terminates at a fitting mounted to the outboard wing of the

upper beam assembly. Inasmuch as the upper beam assembly is narrower than the bundles, when the strap is drawn taut by tightening the winch, it binds on the upper outer corner of the topmost bundle and exerts a force inwardly and downwardly, tending thereby to hold the stack in place tight against the center beam web.

5 Each bundle typically contains a number of pieces of lumber, commonly the nominal 2" x 4",
2" x 6", 2" x 8" or other standard size. The lengths of the bundles vary, typically ranging from 8' to
24', in 2' increments. The most common bundle size is nominally 32 inches deep by 49 inches wide,
although 24 inch deep bundles are also used, and 16 inch deep bundles can be used, although these
latter are generally less common. A 32 inch nominal bundle may contain stacks of 21 boards, each 1 -
10 1/2 inch thick, making 31 - 1/2 inches, and may include a further 1 - 1/2 inches of dunnage for a total
of 33 inches. The bundles are loaded such that the longitudinal axes of the boards are parallel to the
longitudinal, or rolling, axis of the car generally. The bundles are often wrapped in a plastic sheeting
to provide some protection from rain and snow, and also to discourage embedment of abrasive
materials such as sand, in the boards. The bundles are stacked on the car bunks with the dunnage
15 located between the bundles such that a fork-lift can be used for loading and unloading. For bundles
of kiln dried softwood lumber the loading density is taken as 1600 to 2000 Lbs. per 1000 board-feet.

 It has been observed that when the straps are tightened, the innermost, uppermost boards of
the topmost bundle bear the greatest portion of the lateral reaction force against the center beam due
to the tension in the straps or cables. It has also been observed that when these bundles bear against
20 the vertical posts of the center beam, the force is borne over only a small area. As the car travels, it is
subject to vibration and longitudinal inertia loads. Consequently the plastic sheeting may tend to be
torn or damaged in the vicinity of the vertical posts, and the innermost, uppermost boards can be
damaged. The physical damage to these boards may tend to make them less readily saleable. Further,
whether or not the boards are damaged, if the plastic is ripped, moisture can collect inside the
25 sheeting. This may lead to the growth of molds, and may cause discolouration of the boards. In some
markets the aesthetic appearance of the wood is critical to its saleability, and it would be
advantageous to avoid this discolouration.

 In part, the difficulty arises because the bearing area may be too small. Further, the join
between the upstanding web portion of the center beam and the upper beam assembly can coincide
30 with the height of the topmost boards. This join is not always smooth. Further still, when the posts are
fabricated the flanges may not stand perfectly perpendicular to the web, such that one edge of the
flange may bear harder against the bundles than another.

 It is also desirable that the bundles stack squarely one upon another. Although it is possible to
35 use wooden battens at the top end of the center beam web, this will tend to cause the top bundle to sit

outwardly of its neighbours. It has been observed that a thin wooden batten, of 3/4" thickness may tend to bow inwardly between adjacent posts, and may not spread the wear load as much as may be desired. A 1 - 1/2 inch thick wooden batten may have a greater ability to resist this bowing effect. However, the space available for employing a batten may tend to be limited by the design envelope of the car. Inasmuch as is advantageous to load the car as fully as possible, and given that the design of the car may usually reflect a desire to maximize loading within the permissible operational envelope according to the applicable AAR standard, the use of a relatively thick wooden batten may tend to push the outside edge of the top bundle outside the permissible operational envelope. Wooden battens may also be prone to rotting if subject to excessive exposure to moisture, or may be consumable wear items that may require relatively frequent periodic replacement.

It would be desirable to have an upper beam assembly that is integrated into the structure, that is formed to spread the bearing load across a larger area, that would tend to resist the bowing phenomenon, that would tend not to require frequent replacement, and that would tend not to be prone to rotting.

Existing center beam cars tend to have been made to fall within the car design envelope, or outline, of the American Association of Railroads standard AAR Plate C, and tend to have a flat main deck that runs at the level of the top of the main bolsters at either end of the car. In U.S. Patent 4,951,575, of Dominguez et al., issued August 28, 1990, a center beam car is shown that falls within the design envelope of plate C, and also has a depressed center deck between the car trucks. It would be advantageous to be able to operate center beam cars that exceed Plate C and fall within AAR Plate F, with a full load of lumber in bundles stacked 5 bundles high. A five bundle high load of 33 inch bundles requires a vertical clearance in the left and right hand bunks of at least 165 inches. This significantly exceeds the vertical loading envelope of a plate C car.

Increased vertical loading to exceed Plate C, as in a Plate F car, may tend also to increase the height of the center of gravity of a loaded car above the allowable vertical center of gravity height limit of 98 inches measured from top-of-rail (TOR). Consequently it may be desired to drop the center portion of the deck further to once again lower the center of gravity. However, as the deck is dropped further, the deck must also become narrower to remain within the AAR design envelope, whether of Plate C or Plate F. Further still, when the truck centers of the car exceed 46 ft. 3 in., the mid-span car width must be reduced due to swing out as the car travels through corners. That is, the car must lie within the design envelope of a 10'- 8" wide car with 46' - 3" truck centers, on a 13° curve (equivalent to a track center radius of 441.7 ft.).

As the allowable car width becomes narrower, either due to increasing the truck centers beyond 46 ft. 3 in., or due to lowering the height of the decking, it is highly desirable to retain as

much of the remaining lateral width as possible to support the bundles. Moreover, it has become desirable to provide a bunk width sufficient to carry 51 inch wide bundles, as well as 49 inch wide bundles. In the past, as shown in U.S. Patent 4,951,575 winches have been installed outboard of the side sills at longitudinal stations corresponding to the longitudinal stations of the outboard ends of the cross bearers. These winches are used to cinch the strapping that is used to secure the load to the center beam top compression member wings, or, in the case of a partially loaded car, to the center beam main vertical web assembly. The winches tend to extend further laterally outboard, relative to the longitudinal centerline, than any other part of the car. Given the inwardly angled profile of the lower portions of the Plate C and Plate F envelopes, each incremental decrease in overall car width measured from the centerline to the outboard extremity of the winch permits an incremental lowering of the loaded center of gravity of the car. Consequently, it is advantageous to make the winch mounting as laterally compact as possible.

In known center beam cars, such as those shown in U.S. Patent 4,951,575 and in U.S. Patent 4,802,420 of Butcher et al., issued February 7, 1989, the deck structure of the cars has included inwardly tapering risers mounted above the cross bearers, with longitudinally extending side sills running along the ends of the cross-bearers. The side sills have been angle or channel sections. In U.S. Patent 4,951,575 the side sills are z-sections with the upper leg of the Z extending outward, the lower leg extending inward, and the web between the two legs running vertically. In U.S. Patent 4,802,420 of Butcher et al., the side sill is a channel section, with the legs extending laterally outward and the web, being the back of the channel, extending vertically between the two legs. In both cases the winch is mounted outward of the vertical web.

In center beam cars it is desirable that the main center sill be aligned with the couplers to reduce or avoid eccentric draft or buff loads from being transmitted. In dealing with lateral loads, the side sills act as opposed flanges of a beam. The loads in the side sills, whether in tension, compression, vertical shear or lateral bending, tend to be transferred to the main sill through a main bolster assembly at each end of the car. In general the bolster is located at a level corresponding to the height of the main sill, and the shear plate, if one is used, is typically at a level corresponding to the level of the upper flange of the main sill.

It is desirable to have a well deck, also called a depressed center deck or dropped deck, between the trucks, to increase the load that can be carried, and so to increase the overall ratio of loaded weight to empty weight of the car, and also to reduce the height of the center of gravity of the car when loaded, as compared to a car having a flat, straight-through deck from end to end carrying the same load. In the case of a well deck, compression and tension loads in the side sills must be carried from the level of the side sills in the well, to the level of the side sills over the trucks, and then through the bolster structure and into the main sill. The transmission of forces through the vertical

distance of the eccentricity of the rise in the side sills from the well to the bolster results in the generation of a moment. When the side sill has a knee at the transition from the well to the end structure of the car, the height of the knee defines the arm of the moment. It is advantageous not to create an unnecessarily large moment couple, and hence to keep the knee height small.

5 The coupler height of rail road cars is 34 1/2" above top of rail (TOR). This is a standard height to permit interchangeable use of various types of rail cars. The main sill, or stub sill if used, tends to have a hollow box or channel section, the hollow acting as a socket into which the coupler is mounted. The minimum height of the main sill at the trucks (or stub sill, if one is used) and end structure bolsters tends to be determined by the coupler height, and the height required to clear the
10 wheels. The height of the well deck is limited by the design envelope, be it Plate C, Plate F, or some other. In general, however, the height of the shear plate, or top flange of the bolster, to the well decking is less than the desired 33 inch bundle height. It is desirable for the top of the first layer of bundles stacked in the well to be at a height that permits the next layer of bundles to match the height of bundles stacked over the trucks. Consequently it would be advantageous to have a false deck, or
15 staging, mounted above the shear plate, or if there is no end structure shear plate, then above the bolster, at a level to match the level of the top of the bundles carried in the well between the trucks.

 One way to reduce the stress concentration at the knee is to make the side sill section of the end portion of the sill deeper. Another way to reduce the stress concentration at the knee is to make the knee member wider. On the longitudinally inwardly facing side of the knee (that is, the side
20 oriented toward the lading in the well) the flange of the vertical leg of the knee may tend to extend perpendicularly. On the longitudinally outboard side, that is, the side facing the truck, the longitudinally outboard flange can be angled, or swept, resulting in a tapering leg, rather than one with parallel flanges. An increase in the section width, due to tapering the longitudinally outboard flange is desirable, as it permits a reduction in the stress concentration in the side sill assembly at the
25 knee, and tends to provide greater truck clearance.

 It may also be desirable or advantageous to be able to adjust the height of the structure over the bolster under circumstances where loads other than 33 inch bundles of lumber are carried, either by raising or lowering the staging to a different height, or lowering or removing it altogether such that the load is borne through the bolster and shear plate structure.

30 **SUMMARY OF THE INVENTION**

 In an aspect of the invention there is a center beam railroad car having a longitudinal centerline. The railroad car is supported by rail car trucks at either end thereof. The railroad car comprises a cargo support structure borne between the trucks, upon which cargo can be carried. There is a web work assembly including an array of posts mounted along the longitudinal centerline

of the rail road car. The array extends upwardly of the cargo support structure, and the array is braced longitudinally. An upper beam assembly surmounts the web work assembly. The upper beam assembly has cantilevered wings extending laterally of the longitudinal centerline. The railroad car has a load limit height defined at a level measured upwardly from the cargo support structure, and has
5 a nominal load height that is equal to the largest integer multiple of 33 inches that is less than the load limit height. The web work assembly has at least one skirt member mounted thereto to define a longitudinally extending face against which loads placed laterally outward thereof can bear. The skirt member extends from a first height that is at least as high as the nominal load height to a second height that is at least as low as a height that is six inches below the nominal load height.

10 In another aspect of the invention there is a center beam car having a longitudinal centerline. The center beam car is supported by rail car trucks at either end thereof. The center beam rail car has a center sill extending between the trucks. There is a decking structure extending laterally of the center sill upon which loads can be placed. An open truss structure extends upwardly from the center sill. An upper beam assembly is mounted upon the open truss structure. The upper beam structure
15 includes laterally extending wing portions and a vertical stem portion. The stem portion is mounted to the open truss structure at a joining interface, and the laterally extending wing portions are mounted to the stem. The stem includes a pair of longitudinally extending, laterally spaced apart, skirt members. The skirt members each have an outwardly facing surface against which cargo placed laterally outboard thereof can bear. The center beam car has an upper load limit height defined at a
20 level between the decking structure and the laterally extending wings. The skirts are located to overlap the load limit height. The outside lateral dimension of the stem matches the overall outside dimension of the open truss structure at the joining interface.

In another aspect of the invention there is a center beam car having a longitudinal centerline. The center beam car is supported by rail car trucks at either end thereof. The center beam railroad car
25 has a center sill extending between the trucks, a decking structure extending laterally of the center sill upon which loads can be placed, an open truss structure extending upwardly from the center sill and an upper beam assembly mounted upon the open truss structure. The upper beam structure includes laterally extending wing portions. The open truss structure has a pair of longitudinally extending, laterally spaced apart, skirt members mounted thereto. The skirt members each have an outwardly
30 facing surface against which cargo placed laterally outboard thereof can bear. The center beam car has an upper load limit height defined at a level between the decking structure and the laterally extending wings. The skirts are located to overlap the load limit height. The skirts have at least one reinforcement mounted laterally inboard thereof to discourage lateral deflection of the faces when cargo placed laterally outward thereof bears against the skirts.

In a further aspect of the invention, there is a rail road car having a longitudinal centerline. It comprises a pair of rail car trucks and a center beam assembly carried thereupon. The center beam assembly has a lower flange assembly, an upper flange assembly, and a web assembly extending between the upper and lower flange assemblies. The web assembly has a plurality of upwardly extending posts. The posts have a lower region and an upper region. The web assembly has a non-consumable skirt mounted to the upper region of the posts. The skirt presents a bearing surface. The bearing surface faces laterally outward relative to the longitudinal centerline of the rail road car. Cargo can bear against the bearing surface.

In another aspect of the invention there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a deck structure and a central vertical web assembly running along the car. The vertical web assembly extends upwardly of the deck structure. A top truss assembly surmounts the vertical web assembly. The deck structure includes first and second end decking portions mounted over the respective first and second trucks, and a medial decking portion lying between the trucks. The medial decking portion is stepped downward relative to the first and second end decking portions. The top truss assembly is mounted at a height exceeding AAR Plate C.

In an additional feature, the body has a bunk defined between the deck structure and the top truss. The bunk has a loading height measured between the medial decking portion and the top truss that is at least 165 inches. In another additional feature, the car has a center sill. The deck structure is supported thereby. The web assembly includes an array of posts extending upwardly from the main sill and has an upper region adjacent to the top truss and a lower region adjacent to the decking structure. The upper region of the web assembly has at least one longitudinally extending skirt against which lading can be placed.

In still another additional feature, the car has a center sill. The deck structure is supported thereby. The web assembly includes an array of posts extending upwardly from the main sill and has a lower region adjacent to the decking structure and an upper region distant therefrom. The car has an upper beam assembly. The upper beam assembly includes the top truss and a beam stem. The top truss is mounted upon the beam stem and the beam stem is mounted to the upper region of the web assembly. The beam stem includes at least one longitudinally extending skirt against which lading can be placed.

In yet another additional feature, the medial decking portion lying between the two trucks is at least 28' - 0" long. In a further additional feature, the medial decking portion lying between the two trucks is at least 40' - 0" long.

In another additional feature, the end decking portions and the medial decking portion each have a load bearing interface, and the load bearing interface of the end decking portions is stepped upwardly relative to the load bearing interface of the medial decking portion a distance of at least 30 inches. In still another additional feature, at least one of the end decking portions has staging
5 mounted thereon to define a load bearing interface spaced upwardly of at least one end decking portion. In yet another additional feature, the staging is moveable to a storage position. In an additional feature, the car has a pair of side sills extending along the deck structure. The side sills each have a medial side sill portion mounted to the medial decking portion. The medial side sill portion has a first depth of section. The side sills each have end side sill portions mounted to the end
10 decking structures. The end side sill portions have a second depth of section. The first depth of section is less than the second depth of section.

In still another additional feature, the end decking portions include lading support structure mounted thereon defining an end section lading interface. The end section lading interface lies at a height greater than 42 inches above top of rail. In yet another additional feature, the car has a pair of
15 side sills extending along the deck structure. The side sills each have a medial side sill portion mounted to the medial decking portion. The medial side sill portion has a first depth of section. The side sills each have end side sill portions mounted to the end decking structures. The end side sill portions have a second depth of section. The first depth of section is less than the second depth of section.

In still yet another additional feature, the car has a pair of side sills extending along the deck
20 structure. The side sills each have a side sill medial portion mounted to the medial decking portion. The medial side sill portion has a first depth of section. The side sills each have side sill end portions mounted to the end decking structures. The side sill end portions have a second depth of section. Each of the side sills has a knee joining the side sill medial portion to each of the side sill end
25 portions. Each knee has a longitudinally inboard flange, a longitudinally outboard flange, and webbing extending therebetween. The longitudinally outboard flange has a lower extremity and an upper extremity. The lower extremity lies at a longitudinally inboard station relative to the upper extremity.

In another additional feature, the car has a pair of side sills extending along the deck
30 structure. The side sills each have a medial side sill portion mounted to the medial decking portion. The side sills each have end side sill portions mounted to the end decking structures. The medial side sill portion has a medial portion side sill web extending from a first edge to a second edge. The first edge lies at a greater height than the second edge, and the first edge lies a further distance transversely outboard than the second edge. In yet another additional feature, the medial decking
35 portion has at least one lading securement apparatus mounted to the medial portion side sill web.

In another aspect of the invention, there is a center beam rail road car having a longitudinal centerline and a pair of ends. The rail road car is supported by rail car trucks at either end thereof. The rail road car has a cargo support structure borne between the trucks, upon which cargo can be carried. The cargo support structure includes a pair of first and second end structures each mounted over a respective one of the trucks, and a medial structure mounted between the trucks. The medial structure is stepped downwardly relative to the end structures. A web assembly includes an array of spaced apart posts mounted at intervals along the longitudinal centerline of the rail road car. The array extends upwardly of the cargo support structure. An upper beam assembly surmounts the web assembly. The upper beam assembly has cantilevered wings extending laterally of the longitudinal centerline. The railroad car has a load limit height defined at a level measured upwardly from the medial structure, and having a nominal load height that is at least as great as the largest integer multiple of 33 inches that is less than the load limit height. The web assembly has at least one skirt member against which loads placed laterally outward thereof can bear. The skirt member extends between a first height and a second height straddling the nominal load height.

In an additional feature of this aspect of the invention, the skirt extends a longitudinal distance corresponding to at least one of the intervals. In another additional feature, the first height is at least as great as the load limit height, and the second height is at least 6 inches below the nominal load height.

In another aspect of the invention, there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a deck structure and a central vertical web assembly running along the car. The vertical web assembly extends upwardly of the deck structure. A top truss assembly surmounts the vertical web assembly. The deck structure includes first and second end decking portions mounted over the respective first and second trucks. The first and second end decking portions have structural members presenting respective first and second end portion load bearing interfaces, and a medial decking portion lying between the trucks. The medial decking portion has at least one member presenting a medial load bearing interface. The medial load bearing interface is stepped downward relative to the first portion load bearing interface through a step distance. The step distance is greater than 30 inches.

In another aspect of the invention, there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a deck structure and a central vertical web assembly running along the car between the ends. The vertical web assembly extends upwardly of the deck structure. A top truss assembly surmounts the vertical web assembly. The deck structure includes first and second end decking portions mounted over the respective first and second trucks and a medial decking portion lying between the trucks. The medial decking portion is stepped downward relative to the first and second end decking portions. At least

one of the first and second end deck portions has staging mounted thereupon. The staging has a load support member spaced upwardly of at least one first and second end deck portions.

5 In another aspect of the invention there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a deck structure and a central vertical web assembly running along the car between the ends. The vertical web assembly extends upwardly of the deck structure. A top truss assembly surmounts the vertical web assembly. The deck structure includes first and second end decking portions mounted over the respective first and second trucks. A medial decking portion lies between the trucks. The medial decking portion is stepped downwardly relative to the first and second end decking portions. The
10 deck structure has laterally outboard side sills running therealong. Each of the side sills has first and second end decking side sill portions mounted to respective ones of the first and second end decks, and a medial side sill portion mounted to the medial deck portion. The medial deck portion is joined to the end deck portions by knee braces. Each of the knee braces has a longitudinally inboard flange adjacent to the medial portion. The inboard flange extends vertically and each of the knee braces has
15 a longitudinally outboard flange. The longitudinally outboard flange extends from a lower portion thereof lying at a first height relative to top of rail, to an upper portion thereof lying at a second, greater, height relative to top of rail. The upper portion lies further from the longitudinally inboard flange than the lower portion.

20 In another aspect of the invention, there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a deck structure and a central vertical web assembly running along the car. The vertical web assembly extends upwardly of the deck structure. A top truss assembly surmounts the vertical web assembly. The deck structure includes first and second end decking portions mounted over the respective first and second trucks, and a medial decking portion lying between the trucks. The medial decking
25 portion is stepped downward relative to the first and second end decking portions. The medial decking portion has a pair of medial decking side sills mounted therealong. Each of the side sills has a web. The web has an upper edge and a lower edge. The upper edge lies further outboard than the lower edge. In an additional feature, the medial decking side sill has a load securing device mounted transversely outboard thereof.

30 In another additional feature, at least one of the end decking portions has an end decking side sill. The end decking side sill has a web. The end decking side sill web has an upper edge and a lower edge, and the upper edge of the end decking side sill web lies further outboard than the inner edge thereof.

In another additional feature, the medial decking side sill portion is inclined at a first angle relative to the vertical, and the end decking side sill web is inclined at a second angle relative to the vertical. The first angle is greater than the second angle. In still another additional feature, the end decking side sill web has a load securing device mounted transversely outboard thereof.

5 In another aspect of the invention, there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a deck structure and a vertical web assembly running along the car. The vertical web assembly extends upwardly of the deck structure. A top truss assembly surmounts the vertical web assembly. The deck structure includes first and second end decking portions mounted over the respective first and second
10 trucks, and a medial decking portion lies between the trucks. The medial decking portion is stepped downward relative to the first and second end decking portions. The medial decking portion has a pair of medial decking side sills mounted therealong. At least one of the end decking portions has a pair of end decking side sills mounted therealong. The end decking side sills have a greater depth of section than the medial decking side sills.

15 In another aspect of the invention, there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a center sill and a deck structure extending outboard of the center sill. A vertical web assembly runs along the car. The vertical web assembly extends upwardly of the center sill structure. A top truss assembly surmounts the vertical web assembly. The top truss lies at a height exceeding AAR Plate C. The deck
20 structure includes first and second end decking portions mounted over the respective first and second trucks. A medial decking portion lies between the trucks. The medial decking portion is stepped downward relative to the first and second end decking portions. At least one of the end decking portions has a cargo support interface lying at a level greater than 42 inches above top of rail.

25 In another aspect of the invention, there is a center beam rail road car having a center beam car body mounted on a pair of first and second spaced apart rail car trucks. The body has a center sill having an upper flange and a lower flange. A deck structure extends outboard of the center sill. A vertical web assembly runs along the car. The vertical web assembly extends upwardly of the center sill structure. A top truss assembly surmounts the vertical web assembly. The top truss lies at a height exceeding AAR Plate C. The deck structure includes first and second end decking portions mounted
30 over the respective first and second trucks, and a medial decking portion lying between the trucks. The medial decking portion is stepped downward relative to the first and second end decking portions. At least one of the end decking portions has a cargo support interface lying at a greater height than the upper flange of the center sill.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows an isometric, general arrangement view of a center beam rail road car having a depressed center deck;

Figure 2a shows a side view of a center beam rail road car similar to the center beam car of Figure 1;

Figure 2b shows an alternate configuration of car to that shown in Figure 2a;

Figure 2c shows an alternate configuration of car to that shown in Figure 2a;

Figure 2d shows an alternate configuration of car to that shown in Figure 2a;

Figure 2e shows an alternate configuration of car to that shown in Figure 2a;

Figure 2f shows an alternate configuration of car to that shown in Figure 2a;

Figure 2g shows a side view of one half of an alternate center beam rail road car to the center beam rail road car of Figure 1;

Figure 3a shows a perspective view of a detail of a deck transition section of the center beam car of Figure 2a;

Figure 3b shows an alternative to the transition section of Figure 3a;

Figure 3c shows an alternative, removable, load supporting structure for an end section of a center beam car otherwise similar to the rail car of Figure 2a;

Figure 3d shows an alternative, collapsible load supporting structure for an end section of a center beam railroad car similar to the car of Figure 2a;

Figure 3e shows an isometric view of a detail of a deck transition of the center beam rail road car of Figure 2g;

Figure 4a shows a half section of the car of Figure 2a taken on section '4a - 4a';

Figure 4b shows a half section of the car of Figure 2a taken on section '4b - 4b';

Figure 4c shows a half section of an end deck taken on section '4c - 4c' looking toward a cross-tie of the car of Figure 2a;

Figure 4d shows a cross-section of an end deck taken on section '4d - 4d' looking toward the main bolster of the car of Figure 2a;

Figure 4e shows an enlarged detail of the cross-section of Figure 4a;

Figure 5a shows a cross-section of the car of Figure 2g taken on section '5a - 5a';

Figure 5b shows a cross-section of the car of Figure 2g taken on section '5b - 5b';

Figure 5c shows a cross-section of the car of Figure 2g taken on section '5c - 5c' looking toward the main bolster;

Figure 5d shows a cross-section of the car of Figure 2g taken on section '5d - 5d';

Figure 5e shows a cross-section of the car of Figure 2g taken on section '5e - 5e';

Figure 6a shows an enlarged detail of Figure 5a;

Figure 6b shows an enlarged detail of Figure 5b;

Figure 6c shows an enlarged detail of Figure 5c;

Figure 6d shows an enlarged detail of Figure 5d;

Figure 6e shows an enlarged detail of Figure 5e;

Figure 7a shows a detail of the upper beam structure of the car of Figure 2a;

Figure 7b shows a side sectional view of the detail of Figure 7a;

5 Figure 8a shows an alternate detail to that of Figure 7a;

Figure 8b shows a side sectional view of the detail of Figure 8a;

Figure 9a shows an alternate detail to that of Figure 7a;

Figure 9b shows a side sectional view of the detail of Figure 9a;

Figure 10a shows an alternate detail to that of Figure 7a;

10 Figure 10b shows a side sectional view of the detail of Figure 10a;

Figure 11a shows an alternate detail to that of Figure 7a;

Figure 11b shows a side sectional view of the detail of Figure 11a;

Figure 12a shows an alternate detail to that of Figure 7a;

Figure 12b shows a side sectional view of the detail of Figure 12a;

15 Figure 13 shows an alternate detail to that of Figure 7a;

Figure 14 shows an alternate detail to that of Figure 7a;

Figure 15a shows an alternate detail to that of Figure 7a;

Figure 15b shows an alternate detail to that of Figure 15a;

Figure 15c shows an alternate detail to that of Figure 15a;

20 Figure 15d shows an alternate detail to that of Figure 15c;

Figure 15e shows an alternate detail to that of Figure 15c;

Figure 15f shows an alternate detail to that of Figure 15d;

Figure 16 shows an alternate detail to that of Figure 7a;

Figure 17 shows an alternate detail to that of Figure 7a;

25 Figure 18 shows an alternate detail to that of Figure 7a; and

Figure 19 shows an alternate detail to that of Figure 7a.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

30 The description which follows, and the embodiments described therein, are provided by way of illustration of an example, or examples of particular embodiments of the principles of the present invention. These examples are provided for the purposes of explanation, and not of limitation, of those principles and of the invention. In the description which follows, like parts are marked throughout the specification and the drawings with the same respective reference numerals. The drawings are not necessarily to scale and in some instances proportions may have been exaggerated

35 in order more clearly to depict certain features of the invention.

A center beam railroad car is indicated in Figure 1 generally as **20**. It has a center beam railroad car body **21** carried on a pair of longitudinally spaced apart railroad car trucks **22** and **23** and operable to, roll in a rolling, direction along rails in the generally understood manner of rail cars. Car **20** has a longitudinal centerline **25** lying at the center of the coupler height and in a longitudinal plane of symmetry, indicated generally as **24**, which intersects the kingpin connections of trucks **22** and **23**. Car **20** has a deck structure **26** that has end deck portions **27**, **28** and a medial deck portion **29**, carried between the trucks at a height, relative to the top of rail (TOR) that is lower than the height of the end deck portions **27**, **28**.

The structure of a center beam car is analogous to a deep beam having a tall central structure to approximate the web of a beam, or a web-like structure or truss assembly, a wide flange at the bottom, and a wide flange at the top. In the case of car **20**, the central web assembly is indicated generally as **30** and runs in the longitudinal direction (that is, the rolling direction of the car), the top flange function is served by a top truss assembly **32**, and the lower flange function is performed by an assembly that includes a lateral support structure **34**, in the nature of a deck, or frame, or staging upon which cargo can be placed, and that extends laterally outward to either side of a main center sill **36**, and main center sill **36** itself. Lateral support structure **34** generally includes deck structure **26**, and its outboard left and right hand side sills **42** and **44**.

It will be appreciated that aside from fittings such as hand grabs, ladders, brake fittings, and couplers, the structure of car **20** is symmetrical about the longitudinal plane of symmetry **24**, and also about a transverse plane of symmetry **31** at the mid-length station of the car. In that light, a structural description of one half of the car will also serve to describe the other half. The features of car **20** thus enumerated are basic structural features of a center beam car having a depressed center deck.

In detail, main center sill **36**, is a fabricated steel box beam that extends longitudinally along centerline **25** of car **20** throughout its length, having couplers **38** mounted at either end. Cross bearers **40** extend outwardly from center sill **36** to terminate at a pair of longitudinal left and right hand side sills **42**, **44** that also run the length of the car. In the various embodiments of rail cars shown herein, cross-bearers are indicated as item **40** and cross-ties are indicated as item **39**. These cross bearers and cross ties extend laterally outward from center sill **36** on approximately 4 ft centers. Decking **46** is mounted to extend between cross-bearers **40**, and cross-ties **39** providing a shear connection between adjacent cross-bearers when side loads are imposed on the car. Structural members in the nature of tapered risers **48** are mounted above the cross-bearers to form the base of a bunk for carrying loads. Risers **48** are tapered so that loads stacked thereupon will tend to lean inwardly toward the center-line of car **20**. The upper surfaces of risers **48** define respective end decking portion and medial decking portion load-bearing interfaces. The combined structure of center sill **20**, cross-bearers **40**, and side

sills **42, 44** and decking **46** provides a wide, lower beam or lower flange assembly extending laterally outward from the longitudinal centerline of car **20**.

As noted above, deck structure **26** has a first end portion, namely end deck portion **27**, a second end deck portion, namely end deck portion **28**, and a medial deck portion **29**. At each of the transitions from either end deck portion **27** or **28** to medial deck portion **29** there is a knee, indicated as either **47** or **49**. Not only is deck structure **26** stepped in this manner, but so too are side sills **42** and **44**, each having end members **41, 43**, and a medial span member **45**.

At either end of car **20** there are vertically upstanding fore and aft end bulkheads **50** and **52** which extend from side to side, perpendicular to the central longitudinal plane **24** of car **20**. Running the full length of car **20** between end bulkheads **50** and **52** is an array **54** of upright posts **56, 57**. Array **54** is reinforced by diagonal braces **58, 59**, that provide a shear path for vertical loads.

The array **54** of posts **56, 57** is surmounted by an upper beam assembly **60** and deep beam top chord assembly **62**. An open framework top truss **64** is mounted atop deep beam top chord assembly **62**. Truss **64** has lateral wings **65** and **67** that are mounted to extend outboard from the central plane of car **20** in a cantilevered manner. Truss **64** has longitudinal stringers **66**, cross members **68** and shear plates **69**.

As indicated in Figures **2a, 2b, 2c, 2d, 2e** and **2f**, there are many different possible configurations of posts and diagonal bracing. In Figure **2a**, a center beam railroad car with a depressed center deck is indicated as **70**. It has an array of vertical posts **72** that includes fabricated posts **73** having a generally H shaped section, and posts **74** having a generally C-channel shaped section, both type being more fully described below. The end bays have solid panels **75, 76** respectively. End diagonal struts **77, 78** extend upwardly and longitudinally outboard away from the respective truck centers. Structural reinforcement members in the nature of left and right hand two-bay inboard diagonal braces, are indicated as **79, 80**. Left and right hand three-bay diagonal braces are indicated as **81, 82** with the upper ends of braces **81, 82** overlapping at the upper region of central bay **84**.

In Figure **2b**, a car **83** is similar to car **70**, except insofar as an extra pair of two-bay diagonal braces **79, 80** being employed in place of braces **81, 82** with central bay **84** being free of diagonal bracing. In Figure **2c**, a center beam railroad car **85** is similar to car **70**, but rather than using overlapping three-bay braces, **81** and **82**, an additional tapered vertical post **86** is mounted at mid-span in central bay **84**, and a pair of two-and-a-half bay braces **87, 88** meet at an upper portion of post **86**. In Figure **2d**, a car **90** is similar to car **85**, but a shear plate **91** is mounted in central bay **84**. In Figure **2e**, a center beam railroad car **92** is similar to cars **85** and **90**, but employs a single-bay diagonal brace **93**. In Figure **2f**, a center beam railroad car **94**, similar to cars **85, 90, 92**,

employs a pair of crossed single-bay braces **93, 95** in central bay **84**. Of these, the embodiment of Figure **2f** is preferred.

In all of cars **70, 83, 85, 90, 92** and **94**, staging, in the nature of false floors **96, 98** is carried above the respective end deck portions. This staging is offset from the lading supporting structure of medial deck portion **29** by a height increment indicated as **S** (Figure **4a**). In all of the embodiments illustrated in Figures **2a, 2b, 2c, 2d, 2e** and **2f**, the step increment corresponds to the height of a nominal 32 inch bundle of lumber, plus dunnage, (that is, 31 and 1/2 inches of lumber plus 1 and 1/2 inches of dunnage).

Figures **4a** and **4b** are half sectional views of center beam railroad car **70** taken, respectively, at cross-tie **41** of end deck portion **27** looking inboard parallel to centerline **25**, and at mid-span of medial deck portion **29**, looking toward the nearest adjacent cross-bearer **40**. The outline of AAR Plate **F** is indicated generally as '**F**'. A main center sill is indicated, as above, as **36**. It has an upper horizontal member in the nature of upper main flange **102**, and a pair of spaced apart vertical shear carrying members in the nature of left and right hand main sill webs **103, 104**, thus forming three sides of a box. The fourth side of the box is formed by a lower horizontal member, in the nature of a main sill lower flange **106**. Lower flange **106** has an end portion, running along the outboard portion of main sill **36**, in a manner similar to a stub sill, indicated in Figure **3a** as **108** at a height for mounting upon truck **22** or **23** as the case may be. The rectangular female socket **28** defined by the inner walls of items **102, 103, 104** and **108** is of a size and shape for receiving the male end of a coupler, such as coupler **38**.

As seen in Figure **3a** the inboard portion of lower flange **106** of main sill **36**, such as extends along medial deck portion **29**, is indicated as **107** and lies at a height relative to TOR that is below portion **108**. Lower flange portions **108** and **110** are joined by a smoothly swept transition section **109**, as indicated in phantom in Figure **3a**.

As seen in Figures **3a, 4a**, and **4b**, in the medial, or drop deck portion of the car, indicated as **29**, there are cross-bearers, **40**, as noted above. The endmost cross bearer of portion **29** next to knee **47** is indicated as **112**. It is suspended from, and extends transversely to, main center sill **36**. Cross bearer **112** has a vertically standing web, **114**, and left and right hand upper flanges **115, 116**. Flanges **115, 116** lie flush, and co-planar, with the outboard extremities of lower flange portion **110**. (That is, flush with the portions of flange portion **110** that stand outwardly proud of vertical webs **103** and **104**). The join between flanges **115, 116** and flange portion **110** is smoothly radiused.

Web **114** has left and right hand tapered portions **117, 118**, and a continuous lower flange **120** that follows the profile of the lower edge of portions **117, 118**. Longitudinal gussets **122, 123** are placed between adjacent cross-bearers **112** to encourage the maintenance of parallelism between

adjacent webs 114. Each upper flange 115, 116 of each cross bearer 112 has mounted on it a riser 124 that is tapered in profile, being shallowest closest to the car centerline 25, and deepest at its outboard extremity so that lading borne thereon will tend to have an inward slant. The ends of upper flanges 115, 116 and lower flange 120 are flared and radiused to meet the inner face of longitudinally extending medial side sill portion 126. The upper flange 130 of side sill portion 126 lies flush, and co-planar with, upper flange 115, (or 116 as may be), the outboard end of riser 124 overlying side sill flange 130. Those portions of flange 110, flange 115 (or 116) and flange 130 that remain exposed provide a peripheral lap surface upon which floor sheets 127, 128 can be welded, providing a shear connection between those elements.

As best seen in Figures 4a, 4b and 4e medial side sill portion 126 has a channel like profile, having top or upper flange 130, noted above, a bottom or lower flange 132, and a back, or web, 134. However, while top flange 130 and bottom flange 132 lie in parallel horizontal planes, web 134 does not stand perpendicular to them, and does not stand vertically perpendicular. Rather, web 134 is canted upward and outward at an angle β measured from the vertical, such that flange 130 is displaced, or skewed, or stepped, outward relative to flange 132. As seen in Figure 4a, the extent of this outward positioning is such that both upper and lower flanges fall within the envelope of Plate F. A load securing device in the nature of a winch 138 is mounted to the outboard face of web 134 for tightening strapping 136 about the lading 137. The slanted incline of web 134 permits the center of rotation of winch 138 to be drawn inward toward the center line of rail car 70 (or 20, 83, 85, 90, 92, or 94 as the case may be), thus tending to permit the medial portion 29 of deck structure 26 to be carried at a lower height than otherwise.

The construction of end deck portion 28 (or 27), is shown in Figures 3a, 4a, and 4d. Main bolster 142 extends laterally outward from the main sill 36 at the longitudinal station corresponding to the truck center, whether of truck 22 or 23, the car being symmetrical about its mid span transverse plane. The lower flange of bolster 142 is formed to follow an upwardly and outwardly stepped profile to clear the wheels of truck 22 (or 23) through the turning envelope of the truck relative to the car generally. End deck structure 140 (Figure 3a) includes a cross tie 146 located roughly 8 ft longitudinally outboard of main bolster 142, (Figure 2a and 4c) cross tie 148 (Figure 2a) located roughly 4 ft. longitudinally outboard of main bolster 142, and cross tie 150 (Figure 2a) located roughly 4 ft. longitudinally inboard of main bolster 142. A side sill end portion is indicated as 152 (Figure 3a), and extends along the transversely outboard, or distal, ends of main bolster 142, and cross ties 146, 148 and 150.

In Figure 4d, side sill end portion 152 also has the form of a skewed C-channel, having an outwardly and upwardly slanted web or back 154 having an upper edge and a lower edge, the upper edge lying further transversely outboard than the lower edge. Back 154 is inclined from the vertical at

an angle ψ . ψ is less than β described above. Side sill end portion 152 has a top flange 156 that is substantially level in a horizontal plane; and a bottom flange 158 that is parallel to top flange 156, but inwardly inset according to the horizontal run of slanted back 154. Winches 160 (not shown in Figure 3a) are mounted at the longitudinal stations corresponding to main bolster 142 and cross ties 146, 148, and 150.

A staging assembly, in the nature of a false floor is indicated generally as 170. It includes lateral vertical web members in the nature of false floor webs 174, 176, 178 (Figure 2a) and 180 mounted above, and at the longitudinal stations of, cross tie 146, cross tie 148, main bolster 142 and cross tie 150. A false floor support, in the nature of an angle iron 182, is mounted to the inboard wall face of end bulkhead 184 at a level corresponding to the level of the upper edges of false floor web top flanges 185 (Figure 3a) of false floor webs 174, 176, 178 and 180 (Figure 2a). A vertically extending longitudinal false floor web 186 (Figure 3a) is mounted above, and runs along, side sill end portion 152. A floor sheet 188 is then welded above, and is supported by items 174, 176, 178, 180 and 182. Tapered risers, 190 (not shown in Figure 3a), upon which lading can rest, are mounted above the respective laterally extending vertical web members. The incremental height distance of the rise from the load supporting interface of risers 124 (Figure 4a) to the load supporting interface of risers 190 (Figure 4a), measured perpendicular to the slope of risers 124, 190, corresponds to the height of a bundle of lumber, plus dunnage. In the preferred embodiment this incremental height is 33 $\frac{5}{8}$ " +/- $\frac{1}{8}$ ", although it can be a lesser height, such as 30 inches with any discrepancy being made up by dunnage. Vertical webs, namely gussets 192, 194 (Figure 3a) are mounted between adjacent pairs of vertical posts to the level of the false floor as supports for the otherwise unsupported inner edge of floor sheet 188. Covers 196 act as gussets filling the gaps between adjacent posts and gussets 192, 194.

Knee 47 is located at the transition, or step, between end portion 28 and medial deck portion 29. Knee 47 is located at a mid-bay longitudinal station between the longitudinal stations of formed post 206 and fabricated post 208. A laterally extending, generally horizontal transition flange 210 extends flush with, and between, main sill lower flange 107 and side sill medial portion upper flange 102. At the same longitudinal station, a side sill end portion stiffener, in the nature of a rectangular tube 216, is mounted to extend between center main sill 36 and the inboard end of side sill end portion 152. A vertical wall member, in the nature of a well bulkhead sheet 220 is mounted to extend vertically upward from transition flange 210, past the inboard end of side sill end portion 152 and rectangular tube 216, up to the level of false floor sheet 188. Sheet 220 terminates at its upward end in a formed flange 222, which overlaps, and is welded to, sheet 188. An inner tapered gusset 226 is located at the longitudinal station of transition flange 210 and extends between the inner face of medial side sill portion and the underside of transition flange 210. Similarly, at the same longitudinal station, a side sill gusset 230 reinforces the section of side sill portion 126.

As viewed from the side of car 70 as illustrated in Figure 3a, knee 47 appears to have a longitudinally inboard vertical flange 232, that is, the transversely outboard or distal margin of well bulkhead sheet 220, and an outboard, angled flange 234 that faces, generally, toward truck 23, with a web or webs extending between sheet 220 and flange 234. Flange 234 includes three aligned portions. The first, lowest portion is a side sill gusset member 236, that closes the end of side sill portion 126 and extends upwardly on a slant toward the lower or bottom flange 158 of side sill end portion 152, to a locus of intersection somewhat inboard of the longitudinal station of formed post 206. The line of member 236 is continued by side sill end portion gusset 238, which is slanted to lie within the flanges and back of side sill end portion 152, and by a false floor gusset 239, located on the same angle between the top flange of side sill end portion 152 and false floor sheet 188. A trapezoidal gusset 240 fills the void between the bottom flange 158 of portion 152, the upper or top flange 130 of the end of medial portion 126, sheet 220, and flange 234. When seen in end view, as in Figure 4a, flange 234, and the outboard edge of sheet 220, both follow an upwardly and outwardly angled profile, lying within Plate F. Providing an angled flange in this way, and thereby effectively deepening the width of section of vertical flange 232 of knee 47 may tend to increase the width of structure over which a moment couple generated in side sill medial portion 126 can be carried, thus tending to reduce the stress levels in the transition. Flange 234 terminates, at its upward and outward end, at false floor support top flange 185. Upper main sill flange 102 is trimmed back flush with main sill side webs 103 and 104 in the well section or medial portion of the car so that a smooth face is presented next to the lading.

An alternative embodiment of end deck structure is shown in Figure 3b. Rather than employing a false deck mounted above the side sill end portion, a deeper side sill end section is employed. An end deck portion is indicated generally as 250. It includes a main bolster and vertical posts, both formed and fabricated, as above. A deep side sill end section 252 has a lower flange 254 at the same level as that of lower or bottom flange 158 of side sill end portion 152 described above (that is, at a height to clear the operational envelope of the adjacent truck 22 or 23). The upper flange 256 of section 252 is carried at the same height as the false floor top flange 185 described above. The vertical web 258 of section 252 then serves as the longitudinal outboard web of the staging, or false floor. In place of cross-ties 146, 148 and 150, and transversely oriented vertical false floor webs 174, 176, and 178, a transverse support 260 has a bottom flange 262, a vertical false floor web 264, and an upper flange 266. Bottom flange 262 is carried at an elevation equal to that of lower flange 254 of side sill end section 252 and upper flange 102 of main center sill 36.

In place of diagonal, angled flange 234, knee 270 has an inclined flange 272 that boxes in the end of medial side sill portion 274 and meets lower flange 254 of end section 252. Web 258 of side sill end section 252 has a knee, and a web stiffener 278 is run across the corner between upper and lower flanges 256, and 254. A boxed end stiffener 280 is used in place of rectangular tube 216, and a

web 282 fills the space between well bulkhead sheet 220, side sill medial portion upper flange 130, inclined flange 272, and web stiffener 278. Web 258 and web 282 are portions of a single, monolithic port. As in the embodiment of Figure 3a, the tapered vertical leg that is created in this manner has a greater depth of section and may tend to be advantageous in carrying moment couples through the end deck to well deck transition. False floor sheets and risers are located as described above.

In Figure 3c, removable staging, or a removable false floor assembly 300, includes a conventional end decking structure medial side sill, and a series of removable lading support beams 304 upon which bundles of lumber can be carried. Each beam has an upper flange 306, a web 308, and a lower flange 310. Lower flange 310 carries attachment fittings in the nature of bolts 312 to permit it to be located at a longitudinal station abreast of respective ones of posts 314 and 316. Tapered risers 318 are separable, and have the same attachment fitting footprint as lower flange 310, so it can be re-applied to the conventional deck. Support beams 304 can be located in storage positions nested inside the flanges of posts 314 and 316, as desired.

In the further alternative embodiment of Figure 3d, a center beam rail road car 320 has a moveable decking end portion sheet indicated generally as 322. Sheet 322 is hinged at 324, 326 to permit rotation upward to lie in an up, or storage position against the outside face of posts 328 and 330. A collapsible support structure, in the nature of a set of diagonal links 332 and vertical struts 334 support sheet 322 when it is deployed in its down, or use, position. Links 332 and struts 334 are mounted to lugs 336 mounted on cross tie 338 and main bolster 340 respectively. Risers 342 are also mounted to cross tie 338 and main bolster 340, the height of risers 342 exceeding the height of lugs 336. Fenders 344 are mounted to the underside of sheet 322, and stand proud of those of lugs 336 that are also mounted to the underside of sheet 322, and to which the upper ends of links 332 and struts 334 mount.

In Figure 2g, a dropped deck center beam rail road car is indicated generally as 350. It has a web structure 352 and a top truss structure 354 substantially the same as those shown in Figure 2f. Car 350 differs from those described above as shown in the isometric view of Figure 3e and the sectional views of Figures 5a – 5e and the detail views of Figures 6a to 6e. The main sill is indicated as 356. It has a top cover plate 358, left and right hand side webs 360, 361, and a bottom flange 364, all welded in a box structure. Side webs 360 and 361 are tapered inward at the same angle, and in the same planes as, the flanges of the upright posts, 365, 366, so that there is slope continuity. Cross-bearers 368 are mounted transversely below main sill 356, the web 370 of cross bearers 368 running beneath main sill 356 and having left and right hand portions extending to either side of main sill 356, generally similar to the embodiment of Figure 4e described above. Hollow structural members, in the nature of hollow steel tubes, identified as risers 374, locate over the top flanges of cross-bearers 368,

each having an inboard end seated upon the upper side of bottom flange **364**, abutting respective side webs **360** and **361**.

Side sills **376** and **378** extend along the outboard ends of cross-bearers **368**. Side sills **376** and **378** have end portions **380** and **382**, and medial portions **384** (Figure 3e). Medial portions **384** extend along the dropped deck portion of the car, and are, consequently, stepped downwardly relative to end portions **380** and **382**. As with side sills **126** and **152** described above, each of side sills **376** and **378** is skewed – that is, while the flanges are parallel, the lower side sill flange is stepped inboard relative to the upper side sill flange, and the back, or web, of the side sill is canted inward at an angle. Web **370** has a depth at its left and right hand outboard, or distal, extremities that corresponds to the depth of the side sill between the top and bottom flanges. The bottom flanges **369** of cross-bearers **368** extend outwardly such that the bottom flange of side sills **376** and **378** seat thereon. The winch arrangement is similar to that described above.

As above, the dropped deck portion of the deck ends at left and right hand knees, indicated as **392**, **394**. Other than being of opposite hands, they are of identical construction. The medial portion of the side sills, **384**, has been described above. The end portions **380** and **382** are formed from deep wide flanged beams. As noted above, the depth of the beam is determined at the lower flange by the height required to give adequate clearance over the wheels when the car is fully loaded and cornering, and the upper height limit of the upper flange is determined by the 33 $\frac{5}{8}$ " height increment at the step in the deck at knees **392** and **394**. Notably, there is no false floor. End portions **380** and **382** terminate, at their inboard ends at knees **392** and **394**, at a corner, **400**, that is enclosed with an angled end gusset **402** running on the diagonal between the upper and lower flanges of end portion **380** or **382**, as the case may be.

The upright portion, **404** of side sills **376** and **378**, have a front flange member **406** facing the well, a rear facing flange member **408** facing the adjacent truck, an irregular quadrilateral upper web portion **410** and a lower web portion **412**. Front flange member **406** is a substantially flat metal plate, and is mounted in a vertical plane. The metal plate is trimmed to provide smoothly radiused transitions to mate with an upper cross member **414**, a medial cross member **416**, and a bottom cross member **418**. At its lower extremity front flange member **406** has a sill engagement fitting, or seat, in the nature of a hook-shaped cut-out conforming to the inward profile of medial side sill member **384**. That is, the upper edge of the cut-out conforms to the top flange of the medial side sill portion, the outboard edge of the inwardly curving leg **422** conforms to the back, or web, of the medial side sill portion, and the smoothly curved toe **424** conforms to the bottom flange of the medial side sill. A gusset **426** seats within medial side sill portion **384**, in the plane of front facing flange member **406**, completing the section.

Rear facing flange member 408 is made from a bent plate cut to the desired profile. An upper leg 428 of member 408 runs downwardly from the end of the lower flange 427 of end side sill portion 380 (or 382) on an angle along the edge of quadrilateral web portion 410. It bends downward into a lower leg 430 lying in a vertical plane at the longitudinal station of the end of the medial portion 384. Member 408 also has an inwardly tending leg 432 cut to a similar profile to leg 422 and toe 424, although having greater width when seen perpendicular to the vertically extending plane. A gusset 434 seats within the end section of side sill medial section 384 in the plane of leg 432, in a manner similar to gusset 426.

Lower cross-member 418 is an angle iron having one leg 436 trimmed to lie in a vertical plane, perpendicular to the longitudinal centerline of car 350, between side web 360 (or 361) of main sill 356 and the trimmed transition of front flange member 406. The other leg 435 of member 418 is trimmed to lie between, and be welded to, the outer edge of bottom flange 364 of main sill 356 and the juncture of the back or web, and upper flange of medial side sill portion 384. A stringer in the nature of an upwardly opening channel 438 extends from a hangar bracket web mounting 437 on the underside of member 418 to the first cross-bearer 439 (Figure 2g).

In this embodiment it will be noted that the cap, or upper flange of main sill 356 is carried at a height corresponding to the height of the upper, or end, deck portions. Figure 5c shows the deep main bolster 440 at section 5c- 5c. As can be seen, left and right hand arms 442 and 444 of main bolster 440 have outer, or distal extremities 445 that have the same depth of section as side sill end portions 380, 382. The root of main bolster 440 at the juncture of main sill 356 has a depth extending from the truck center plate mounting to the height of the upper deck. Main bolster 440 has inner shoulders 446, and sloped intermediate portions 448 joining the inner and distal portions, with a stepped flange 450 extending fully along the lower edge of the bolster web. At this section, the tapered walls or webs, of main sill 356 are bracketed by two heavier, vertical plates 452, 454. Plates 452 and 454 form the inner end of the end portion of the center sill 356. A heavier top flange 456 forms the top plate of the end portion of main sill 356.

Figures 5d and 6d show the penultimate cross-bearer 458 located at the longitudinal station between upright post 459 and main bolster 440. A coupler pocket 464 is formed by welding a lower web 466 between plates 452 and 454. Pocket 468, and smoothly tapered cross member 460 are shown in Figure 5e.

In the one embodiment, car 70 has a well deck portion that is 40 ft-6 in. long. The internal lading height of the well, that is, the nominal loading height of the bunk defined between the medial decking portion load bearing interface and the wings 65, 67 (Figure 7a) of top truss 64 is 165 inches. As such, the height of top truss 64 from TOR, at roughly 16 ft-7 in., significantly exceeds the AAR

Plate C maximum allowable height of 15 ft-6 in. The upper flange of main sill **36** is carried at a height, relative to TOR, that is high enough to permit the top surface of the coupler to fit within main center sill **36** as in a socket. The centerline coupler height is 34 ½ inches above TOR. For a Plate F car, the height of the top of the coupler head is roughly 40 ¾ inches above TOR for a car, as new, with un-worn wheels, unloaded. Thus the top surface height of a ¾" thick main center sill top flange is roughly 41 – 1/2 inches above TOR. In the case of the staging, or false floor structures described above, the level of the false floor sheeting and hence of all points on the associated tapered risers, is above the level of the top flange **102** of main center sill **36**, that is, at a level that is at least **42** inches from TOR. In the preferred embodiment of Figure **3a**, this height, taken at the truck centers, for a new car with no lading and un-worn wheels, is 12 - 1/2 inches above the level of the main sill, or roughly 53 -1/2 inches above TOR (+/- 1 inch).

Although a 40 ft., 6 in. medial deck, or well deck, is preferred, a shorter well deck could be employed, such as 28 ft. 6 in., 32 ft. 6 in., or 36 ft. 6 in., it being advantageous that the well deck be at least 28 ft. long.

Each of center beam cars **20**, **70**, **83**, **85**, **90**, **92** and **94** and **350** has an array of center beam web posts, indicated generally as **54** in the context of Figure **1**. Each of these arrays includes fabricated posts, having a generally H-shaped cross-section, and roll formed posts having a generally C-shaped cross-section. In the embodiments of Figures **2a**, **2b**, **2c**, **2d**, **2e**, **2f**, **3a**, **3b** and **3c**, while all of these posts are rooted to main center sill **36**, the posts mounted on the end portions of the respective railcars are formed to meld with main sill extensions, such as gussets **192** and **194**, (both Figure **3a**).

Other than as described above in the context of Figures **3a**, **3b**, **3c** and **3d**, a description of post **73** will serve also to describe the other posts having H-shaped cross-section in the various embodiments of rail road cars described herein. Similarly, a description of post **74** will serve to describe the other posts having C-shaped cross-sections in the various embodiments

Each of posts **73** has a central web **494** lying in a vertical plane perpendicular to the plane **24** of car **20** or car **70**, **83**, **85**, **90**, **92**, **94**, or **350**. Web **494** is tapered from a wide bottom adjacent main center sill **36** to a narrow top. At the outboard extremities of web **494** there are left and right hand flanges **496** and **498** (Figure **7a**) that each lie in a longitudinal plane inclined at an angle a defined (from the vertical) by the slope of the taper of web **494**. At the top of each post **73**, **74** web **494** has been trimmed back to a pair of tabs **500**, **502** at the ends of flanges **496**, **498**. This yields a seat, socket, relief, or rebate in the nature of a generally U-shaped notch or slot **504** into which top chord assembly **62** can seat.

5 A horizontal cross-section of post 73 will generally have an H-shape, with web 494 lying centrally relative to flanges 496 and 498. Post 74, by contrast, although tapered in a similar manner to post 474, has a horizontal cross-section of a U-shaped channel, with its web being the back of the U, and the flanges being a pair of legs extending away from the back. Each diagonal member 58 (or 59 or struts 77, 78 or braces 79, 80, 81, 82, 87, 88) has a first end rooted at a lower lug 97 welded at the juncture base of one of posts 73 adjacent to the juncture of post 73 with main center sill 36, and a second diagonal end rooted in an upper lug 99 at the juncture of another adjacent post 73 and top chord assembly 62. Midway along its length, diagonal beam 58 (or 59 or struts 77, 78 or braces 79, 80, 81, 82, 87, 88) passes through post 74 intermediate the pair of posts 73 to which diagonal 58 (or 59 or struts 77, 78 or braces 79, 80, 81, 82, 87, 88) is mounted. It is intended that the respective flanges of the various posts 73 and 74 lie in the same planes on either side of the central plane 24 of car 20 (or 70, 83, 85, 90, 92, 94, 350) to present an aligned set of bearing surfaces against which lading can be placed.

15 The incline of flanges 496, 498 is roughly at right angles to the inward taper of risers 48. This permits generally square cornered bundles to be stacked neatly in the clearance opening of the bunk defined between the underside of the top truss 64 and risers 48.

20 In the embodiment of Figures 7a and 7b, upper beam assembly 510 can be defined as the combination of top chord assembly 62 and top truss 64. It has a cross section in the shape, generally, of a 'T', with the cross-bar of the T being defined by wings 65 and 67 of top truss 64, and the stem of the 'T' being defined by top chord assembly 62, described more fully below.

25 Straps 136 (Figure 4a) are provided to attach to the outboard, distal extremities of wings 65 and 67 of top truss 64, to be wrapped outboard of the load, and to be tightened by a come-along, a winch, a pawl-and-ratchet type of mechanism, noted above as 138, or similar tightening device mounted to the respective side sill 42 or 44. An operator turns mechanism 138 with the aid of an extension bar or handle (not shown). When tightened, straps 136 bear against the outboard, upper corners of bundles indicated as 137, tending to force their inboard, upper regions, indicated generally as 518, most tightly against the upright center beam web structure of the railroad car that extends along plane of symmetry 24, namely array 54 and the outer shank, or skirt, of the stem of upper beam assembly 60.

30 The embodiment illustrated in Figures 7a and 7b has an inside loading clearance indicated as 'A' of 169 $\frac{3}{8}$ inches perpendicular to risers 48. It also has a loading limit indicated as 'B' extending perpendicular to the slope of web 74, at a height 163 $\frac{1}{2}$ inches above, and measured perpendicular to, risers 48. The nominal load height is then 165 inches for 5 bundles at 33 inches each, including dunnage. The nominal load height, in general, for 31 $\frac{1}{2}$ inch bundles of kiln dried lumber is thus the

largest integer multiple of 33 inches that is less than the load limit height. In the illustrations of Figures 7a and 7b, 4a and 4b, this loading limit permits 51 inch wide bundles to fall within the loading envelope defined by AAR plate 'F'.

Deep beam section 510 is shown in cross-section in Figure 7a. It includes a first, or upper formed section 540 in the shape of an inverted U, having a back 542 and left and right hand legs 544, 546. Legs 544, 546 are splayed outwardly relative to the vertical at angle α to match the angle of the taper of the flanges of posts 73 and 74. Upper formed section 540 also has inwardly stepped shoulders 541 and 543 to accommodate the mating ears of gusset plates 545 and 547 which join top truss 64 to top chord assembly 62. Deep beam section 510 also includes a second formed section 550 that is generally U-shaped, having a back 552, and a pair of left and right hand legs 554 and 555. Legs 554 and 555 each have a proximal region 558, 559 relative to back 552 that is stepped inwardly to form a shoulder 560 and a neck 562 of a size to nest between tabs 500, 502 of post 73 or 74, as the case may be. Tabs 500, 502 are formed by trimming web 494 to conform to the depth of shoulder 560. Legs 554, 555 also each have an inwardly stepped toe 568, 569 stepped inward a distance equal to the wall thickness of legs 554, 555 such that toes 570, 571 of legs 544, 546 of member 540 can overlap, and seat outside of, outside toes 568, 569 respectively, and be fillet welded in place. Legs 554 and 555 are angled inward to yield slope continuity with both legs 544 and 546 and also with flanges 496 and 498 of post 73 (or corresponding flanges of posts 74 as may be). That is, legs 554, 555 are toed inward at the same angle from the vertical at which legs 544, 546 are splayed outward so that the exterior surfaces are flush with, and lying in the planes of, the respective flanges of posts 73 and 74. The exterior surfaces so defined can be termed skirts.

Gussets 572 and 574 are welded inside formed section 550 and 540 respectively at longitudinal stations along the length of car 20, (or 70, 83, 85, 90, 92, 94, 350) corresponding to the various longitudinal stations of the webs of posts 73 and 74 respectively, thus providing a substantially continuous web from main sill 36 to top truss 64. There is, however, a web discontinuity between gusset 572 and gusset 574 indicated by gap 'G', seen in Figure 7b. In light of this discontinuity, gussets 572 and 574 have main web legs 576, 577 that, when installed, lies in the vertical plane of web 494 and a toe 578, 579 extending at a right angle therefrom, lying in a horizontal plane. The lateral edges of toes 578 and 579 are welded along the inside faces of toes 568, 569 and 570, 571 respectively and extend a distance comparable to the width between the respective toes at that point. In the preferred embodiment the overall height of top chord assembly 62 is 27 inches, with $\frac{1}{4}$ inch wall thickness on legs 544, 546, 554 and 555. In the preferred embodiment the length of legs 544, 546 is $13\frac{1}{2}$ inches, and the overall length of legs 554, 555 is $14\frac{1}{2}$ inches. Nominally, shoulder 560 overlaps tabs 500 and 502 by 2 inches. That is, tabs 500, 502 extend 2 inches beyond web 494. Toes 578 and 579 are both 6 inches long, and the nominal width of gap 'G' is about $6\frac{3}{4}$ inches.

In this way, when assembled, legs **554**, **555** and **544**, **546** form respective left and right hand outwardly facing bearing surfaces against which a load may bear, and over which a reaction force to tension in the tightening straps can be spread. In the span between the stations of adjacent posts (whether **73** or **74**), the skirts, or bearing surfaces, formed in this way are reinforced by the laterally inward web, (that is, back **552**) which connects both skirts (that is, legs **544** and **554**, and legs **546** and **555**). The laterally inward reinforcement need not be immediately behind the respective skirt or facing, but rather can be offset, as illustrated in Figure **7a**, with the influence of the web stiffening the face some distance away. The web is "inward" of the skirts in the sense of lying behind, or shy of, the profile of the contact interface with the wood bundles, since the reinforcement lies toward the centerline of the rail car, rather than proud of, the respective skirt faces. In this way an inwardly disposed stiffener will not protrude and rub against an object bearing against the outwardly facing surface of the respective skirt.

In an alternative embodiment shown in Figures **8a** and **8b**, a deep beam section **590** has a pair of left and right hand formed sections **592**, **594** surmounted by a rectangular tube **596**, upon which top truss **64** is mounted. Each of sections **592**, **594** has a main sheet **600**, an inwardly stepped shoulder **602**, an inwardly extending leg **604** and an upturned toe **606**. In place of gussets **572** and **574**, section **590** has gussets **608**, **610** having a main, vertical leg **612**, **613** and a horizontal leg **614**, **615**. Vertical legs **612**, **613** are contoured to match the inside wall shape of formed sections **592**, **594** respectively, and are located at longitudinal stations to correspond to the longitudinal stations of the webs of posts **73** and **74** as above. Vertical legs **612**, **613** are separated by a vertically extending gap having a width 'H'. Once gussets **608**, **610** are welded in place, formed sections **592**, **594** are welded along the seam where legs **604** of sections **592**, **594** abut along the centerline of car **20** or **70**, **83**, **85**, **90**, **92**, **94**, **350**. As above, the step in sections **592**, **594** is of a size to seat between tabs **500** and **502** of posts **73**, or **74**, and the distal tips of main sheets **600** are fillet welded to the side faces of tube **596**. As above, there is slope continuity between main sheets **600** and the corresponding flanges **496**, **498**.

In the alternative embodiment of Figures **9a** and **9b**, a deep upper beam assembly **620** has a pair of angle irons **622** and **624** welded longitudinally inside tabs **500** and **502** of posts **73** and **74**. Angle irons **622** and **624** each have an inwardly extending toe **626**, **627** which bottoms on the cut edge of web **494**, and an upwardly extending leg bent to conform to the slope of flanges **496** and **498**. Beam **620** also has a pair of left and right formed sections **628**, **629** each having a main sheet portion **630**, **631**, an inwardly extending leg **632**, **633** and a re-entrant toe **634**, **635**.

On assembly, L-shaped gussets **636**, **637** are welded in each of sections **628**, **629**. Gussets **636** and **637** each have a profile to match the inside profile of the upper regions of main sheet portions **630**, **631**, legs **632**, **633** and toe **634**, **635**. The toe of gussets **636** and **637** are welded along their outboard edges to the inside face of main sheet portions **630**, **631**. Sections **628** and **629** are

welded along the centerline seam between abutting toes **634** and **635**. A further, main gusset **640** is trimmed to a shape to permit welding of its top edge to the underside of the toes **638**, **639** of gussets **636**, **637**, its side edges to the inner face of the lower regions of main sheet portions **630** and **631**; once welded in this manner, the base leg **642** of gusset **640** can be welded to toes **626** and **627** of angle irons **622** and **624**, with a plug weld formed to fill the longitudinal gap therebetween. Gusset **640** is also trimmed to have reliefs **644**, **645** to permit entry between the upwardly extending legs of angle irons **622**, **624**. Gussets **636**, **637** and **640** are located at longitudinal stations that correspond generally to the longitudinal stations of posts **56** and **57** as the case may be. Legs **632**, **633** of sections **628**, **629** form, ideally, a flat surface to weld to top truss assembly **64**, as before. Similarly, when installed, main sheet portions **630**, **631** have slope continuity with flanges **496** and **498**.

In the alternative embodiment of Figures **10a** and **10b**, a deep upper beam **650** has a pair of formed sections **652**, **654**, a rectangular steel tube **656**, a main gusset **658** and minor gussets **660** and **662**. On assembly, minor gussets **660** and **662** are welded inside the lower regions of formed section **652** and **654**, being shaped to conform to the shape of the lower region of outer main sheets **666**, **668**, inwardly stepped shoulder **670**, **672**, and inwardly extending legs **674**, **676**. A gap 'P' is left between the respective inboard edges of gussets **660** and **662**, and their outboard edges are welded to the inner face of main sheets **666**, **668**. Gussets **660**, **662** are trimmed to be clear of re-entrant toes **678**, **680**. Main gusset **658** is welded upon minor gussets **660**, **662**, with its lateral edges welded to the inside face of main sheets **652** and **654**. Tabs **682**, **684** at the distal ends of main sheets **666**, **668** embrace the outer side faces of steel tube **656**.

In the alternative embodiment of Figures **11a** and **11b**, a deep upper beam assembly **690** has a longitudinally extending inverted C-channel **692** upon which is welded a generally U-shaped formed section **694** having a back **696** and upwardly extending legs **698**, **700** bent to lie on the slopes of the flanges of posts **73** and **74**, as above. The distal ends of legs **698** and **700** abut the lower edges of a pair of skirt plates **702** and **704**. A weld is formed along the abutting edges of the legs and skirts. At their furthest ends, skirt plates **702**, **704** are welded to the outside faces of a steel tube **710**. Top truss assembly **64** surmounts assembly **690**. Minor gussets **706** are welded inside C-channel **692** at the longitudinal stations of posts **56** and **57**, as above, and gussets **708** are welded inside legs **698**, **700** and plates **702**, **704** thereby providing a form to define the angular profile upon which they lie. As before, that profile is such as to yield a surface lying flush with the outer surfaces of posts **73** and **74**.

The alternate embodiment of deep beam **720** of Figures **12a** and **12b** is similar to that of Figures **11a** and **11b**, but differs insofar as C-channel **692** and formed section **694** have been combined into a singular formed section **722** having inwardly stepped shoulders **724** to yield a plug shaped head **726**, similar to that described in the context of Figures **7a**. Further, rather than straight

legs 698 and 700, formed section 722 has inwardly stepped toes 728 and 730, again, similar to those shown in Figure 7a. Skirt plates 732 and 734, similar to skirt plates 702 and 704, again extend between toes 728 and 730 to terminate on the outer side faces of a rectangular steel tube 736.

In this instance a large gusset 738 is welded inside section 722, and plates 732 and 734. Gusset 738 has a vertical leg 740 having a profile cut to yield the desired slope continuity with the flanges of posts 73 and 74.

The alternate embodiment of deep beam 750 of Figure 13 is similar to that of Figure 11a. However, as in Figure 12a, C-channel 692 and formed section 694 have been supplanted by a single formed section 752 having a back 754, a pair of legs 756, 758 having inwardly stepped shoulders and a pair of distal toes. A gusset 760 is mounted within formed section 752 at each of the longitudinal stations of car 20 corresponding to the longitudinal stations of the webs of posts 73 and 74, as described above. However, gussets 760 terminate in a horizontal leg lying shy of the tips of the distal toes of legs 758 and 756 such that another formed section 762 can seat between them. Formed section 762 has a back 764, legs 766, 768 and shoulders 770, 772. An internal stiffener in the nature of a gusset 774 is located at each of the longitudinal post stations. Back 764 provides a horizontal web sufficiently close to top truss assembly 64 that no rectangular steel tube is employed. As before, the outer faces of legs 766, 768 and legs 758, 756 are intended to lie in the same planes as the flanges of posts 73 and 74. The external faces of each of formed sections 752 and 762 each extend about a foot in depth, relative to top truss assembly 64, and present, more or less, a 2 foot wide skirt, or band, that overlaps the load limit, and the maximum loading height.

In the embodiment of Figure 14, a deep beam assembly 780 is generally similar to deep beam assembly 750, but rather than have step-shouldered formed sections it has a C-channel 782 for mounting between tabs 500 and 502 as in Figure 11a above, with gussets 784 mounted as described in Figure 11a. Above this is a first pair of angle irons 786, 788, bent to present outer faces lying on the desired slope of the flanges of posts 73 and 74 as the case may be. Formed angles 786, 788 are welded on a series of lateral gussets 790, again, at the longitudinal stations of vertical posts 73 and 74. Formed angles 786 and 788 are also butt welded to each other along the tips of their inwardly extending toes 792, 794. Another pair of angle irons 800, 802 are welded on an array of gussets 804, and along a butt welded seam at their inwardly extending toes 805, 806, and mounted above angle irons 786 and 788, as shown, such that their generally upwardly extending legs 808, 810, and the consequent skirt-like surface they present, lie flush with, and on the same slopes as, the respective flanges of posts 73 and 74.

The embodiment of Figure 15a shows a half view of a retro-fit installation. (As the section is symmetrical about the center line of the car, only one half is illustrated.) An existing center beam post

is shown as **820**. It has a web **822** trimmed down to leave tabs **824** and **826** which lie to either side of, and are welded to, a rectangular steel tube **825** upon which a top truss assembly **828** is mounted. A skirt panel **830** is formed with a stiffener in the nature of an inwardly bent toe **832**. The length of main leg **834** is roughly 2 feet, such that its outer face overlaps both the maximum load height and the load limit height. Toe **832** is trimmed to accommodate the flanges of post **820** (analogous to posts **56** or **57**). An additional reinforcement, or longitudinal stiffener, in the nature of angle **836** of a length to lie between successive posts **820**, is welded to the inner face of main leg **834** at an intermediate level roughly halfway between top truss assembly **828** and toe **832**. Angle **836** will tend to cause main leg **834** to resist lateral deflection between adjacent posts **820**, thereby tending to maintain main leg **834** in a position to spread loads placed against it.

Panel **830** could be as thick as $\frac{1}{2}$ or $\frac{5}{8}$ inches. Although panel **830** is preferably a metal sheet welded to posts **820**, a different fastening means, such as rivets, bolts or the like, could be used. A smooth steel face is preferred, but other metals, such as aluminum, could be used, or a suitable, rot resistant, UV resistant polymer could be selected, either as a solid sheet or as a face coating or layer, or sheet, upon a metal substrate. It is preferred that the material chosen be a non-consumable material, that is, one that may tend not to be prone to require frequent replacement such as may be required if softwood lumber battens are used, and also one that has little or no tendency to develop wood rot or to support the growth of molds.

Panel **830** need not be integrally formed with bent toe **832**, but could be fabricated by using a flat sheet **840** as the external face plate, with an angle iron **842**, or similar stiffener, welded along the inward facing bottom edge of the face plate between pairs of posts **820**, as indicated in the other half view shown in Figure **15b**.

Figure **15c** is again a half section, showing a hollow cell panel **844** in place of panel **830**. Hollow cell panel **844** has an external skin **846**, an internal skin **848**, and an intermediate hollow cell core **847** for carrying shear between skins **846** and **848**. The hollow cells usually have a hexagonal columnar shape, the columns running perpendicular to the skins. The thickness of hollow cell panel **844** has been exaggerated for the purposes of illustration. Although skins **846** and **848** may be made of steel, they may also be made of other substances, such as structural polymers, reinforced polymers, aluminum, or other suitable material.

Figure **15d** is similar to Figure **15c**, but web **850** of post **852** has been trimmed back to permit outwardly facing external face **854** of hollow cell panel **856** to lie flush with flange **858** of post **852**. Hollow cell panel **856** is similar in construction to hollow cell panel **844**, having a pair of skins and a hollow core.

Figures **15e** and **15f** correspond to Figures **15c** and **15d** respectively, and illustrate the use of a corrugated core sandwich, either standing proud of the flange of the post, as illustrated by sandwich **849** in Figure **15e**, or flush with a trimmed down flange **851** as shown by sandwich **853** in Figure **15f**. The corrugated sandwiches have inner and outer metal skins, with a reverse folded, corrugated core maintaining the skins in a spaced apart, parallel planar relationship.

In each of the embodiments illustrated in Figures **15a**, **15b**, **15c**, **15d**, **15e** and **15f** the vertical extent of the skirt can be chosen according to the lading customarily carried by the car. As noted above, in general the skirt overlaps the nominal loading height, and extends a modest distance below the nominal loading height, whether 6 inches, 12 inches, 18 inches, 24 inches, 30 inches, or 36 inches. The skirt may also tend to overlap the maximum load limit height, and, further still, to be joined at a welded lap joint to the top chord, or top chord assembly.

The embodiment of Figure **16** shows a deep beam assembly **860** that is similar to deep beam assembly **780** of Figure **14** but does not have slope continuity with the flanges of posts **73** and **74**. Rather, the sides **862** and **864** of deep beam assembly **860** are parallel, and rise generally vertically. A channel **870** is welded along the back of pressing **872** to engage the notch formed in the upper end of post **73** (or **74**, as may be). A further U-shaped pressing **878** is welded above pressing **872**.

The embodiment of Figure **17** is similar to the embodiment of Figure **16**, except insofar as it has a single formed section **866** with shoulders **868** in lieu of a C-channel **870** and section **862**. Similarly, its upper formed section **874** also has shoulders **876**, in contrast to upper section **878** of assembly **860**. Gussets are indicated as **880** and **882**.

In the embodiment of Figure **18** deep beam assembly **890** has an inverted U-shaped formed section **892** having parallel legs **894**, **896**. A notch has been cut in web **898** of post **900** such that a longitudinally extending rectangular steel tube **902** can seat between tabs **904** and **906** of flanges **908** and **910**. The distal tips **912** and **914** of legs **894** and **896** are welded along the side faces of tube **902**. In the embodiment of Figure **19** a formed section **920** is used in place of rectangular steel tube **902**. In the cases of both Figure **18** and Figure **19**, the overall depth of the side skirts defined by legs **894**, **896** or **922**, **924**, is roughly half that of the embodiments of Figures **7a**, **8a**, **9a**, **10a**, and **11a**, being roughly 1 ft. This width overlaps both the load limit height and the maximum load height.

In the embodiment of Figure **2f**, legs **544** and **546** extend from a root at the join to top truss **64**, to a level below the upper load limit. Legs **544** and **546** are roughly 24 inches long so that the bottom edge of legs **544** and **554** will extend down roughly half the height of the top bundle to act as a skirt against which a larger bearing area of the bundle can bear, as compared to the width of the flanges of the posts by themselves. The skirt has a mid level reinforcement between its upper and

lower extremities, namely web stiffener 504 to discourage lateral deflection of the skirt, or bowing inward.

5 In alternative embodiments, the level of the bottom edge of the legs could be as little as one board (1 and 1/2 inches, kiln dried wood) below the top edge of the design bundle height, but is expected to be most commonly 12 inches, 24 inches (as in the preferred embodiment) or 30 inches deep when measured from the join to the top truss.

10 It is possible to manufacture a generally similar center beam car to fall within the loading profile defined by AAR plate 'F', or some other height. In that case, the desired load limit height is the height that is the largest integer multiple of 33 that is less than the clearance opening. The minimum height of the bottom edge of the leg, or skirt, is desirably 1 and 1/2 inches or more below the nominal load height, typically such that the overall height of the skirt is, nominally, an integer multiple of 6 that is at least 12 inches. Preferably, the skirt extends to a height that is at least half way down the top bundle of the nominal design load, and possibly to a height that is the full depth of the top bundle.

15 Although the main deck could be a continuous decking structure, this need not necessarily be so. The main deck, or lower beam structure could be in the form of an open truss, or grid work. Car 20, and the other rail road cars described herein, are preferably of all-steel construction. However, although the web work assembly of the center beam, and the top truss section is preferably a welded steel fabricated structure, it could be made of aluminum.

20 Various embodiments of the invention have now been described in detail. Since changes in and or additions to the above-described best mode may be made without departing from the nature, spirit or scope of the invention, the invention is not to be limited to those details, but only by the appended claims.

Claims

1. A center beam rail road car comprising
a deck structure for carrying vertical loads, said deck structure being carried by rail car
trucks, said deck structure having first and second end portions and a medial portion
lying between said first and second end portions, said first and second end portions
being stepped upwardly relative to said medial portion;
first and second end bulkheads extending upwardly from opposite ends of said deck
structure;
a center beam assembly running lengthwise along said rail road car between said bulkheads,
said center beam assembly standing upwardly of said deck structure;
a center sill running along said deck structure;
said first end portion of said deck structure having a first end portion deck sheet;
said center sill having a first center sill end portion, said center sill end portion having an
upper flange and a pair of spaced apart webs extending downwardly from said upper
flange;
a draft pocket cap plate mounted within said first center sill end portion between said pair of
spaced apart webs, said draft pocket cap plate lying at a lower level than said first
end portion deck sheet; and
a draft pocket defined between said pair of webs and below said draft pocket cap plate.
2. A dropped deck center beam rail road car comprising:
a center beam rail road car body having a deck structure including first and second end
portions and a medial deck portion located therebetween, said first and second end
portions being stepped upwardly relative to said medial deck portion;
upstanding bulkheads mounted at either end of said deck structure, and a center beam
assembly standing upwardly from said deck structure, said center beam assembly
running lengthwise between said bulkheads;
said deck structure having left and right hand laterally outboard margins and respective first
and second side sills running therealong, each said side sill including a pair of first
and second end side sill portions running along said first and second end portions of
said deck structure respectively; and a medial side sill portion running along said
medial portion of said deck structure;
said deck structure including transition sections joining each said medial side sill portion to
said first and second end side sill portions lying longitudinally outboard thereof
respectively;
each said transition section including

a first flange standing upwardly from an end of said medial side sill portion;
a second flange extending upwardly and longitudinally outboard relative to said
medial side sill portion; and
a web extending between said first and second flanges.

5

3. A dropped deck center beam rail road car comprising:

a center beam rail road car body having a deck structure running between a pair of first and
second upstanding bulkheads, said deck structure including first and second end
portions and a medial deck portion located therebetween, said first and second end
portions being stepped upwardly relative to said medial deck portion;

10

a center beam assembly standing upwardly of said deck structure, said center beam assembly
running lengthwise between said bulkheads;

said deck structure having left and right hand laterally outboard margins and respective first
and second side sills running therealong, each said side sill including a pair of first
and second end side sill portions running along said first and second end portions of
said deck structure respectively, and a medial side sill portion running along said
medial portion of said deck structure;

15

said deck structure includes transition sections joining each said medial side sill portion to
the first and second end side sill portions lying longitudinally outboard thereof
respectively;

20

each said transition section including

a flange member running from a low, longitudinally inboard end adjacent to an end
of the medial side sill portion adjoining said transition section, to a higher,
longitudinally outboard end adjacent the side sill end portion adjoining said
transition section; and

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a web member having an edge running along, and joined to, said flange member.

4. A dropped deck center beam rail road car comprising:

a center beam rail road car body having a deck structure including first and second end
portions and a medial deck portion located therebetween, said first and second end
portions being stepped upwardly relative to said medial deck portion;

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a pair of side sills extending along said deck structure, said side sills each having a side sill
medial portion mounted to said medial portion of said deck structure:

said side sills each having side sill end portions running along said end portions of said deck
structure;

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each of said side sills having a knee joining said side sill medial portion to each of said side
sill end portions;

each said knee having a longitudinally inboard flange, a longitudinally outboard flange, and webbing extending therebetween;
said longitudinally outboard flange has a lower extremity and an upper extremity; and
said lower extremity lies at a longitudinally inboard station relative to said upper extremity.

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5. A center beam rail road car comprising:

a center beam car body mounted on a pair of first and second spaced apart rail car trucks,
said body having

a deck structure running between first and second end bulkheads; and

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a center beam assembly running along said car between said bulkheads, said center
beam assembly extending upwardly of said deck structure;

said deck structure including first and second end deck portions mounted over said
respective first and second trucks, and a medial deck portion lying between said
trucks, said medial deck portion being stepped downward relative to said first and
second end deck portions;

15

said medial deck portion having a pair of medial deck side sills mounted therealong;
at least one of said end deck portions having a pair of end deck side sills mounted
therealong; and

said end deck side sills having a substantially greater depth of Section than said medial deck
side sills.

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6. A center beam rail road car comprising:

a center beam car body mounted on a pair of first and second spaced apart rail car trucks,
said body having

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a center sill;

a deck structure extending laterally outboard of said center sill, said deck structure
running between first and second end bulkheads,

a center beam assembly running along said car between said bulkheads, said center
beam assembly extending upwardly of said center sill, and

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said center beam assembly having an uppermost member lying at a height
exceeding AAR Plate C;

said deck structure including first and second end deck portions mounted over said
respective first and second trucks, and a medial deck portion lying between said
trucks, said first and second end deck portions being stepped upwardly relative to
said medial deck portion; and

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at least one of said end deck portions having a cargo support interface lying at a level
substantially greater than 42 inches above top of rail.

7. A center beam rail road car comprising:

a center beam car body mounted on a pair of first and second spaced apart rail car trucks,
said body having

a center sill having an upper flange and a lower flange;

a deck structure extending laterally outboard of said center sill, said deck structure
running between a pair of first and second end bulkheads,

a center beam assembly running along said car, said center beam assembly
extending upwardly of said center sill, and

said center beam assembly having an uppermost member lying at a height
exceeding AAR Plate C;

said deck structure including first and second end deck portions mounted over said
respective first and second trucks, and a medial deck portion lying between said
trucks, said first and second end deck portion\$ being stepped upwardly relative to
said medial deck portion; and

at least one of said end deck portions having a cargo support interface lying at a substantially
greater height than said upper flange of said Center sill.

8. A center beam rail road car comprising:

a deck structure for carrying vertical loads, said deck structure being carried by rail car
trucks, said deck structure having first and second end portions and a medial portion
lying between said first and second end portions, said first and second end portions
being stepped upwardly relative to said medial portion;

first and second end bulkheads extending upwardly from opposite ends of said deck
structure;

a center beam assembly running lengthwise along said rail road car between said bulkheads,
said beam assembly standing upwardly of said deck structure;

a coupler extending longitudinally outboard beyond said first bulkhead to permit releasable
coupling of said center beam railroad car to another railroad car, said coupler having
a coupler centerline height; and

said first end portion of said deck structure has a load bearing interface, upon which to place
lading, said load bearing interface being carried at least 18 ½" higher than said
coupler centreline height.

9. A center beam rail road car comprising:

a deck structure for carrying vertical loads, said deck structure being carried by rail car
trucks, said deck structure having first and second lend portions and a medial portion

lying between said first and second end portions, said first and second end portions being stepped upwardly relative to said medial portion;
first and second end bulkheads extending upwardly from opposite ends of said deck structure;

5 a center beam assembly running lengthwise along said rail road car between said bulkheads, said center beam assembly standing upwardly of said deck structure;
said deck structure having left and right hand laterally outboard margins and respective first and second side sills miming therealong, each said side sill including a pair of end side sill portions running along said first and second end deck portions respectively,
10 and a medial side sill portion running along said medial deck portion;

said deck structure includes transition sections joining each said medial side sill portion to the first and second side sill portions lying longitudinally outboard thereof respectively;

each said transition section including

15 a flange member running from a low, longitudinally inboard end adjacent to an end of the medial side sill portion adjoining said transition section, to a higher, longitudinally outboard end adjacent the side sill end portion adjoining said transition section; and

a web member having an edge running along, and joined to, said flange member.

20 10. A center beam rail road car comprising:

a rail car body including a deck structure carried by railcar trucks, said rail car body having first and second ends,

said railcar body having structural members mounted at either end thereof to define first and second draft pockets;

25 respective first and second couplers mounted in said draft pockets;

said first coupler having a coupler centreline height;

one of said structural members being a horizontal plate defining an upper wall of said first draft pocket;

30 first and second end bulkheads extending upwardly from opposite ends of said deck structure;

a center beam assembly running lengthwise between said bulkheads, said center beam assembly standing upwardly of said deck structure;

said deck structure having first and second end portions and a medial portion lying between
35 said first and second end portions;

said first and second end portions of said deck structure being stepped upwardly relative to said medial portion of said deck structure;

said first end portion of said deck structure having a load bearing interface upon which to place lading;

said coupler centreline height being lower than said horizontal plate by a first distance;

said horizontal plate being lower than said load bearing interface of said first end portion of said deck structure by a second distance; and

said second distance being greater than said first distance.

11. The center beam rail road car of any one of claims 1 to 10 wherein said medial portion of said deck structure is stepped downward relative to one of said end portions of said deck structure a distance of about $33 \frac{5}{8}$ inches.

12. The center beam rail road car of any one of claims 1 to 10 wherein said first and second end portions of said deck structure are stepped upwardly relative to said medial portion of said deck structure between 30" and $33 \frac{3}{4}$ ".

13. The center beam railroad car of any one of claims 1 to 10 wherein said first and second end portions of said deck structure are stepped upwardly relative to said medial portion of said deck structure an amount commensurate to a nominal 32" bundle of lumber.

14. The center beam railroad car of any one of claims 1 to 5 and 8 to 10 wherein said bulkheads have a height exceeding AAR Plate 'C'.

15. The center beam car of any one of claims 1 to 10 wherein said bulkheads fall within AAR Plate 'F'.

16. The center beam rail road car of any one of claims 1 to 10, wherein said center beam assembly includes a top chord member extending between said end bulkheads.

17. The center beam rail road car of claim 16 wherein said top chord member is a beam having smooth sides, said smooth sides each presenting a smooth surface against which to secure lading.

18. The center beam rail road car of any one of claims 1 – 10 wherein said center beam assembly includes an array of posts extending upwardly from said deck, said posts having flanges against which to abut lading.

19. The center beam rail road car of claim 18 wherein said posts have tabs extending upwardly from said flanges, and said center beam assembly includes a top chord member seated between said tabs.

20. The center beam rail road car of claim 18 wherein said center beam assembly includes a top chord member mounted flush with said flanges of said posts.

5 21. The center beam rail road car of claim 18 wherein said posts each have a pair of first and second flanges, each of said flanges presents a laterally facing bearing face against which to position stacked bundles of lumber, and a web extends between said flanges.

10 22. The center beam rail road car of any one of claims 2 to 5, and 8 to 10, wherein:
a center sill runs between said bulkheads, said center sill having first and second end portions, and a medial portion between said first and second end portions;
said center beam assembly includes an array of posts standing upwardly from said center sill;
a group of said posts of said center sill extend upwardly from said medial portion of said center sill;
15 said medial portion of said center sill presents members having lateral bearing surfaces; and
said group of said posts, said medial portion of said center sill, and said medial portion of said deck co-operate to define bunks to either side of said center sill for receiving stacked bundles of lumber.

20 23. The center beam rail road car of any one of claims 1, 6 and 7 wherein:
said center sill has first and second end portions, and a medial portion between said first and second end portions;
said center beam assembly includes an array of posts standing upwardly from said center sill;
25 a group of said posts of said center sill extend upwardly from said medial portion of said center sill;
said medial portion of said center sill presents members having lateral bearing surfaces; and
said group of said posts, said medial portion of said center sill, and said medial portion of said deck co-operate to define bunks to either side of said medial portion of said
30 center sill for receiving stacked bundles of lumber.

24. The center beam rail road car of claim 18 wherein said flanges of said posts have smoothly radiused edges.

35 25. The center beam rail road car of claim 18 wherein said flanges of said posts have smoothly radiused edges.

26. The center beam rail road car of any one of claims 1 to 10 wherein winches are mounted along said deck structure, and are operable to tighten bundles of lading next to said center beam assembly.

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27. The center beam rail road car of any one of claims 2 to 5, and 8 to 10, wherein a center sill runs along said car, said center sill having first and second end portions and a medial portion, said medial portion being narrower than said end portions.

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28. The center beam rail road car of any one of claims 2 to 5, and 8 to 10, wherein a center sill runs along said car, said center sill having first and second end portions and a medial portion therebetween, said medial portion of said center sill being deeper than said end portions of said center sill.

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29. The center beam rail road car of any one of claims 1, 2 to 5, and 8 to 10, wherein a center sill runs along said car, said center sill has first and second end portions and a medial portion therebetween, said medial portion of said center sill (having a greater ratio of depth to width than said end portions of said center sill).

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30. The center beam rail road car of any one of claims 1, 6 and 7, wherein said center sill has first and second end portions and a medial portion therebetween, and said medial portion of said center sill is narrower than said end portions of said center sill.

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31. The center beam rail road car of any one of claims 1, 6 and 7, wherein said center sill has first and second end portions and a medial portion therebetween, said medial portion being deeper than said end portions.

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32. The center beam rail road car of any one of claims 1, 6 and 7, wherein said center sill has first and second end portions and a medial portion therebetween, said medial portion of said center sill having a greater depth to width ratio than said end portions of said center sill.

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33. The center beam rail road car of any one of claims 2 to 5, and 8 to 10, wherein:
a center sill runs lengthwise between said bulkheads;
said center sill has first and second end portions and a medial portion;
said medial portion of said center sill is narrower than said end portions of said center sill;
said first and second end portions of said deck structure and said medial portion of
said deck structure have respective deck sheets;

said medial portion of said center sill has an upper flange lying at a height corresponding to said deck sheets of said first and second end portions of said deck structure, and said center sill has a lower flange lying at a level corresponding to said deck sheet of said medial portion of said deck structure.

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34. The center beam rail road car of any one of claims 1, 6 and 7 wherein:

said center sill has first and second end portions and a medial portion;

said medial portion of said center sill is narrower than said end portions of said center sill;

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said first and second end portions of said deck structure and said medial portion of said deck structure have respective deck sheets;

said center sill has an upper flange lying at a height corresponding to said deck sheets of said first and second ends of said deck structure, and said center sill has a lower flange lying at a level corresponding to said deck sheet of said medial portion of said deck structure.

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35. The center beam rail road car of any one of claims 2 to 5, and 8 to 10, wherein said rail road car further comprises:

a center sill extending along said rail road car, said center sill having an upper flange, a lower flange, and at least one upright web connecting said upper and lower flanges; and

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said lower flange lying at a height corresponding to said medial portion of said deck structure.

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36. The center beam rail road car of any one of claims 2 to 5 and 8 to 10, wherein said rail road car further comprises:

a center sill extending along said rail road car; said center sill having an upper flange, a lower flange, and at least one upright web connecting said upper and lower flanges;

said upper flange lying at a height corresponding to said first end portion of said deck structure; and

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said lower flange lying at a height corresponding to said medial portion of said deck structure.

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37. The center beam rail road car of any one of claims 1 to 10 wherein said medial portion of said deck structure is at least 28' – 0" long.

38. The center beam rail road car of any one of claims 1 to 10 wherein said medial deck portion lying between said two trucks is at least 40' – 0" long.

39. The center beam rail road car of any one of claims 1 to 10 wherein said medial portion of said deck structure has a length chosen from the set of lengths, consisting of (a) about 28 ½ ft; (b) about 32 ½ ft; (c) about 36 ½ ft (d) about 40 ½ ft.

40. The center beam rail road car of any one of claims 1 to 10 wherein said first end portion of said deck structure lies over a first of said trucks, said first truck having a truck center, and said first end deck portion of said deck structure extends more than 8 feet longitudinally outboard of said truck center of said first truck.

41. The center beam railroad car of any one of claims 1 to 10 wherein said first end portion of said deck structure lies over a first of said trucks, said first truck has a truck center, and said first end portion of said deck structure extends more than 4 feet longitudinally inboard of said truck center of said first truck.

42. The center beam railroad car of claim 40 wherein said first end portion of said deck structure extends more than 4 feet longitudinally inboard of said truck center of said first truck.

43. The center beam railroad car of any one of claims 1, 5 to 7 and 10, wherein:
each said truck has a truck center, and said first portion of said deck structure extends past a first of said truck centers;
said center beam assembly includes an array of posts and diagonal braces;
a post of said array of posts stands upwardly of said first truck center, and at least two of said posts are pitched longitudinally outboard of said first truck center between said first truck center and said first bulkheads.

44. The center beam railroad car of any one of claims 5 to 7 and 10, wherein:
each said truck has a truck center, and said first deck portion of said deck structure extends past a first of said truck centers:
said center beam assembly includes an array of posts and diagonal braces;
a post of said array of posts stands upwardly of said first truck center, and a further post stands upwardly of said end deck portion longitudinally inboard of said truck center.

45. The center beam rail road car of any one of claims 1 to 9 wherein:

said rail road car has first and second ends, structure mounted at said first and second ends of said rail road car defining draft pockets thereat, and couplers mounted in said draft pockets;

said couplers have a coupler centreline height;

5 said structure defining each of said draft pockets including a horizontal plate defining a top wall of said draft pocket, said horizontal plate being located higher than said coupler centreline height by a first distance;

10 said first end portion of said deck structure has a load bearing interface, upon which to place lading, said load bearing interface being located higher than said horizontal plate by a second distance; and

said second distance being greater than said first distance.

46. The center beam railroad car of any one of claims 1 to 9 wherein:

15 said rail road car has first and second ends, structure mounted at said first and second ends of said rail road car defining draft pockets at said first and second ends, and couplers mounted in said draft pockets;

said couplers have a coupler centreline height;

20 said structure defining each of said draft pockets includes a horizontal plate defining an upper wall of said draft pocket, said horizontal plate being located higher than said coupler centreline height by a first distance;

said first end portion of said deck structure includes a deck sheet located higher than said horizontal plate by a second distance;

said second distance being greater than said first distance.

25 47. The center beam railroad car of any one of claims 1 to 10 wherein said first end portion of said deck structure has a load bearing interface carried more than 52 ½" above TOR.

30 48. The center beam railroad car of any one of claims 1 to 10 wherein said first end portion of said deck structure includes a load bearing interface carried between 52 ½" and 54 ½" above TOR.

49. The center beam railroad car of any one of claims 1 to 10 wherein said first end portion of said deck structure includes a deck sheet carried more than 52 ½" above TOR.

35 50. The center beam railroad car of any one of claims 1 to 10 wherein said first end portion of said deck structure includes a deck sheet carried between 52 ½" and 54 ½" above TOR.

51. The center beam railroad car of any one of claims 1, 5 - 8 and 10, wherein said end portions of said deck structure are bounded by end deck side sill portions running along side thereof, said end deck side sill portions each having an upper flange having an upper surface lying more than 52 ½" above TOR.

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52. The center beam railroad car of any one of claims 1 to 9 wherein said car has a coupler mounted thereto to permit coupling to other railroad cars, said coupler having a coupler centerline height, and said first end portion of said deck structure has a first end portion load bearing interface carried more than 18 ½" higher than said coupler centreline.

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53. The center beam railroad car of any one of claims 1 to 9 wherein said car has a coupler mounted thereto to permit coupling to other railroad cars, said coupler having a coupler centerline height, and said first end portion of said deck structure has a first end portion load bearing interface carried between 18 ½" and 20 ½" higher than said coupler centreline.

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54. The center beam railroad car of any one of claims 1 to 9 wherein said car has a coupler mounted at said first end thereof, said coupler having a coupler centerline height, and said end deck portion includes an end deck sheet mounted more than 18 ½" above said coupler centreline.

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55. The center beam railroad car of any one of claims 1 to 9 wherein said car has a coupler mounted at said first end thereof, said coupler having a coupler centerline height, and said end deck portion includes an end deck sheet mounted between 18 ½" and 20 ½" above said coupler centreline.

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56. The center beam rail road car of any one of claims 2 – 5, 8 and 9, further comprising:
a center sill running along said deck structure;
said first end portion of said deck structure having a first end deck sheet;
said center sill having a first center sill end portion, said center sill end portion having an upper flange and a pair of spaced apart webs extending downwardly from said upper flange:
a draft pocket cap plate mounted within said first center sill end portion between said pair of spaced apart webs; said draft pocket cap plate lying at a lower level than said deck sheet; and
a draft pocket defined between said pair of webs and below said draft pocket cap plate.

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57. The center beam rail road car of claim 56 wherein a first bolster extends laterally from said main sill to support said first end portion of said deck structure, said bolster having an upper flange extending in a plane lying at a greater height than said draft pocket cap plate.

58. The center beam rail road car of claim 56 wherein:

said center sill has a central portion adjacent to said medial portion of said deck structure,
and first and second end portions adjacent to said first and second end portions of
said deck structure respectively;

said central portion of said center sill has an upper flange, a pair of spaced apart webs
extending downwardly from said upper flange and a lower flange mounted to said
webs, said upper flange, said lower flange and said webs of said center sill defining
a hollow box beam;

said medial portion of said deck structure has a deck sheet; and

said lower flange of said central portion of said center sill is mounted at a level
corresponding to said deck sheet of said medial portion of said deck structure.

59. The center beam car of claim 58 wherein said center sill has a depth of section between said
upper flange and said bottom flange of at least 30 inches.

60. The centerbeam railroad car of any one of claims 2 to 5, 8 and 9, wherein said 5 railroad car
has a center sill having a first end portion, said first end portion of said center sill including two
vertical webs and a horizontal plate co-operating With said vertical webs to define a draft pocket
below said horizontal plate and between said webs, and said first end portion of said deck structure
has a lading support interface carried more than 11 1/4" higher than said horizontal plate.

61. The center beam rail road car of claim 60 wherein said end portion of said center sill includes
a top flange, said vertical webs extend downwardly of said top flange, and said horizontal plate is
spaced downwardly of said top flange between said vertical plates.

62. The centerbeam railroad car of any one of claims 2 to 5, 8 and 9, wherein said railroad car
has a center sill having a first end portion, said first end portion of said center sill including two
vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket
below said horizontal plate and between said webs, and said first end portion of said deck structure
has a lading support interface carried between 11 1/2" and 13 1/2" higher than said horizontal plate.

63. The center beam mil road car of any one of claims 2 to 5, 8 and 9 wherein said rail road car
has a center sill having a first end portion, said first end portion of said center sill including a pair of
spaced apart vertical webs and a horizontal plate co-operating with said vertical webs to define a draft
pocket below said horizontal plate and between said webs, and said first end portion of said deck
structure has a deck sheet carried more than 11 1/2" higher than said horizontal plate.

64. The center beam rail road car of claim 63 wherein said end portion of said center sill includes a top flange, said vertical webs extend downwardly of said top flange, and said horizontal plate is spaced downwardly of said top flange between said vertical plates.

5 65. The center beam rail road car of any one of claims 2 to 5, 8 and 9, wherein said rail road car has a center sill having a first end portion, said first end portion of said center sill including a pair of spaced apart vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket below said horizontal plate and between said webs, and said first end portion of said deck structure as a deck sheet carried between 11 1/2" and 13 1/2" higher than said horizontal plate.

66. The centerbeam railroad car of any one of claims 2 to 5, 8 and 9, wherein:

10 said railroad car has a center sill having a first end portion, said first end portion of said center sill including two vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket below said horizontal plate and between said webs;

15 said medial deck portion has a load bearing interface carried at a first height lying lower than said horizontal plate by a first distance;

said first end portion of said deck structure has a load bearing interface carried at a second height lying higher than said horizontal plate by a second distance; and

a ratio of said first distance to said second distance lies in the range of (a) 22 1/8 : 11 1/2 to (b) 16 1/2 : 13 1/2.

20 67. The center beam rail road car of claim 66 wherein said end portion of said center sill includes a top flange, said vertical webs extend downwardly of said top flange, and said horizontal plate is spaced downwardly of said top flange between said vertical plates.

25 68. The center beam railroad car of any one of claims 6 and 7 wherein said center sill has a first end portion, said first end portion of said center sill includes two vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket below said horizontal plate and between said webs, and said first end portion of said deck structure has a lading support interface carried more than 11 1/2" higher than said horizontal plate.

30 69. The center beam railroad car of any one of claims 6 and 7, wherein said center sill has a first end portion, said first end portion of said center sill includes two vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket below said horizontal plate and between said webs, and said first end portion of said deck structure has a lading support interface carried between 11 1/2" and 13 1/2" higher than said horizontal plate.

70. The center beam rail road car of claim 68 wherein said end portion of said center sill includes a top flange, said vertical webs extend downwardly of said top flange, and said horizontal plate is spaced downwardly of said top flange between said vertical plates.

5 71. The centerbeam railroad car of any one of claims 6 and 7, wherein said center sill has a first end portion, said first end portion of said center sill includes two vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket below said horizontal plate and between said webs, and said first end portion of said deck structure has a deck sheet carried more than 11 1/2" higher than said horizontal plate.

10 72. The centerbeam railroad car of any one of claims 6 and 7, wherein said center sill has a first end portion, said first end portion of said center sill includes two vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket below said horizontal plate and between said webs, and said first end portion of said deck structure has a deck sheet carried between 11 1/2" and 13 1/2" (higher than said horizontal plate).

15 73. The center beam rail road car of claim 71 wherein said end portion of said center sill includes a top flange, said vertical webs extend downwardly of said top flange, and said horizontal plate is spaced downwardly of said top flange between said vertical plates.

20 74. The center beam rail road car of claim 10 wherein said rail road car has a center sill having a first end portion and a second end portion, said first end portion and said second end portions including, respectively, said structural members defining said draft pockets, and said first end portion of said deck structure has a load bearing interface upon which to carry lading, said load bearing interface being carried more than 11 1/2" higher than said horizontal plate.

25 75. The center beam rail road car of claim 10 wherein:
said rail road car has a center sill having first and second end portions, said first and second end portions of said center sill including, respectively, said structural members defining said first and second draft pockets; and
said first end portion of said deck structure has a load bearing interface upon which to place lading, said load bearing interface being carried between 11 1/2" and 13 1/2" higher than said horizontal plate.

30 76. The center beam rail road car of claim 10 wherein said rail road car has a center sill having a first end portion and a second end portion, said first end (portion and said second end portions including, respectively, said structural members defining said draft pockets, and said first end

portion of said deck structure has a deck sheet carried more than $11\frac{1}{2}$ " higher than said horizontal plate.

77. The center beam rail road car of claim 10 wherein said rail road's car has a center sill having a first end portion and a second end portion, said first end portion and said 35 second end portions of said center sill including, respectively, said structural members defining said first and second draft pockets, and said first end portion of said deck structure has a deck sheet carried between $11\frac{1}{2}$ " and $13\frac{1}{2}$ " higher than said horizontal plate.

78. The center beam rail road car of claim 10 wherein:
said rail road car has a center sill extending therealong;
said center sill has a first end portion, said first end portion of said center sill including said structural members defining said first draft pocket;
said medial portion of said deck structure has a load bearing interface, upon which to place lading, said load bearing interface of said medial portion of said deck structure being carried at a first height lying lower than said horizontal plate by a third distance; and
a ratio of said first distance to said second distance lies in the range of (a) $22\frac{1}{8} : 11\frac{1}{2}$ to (b) $16\frac{1}{2} : 13\frac{1}{2}$.

79. The center beam rail road car of claim 78 wherein said end portion of said center sill includes a top flange, said vertical webs extend downwardly of said top flange, and said horizontal plate is spaced downwardly of said top flange between said vertical plates.

80. The center beam rail road car of any one of claims 6 and 7, wherein:
said center sill has a first end portion, said first end portion of said center sill includes two vertical webs and a horizontal plate co-operating with said vertical webs to define a draft pocket below said horizontal plate and between said webs;
said medial portion of said deck structure has a load bearing interface, upon which to place lading, said load bearing interface of said medial portion of said deck structure being carried at a first height lying lower than said horizontal plate by a first distance;
said first end portion of said deck structure has a load bearing interface, upon which to place lading, said load bearing interface of said (first end portion of said deck structure being carried at a second height lying higher than said horizontal plate by a second distance; and
a ratio of said first distance to said second distance lies in the range of (a) $22\frac{1}{8} : 11\frac{1}{2}$ to (b) $16\frac{1}{2} : 13\frac{1}{2}$.

81. The center beam rail road car of claim 80 wherein said end portion of said center sill includes a top flange, said vertical webs extend downwardly of said top flange, and said horizontal plate is spaced downwardly of said top flange between said vertical plates.

5 82. The center beam rail road car of claim 1 wherein:
 said medial portion of said deck structure has a load bearing interface, upon which to place
 lading, said load bearing interface of said medial portion of said deck structure being
 carried at a first height lying lower than said draft pocket cap plate by a first
 distance;
 10 said first end portion of said deck structure has a load bearing interface, upon which to place
 lading, said load bearing interface of said first end portion of said deck structure
 being carried at a second height lying higher than said horizontal plate by a second
 distance; and
 a ratio of said first distance to said second distance lies in the range of (a) $22 \frac{1}{8} : 11 \frac{1}{2}$ to (b)
 15 $16 \frac{1}{2} : 13 \frac{1}{2}$.

83. The center beam rail road car of claim 8 wherein:
 said center beam rail road car has a center sill extending therealong;
 said center sill has a first end portion, said first end portion of said center sill includes two
 20 vertical webs and a horizontal plate co-operating with said vertical webs to define a
 draft pocket below said horizontal plate and between said webs;
 said medial portion of said deck structure has a load bearing interface, upon which to place
 lading, said load bearing interface being carried at a first height lying lower than
 said horizontal plate by a first distance;
 25 said load bearing interface of said first end portion of said deck structure being carried at a
 second height lying higher than said horizontal plate by a second distance; and
 a ratio of said first distance to said second distance lies in the range of (a) $22 \frac{1}{8} : 11 \frac{1}{2}$ to (b)
 $16 \frac{1}{2} : 13 \frac{1}{2}$.

30 84. The center beam rail road car of any one of claims 1 to 7, and 9, wherein:
 said rail road car has first and second ends;
 a first coupler is mounted at said first end of said railroad car, said coupler having a coupler
 centerline height;
 said medial portion of said deck structure has a load bearing interface upon which to place
 35 lading, said load bearing interface of said medial portion of said deck structure
 being carried at a height lying lower than said coupler centerline height by a first
 distance;

said first end portion of said deck structure has a load bearing interface upon which to place lading, said load bearing interface of said first end portion of said deck structure being carried at a height lying higher than said coupler centreline height by a second distance; and

5 a ratio of said first distance to said second distance lies in the range of (a) $9\frac{1}{2} : 20\frac{1}{2}$ to (b) $15\frac{1}{8} : 18\frac{1}{2}$.

85. The center beam rail road car of claim 10 wherein:

10 said medial portion of said deck structure has a load bearing interface upon which to place lading, said load bearing interface of said medial portion of said deck structure being carried at a height lying lower than said coupler centreline height by a second distance; and

a ratio of said second distance to said first distance being in the range of (a) $9\frac{1}{2} : 20\frac{1}{2}$ to (b) $15\frac{1}{8} : 18\frac{1}{2}$.

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86. The center beam railroad car of any one of claims 1, 6, 7 and 10 wherein:

20 said deck structure has left and right hand laterally outboard margins and respective first and second side sills running therealong, each said side sill including a pair of first and second end side sill portions running along said first and second end portions of said deck structure respectively, and a medial side sill portion running along said medial portion of said deck structure;

said deck structure includes transition sections joining each said medial side sill portion to said first and second end side sill portions lying longitudinally outboard thereof respectively;

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each said transition section including

a first flange standing upwardly from an end of said, medial side sill portion;

a second flange extending upwardly and longitudinally outboard relative to said medial side sill portion; and

a web extending between said first and second flanges.

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87. The center beam railroad car of claim 86 wherein said second flange of said transition section terminates at the end side sill portion adjacent to said transition section.

88. The center beam railroad car of any one of claims 1, 6, 7 and 10, wherein:

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said deck structure has left and right hand laterally outboard margins and respective first and second side sills running therealong, each said side sill including a pair of first and

second end side sill portions running along said first and second end deck portions respectively, and a medial side sill portion running along said medial deck portion; said deck structure includes transition sections joining each said medial side sill portion to the first and second end side sill portions lying longitudinally outboard thereof respectively;

each said transition section including

a flange member running from a low, longitudinally inboard end adjacent to an end of the medial side sill portion adjoining said transition section, to a higher, longitudinally outboard end adjacent the side sill end portion adjoining said transition section; and

a web member having an edge mining along, and joined to, said flange member.

89. The center beam railroad car of claim 88 wherein said side sill end portion adjoining to said transition section has a lower flange, an upper flange, and a web running between said upper and lower flanges, and there is web continuity between said web of said side sill end portion and said web member running along, and joined to, said flange member of said transition section.

90. The center beam railroad car of any one of claims 1, 6, 7 and 10, wherein:

said deck structure has left and right hand laterally outboard margins and respective first and second side sills running therealong, each said side sill including a pair of end side sill portions running along said first and second end portions of said deck structure, respectively, and a medial side sill portion running along said medial portion of said deck structure;

said deck structure includes transition sections joining each said medial side sill portion to said first and second side sill portions lying longitudinally outboard thereof respectively;

each said transition section includes a transition bulkhead extending upwardly from said medial deck portion to the end deck portion thereadjacent.

91. The center beam railroad car of claim 90 wherein each said transition section has a foothold mounted thereto to aide in ascending the end portion of said deck structure adjacent thereto.

92. The center beam railroad car of any one of claims 1 to 10 wherein a portion of said deck structure has a longitudinal stringer running thereunder.

93. The center beam railroad car of any one of claims 1, 5 to 8 and 10, wherein:

said deck structure has left and right hand laterally outboard margins and respective first and second side sills running therealong, each said side sill including a pair of end side sill portions running along said first and second end portions of said deck structure, respectively, and a medial side sill portion running along said medial portion of said deck structure; and

said medial portion of said deck structure has a longitudinal stringer running thereunder parallel to, and laterally inboard of, said medial side sill portion.

94. The center beam railroad car of claim 6 wherein said center sill has a medial center sill portion, said medial portion having a bottom flange, and said medial portion of said deck structure includes a sheet extending laterally outboard from said bottom flange of said medial portion of said center sill.

95. The center beam rail road car of claim 94 wherein said sheet mounted to said bottom flange of said medial portion of said center sill is welded thereto.

96. The center beam rail road car of claim 6 wherein said center sill has a medial center sill portion, said medial center sill portion has a bottom plate and a pair of spaced apart webs extending upwardly therefrom, and said bottom plate has margins extending laterally beyond said webs.

97. The center beam rail road car of claim 96 wherein said medial portion of said deck structure includes a sheet extending laterally outboard of one of said margins of said bottom plate.

98. The center beam railroad car of claim 94 wherein said medial portion of said deck structure has cross members providing support from below said load support interface thereof; said cross-members being supported from said center sill.

99. The center beam railroad car of claim 98 wherein said cross members are cross-bearers.

100. The center beam railroad car of claim 99 wherein:
said medial portion of said deck structure has laterally outboard margins, and side sill portions extending along said margins; and
a stringer extends longitudinally from one of said cross-bearers, said stringer being located laterally inboard of said medial side sill portion.

101. The center beam rail road car of claim 15, wherein:
said rail road car has a pair of side sills extending along said deck structure;

said side sills each have a side sill medial portion mounted to said medial portion of said deck structure;

said side sills each have side sill end portions running along said end portions of said deck structure;

5 each of said side sills has a knee joining said side sill medial portion to each of said side sill end portions;

each said knee has a longitudinally inboard flange, a longitudinally outboard flange, and webbing extending therebetween;

said longitudinally outboard flange has a lower extremity and an upper extremity; and

10 said lower extremity lies at a longitudinally inboard station relative to said upper extremity.

102. The center beam rail road car of claim 10, wherein:

said rail road car has a pair of side sills extending along said deck structure;

15 said side sills each have a medial side sill portion mounted to said medial portion of said deck structure;

said side sills each have end side sill portions mounted to said end portions of said deck structure; and

20 each said medial side sill portion has a medial side sill portion web extending from a first margin to a second margin, said first margin lying at a greater height than said second margin, and said first margin lying a further distance transversely outboard than said second margin.

103. The center beam rail road car of claim 102 wherein said medial portion of said deck structure has at least one lading securement apparatus mounted to said medial portion side sill web.

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104. The center beam railroad car of claim 9 wherein said side sill end portion adjoining to said transition section has a lower flange, an upper flange, and a web running between said upper and lower flanges, and there is web continuity between said web of said side sill end portion and said web member running along, and joined to, said flange member of said transition section.

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105. The center beam rail road car of claim 10 wherein:

said rail car body includes a center sill having first and second end portions and a medial portion located therebetween;

35 said first and second end portions of said center sill including, respectively, said structural members defining said first and second drafts pockets;

said medial portion of said center sill having a depth of section of more than 30 inches.

106. The center beam railroad car of claim 10 wherein said load bearing interface of said first end portion of said deck structure is carried more than 18 ½" higher than said coupler centreline.

107. The center beam railroad car of claim 10 wherein said load bearing interface of said first end portion of said deck structure is carried between 18 ½" and 20 ½" higher than said coupler centreline.

108. The center beam railroad car of claim 10 wherein said load bearing interface of said first end portion of said deck structure includes an end deck sheet mounted more than 18 ½" above said coupler centreline.

109. The center beam railroad car of claim 10 wherein said load bearing interface of said first end portion of said deck structure includes an end deck sheet mounted between 18 ½" and 20 ½" above said coupler centreline.

110. The center beam rail road car of claim 10, wherein said medial deck portion has a pair of medial deck side sills mounted therealong, each of said side sills having a web, said web having an upper edge and a lower edge, said upper edge lying further transversely outboard than said lower edge.

111. The center beam rail road car of claim 110 wherein said medial deck side sill has a load securing device is mounted transversely outboard thereof.

112. The center beam rail road car of claim 111 wherein at least one of said end deck portions has an end deck side sill, said end deck side sill has a web, said end deck side sill web has an upper edge and a lower edge, and said upper edge of said end deck side sill web lies further transversely outboard than said inner edge thereof.

113. The center beam rail road car of claim 112 wherein said medial deck side sill portion is inclined at a first angle relative to the vertical, and said end deck side sill web is inclined at a second angle relative to the vertical, said first angle being greater than said second angle.

114. The center beam rail road car of claim 112 wherein said end deck side sill web has a load securing device mounted transversely outboard thereof.

115. The center beam rail road car of claim 110 wherein:
said rail road car has a center sill;

said medial deck portion includes a plurality of cross-bearers extending between said medial deck side sills and said center sill; and

a load securing device is mounted outboard of said web at a longitudinal station corresponding to the junction of one of said cross-bearers with one of said medial deck side sills.

116. A center beam rail road car, comprising:

a center beam car body having a first end and a second end, said car body being mounted on a pair of first and second spaced apart rail car trucks, said body having,

a deck structure capable of bearing vertical loads due to lading, said deck structure having first and second ends,

bulkheads mounted at either end of said deck structure,

a center beam assembly running centrally between said bulkheads, said center beam assembly standing upwardly of said deck structure;

said deck structure including first and second end deck portions mounted over said respective first and second trucks, and a medial deck portion lying between said trucks, said first and second end deck portion; being stepped upwardly relative to said medial deck portion by a step height that corresponding to a nominally 32 inch bundle of lumber; and

said first and second end deck portions and said medial deck portion having load supporting interfaces upon which stacked bundles of lumber can be loaded;

said bulkheads exceeding AAR Plate C;

structure mounted at said first and second ends of said center beam car body defining draft pockets thereat;

couplers mounted in said draft pockets;

said couplers having a coupler centreline height;

said structure defining each of said draft pockets including a horizontal plate defining a draft pocket upper limit, said horizontal plate being located higher than said coupler centreline height;

said first end portion of said deck structure includes a deck sheet located higher than said horizontal plate defining said upper limit of said draft pocket;

said coupler centreline height being lower than said horizontal plate by a first distance, said horizontal plate being lower than said lading supporting interface of said first deck portion by a second distance; and said second distance being greater than said first distance.

117. The center beam rail road car of claim 116 wherein said center beam assembly and said body co-operate to define left and right hand bunks to either side of said center beam assembly for receiving bundles of lumber stack one upon another by forklift, said bunks having a loading height measured above said media] deck portion of at least 165 inches.

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118. The center beam rail road car of claim 116, wherein:
said car has a center sill, said deck structure being supported thereby;
said center beam assembly includes an array of posts extending upwardly from said center sill;
said center beam assembly has an uppermost region most distant from said deck structure and a lower region adjacent to said deck structure;
said upper region of said center beam assembly has at least one longitudinally extending skirt against which lading can be seated and tightened.

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119. The center beam rail road car of claim 116, wherein:
said rail road car has a center sill, said deck structure being supported thereby;
said center sill assembly includes an array of posts extending upwardly from said main sill and has a lower region adjacent to said deck structure and an upper region distant therefrom;
said upper region of said center beam assembly includes a top chord member; and
said top chord member has at least one longitudinally extending skirt against which lading can be placed.

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120. The center beam rail road car of claim 116 wherein:
said body includes a center sill extending from end to end of said rail road car body;
at least one of said end deck portions includes laterally extending, vertical load-bearing beam members extending from said center sill beneath said end deck portion and said medial deck portion; and
said load bearing interfaces of said end deck portions includes staging supported by said load bearing members whereby said load bearing interface is spaced upwardly of said vertical load-bearing beam members.

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121. The center beam rail road car of claim 116 wherein:
said deck structure includes side sills extending therealong;
said medial deck portion of said deck structure has medial side sill portions of said side sills mounted therealong, said medial side sill portions each having an upper flange, a lower flange and a web extending therebetween;

said end deck portions each have end side sill portions of said side sills mounted therealong,
 said end side sill portions each having a lower flange, an upper flange, and a web
 extending therebetween;

each said medial portion of said side sills is structurally connected to first and second ones of
 5 said end portions of said side sills at, first and second transition sections;

each said transition section includes a member having a web, said web having a lower
 margin running longitudinally outboard and upward, and a transition flange
 bordering said lower margin; and

10 said transition flange runs upwardly and longitudinally outboard between one of said medial
 portions of said side sill and the lower flange of the side sill end portion lying
 longitudinally outboard of said transition section.

122. The center beam mil road car of claim 116, wherein:

said car has a pair of side sills extending along said deck structure;

15 said side sills each have a side sill medial portion mounted to said medial deck portion, said
 medial side sill portion having a first depth of section;

said side sills each have side sill end portions mounted to said end deck portions, said end
 side sill portions having a second depth of section;

20 each of said side sills has a knee joining said side sill medial portion to each of said side sill
 end portions;

each said knee has a longitudinally inboard flange, a longitudinally outboard flange, and
 webbing extending therebetween;

said longitudinally outboard flange has a lower extremity and an upper extremity; and

said lower extremity lies at a longitudinally inboard station relative to said upper extremity.

25 123. A center beam rail mad car having a longitudinal centerline and a pair of ends, the rail mad
 car being supported by rail car trucks, said rail road car comprising;

30 a cargo support structure borne between the trucks, upon which cargo can be carried, said
 cargo support structure including a pair of first and second end structures each
 mounted over a respective one of said trucks, and a medial structure mounted
 between said trucks, said end structures being stepped upwardly relative to said
 medial structure;

35 a web assembly including an array of spaced apart posts mounted at intervals along the
 longitudinal centerline of the rail mad car, said array extending upwardly of said
 cargo support structure;

an upper beam assembly surmounting said web assembly;

said railroad car having a load limit height defined at a level measured upwardly from said medial structure, and having a nominal load height that is at least as great as the largest integer multiple of 33 inches that is less than the load limit height; and said web assembly having at least one skirt member against with loads placed laterally outward thereof can bear, said skirt member extending between a first height and a second height straddling said nominal load height;

structure mounted at said ends of said rail road car to define draft pockets thereat; couplers mounted in said draft pockets;

said couplers have a coupler centreline height;

said structure defining each of said draft pockets including a (horizontal plate defining a draft pocket upper limit, said horizontal plate being located higher than said coupler centreline height;

said first end portion of said deck structure includes a load hearing interface located higher than said horizontal plate defining said upper limit of said draft pocket;

said coupler centreline height being lower than said horizontals plate by a first distance, said horizontal plate being lower than said lading supporting interface of said first deck portion by a second distance; and

said second distance being greater than said first distance.

124. The center beam rail road car of claim 123 wherein said (skirt extends a longitudinal distance corresponding to at least one of said intervals.

125. The center beam rail road car of claim 124 wherein said first height is at least as great as said load limit height. and said second height is at least 6 inches below said nominal load height.

126. A center beam rail road car, comprising:

a center beam car body mounted on a pair of first and second spaced apart rail car trucks, said body having

a deck structure carried between a pair of first and second upstanding end bulkheads, and

a center beam assembly running along said car between said bulkheads, said center beam assembly extending upwardly of said deck structure;

said deck structure including first and second end deck portions mounted over said respective first and second trucks;

said first and second end deck portions having structural members presenting respective first and second end portion load bearing interfaces, and a medial deck portion lying

between said trucks, said medial deck portion having at least one member presenting a medial load bearing interface; and
said first load bearing interface being stepped upwardly relative to said medial load bearing interface through a step distance;
5 said step distance being greater than 30 inches;
structure mounted at said ends of said rail road car to define draft pockets thereat;
couplers mounted in said draft pockets, said couplers having a coupler centreline height;
said structure defining each of said draft pockets including a horizontal plate defining a draft
10 pocket upper limit, said horizontal plate being located higher than said coupler centreline height;
said coupler centreline height being lower than said horizontal plate by a distance A, said horizontal plate being lower than said lading supporting interface of said first deck portion by a distance B; and
said B distance being greater than said A distance.

15 127. A center beam rail road car, comprising:

a center beam car body mounted on a pair of first and second spaced apart rail car trucks,
said body having
a deck structure running between a pair of end bulkheads,
20 a center beam assembly running along said car between said bulkheads, said center beam assembly standing upwardly of said deck structure; and
said deck structure including
first and second end deck portions mounted over said respective first and second trucks, and a medial deck portion lying between said trucks, said first and
25 second end deck portions being stepped upwardly relative to said medial deck portion; and
at least one of said first and second end deck portions including staging mounted thereupon,
said staging having a load support member spaced upwardly of said at least one first and second end deck portions.

30 128. A center beam rail road car, comprising:

a center beam car body mounted on a pair of first and second spaced apart rail car trucks,
said body having
a deck structure carried between a pair of first and second end bulkheads,
35 a center beam assembly running between said bulkheads, said center beam assembly extending upwardly of said deck structure;

said deck structure including first and second end deck portions mounted over said respective first and second trucks, and a medial deck portion lying between said trucks, said medial deck portion being stepped downwardly relative to said first and second end deck portions;

5 said deck structure having laterally outboard side sills running therealong, each of said side sills having first and second end deck side sill portions mounted to respective ones of said first and second end decks, and ,a medial side sill portion mounted to said medial deck portion;

said medial deck portion being joined to said end deck portions by knee braces;

10 each of said knee braces having a longitudinally inboard flange adjacent to said medial portion, said inboard flange extending vertically; and

each of said knee braces having a longitudinally outboard flange, said longitudinally outboard flange extending from a low portion thereof lying at a first height relative to top of rail, to an upper portion thereof lying at a second, greater, height relative to top of rail, and said upper portion lies further from said longitudinally inboard flange than said lower portion.

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129. A freight-carrying railroad car, having a body having a pair of opposite sides, a length, a pair of opposite ends each supported on a wheeled truck, said body comprising:

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a center sill extending longitudinally along said body;

a center beam extending along said center sill, the center beam including said center sill, a top chord parallel to and spaced upwardly above and apart from said center sill, and a plurality of upright members each attached to and extending between said center sill and said top chord;

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a plurality of crossbearers, each attached to and extending transversely beneath said center sill, and a floor supported atop said crossbearers on each of said opposite sides of said car body; and

wherein an intermediate portion of said center sill located between said opposite ends of said body includes a pair of upright side plates spaced laterally apart from each other and a horizontal bottom plate interconnecting said side plates with each other and extending laterally outward beyond both of said side plates, and said floor including a floor sheet extending outboard laterally beyond said bottom plate.

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130. The railroad car of claim 129 wherein said floor sheet is welded to a margin of said bottom plate.

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131. The railroad car of claim 129 wherein said bottom plate extends horizontally, said floor sheet extends horizontally, and said floor sheet is joined to said bottom flange.

5 132. The railroad car of claim 129, said body including a pair of side sills located respectively on said opposite sides of said body, each of said crossbearers having a pair of outboard ends and each of said outboard ends being attached to a respective one of said side sills.

133. The railroad car of claim 129 wherein said center sill extends longitudinally of said body from one to the other of said opposite ends.

10 134. The railroad car of claim 129 wherein said crossbearers each include a horizontal bottom flange member attached to a vertical web plate, said vertical web plate having an upper margin attached to an underside of said bottom plate of said center sill.

15 135. The railroad car of claim 134 wherein one of said crossbearers has a pair of outboard portions and a central portion, said central portion being located beneath said center sill; said central portion including a cross bearer bottom flange located beneath, and spaced apart from, said bottom plate of said center sill.

20 136. The railroad car of claim 134 wherein one of said crossbearers has a pair of ill outboard portions and a central portion, said central portion being located beneath said center sill, and said central portion having a greater depth of section than either of said outboard portions.

25 137. The railroad car of claim 129, further including a longitudinal floor support stringer extending longitudinally along said car body parallel with said center sill.

30 138. The railroad car of claim 129 wherein said center sill has a pair of end portions, each end portion being wider than said intermediate portion thereof and interconnected with said intermediate portion thereof by a transition portion, said bottom plate of said intermediate portion being located at a lower height than a respective bottom plate of either of said end portions.

35 139. The railroad car of claim 129 wherein:
said intermediate portion has a first width measured across said vertical side plates of said intermediate portions of said side sill;
said center sill has a pair of end portions interconnected with said intermediate portion thereof by respective transition sections, said end portions each including an end portion bottom plate and a pair of spaced apart upright side plates extending

upwardly from said bottom plate, said end portions each having a second width measured across said spaced apart vertical webs; and
said second distance being greater than first distance.

5 140. The railroad car of claim 129 wherein:
 said center sill has a pair of end portions interconnected with Said intermediate portion
 thereof by respective transition sections;
 said end portions of each center sill each have a horizontal bottom plate; and
 said bottom plate of said intermediate portion of said center sill is located at a lower height
10 than said horizontal bottom plates of said end portions of said center sill.

141. The railroad car of claim 129 wherein said intermediate portion of said center sill includes a top plate interconnecting said upright side plates thereof.

15 142. A freight carrying railroad car of center beam construction, including:
 an elongate car body having opposite sides and a pair of opposite ends defining a length, a
 center sill running along said car body, and a floor structure for carrying lading, said
 floor structure being supported by said center sill;
 said center sill having a pair of upright, longitudinally extending center sill side plates
20 spaced laterally apart from each other, each said center sill side plate having a top
 margin and a bottom margin;
 a center sill top plate interconnecting the top margins of said center sill side plates with each
 other;
 a center sill bottom plate extending along, and attached to, said bottom margins of both of
25 said center sill side plates, and extending laterally outboard beyond each of said side
 plates;
 a plurality of crossbearers interconnected with said center sill beneath said bottom plate, and
 extending laterally beyond said bottom plate on each of said opposite sides of said
 car body;
30 a floor sheet mounted atop said crossbearers and attached to and extending laterally outward
 from said bottom plate of said center sill.

143. The freight carrying railroad car of claim 142 wherein a floor support stringer is located to extend lower than said bottom plate, and said stringer runs parallel to said center sill.

35 144. The freight carrying railroad car of claim 143 wherein said stringer is mounted to an underside of said floor sheet.

145. The freight carrying railroad car of claim 142, wherein:
 side sills run along said opposite sides thereof;
 one of said cross bearers has opposite ends attached to said side sills;
 5 said one of said crossbearers includes web and a horizontal flange; and
 said web standing upwardly from said horizontal flange.
146. The freight carrying railroad car of claim 142 wherein:
 one of said crossbearers has a bottom flange, and a web standing upwardly therefrom toward
 10 said bottom plate of said center sill;
 said crossbearers has a central portion located beneath said center sill, and an outboard
 portion located away from said center sill; and
 said outboard portion of said center sill is less deep than said central portion thereof.
147. A freight-carrying railroad car, comprising:
 a body having a pair of opposite sides, a length, and a pair of opposite ends;
 a center sill extending longitudinally from one end to the opposite end of the body;
 a pair of side sills spaced apart from said center sill, each extending along a respective one of
 20 said pair of opposite sides of said car body;
 a body bolster interconnected with said center sill at one of said opposite ends of said body
 and supported on a wheeled truck, said body bolster including a pair of arms each
 extending laterally outward from said center sill toward a respective one of said
 opposite sides of said body and supporting a respective one of said side sills;
 a floor support riser attached to an upper face of one of said arms of said body bolster, said
 25 floor support riser having a horizontal top face; and (1) a floor sheet extending
 above said floor support riser.
148. The railroad car of claim 147 wherein said center sill includes a pair of upright longitudinally
 extending side plates spaced laterally apart from each other, a horizontal top plate interconnecting
 30 said side plates, and a horizontal bottom plate interconnecting said side plates and extending laterally
 outward beyond each said side plate, and wherein each of said arms of said body bolster includes a
 respective bottom plate welded to a respective margin of said horizontal bottom plate of said center
 sill.
149. A freight-carrying railroad car, having a body having a pair of opposite sides, a length, and a
 35 pair of opposite ends each supported on a wheeled truck, said body comprising:
 a center sill extending longitudinally along said body;

a top chord parallel to and spaced upwardly above and apart from said center sill, and a plurality of upright members each attached to and extending between said center sill and said top chord;

a plurality of crossbearers, each attached to and extending transversely beneath said center sill, and a floor supported atop said crossbearers on each of said opposite sides of said car body; and

wherein an intermediate portion of said center sill located between said opposite ends of said body includes a pair of upright side plates spaced laterally apart from each other and a horizontal bottom plate interconnecting said side plates with each other and extending laterally outward beyond both of said side plates, and said floor including a floor sheet extending outboard laterally beyond said bottom plate, and includes a longitudinal stringer mounted to said floor and extending longitudinally along said car body parallel with said center sill.

150. A freight-carrying railroad car of center beam construction, comprising:

a body having a pair of opposite sides, a length, and a pair of opposite ends;

a center sill extending longitudinally along said body;

a top chord parallel to and spaced upwardly above and apart from said center sill, and a plurality of upright members each attached to and extending between said center sill and said top chord;

a pair of side sills spaced apart from said center sill, each said side sill extending along a respective one of said pair of opposite sides of said car body;

a body bolster interconnected with said center sill at one of said opposite ends of said body and supported on a wheeled truck, said body bolster including a pair of arms each extending laterally outward from said center sill toward a respective one of said opposite sides of said body and supporting a respective one of said side sills;

a floor support mounted above one of said arms of said body bolster; and

a floor sheet supported by said floor support.

151. In a freight-carrying center-beam railroad car having a pair of opposite sides, a length, and a pair of opposite ends, a car body, comprising:

a center beam extending longitudinally along said body, the center beam including a center sill extending longitudinally along said body, a top chord parallel with and spaced upwardly above and apart from said center sill, and a plurality of upright members each extending between said center sill and said top chord, said center sill; upright members and top chord all having respective lateral faces, each of said plurality of upright members including a pair of laterally opposite flange plates and said center

sill including a pair of side plates each forming a part of one of said lateral faces and said flange plates being aligned and interconnected with and extending upward from said side plates of said center sill and said upright members being attached to said center sill and said top chord in such a manner that the lateral faces of the center sill, top chord, and upright members are coplanar;

a plurality of cross bearers, each attached to and extending transversely with respect to said center sill; and

a cargo-supporting floor located above said cross bearer on each side of said opposite sides of said car body.

152. In a freight-carrying center-beam railroad car having a pair of Opposite sides, a length, and a pair of opposite ends, a car body, comprising:

a center beam extending longitudinally along said body, the center beam including a center sill extending longitudinally along said body, a top chord parallel with and spaced upwardly above and apart from said center sill, and a plurality of upright members each extending between said center sill and said top chord, said center sill, upright members and top chord all having respective lateral faces, and said upright members being attached to said center sill and said top chord in such a manner that the lateral faces of the center sill, top chord, and upright members are coplanar;

a plurality of cross bearers, each attached to and extending transversely with respect to said center sill; and

a cargo-supporting floor located above said cross bearer on each of said opposite sides of said car body, said cargo, supporting floor being located at a height exposing a part of said center sill to being in contact with cargo.

153. In a freight-carrying center-beam railroad car having a pair of opposite sides, a length, and a pair of opposite ends, a car body, comprising:

a center beam extending longitudinally along said body,, the center beam including a center sill extending longitudinally along said body, a top chord parallel with and spaced upwardly above and apart from said center sill, and a plurality of upright members each extending between said center sill and said top chord, said center sill, upright members and to chord all having respective lateral faces, and said upright members being attached to said center sill and said top chord in such a manner that the lateral faces of the center sill, top chord, and upright members are coplanar;

a plurality of cross bearers, each attached to and extending transversely with respect to said center sill;

a cargo-supporting floor located above said cross bearers on each of said opposite sides of said car body; and wherein

an intermediate portion of said center sill located between said opposite ends of said body includes a pair of upright side plates spaced laterally apart from each other and a horizontal bottom plate interconnecting said side plates with each other and extending laterally outward beyond both of said side plates, and wherein said floor includes a floor sheet extending outboard laterally beyond said bottom plate.

154. In a freight-carrying center-beam railroad car having a pair of opposite sides, a length, and a pair of opposite ends, a car body, comprising:

a center beam extending longitudinally along said body, the center beam including a center sill extending longitudinally along said body, a top chord parallel with and spaced upwardly above and apart from said center sill, and a plurality of upright members each extending between said center sill and said top chord;

wherein said center sill includes a top plate and a side plate, said side plate having a first lateral face and including an upper margin; and

wherein one of said upright members includes a flange plate having a second lateral face, a bottom margin of said flange plate being located above said upper margin of said side plate with said first and second lateral faces located in a common plane.

155. The car body of claim 154 wherein said top chord includes a third lateral face and said flange plate of said one of said upright members is welded to said top chord with said third lateral face located in said common plane.

156. In a freight-carrying center-beam railroad car having a pair of opposite sides, a length, and a pair of opposite ends, a car body, comprising:

a center beam extending longitudinally along said body and having a pair of opposite sides, the center beam including a center sill extending longitudinally along said body, a top chord parallel with and spaced upwardly above and apart from said center sill, and a plurality of upright members each extending between said center sill and said top chord, said center sill, upright members and top chord all having respective laterally outer faces on at least one of said opposite sides, and said Upright members being attached to said center sill and said top chord in such a manner that the laterally outer faces of the center sill, top chord, and upright members are coplanar and present a continuous planar surface free of laterally outward projections wherever said center beam is exposed to being in contact with cargo on said at least one of said opposite sides;

a plurality of cross bearers, each attached to and extending transversely with respect to said center sill; and
a cargo-supporting floor located above said cross bearers on each of said opposite sides of said car body.

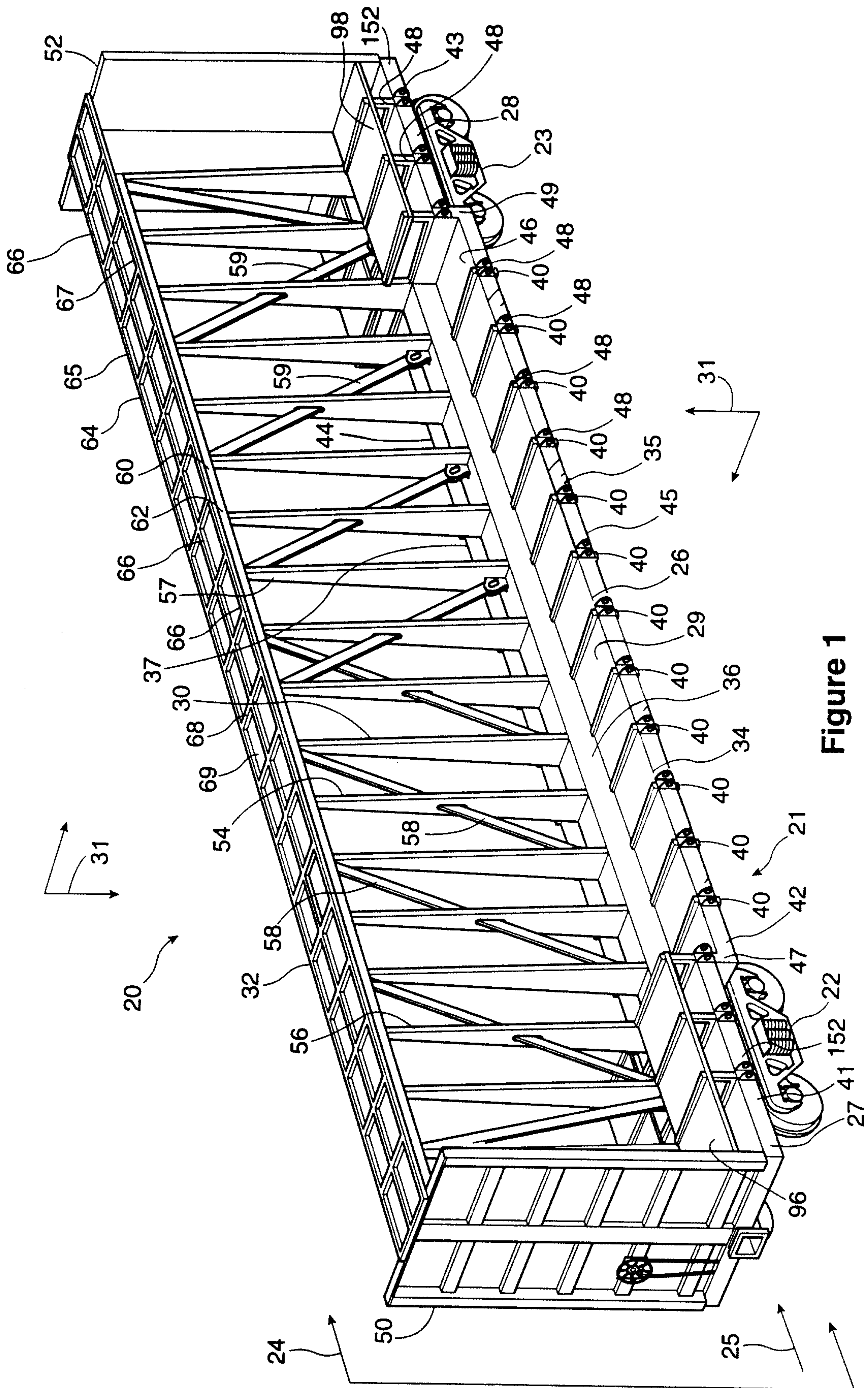


Figure 1

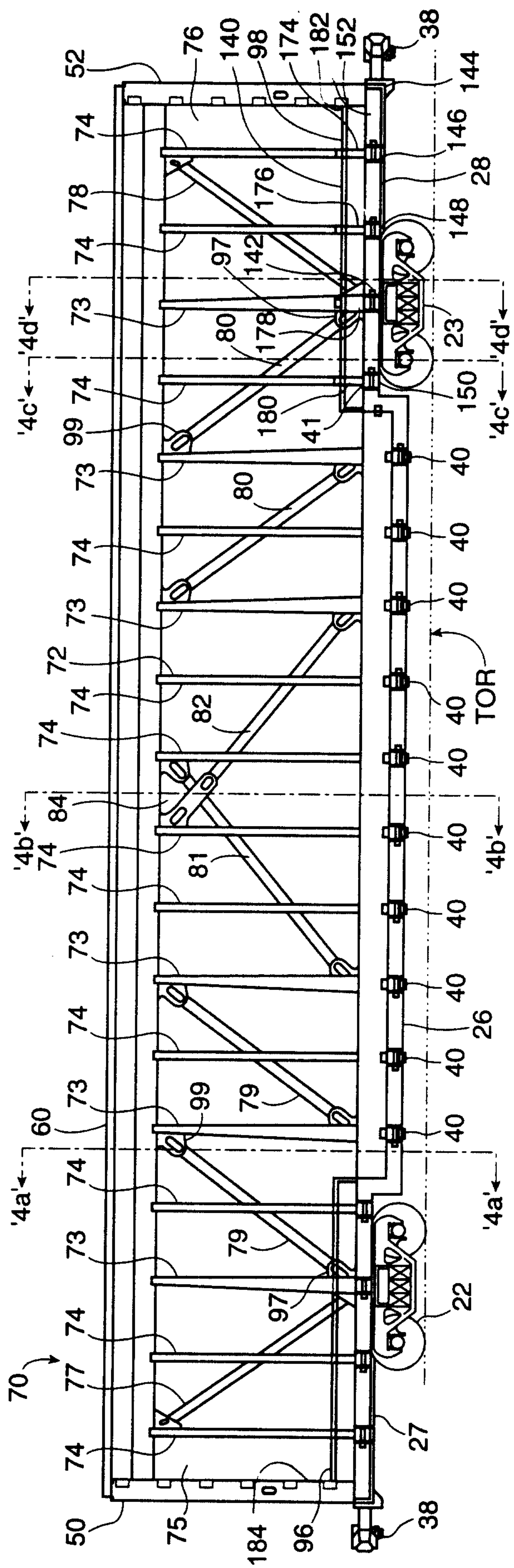


Figure 2a

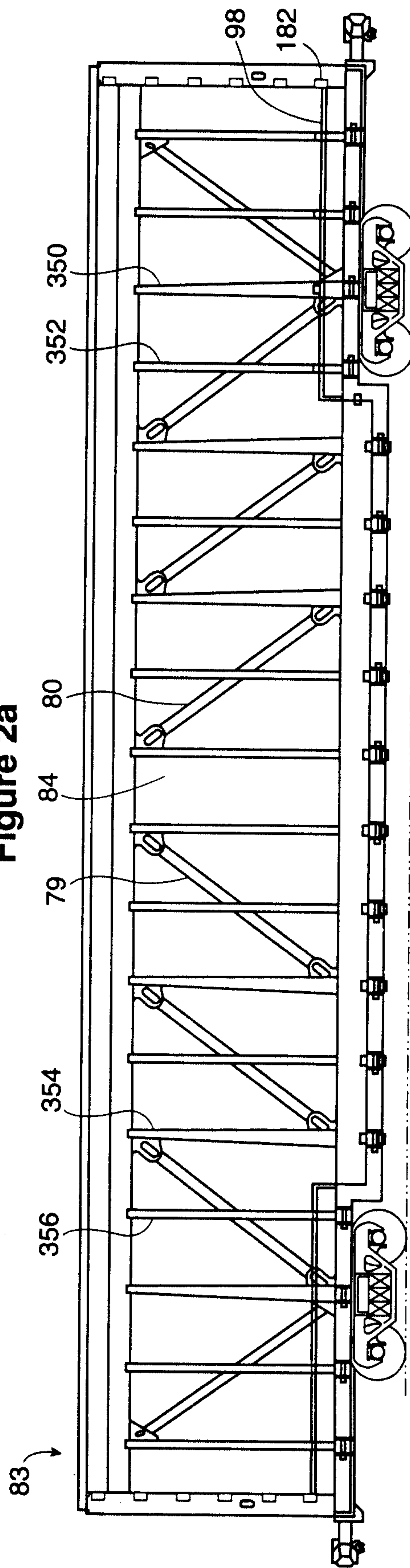


Figure 2b

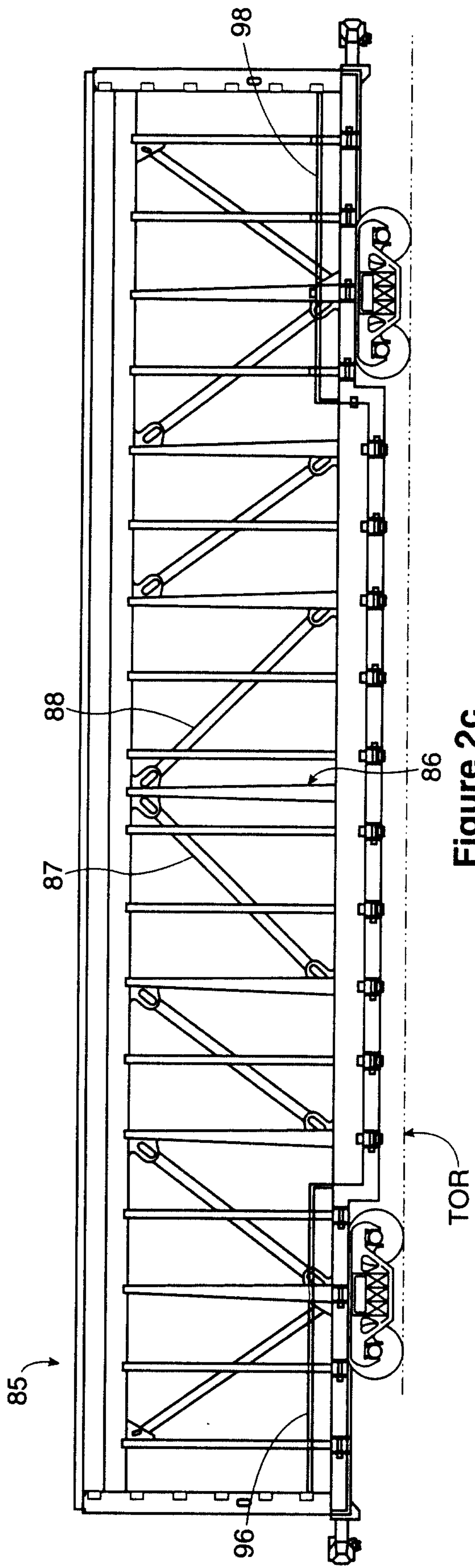


Figure 2c

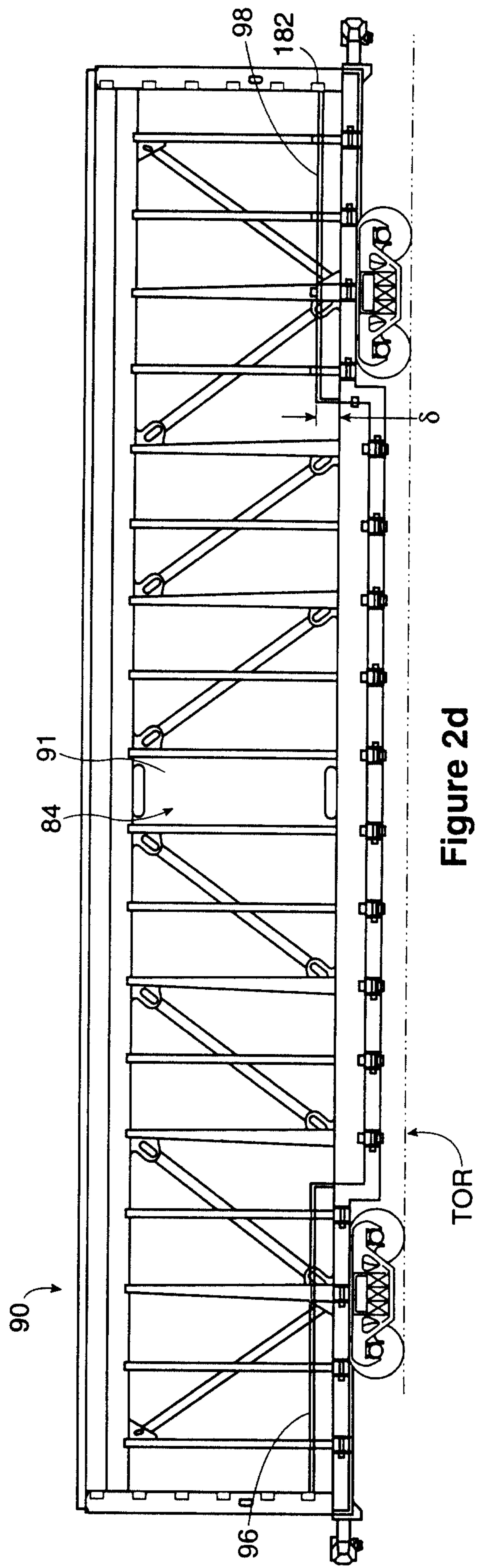


Figure 2d

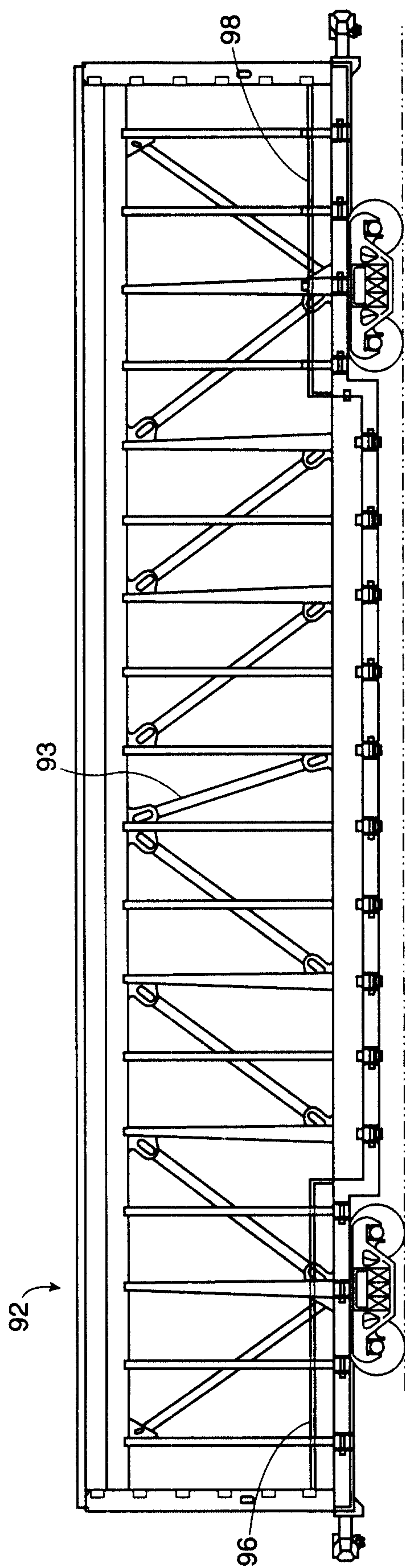


Figure 2e

TOR

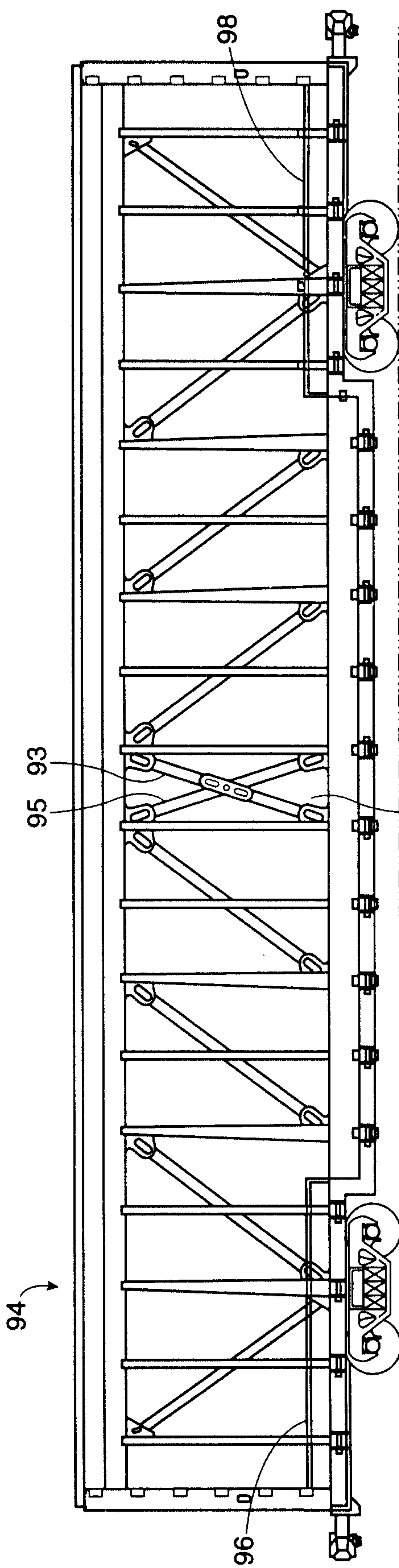


Figure 2f

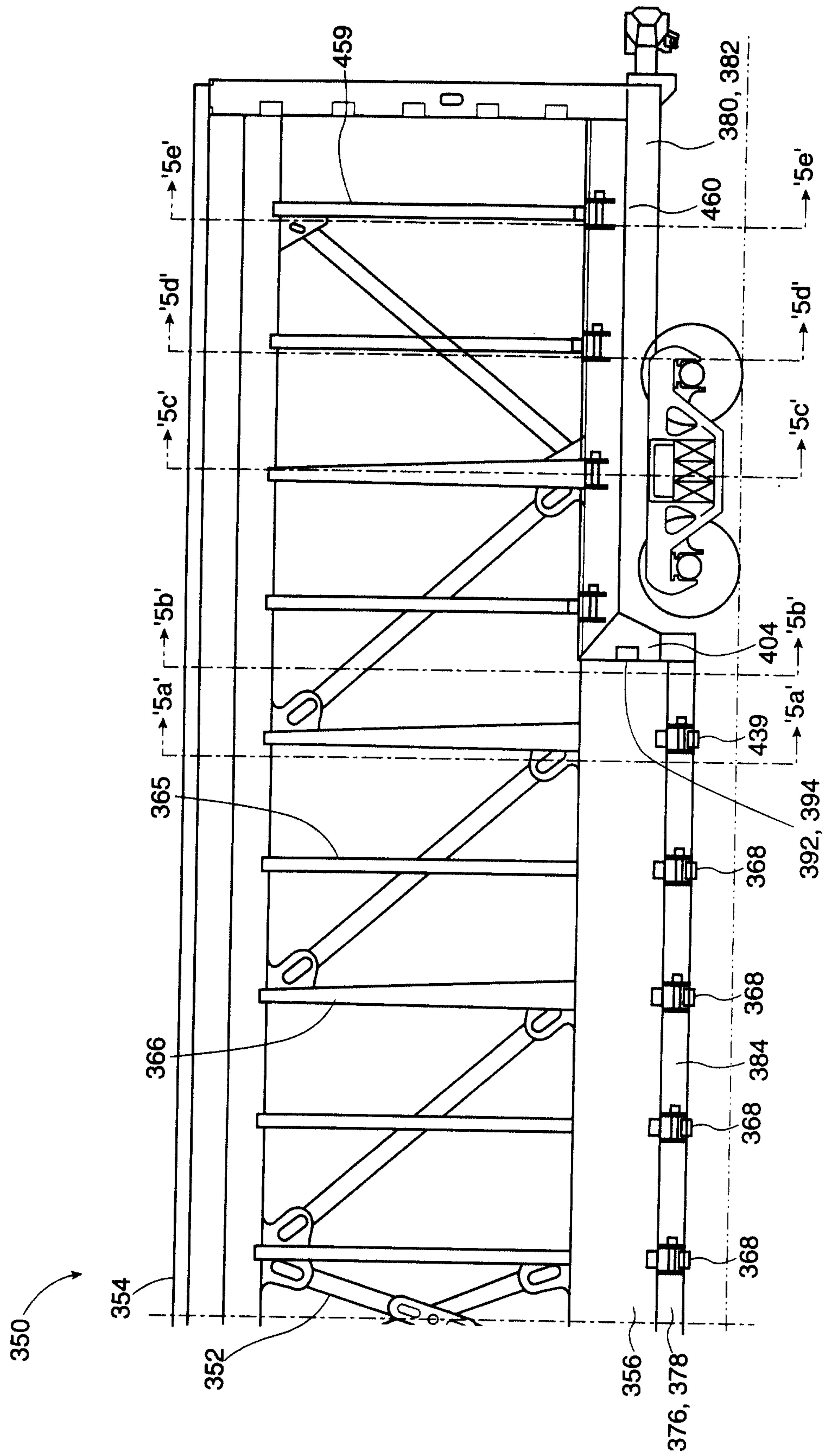


Figure 2g

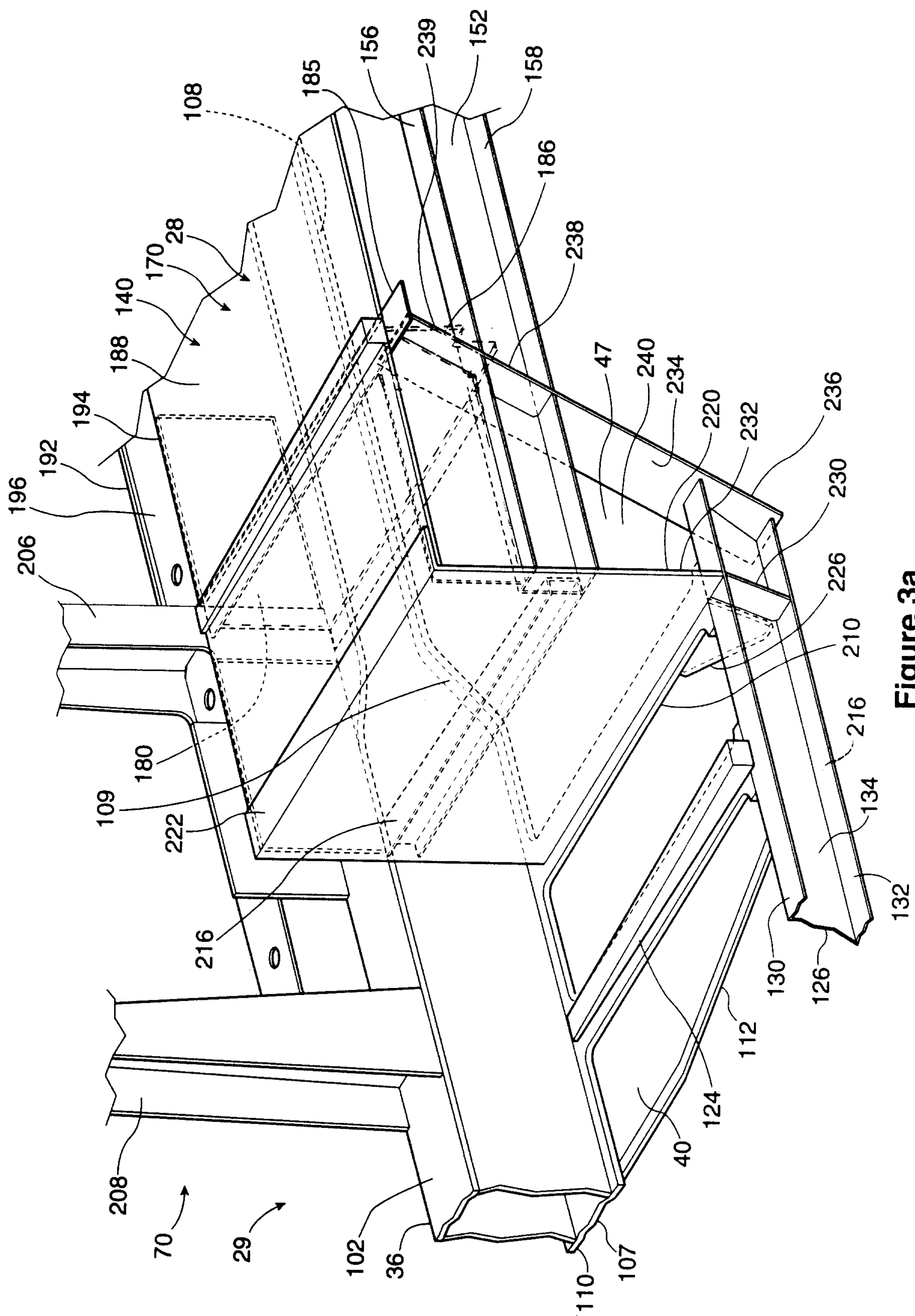


Figure 3a

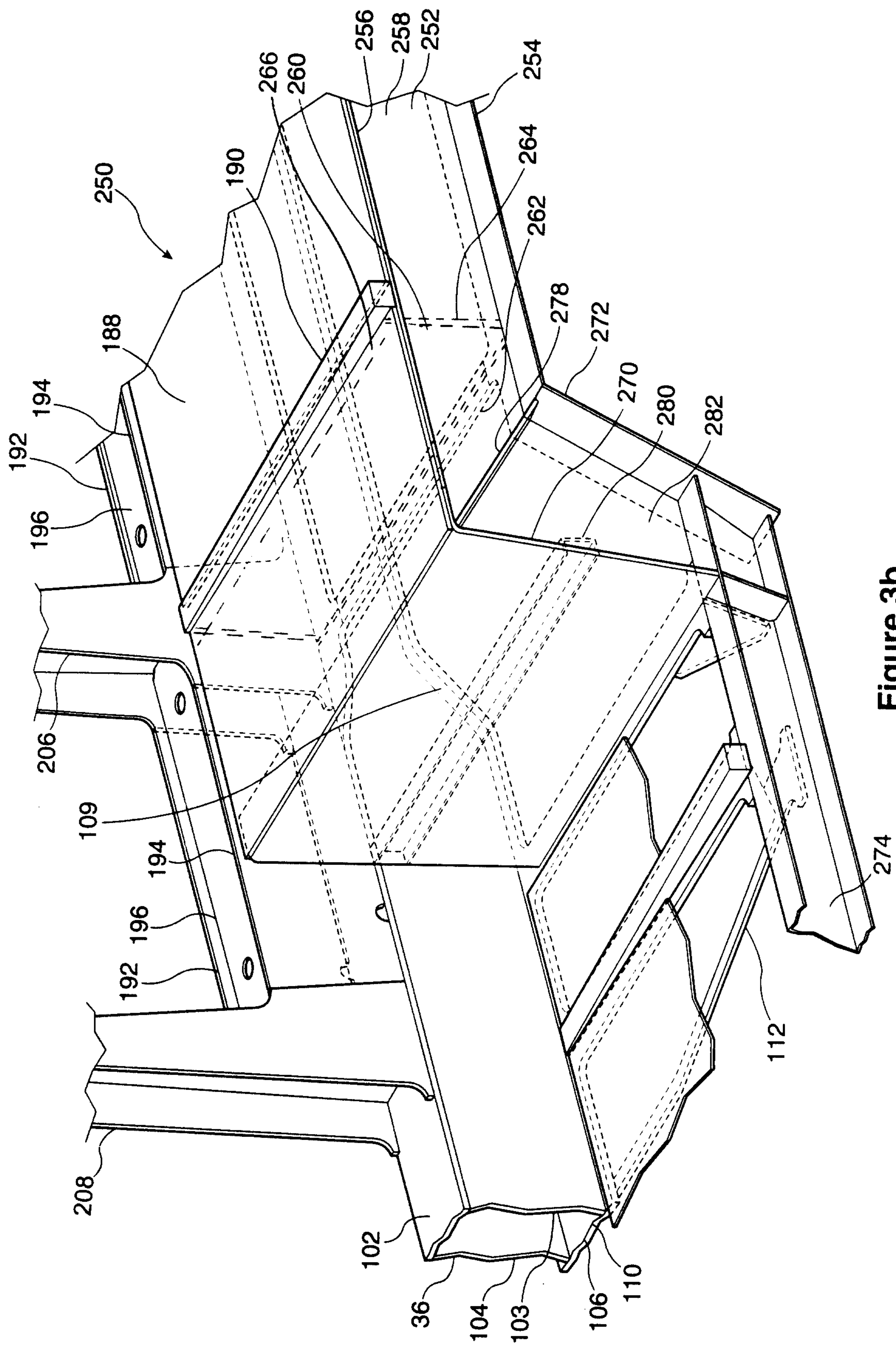


Figure 3b

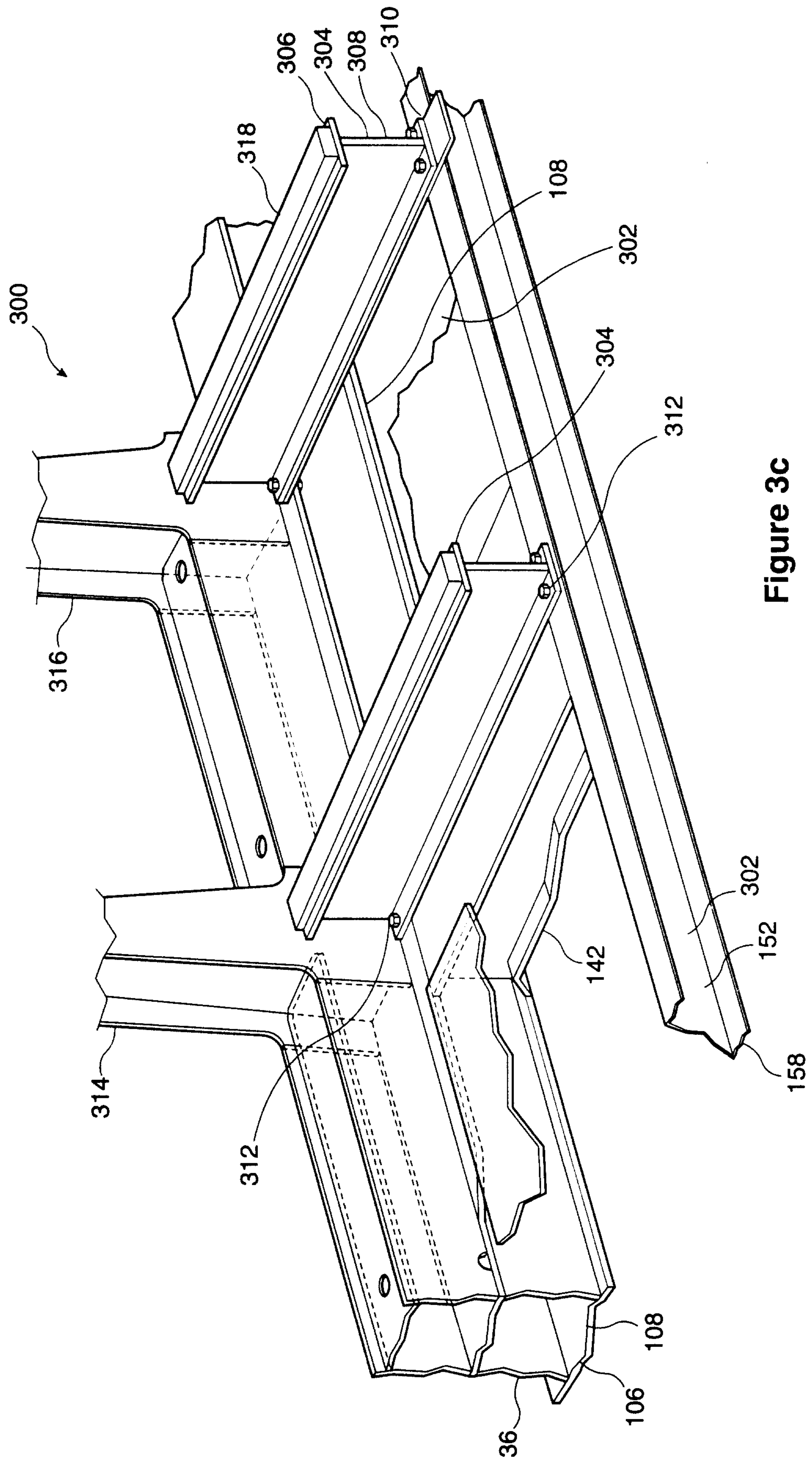
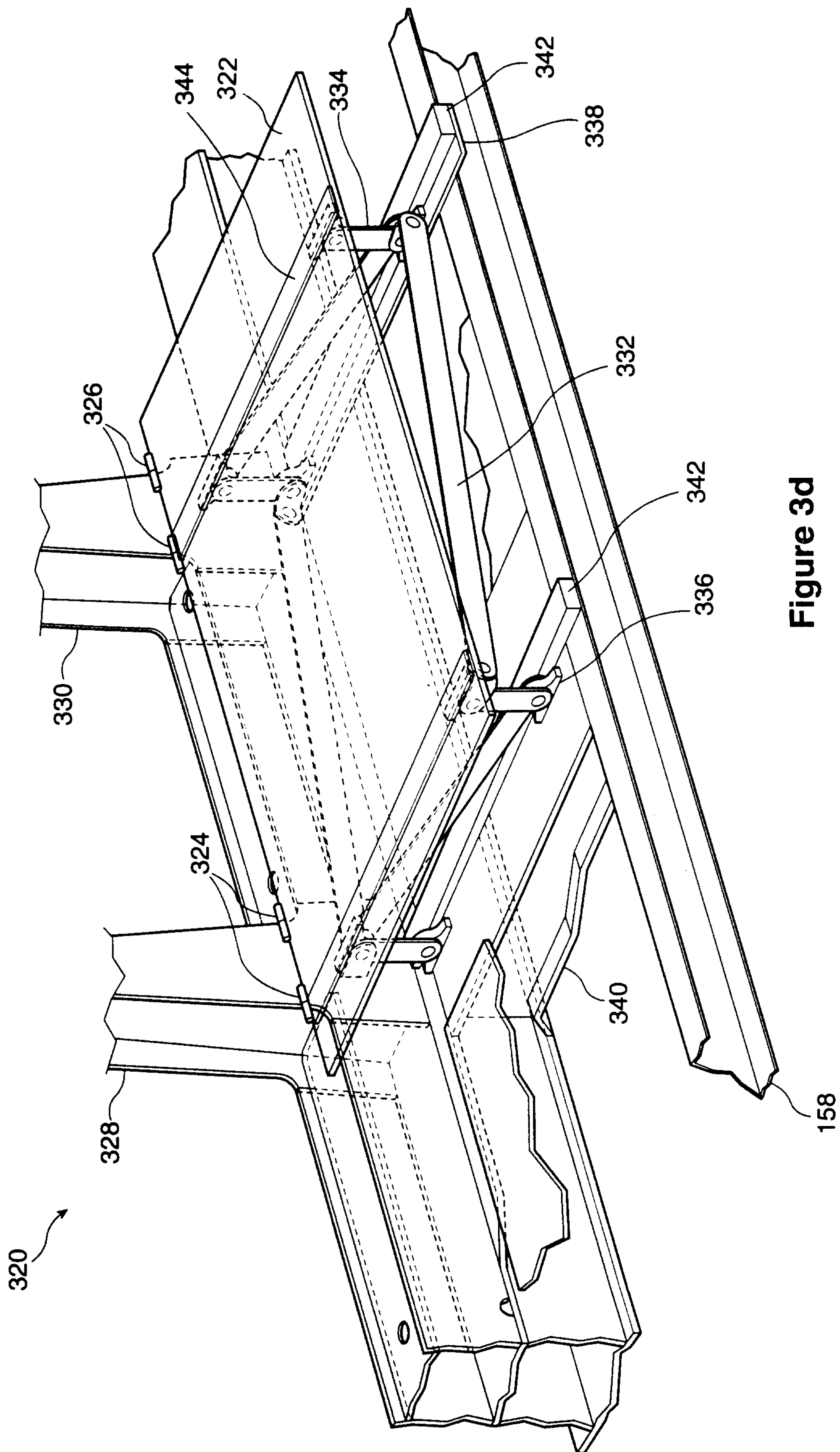


Figure 3c



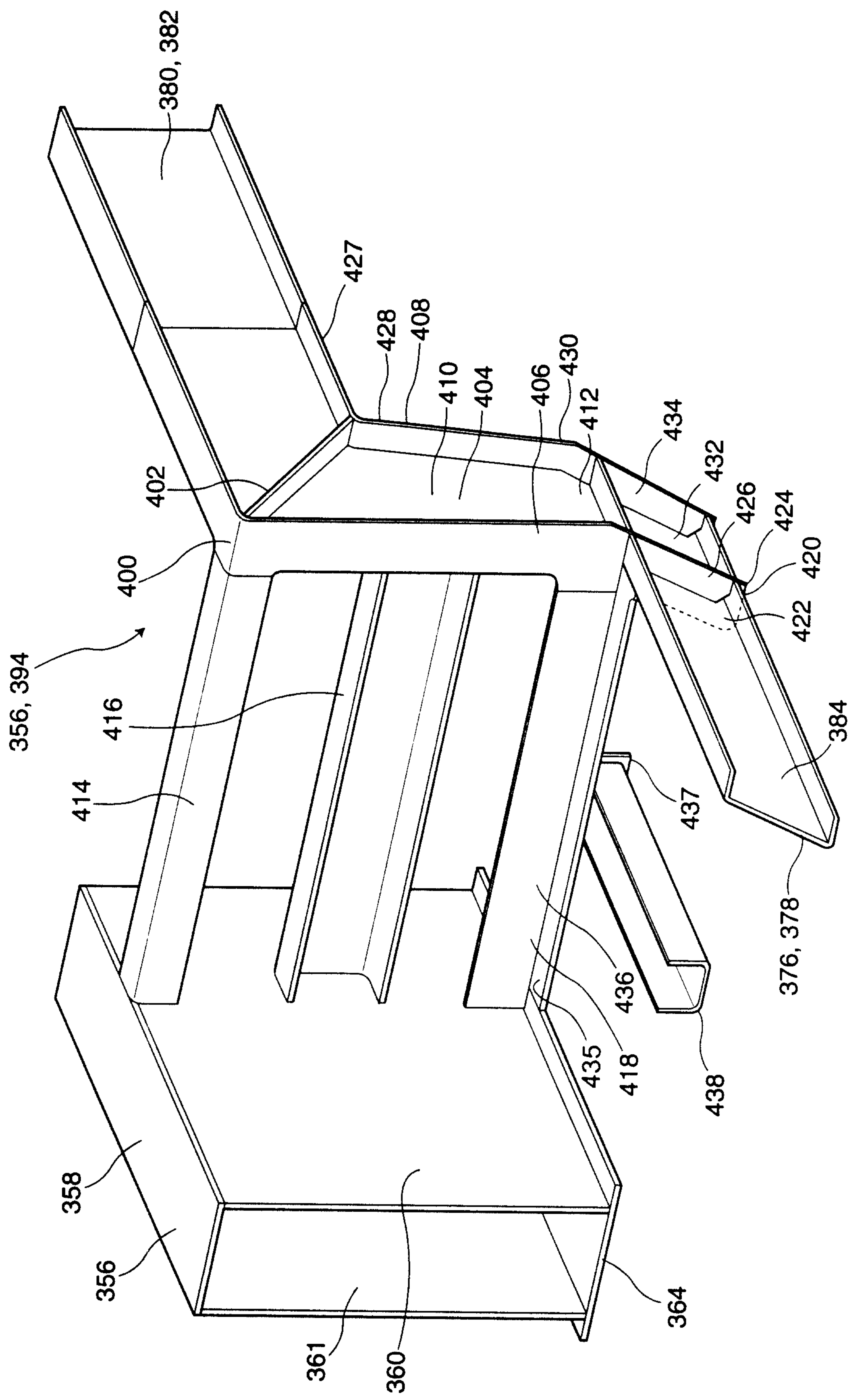


Figure 3e

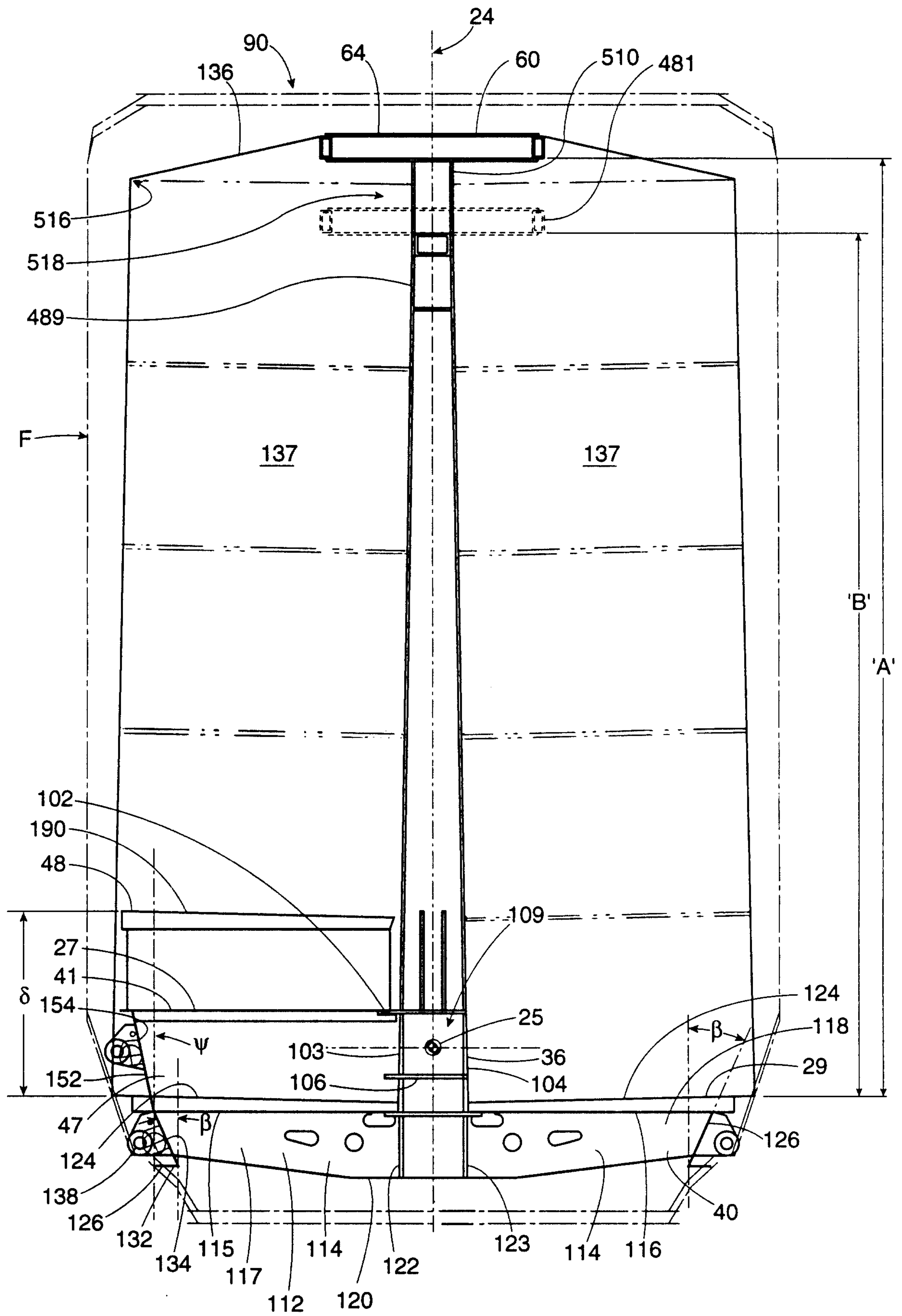


Figure 4a

Figure 4b

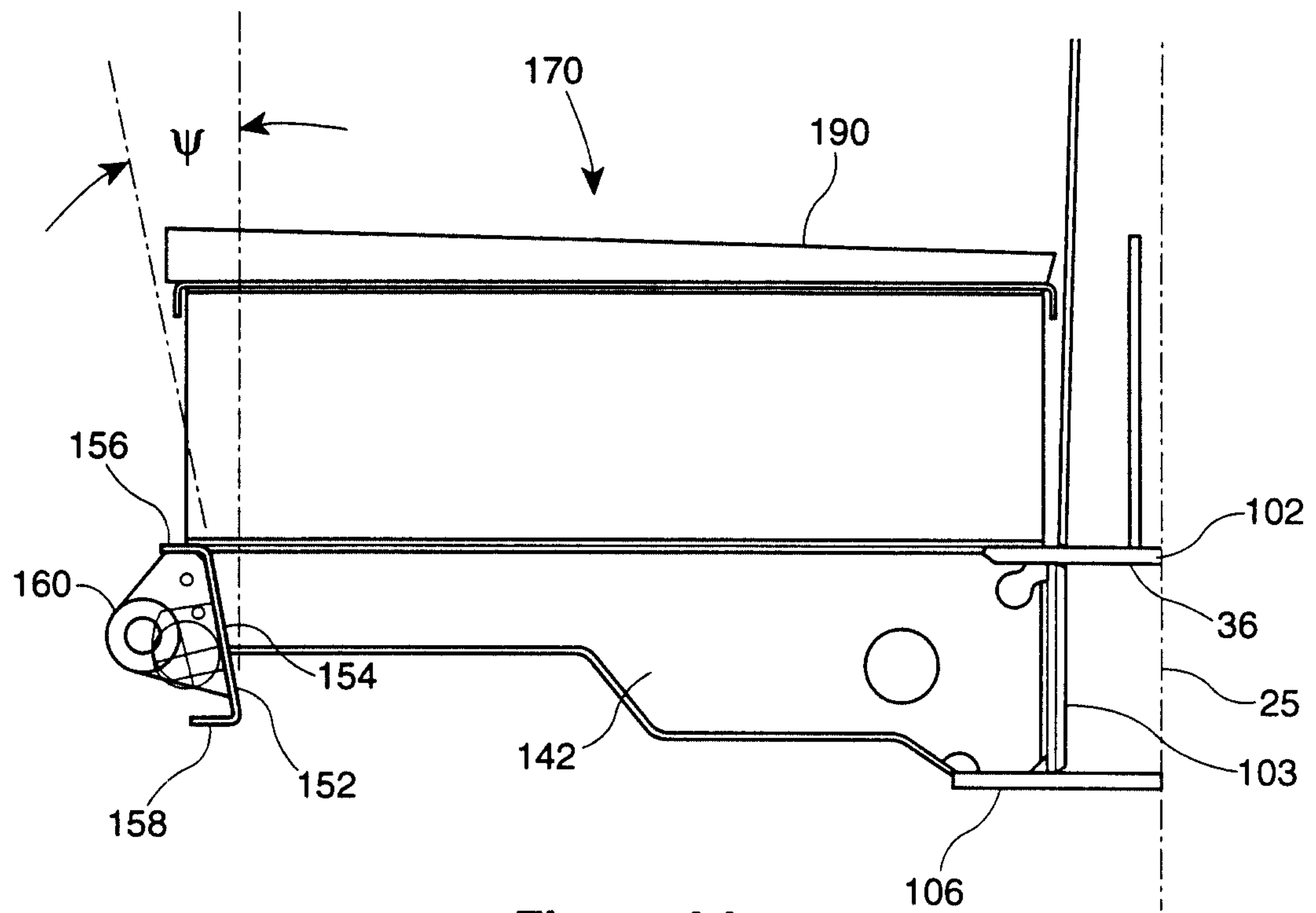


Figure 4d

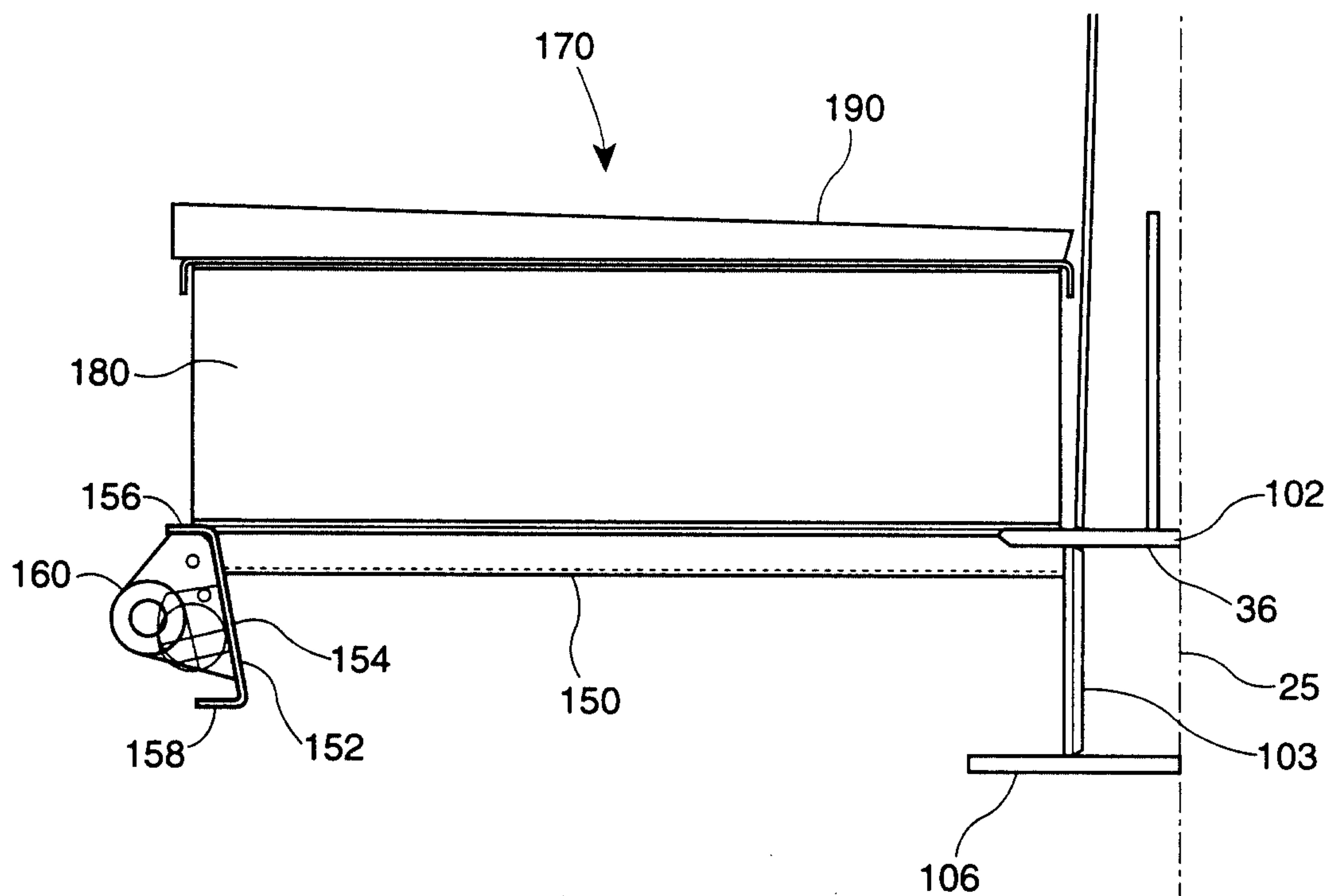


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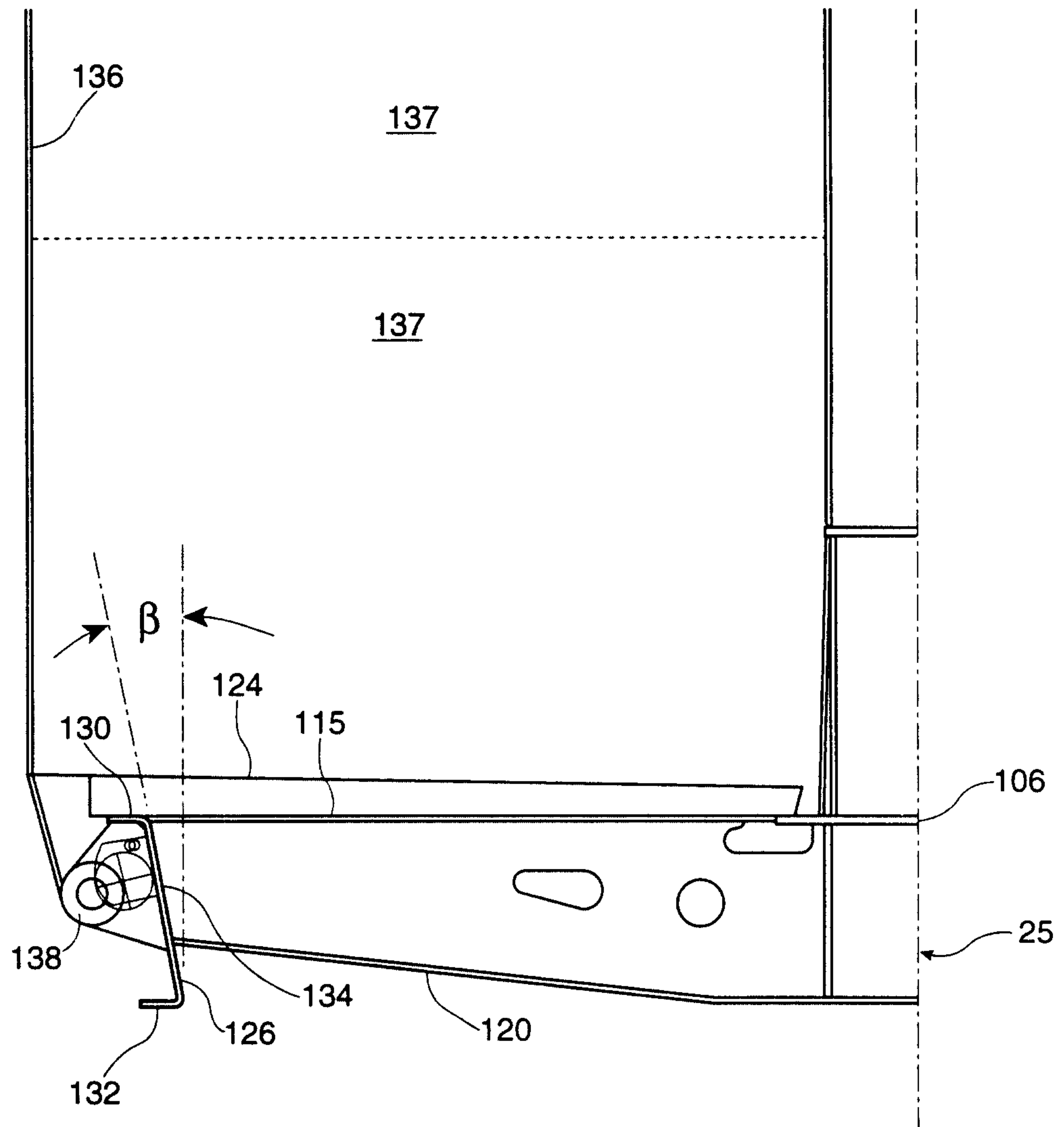


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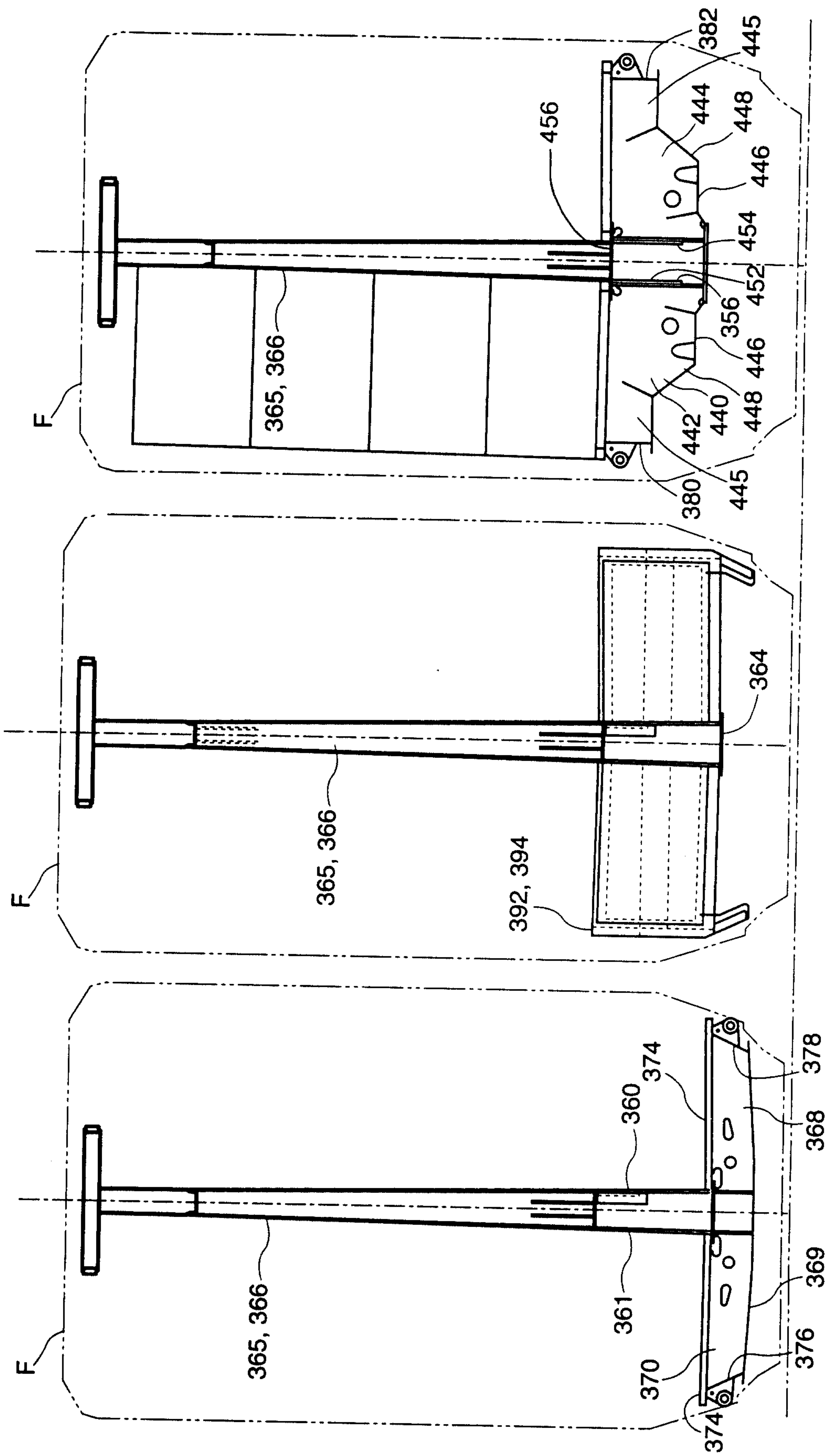


Figure 5a

Figure 5b

Figure 5c

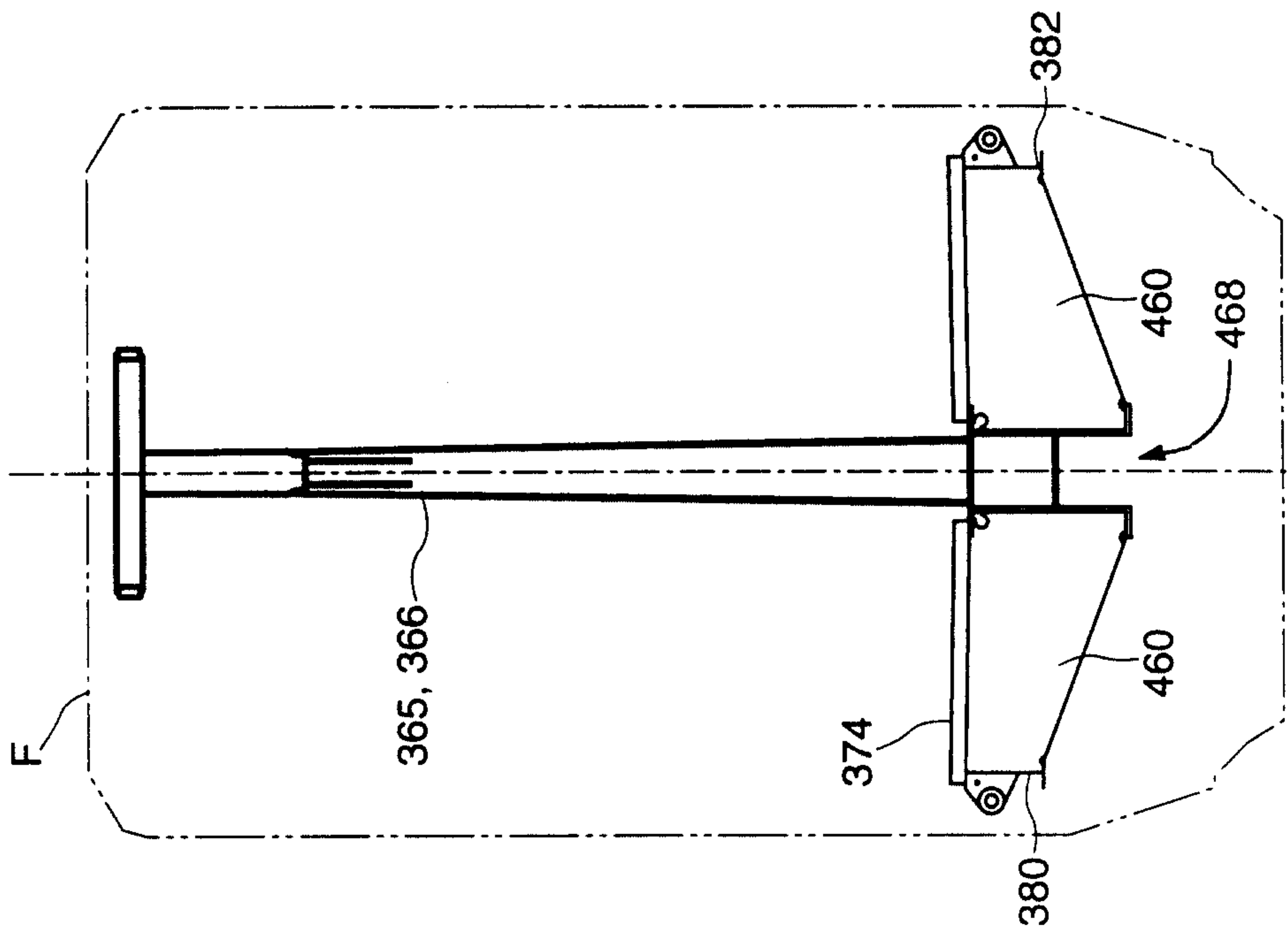


Figure 5e

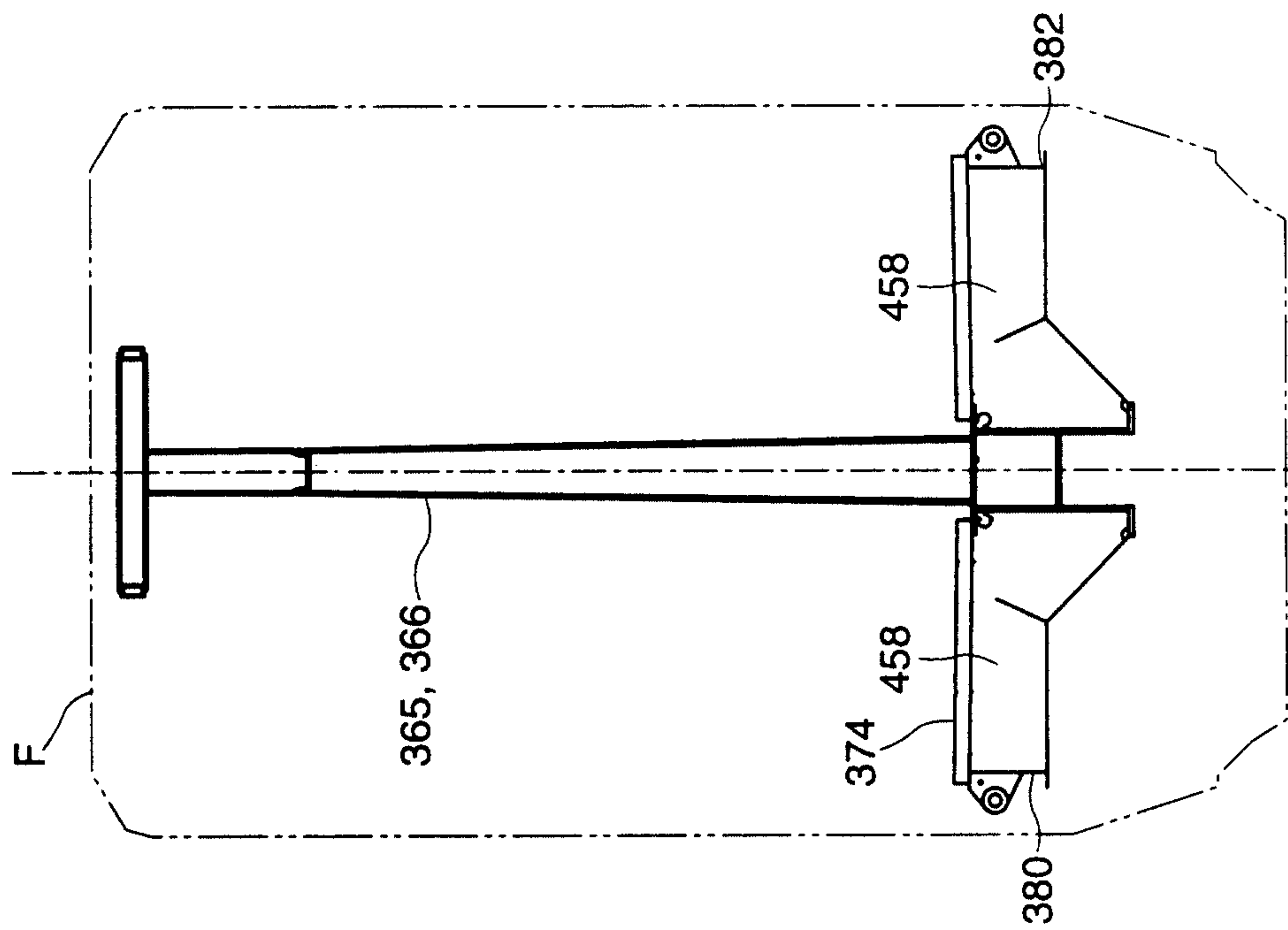


Figure 5d

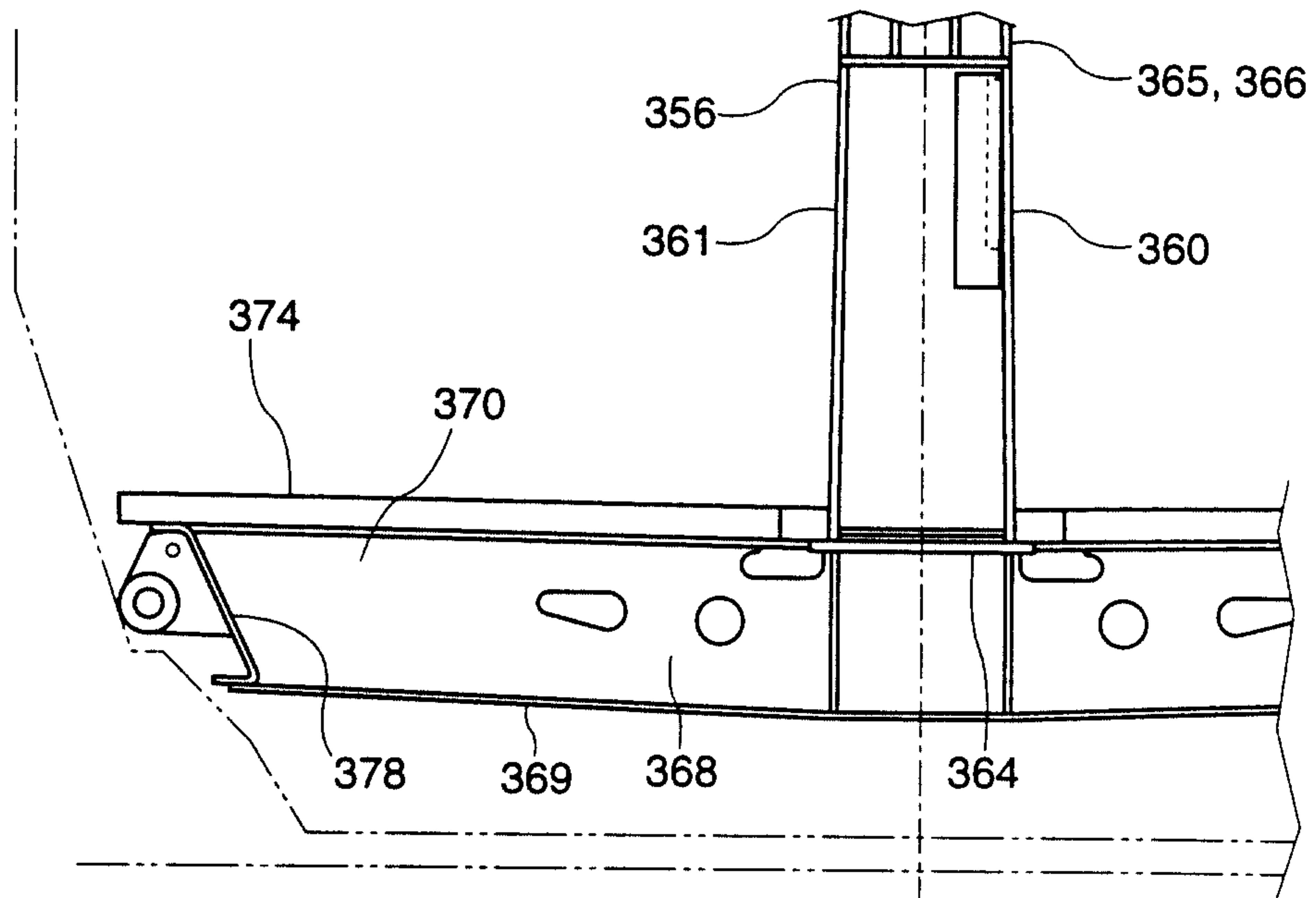


Figure 6a

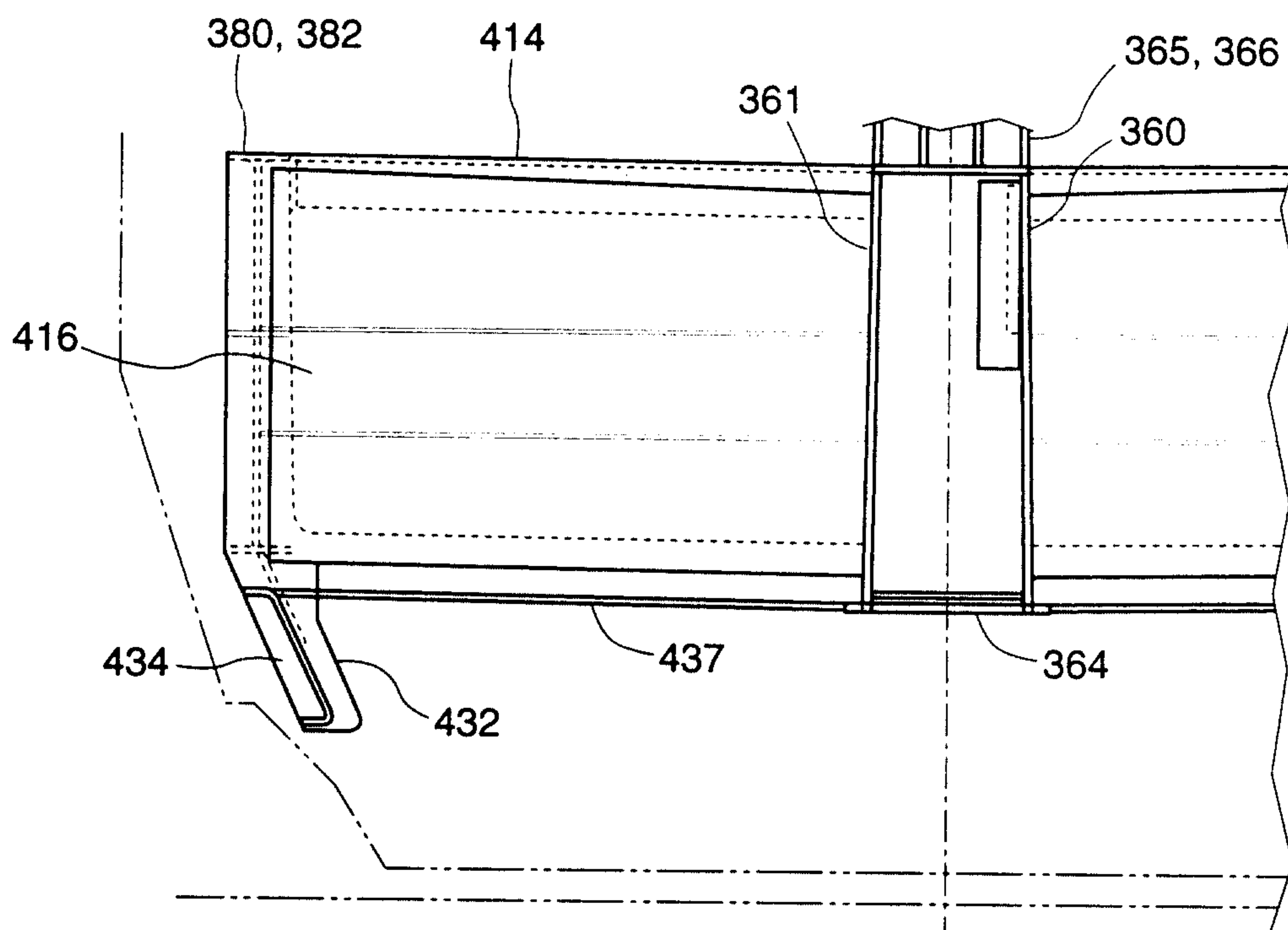


Figure 6b

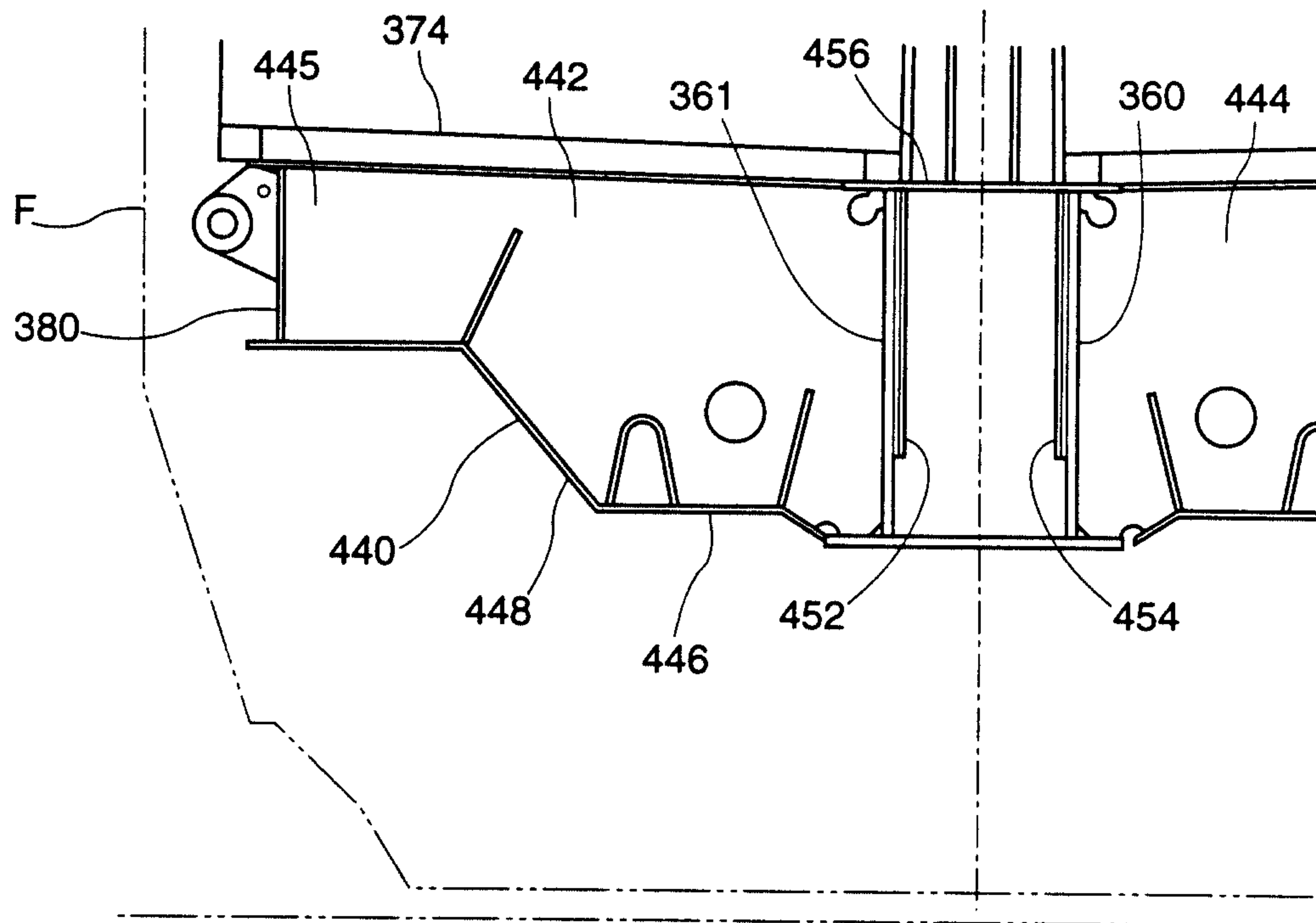


Figure 6c

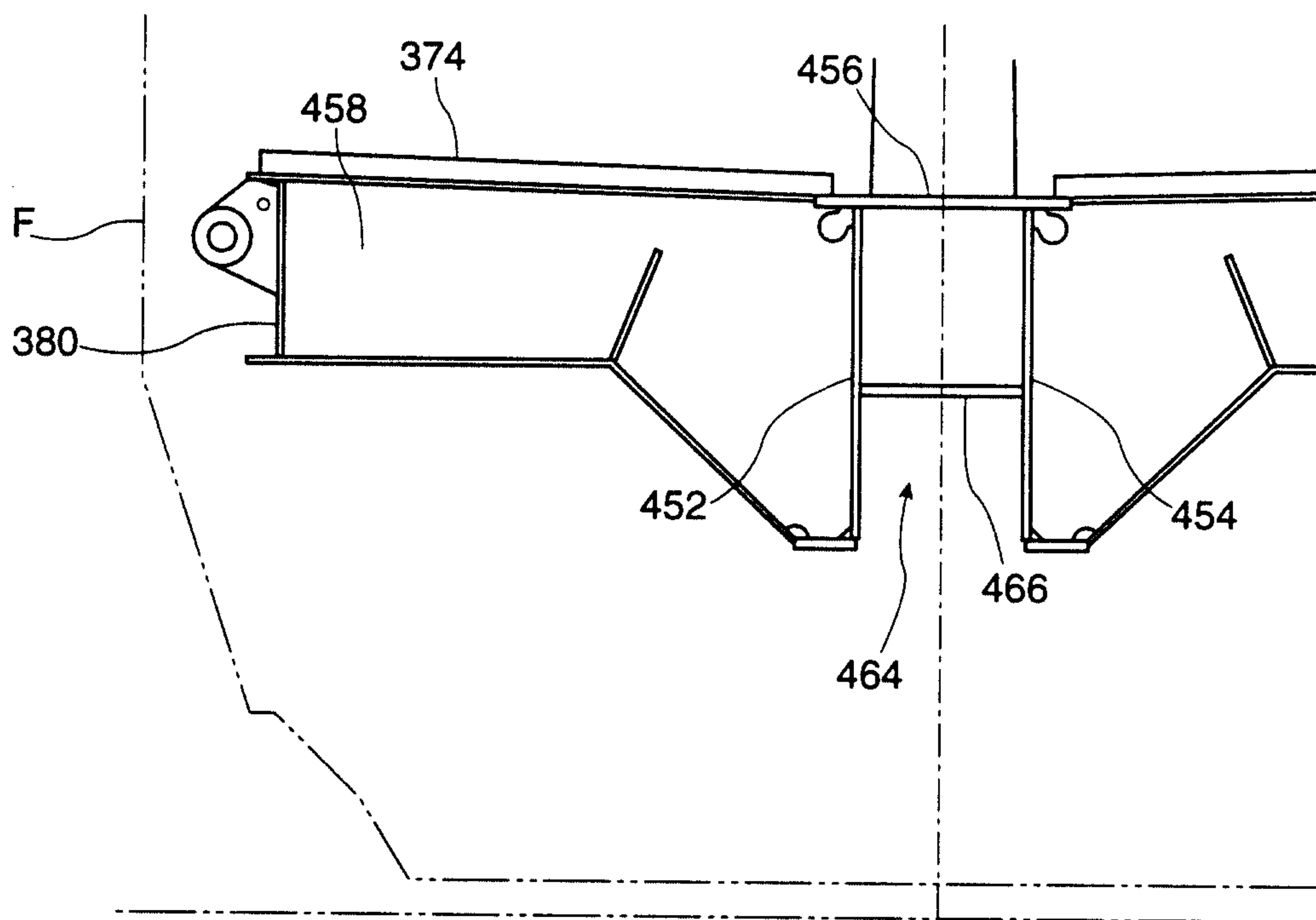


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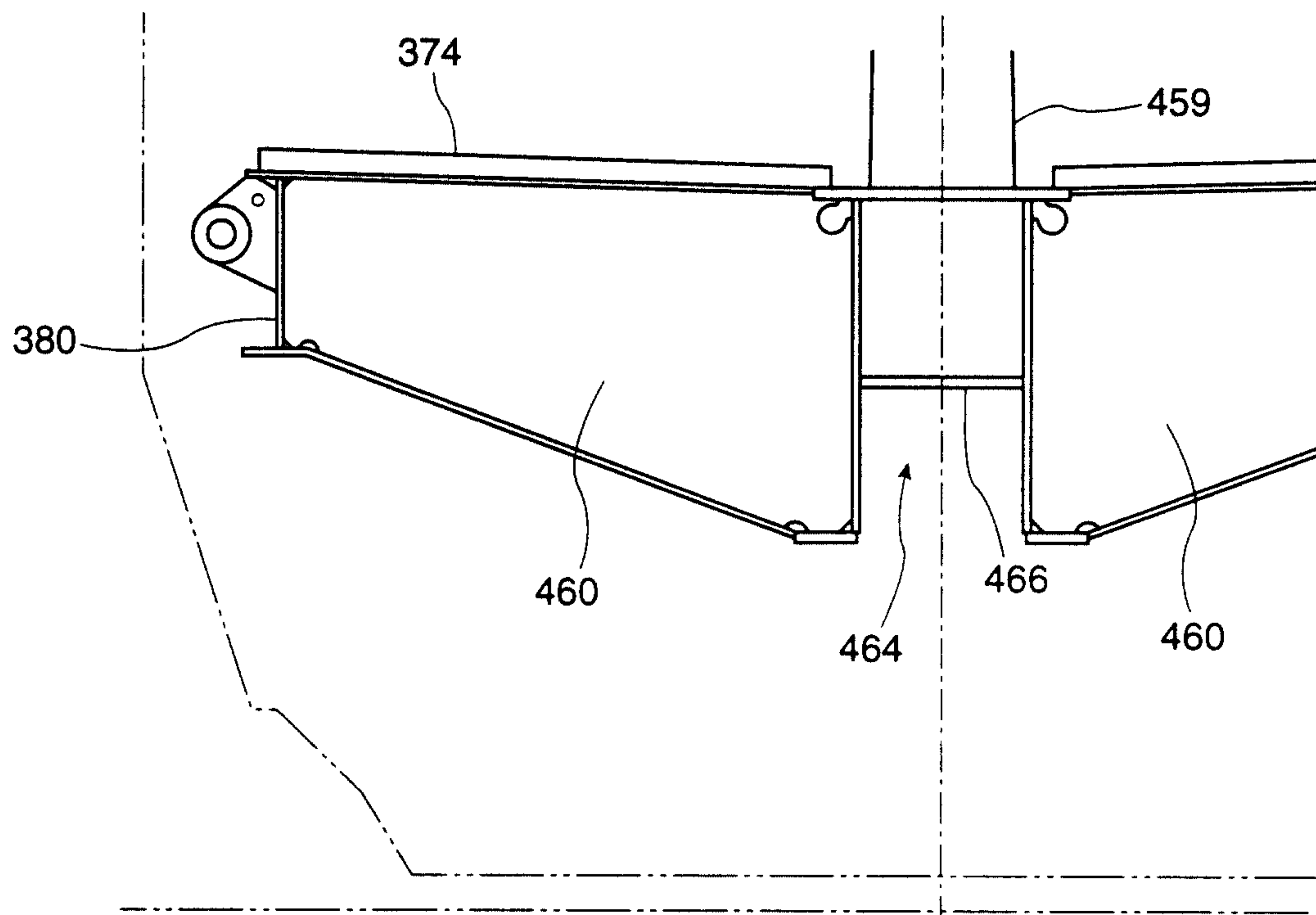


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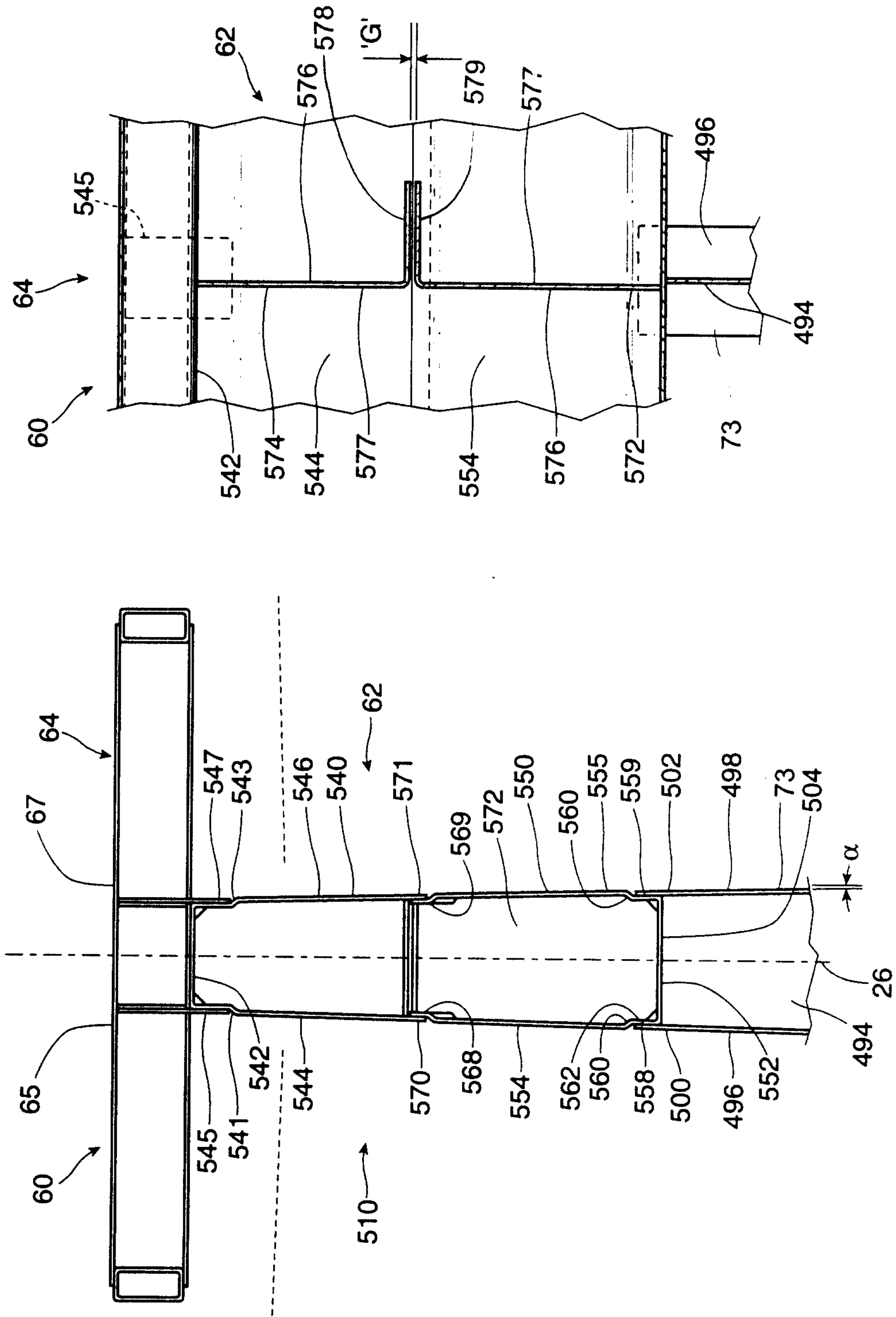


Figure 7a

Figure 7b

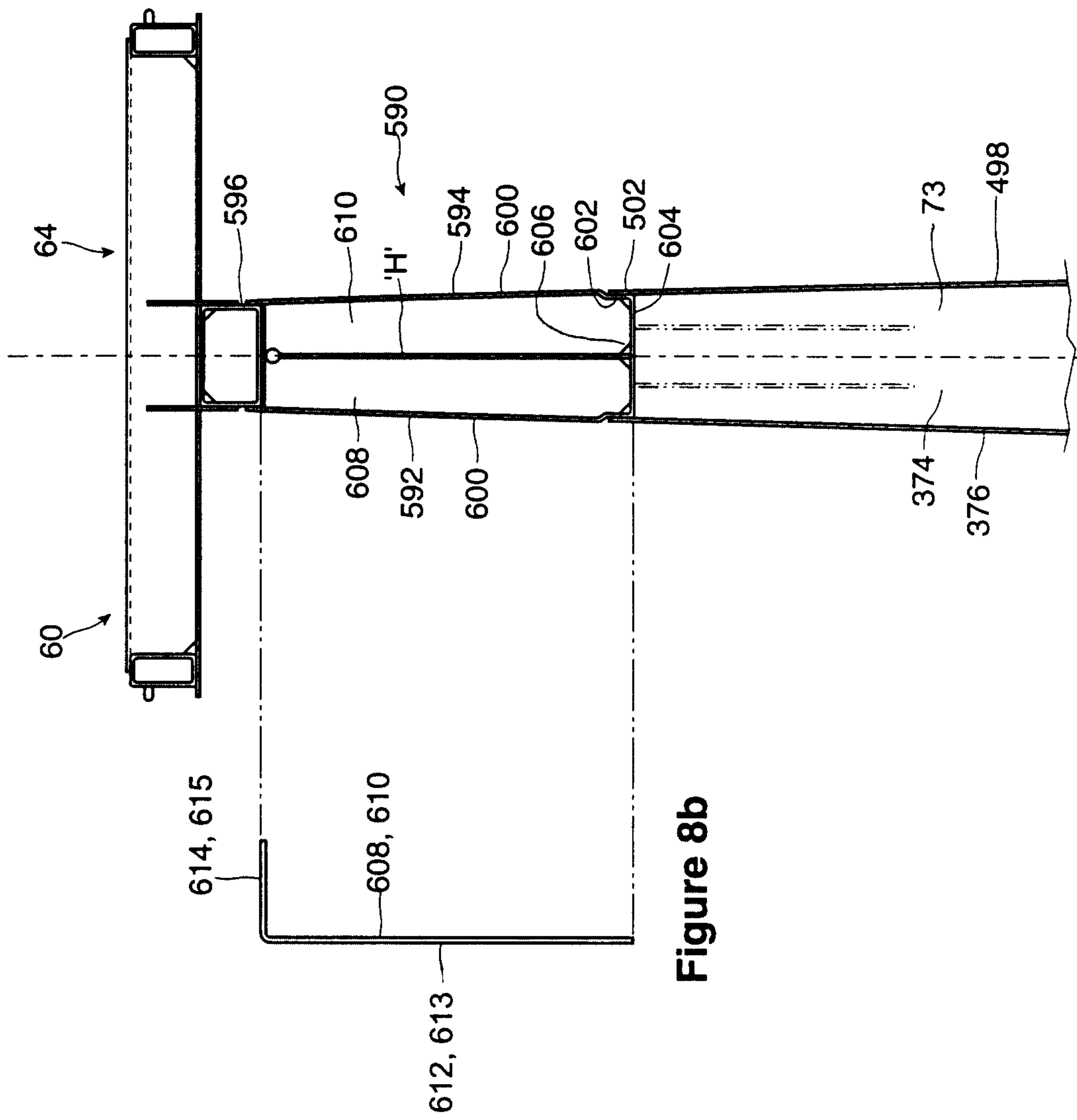


Figure 8a

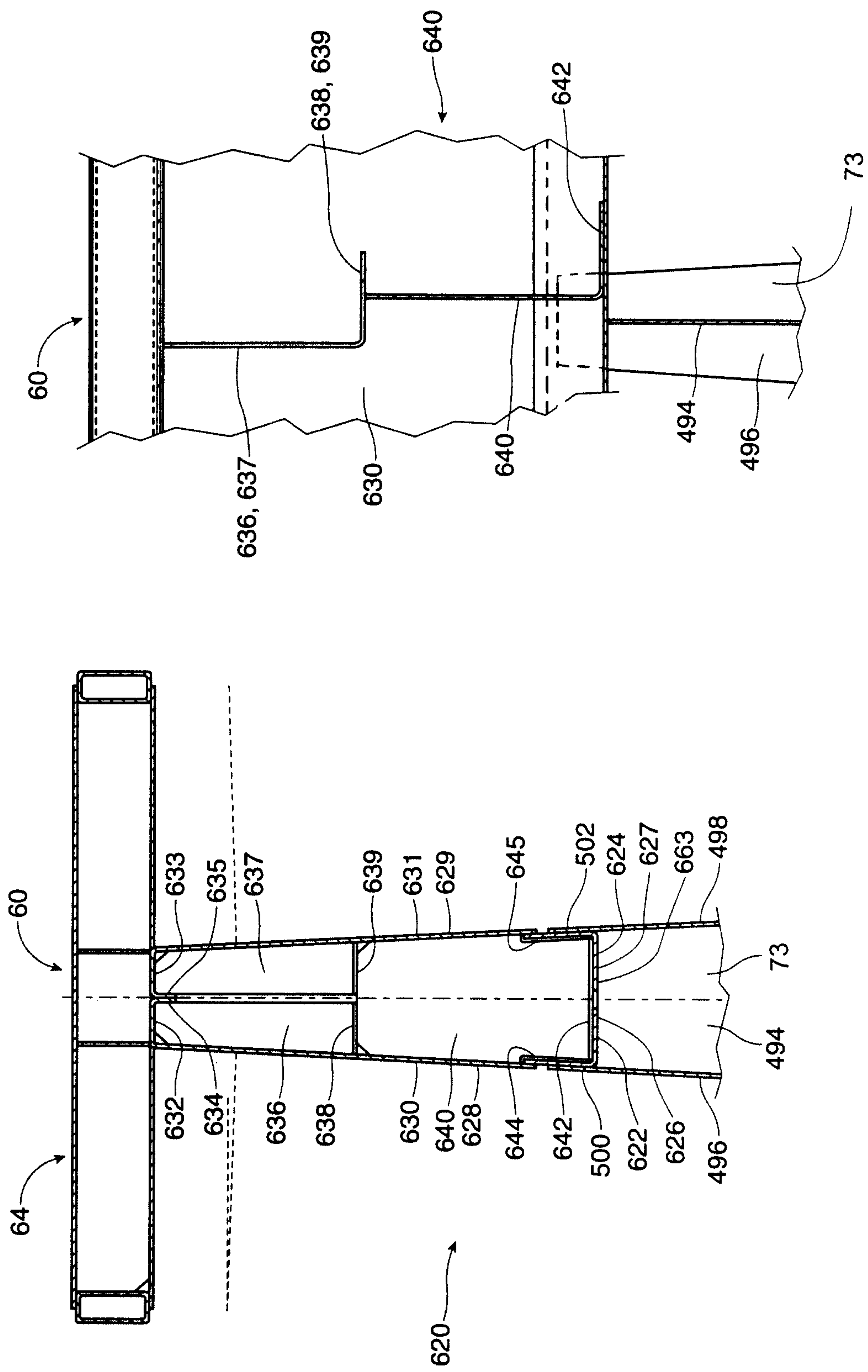


Figure 9a

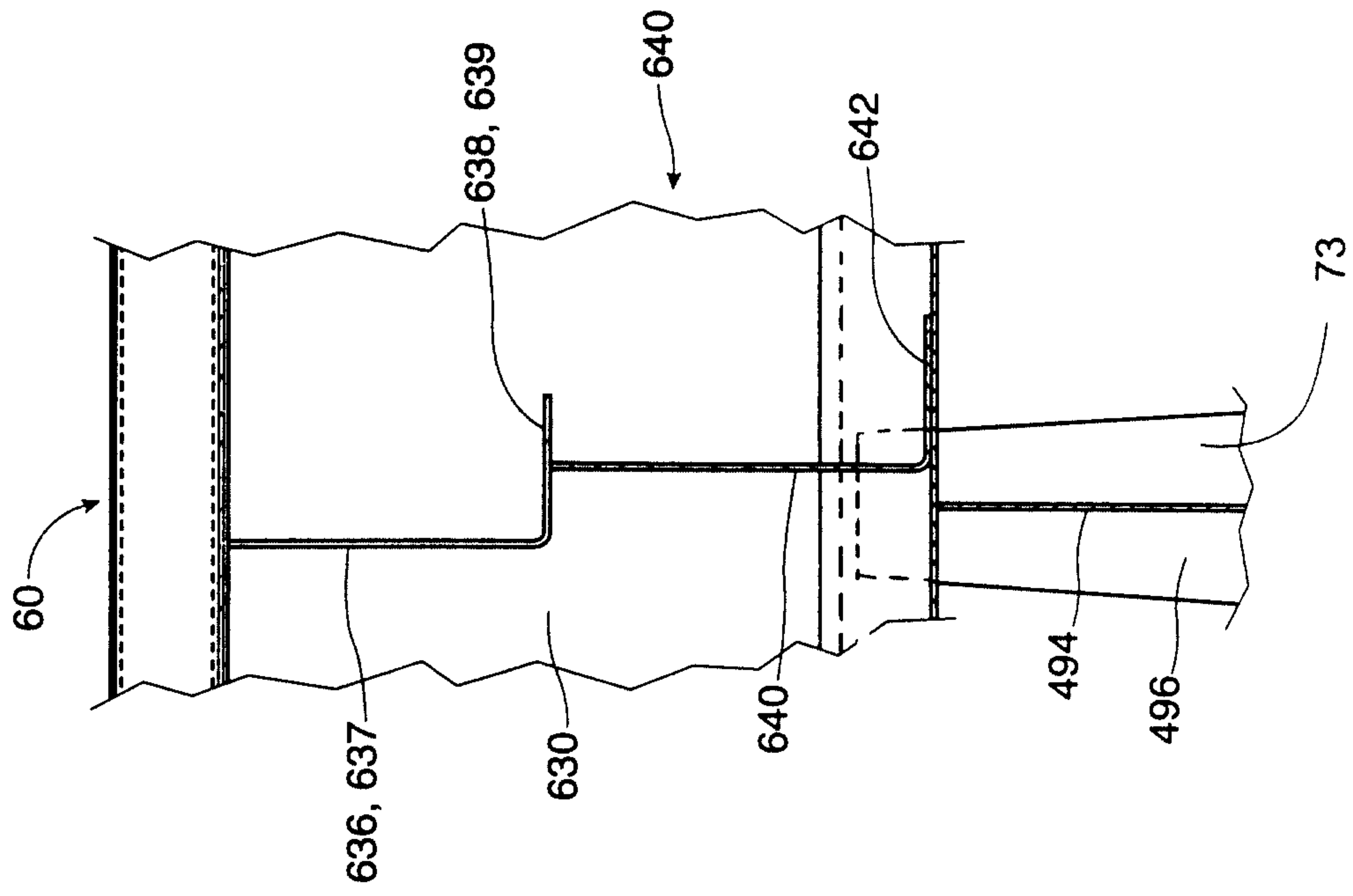


Figure 9b

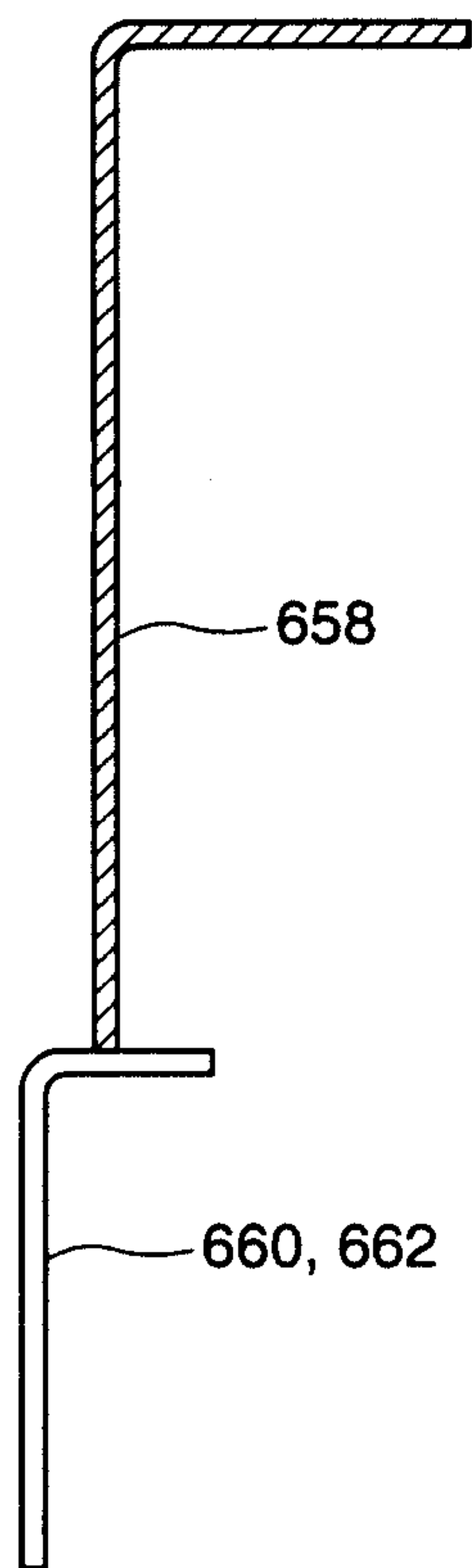


Figure 10b

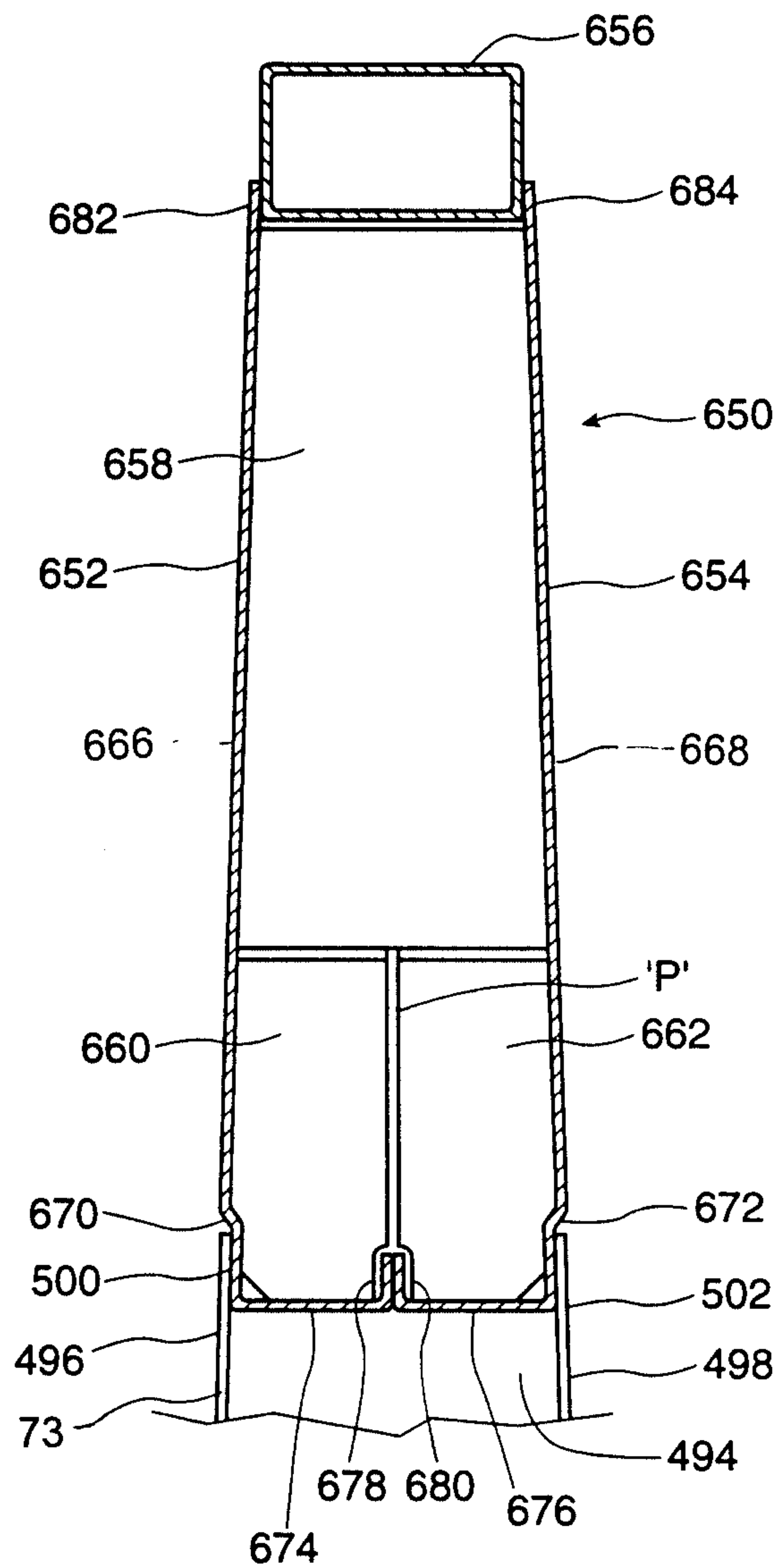


Figure 10a

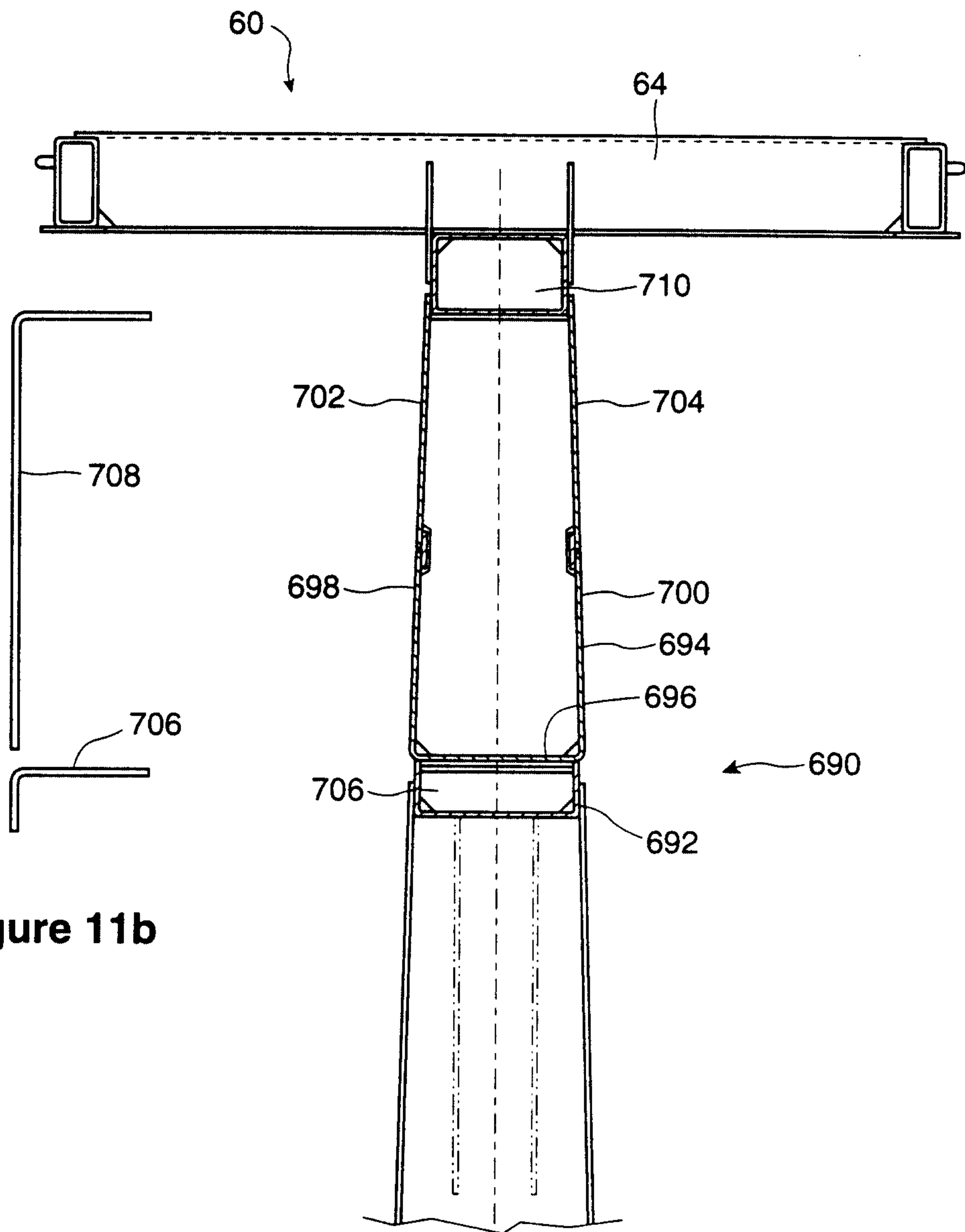


Figure 11b

Figure 11a

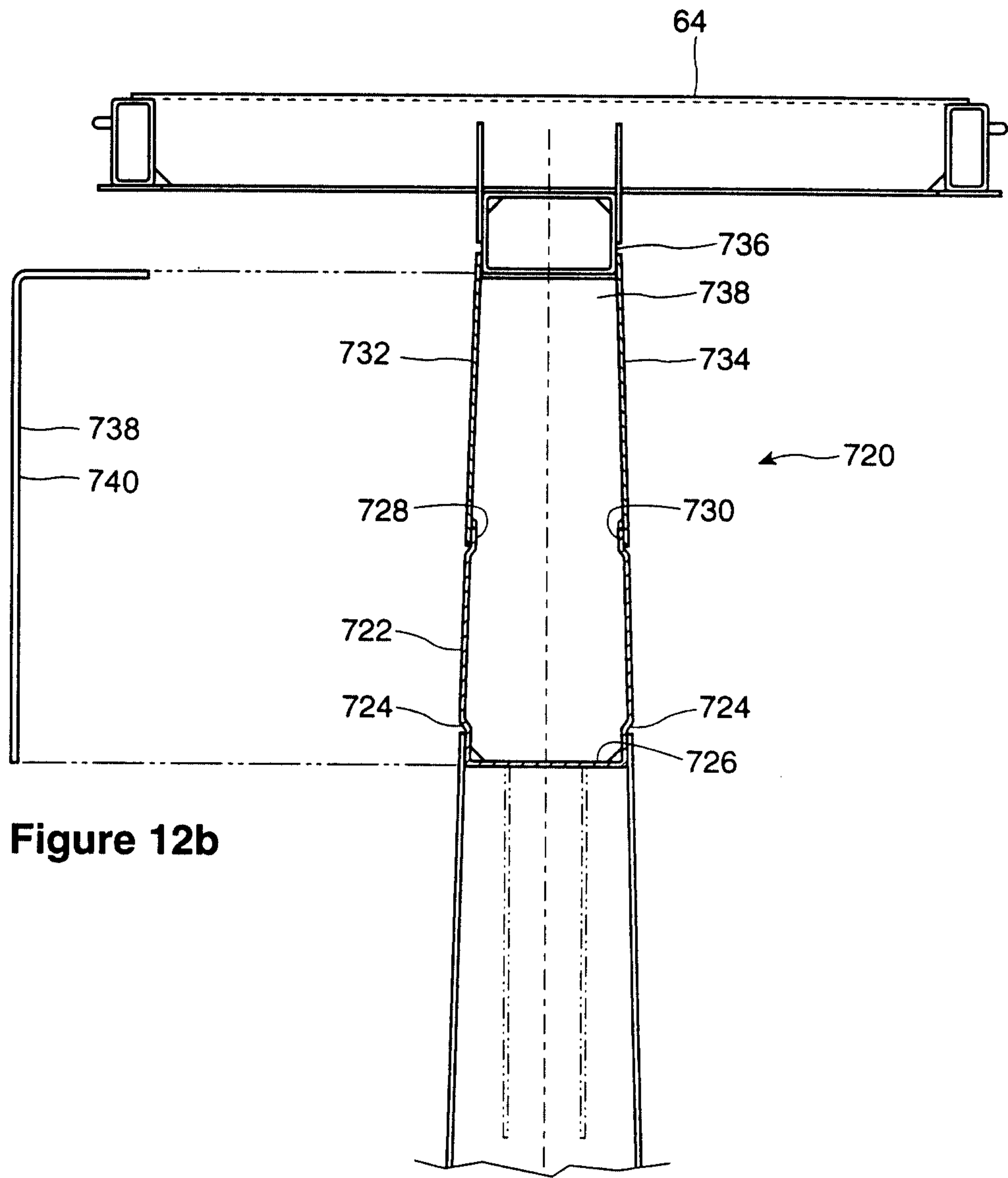
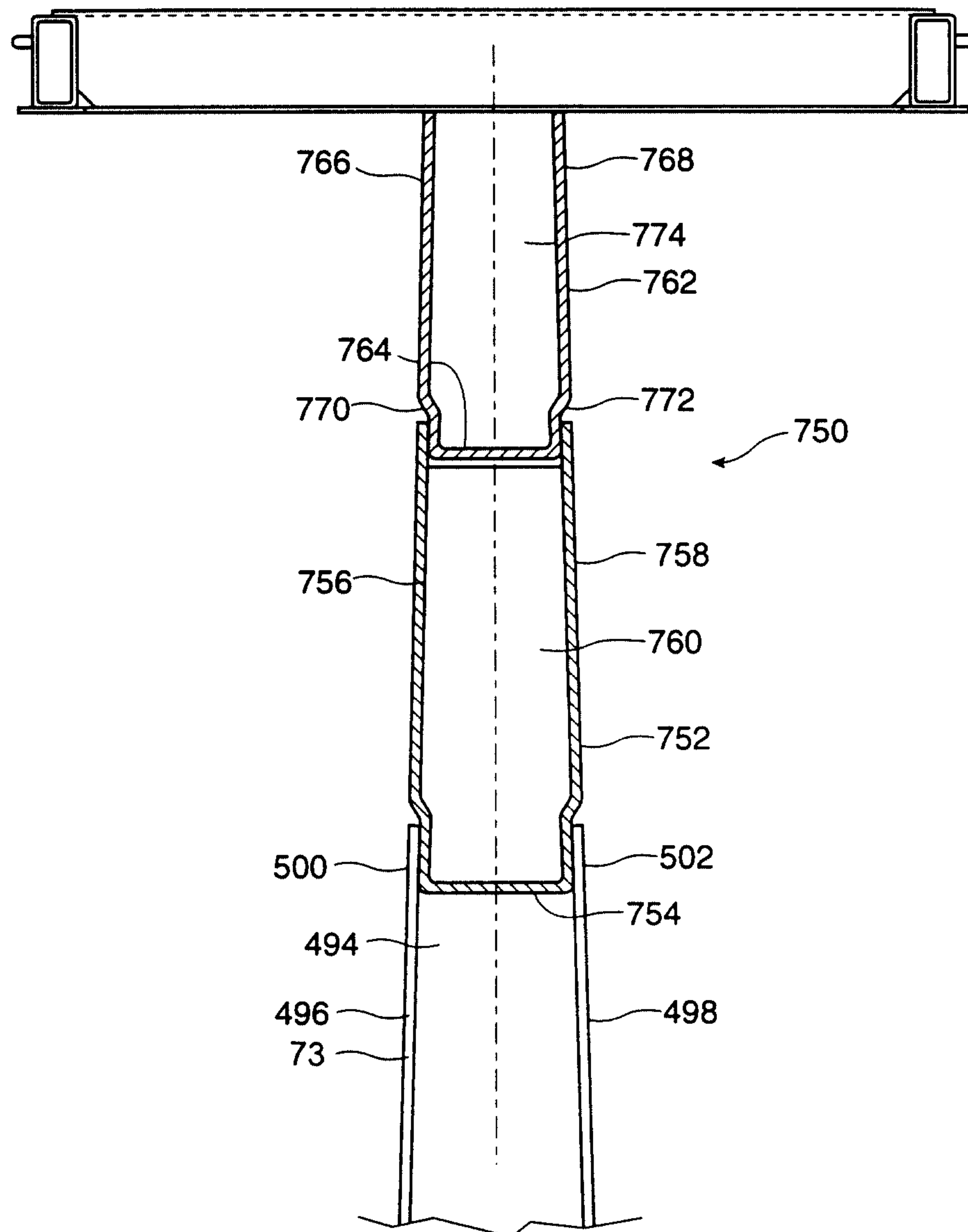
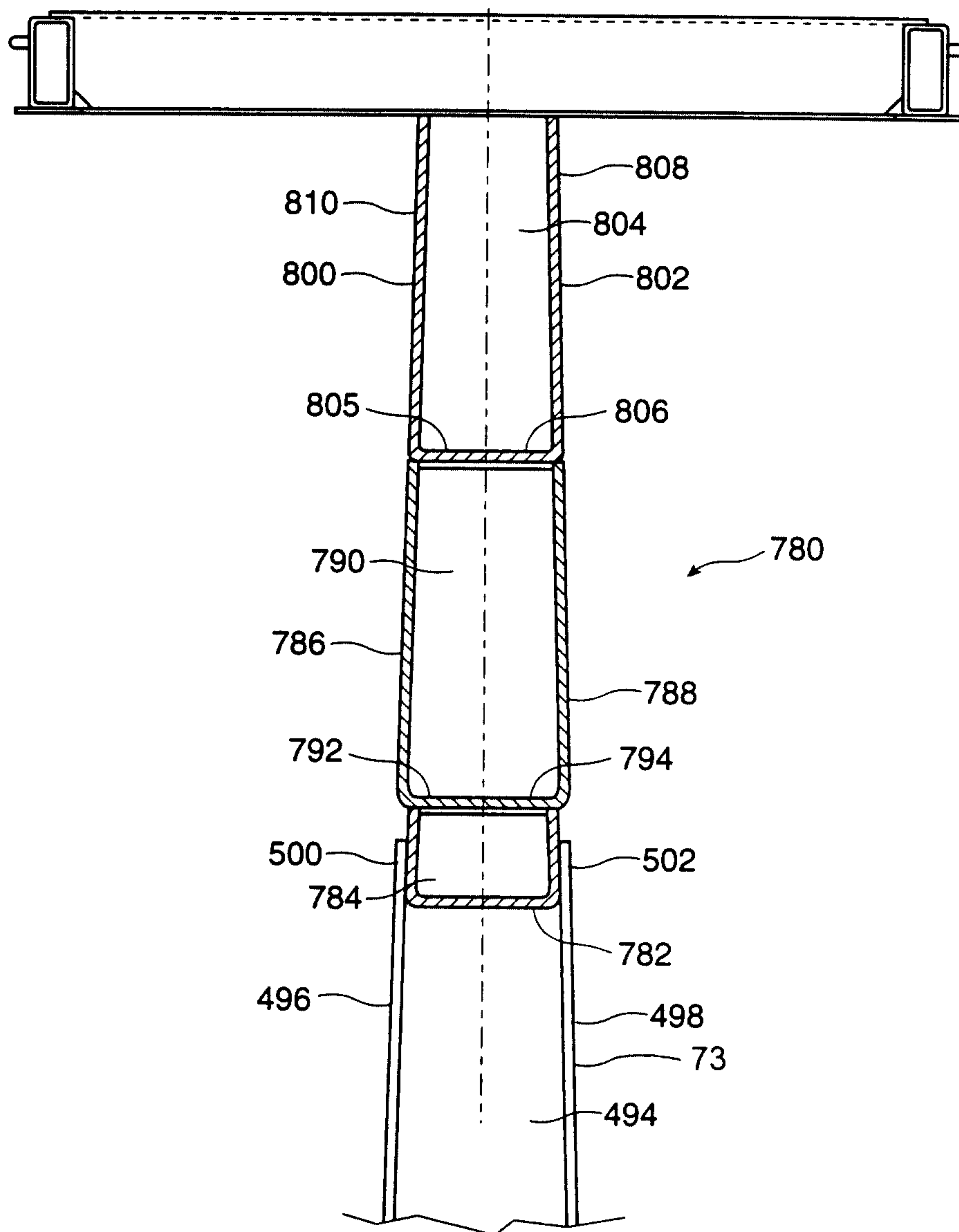
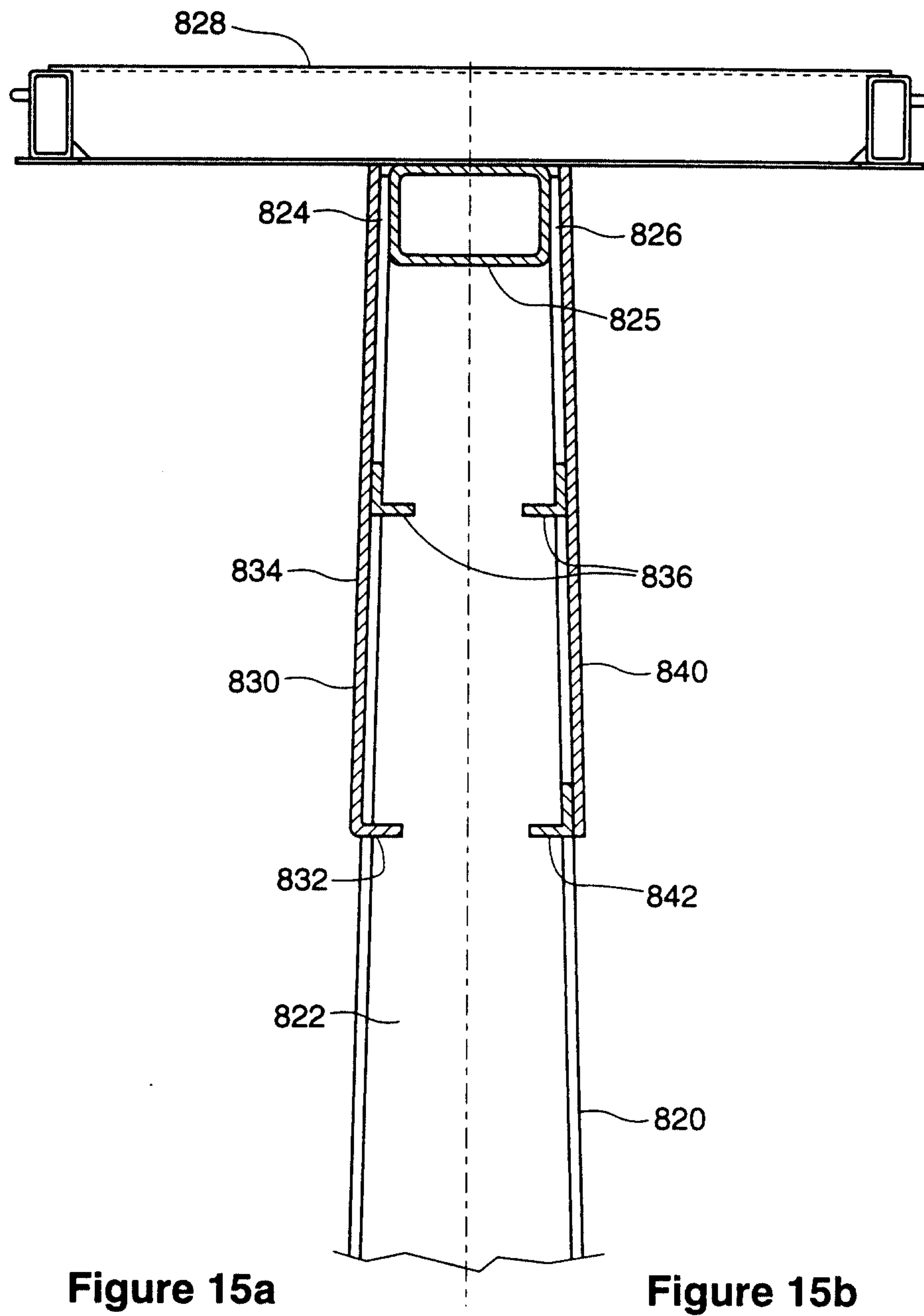


Figure 12b

Figure 12a

**Figure 13**

**Figure 14**



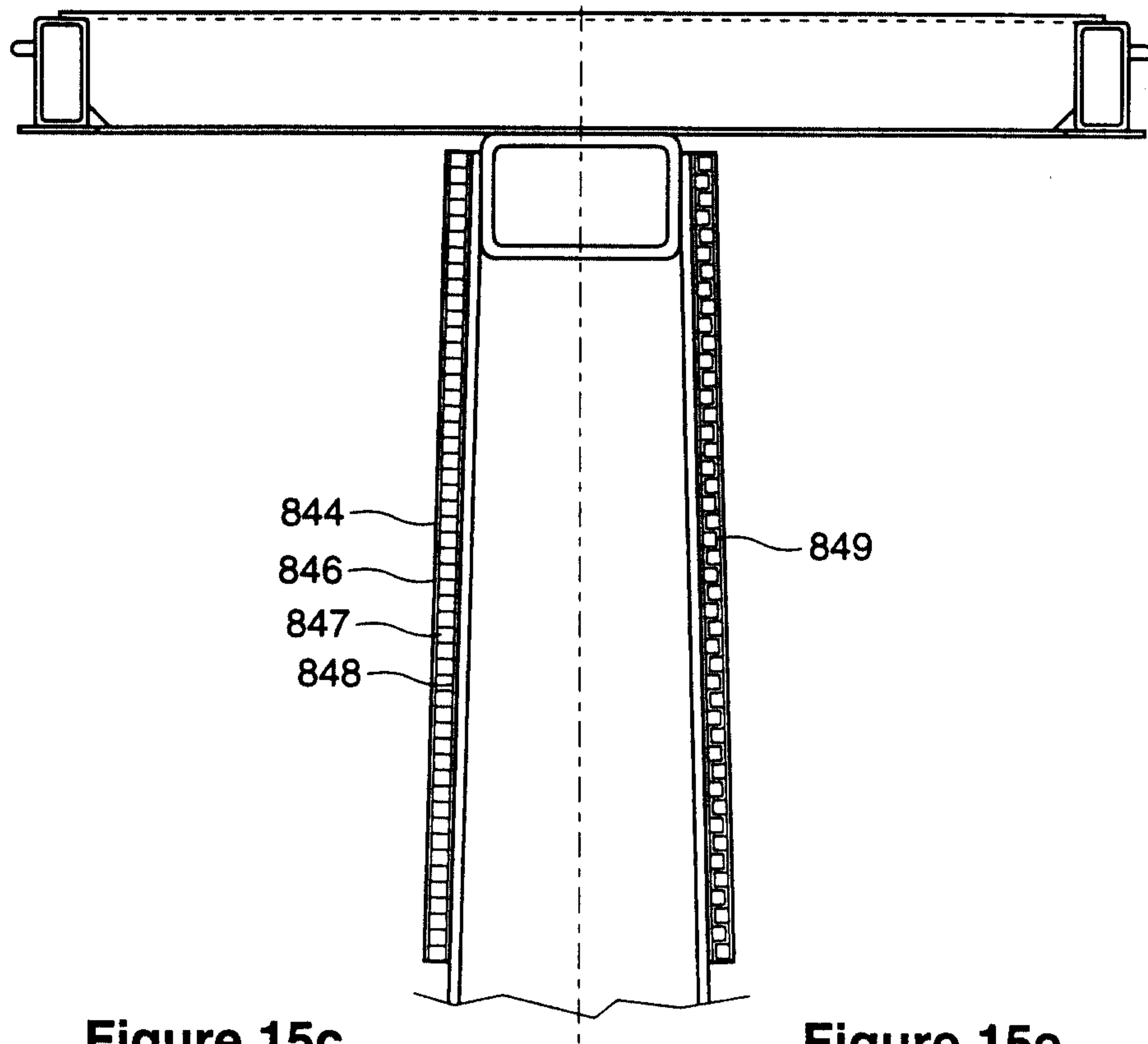


Figure 15c

Figure 15e

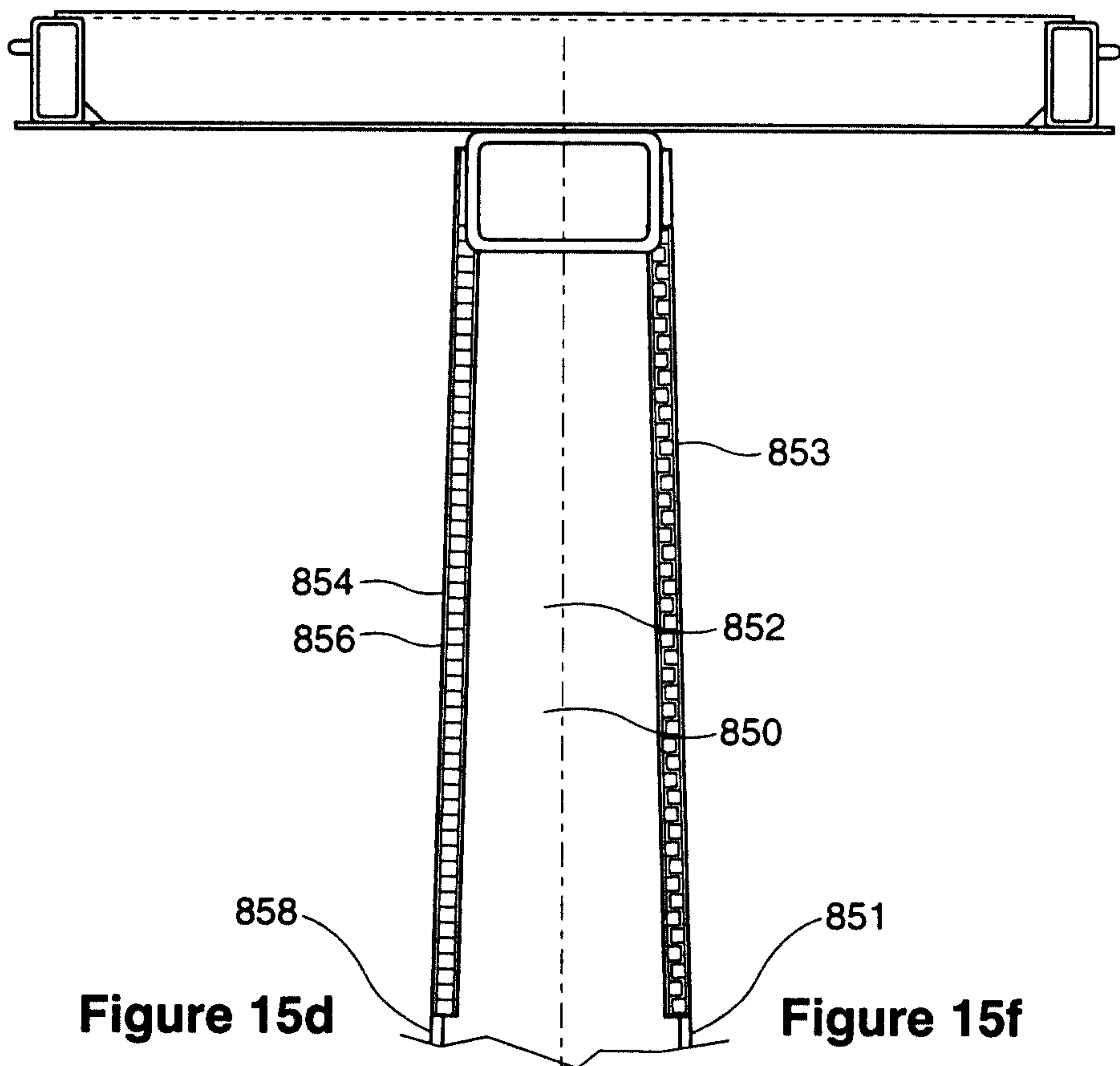


Figure 15d

Figure 15f

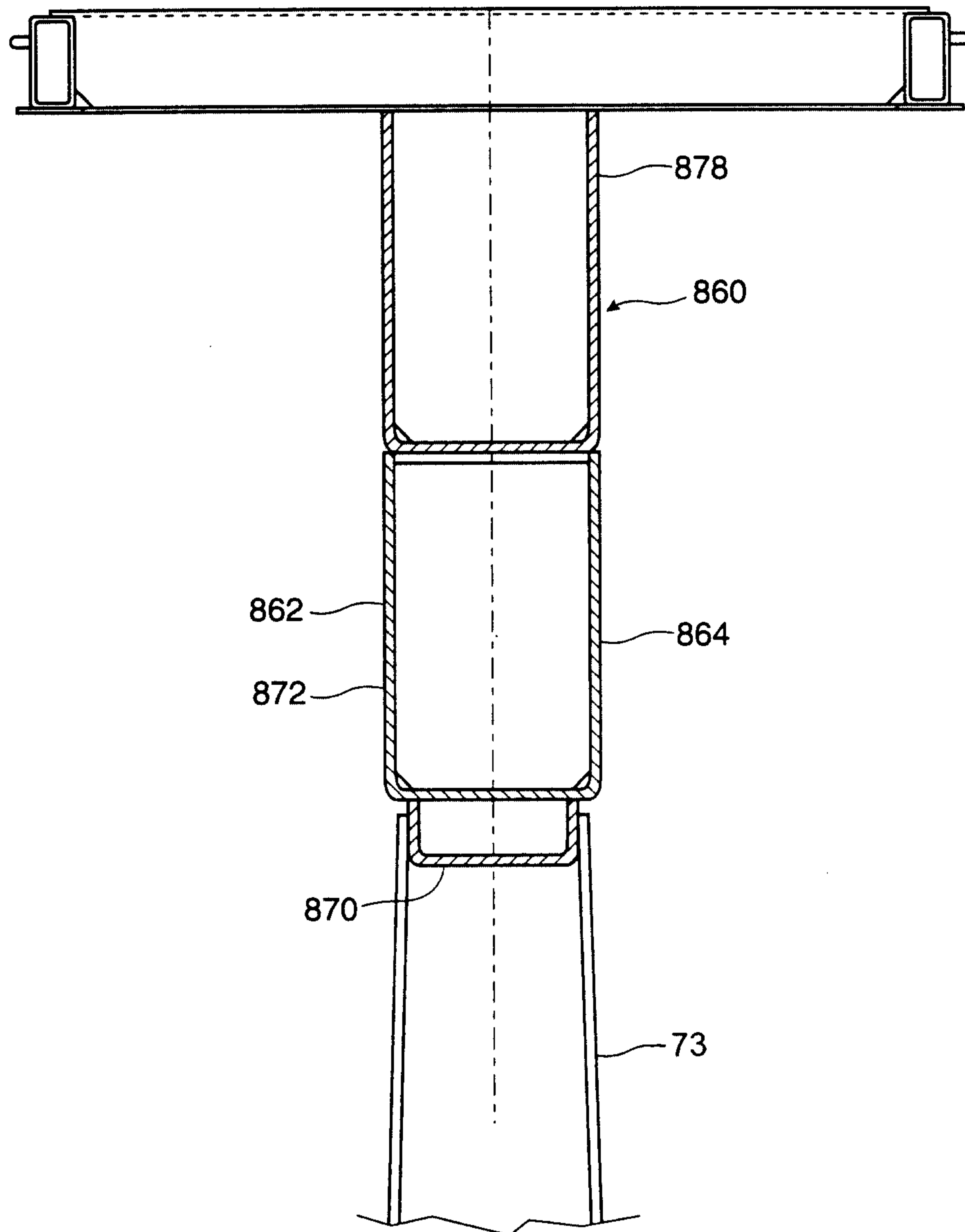


Figure 16

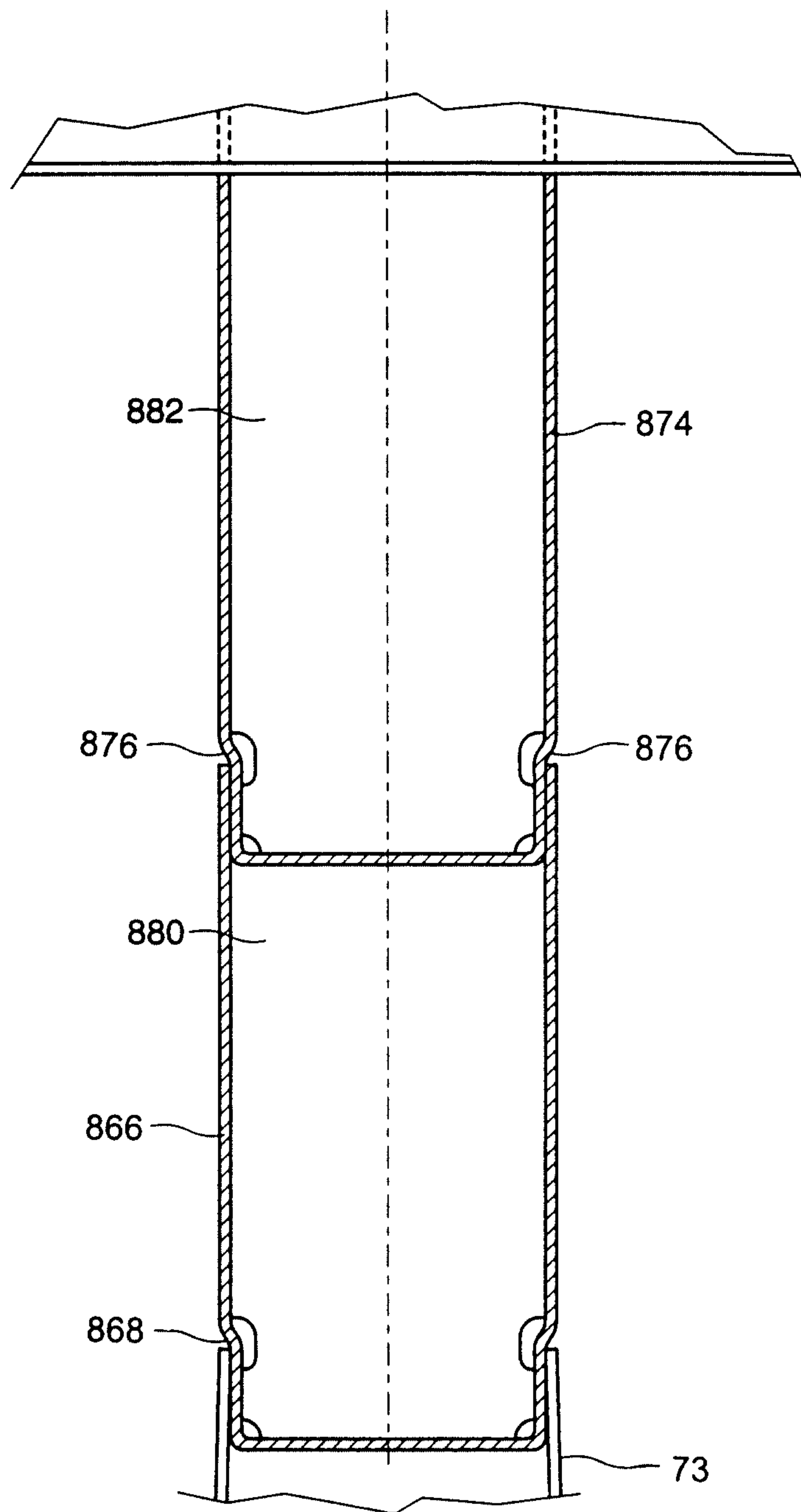


Figure 17

