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(71) Applicant: **TAIYO SEIKI IRON WORKS CO., LTD.**
Nishi-ku, Osaka 550-0023 (JP)

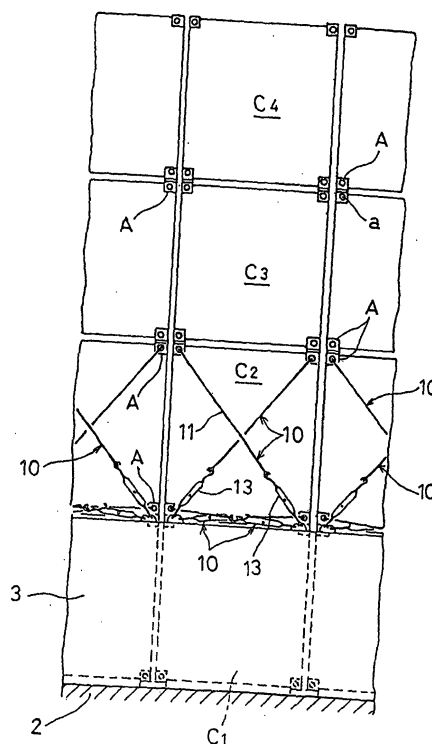
(72) Inventor: **ITO, Hisao,**
Taiyo Seiki Iron Works Co., Ltd.
Nishi-ku, Osaka-shi, Osaka 550-0023 (JP)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

(54) **CONTAINER FIXING METHOD**

(57) A method of tying down containers stacked is proposed which permits shortening of time required for tie-down operation while minimizing fatigue of operators. The containers C1 to C4 are stacked between lashing bridges 3 on a deck 2. A pair of tie-down tools are stretched substantially horizontally between the top of each lashing bridge and the two bottom corner fittings of the container whose bottom surface is substantially at the same level as the top edges of the lashing bridges. The containers C2 are thus rigidly supported. This makes it unnecessary to tie down the topmost one C4 of the stacked containers.

Fig. 5



Description

Technical Field

[0001] This invention relates to a method of tying down a plurality of cargo containers stacked in tiers on a ship deck.

Background Art

[0002] Cargo containers are stacked in tiers on a ship for sea transportation.

[0003] Some of such containers are stacked on a ship deck, while others are stacked in ship's holds. The latter are supported by cell guides, so that it is not necessary to tie them together.

[0004] On the other hand, the containers on the deck tend to incline when the ship rolls. When the containers incline, the weight of upper containers bearing on lower containers tends to shift, causing the lower containers to be deformed into a diamond shape. In the worst case, some lower containers may get damaged.

[0005] In order to prevent lower containers from being deformed into diamond shapes (this phenomenon is called racking), it is usually necessary to tie down containers stacked on a ship deck.

[0006] For example, containers on a ship deck are tied down as shown in Fig. 12. In particular, extendible tie-down tools 10 are stretched between fittings secured to the deck 2 and two top corner fittings A of each of lowermost containers C11 on both sides of each end face thereof so as to cross each other. The lowermost containers C11 are thus tied down to the deck.

[0007] Another pair of extendible tie-down tools 10 are stretched between the fittings on the deck and two bottom corner fittings of each of mid-level containers C12 on both sides of each end face thereof so as to cross each other. The mid-level containers C12 are thus tied down to the deck. Still another pair of extendible tie-down tools 10 are stretched between the fittings on the deck and two bottom corner fittings of each of the top containers C13 on both sides of each end face thereof so as to cross each other. The top containers C13 are thus tied down to the deck.

[0008] As shown in Figs. 14A and 14B, a typical tie-down tool 10 comprises a lashing rod 11 having at one end thereof a head 12 engageable in a hole formed in each corner fitting A of a container C11, C12 or C13, and a turnbuckle 13 having one end thereof adapted to be coupled to the other end of the lashing rod 11 and the other end adapted to be detachably coupled to a fitting on the ship deck 2.

[0009] To cut down on the transportation cost, containers are often stacked on a ship deck in four or more tiers. Each cargo container is 8 feet (2438 mm) high or over. The topmost containers of the four-tier stack are thus very high and it is extremely difficult to stably tie down the topmost containers.

[0010] Thus, if containers are stacked in four or more tiers, lashing bridges 3 as shown in Fig. 13 are used, which are positioned to extend transversely of the ship, spaced from each other by a greater distance than the length of containers in the longitudinal direction of the ship. Containers C11, C12, C13 and C14 are stacked one upon another between the adjacent lashing bridges 3, and tie-down tools 10 are stretched between fittings on the top edge of each lashing bridge 3 and corner fittings A of the containers C12, C13 and C14, which are located above the top edge of the lashing bridges 3 so as to extend obliquely while crossing each other. The lashing tools 10 are then tightened to stably tie down the containers.

[0011] When containers on a ship deck are tied down in the manner as shown in Fig. 12 or 13, the tie-down tools 10 are stretched so as to extend obliquely, and are tightened to tie down the containers. Thus, the corner fittings A are pulled obliquely. Thus the horizontal component of the tensile load applied to the containers when the tools 10 are tightened is rather small. Thus, it is impossible to effectively check horizontal movement of the containers. Thus it is necessary to tie down upper containers C13 and C14, too.

[0012] As is apparent from Figs. 12 and 13, longer lashing rods 11 are needed to tie down higher containers. Longer rods 11 are correspondingly thick and thus heavy. Handling of such long and heavy rods 11 is troublesome and time-consuming, and will fatigue operators.

[0013] If turnbuckles 13 having different tightening lengths are used to tie down the containers C11 to C14, turnbuckles suitable to tie down each of the containers C11 to C14 have to be selected according to the container to be tied down. This markedly reduces the tie-down workability. Thus, heretofore, the same turnbuckles 13 have been used to tie down different containers.

[0014] In this case, as turnbuckles for upper containers C13 and C14, turnbuckles 13 are needed which are heavy and have long tightening length. This causes poor workability in tightening and loosening the turnbuckles. Also, it takes a longer time to tie down the containers C11 to C14, thus making the ship holding time longer.

[0015] An object of this invention is to provide a method of tying down cargo containers in a shorter period of time with less fatigue of operators.

Disclosure of the Invention

[0016] According to the first invention, there is provided a method of tying down containers on a deck of a ship, comprising the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent ones of the lashing bridges so as to extend in the longitudinal direction of the ship, engaging

one end of expandable tie-down tools to corner fittings provided at bottom of each end face of a container having its bottom at substantially the same level as the top of the lashing bridge, coupling the other end of the tie-down tools to the top of the lashing bridge, tightening the tie-down tools to tie down the corner fittings at the bottom of the container substantially horizontally, stretching a pair of tie-down tools between the top of the lashing bridge and corner fittings provided at bottom of a container stacked on the container so as to cross each other at each end face of the container, and tightening the pair of tie-down tools to tie down the corner fittings at bottom of the container in an oblique direction.

[0017] Each of the tie-down tools may comprise a lashing rod having at one end thereof a head adapted to be engaged in a hole formed in a corner fitting provided on a container, and a turnbuckle having one end coupled to another end of the lashing rod and another end adapted to be detachably coupled to the top edge of the lashing bridge. Or, one comprising a turnbuckle and a lashing rod integrally formed may be adopted.

[0018] By tying down corner fittings at bottom of a container whose bottom is at substantially the same level as the top of the lashing bridge by means of horizontally stretched tie-down tools, horizontal movement of the containers is prevented effectively. The containers can thus be supported with high rigidity. This makes it unnecessary to tie down at least the topmost containers, which in turn makes unnecessary the use of long and heavy lashing rods and turnbuckles having a large adjustable length, which were heretofore necessary to tie down topmost containers. Containers can thus be tied down in a shorter time with less fatigue of operators.

[0019] The method may further comprise the steps of stretching another pair of expandable tie-down tools, coupling one end of the tie-down tools to the two top corner fittings of the second container on both sides of each end face thereof, coupling the other ends of each pair of the tie-down tools to the top of the lashing bridge such that each pair of the tie-down tools extend obliquely so as to cross each other, and tightening the pairs of tie-down tools to tie down the corner fittings at top of the container in an oblique direction. This increases stability of the containers and prevents lacking effectively.

[0020] The said problems can be solved by the second to seventh inventions.

[0021] The method of the second invention of tying down containers on a deck of a ship comprises the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent ones of the lashing bridges so as to extend in the longitudinal direction of the ship, engaging one end of expandable tie-down tools to corner fittings provided at bottom of each end face of a container having its bottom at substantially the same level as the top of the lashing bridge,

coupling the other end of the tie-down tools to the top of the lashing bridge, tightening the tie-down tools to tie down the corner fittings at the bottom of the container substantially horizontally, stretching a pair of tie-down tools between the top of the lashing bridge and corner fittings provided at top of the container so as to cross each other at each side of the container, and tightening the pair of tie-down tools to tie-down the corner fittings at top of the container in an oblique direction.

[0022] The method of third invention comprises the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent ones of the lashing bridges so as to extend in the longitudinal direction of the ship, engaging one end of expandable tie-down tools to corner fittings provided at bottom of each end face of a container having its bottom at substantially the same level as the top of the lashing bridge, coupling the other end of the tie-down tools to the top of the lashing bridge, tightening the tie-down tools to tie down the corner fittings at the bottom of the container substantially horizontally, stretching a pair of tie-down tools between the top of the lashing bridge and corner fittings provided at bottom of a container stacked on a container stacked on the container so as to cross each other at each side of the container, and tightening the pair of tie-down tools to tie down the corner fittings at bottom of the container in an oblique direction.

[0023] The method of the fourth invention comprises, in addition to the steps of the third method, the steps of stretching another pair of expandable tie-down tools, coupling one end of the tie-down tools to the two top corner fittings of the second container on both sides of each end face thereof, coupling the other ends of each pair of the tie-down tools to the top of the lashing bridge such that each pair of the tie-down tools extend obliquely so as to cross each other, and tightening the pairs of tie-down tools to tie down the corner fittings at top of the container in an oblique direction.

[0024] The method of the fifth invention comprises, in addition to the steps of the third or fourth method, the steps of stretching another pair of expandable tie-down tools, coupling one ends of the tie-down tools to top corner fittings at bottom of a container stacked on the container on both sides of each end face thereof, coupling the other ends of the tie-down tools to the top of each lashing bridge such that each pair of the tie-down tools extend obliquely crossing each other, and tightening the tie-down tools to tie down the corner fittings at top of the container obliquely.

[0025] The method of the sixth invention comprises the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent

ones of the lashing bridges so as to extend in the longitudinal direction of the ship, engaging one end of expandable tie-down tools to corner fittings provided at bottom of each end face thereof of a container having its bottom at substantially the same level as the top of the lashing bridge, coupling the other end of the tie-down tools to the top of the lashing bridge, tightening the tie-down tools to tie down the corner fittings at the bottom of the container substantially horizontally, stretching a pair of tie-down tools between the top of the lashing bridge and corner fittings provided at top of a container stacked on the container so as to cross each other at each side of the container, and tightening the pair of tie-down tools to tie down the corner fittings at bottom of the container in an oblique direction.

[0026] The method of the seventh invention comprises, in addition to the steps of the sixth method, the steps of stretching another pair of expandable tie-down tools each having first and second ends, coupling the first ends of the tie-down tools to the two top corner fittings of the second container on both sides of each end face thereof, coupling the second ends of each pair of the tie-down tools to the top edge of each lashing bridge such that each pair of the tie-down tools extend obliquely crossing each other, and tightening the pairs of tie-down tools to pull the top corner fittings of the container obliquely downwardly.

[0027] In any of the second to seventh inventions, tying down the corner fittings of the containers substantially horizontally serves to support the containers with increased rigidity, thus making it unnecessary to tie down the topmost ones of the stacked containers.

Brief description of the drawings

[0028] Fig. 1 is a plan view of a container ship loaded with containers, Fig. 2 is a vertical sectional front view of containers tied down by the method of this invention, Fig. 3 is an enlarged front view of part of Fig. 2, Fig. 4 is a vertical sectional front view of containers tied down by the method of second embodiment, Fig. 5 is a vertical sectional front view of containers tied down by methods of 3rd embodiment, Fig. 6 is a vertical sectional front view of containers tied down by methods of 4th embodiment, Fig. 7 is a vertical sectional front view of containers tied down by methods of 5th embodiment, Fig. 8 is a vertical sectional front view of containers tied down by methods of 6th embodiment, Fig. 9 is a vertical sectional front view of containers tied down by methods of 7th embodiment, Fig. 10 is a vertical sectional front view of containers tied down by methods of 8th embodiment, Fig. 11 is a vertical sectional front view of containers tied down by methods of 9th embodiment, Figs. 12 and 13 are vertical sectional front views of containers tied down by conventional methods, and Figs. 14(I) and 14(II) are front views of a tie-down tool.

Best mode for embodying the invention

[0029] The embodiments will be described with reference to the drawings. As shown in Fig. 1, a plurality of lashing bridges 3 are arranged on the deck 2 of a ship 1 so as to extend transversely of the ship 1, spaced from each other in the longitudinal direction of the ship 1. The distance between the adjacent bridges 3 is such that containers can be placed therebetween with their length direction in alignment with the longitudinal direction of the ship. Their height is substantially a multiple of general purpose cargo containers. In the embodiment, as shown in Fig. 2, the lashing bridges 3 are substantially as high as containers.

[0030] As shown in Fig. 2, first to fourth containers C1-C4 are stacked one on another between the adjacent lashing bridges 3 with their length direction in alignment with the longitudinal direction of the ship. Each container has corner fittings A each at one of eight corners thereof. As shown in Fig. 3, each corner fitting A has three holes a each in one of three faces defining the corner.

[0031] The first or lowermost containers C1 have their bottom four corner fittings A positioned by container positioning fittings (not shown) on the deck 2.

[0032] The first to third containers C1-C3 have their top corner fittings A coupled to the corresponding bottom corner fittings A of the second to fourth containers C2-C4, respectively, by means of container coupling tools (not shown).

[0033] The containers are further tied down using tie-down tools 10 as shown in Fig. 14.

[0034] Specifically, the head 12 of the lashing rod 11 of one of a pair of tie-down tools 10 is engaged in one of the two bottom corner fittings A of the second container C2 on both sides thereof, and the free end of the turnbuckle 13 coupled to the other end of the turnbuckle 13 is engaged in a fitting 20 provided on the top edge of the lashing bridge 3 near the other of the two bottom corner fittings A. The head 12 of the lashing rod 11 of the other of the pair of tie-down tools 10 is engaged in the other of the two bottom corner fittings A of each second container C2 on both sides of each end face thereof, and the free end of the turnbuckle 13 of the other of the pair of tie-down tools 10 is engaged in another fitting 20 provided on the top edge of the lashing bridge 3 near said one of the two bottom corner fittings. The turnbuckle 13 of each tie-down tool 10 is turned to clamp the tie-down tool. Since the bottom surfaces of the second containers C2 are substantially at the same level, the tie-down tools 10 extend substantially horizontally.

[0035] Thus, substantially horizontal tensile loads are applied to the bottom corner fittings A of the second containers C2 from the horizontally extending tie-down tools.

[0036] After tying down the second containers C2, the heads 12 of the lashing rods 11 of another pair of tie-down tools 10 are engaged, respectively, in the two bot-

tom corner fittings A of each third container C3, which is stacked on the second container, on both sides thereof, while the ends of the turnbuckles 13 of said another pair of tie-down tools 10 are engaged in the two fittings 20 provided on the top edge of the lashing bridge 3 so that said another pair of tie-down tools 10 extend obliquely crossing each other. The tools 10 are then tightened to tie down the third container C3 by pulling the bottom corner fittings A obliquely downwardly.

[0037] Since each second container C2 is pulled horizontally at its bottom corner fittings A in opposite directions, it is possible to effectively check lateral displacement of the second containers. They are thus extremely stably supported with high rigidity.

[0038] Since the second containers C2 are extremely stably supported, and the third containers C3, which are stacked on the second containers, are also stably tied down by the tie-down tools 10, there is no need to tie down the uppermost fourth containers C4. Thus, in this arrangement, there is no need to use long and heavy lashing rods and turnbuckles that need a large tightening amount. This greatly improves the workability and also significantly shortens the time needed to tie down containers and reduce fatigue of operators.

[0039] The tie-down tools 10 stretched horizontally to pull containers horizontally can apply axial tensile force to the corner fittings A of the second container C2, and therefore, in comparison with tie-down tools stretched obliquely to pull containers obliquely, their lashing rods 11 can be formed with a much smaller diameter than those of the latter tie-down tools. Also, since the horizontally stretched tie-down tools 10 are short in length, they can be tightened sufficiently with a small tightening amount. This allows the use of shorter and thus lighter turnbuckles 13. This saves the material cost.

[0040] In the second embodiment of Fig. 4, in addition to the tie-down tools 10, another pair of tie-down tools 10 are stretched between the top corner fittings A of each second container C2 on both sides of each end face thereof and two fittings provided on the top edge of the lashing bridge 3 so as to extend obliquely crossing each other. Of course, such additional pair of tie-down tools 10 serve to further stably support the second containers C2. This makes it possible to stack an additional container on top of each fourth container C4.

[0041] Figs. 5-11 show other embodiments of this invention.

[0042] The third embodiment of Fig. 5 is different from the first embodiment of Fig. 2 in that instead of obliquely stretching a pair of tie-down tools 10 between the bottom corner fittings A of each third container C3 on both sides of each end face thereof and fittings on the top edge of the lashing bridge 3, they are stretched between the top corner fittings A of each second container C2 on both sides of each end face thereof and the fittings on the top edge of the lashing bridge 3 so as to cross each other, thereby obliquely pulling the top corner fittings A of the second containers C2.

[0043] In the fourth embodiment of Fig. 6, lashing bridges 3 having substantially twice the height of each container are used. First to fifth containers C1-C5 are stacked one on another in five tiers. A first pair of tie-down tools 10 are stretched substantially horizontally between the top corner fittings A of each of the second lowermost containers C2 on both sides of each end face thereof and a pair of fittings provided on the top edge of each lashing bridge 3, thereby tying down the second containers C2 so as not to move horizontally. A second pair of tie-down tools 10 are stretched obliquely between the bottom corner fittings of each of the fourth containers C4 on both sides of each end face thereof and the pair of fittings on the top edge of each lashing bridge 3 to obliquely downwardly pull the bottom corner fittings A of the fourth containers C4.

[0044] When containers are stacked in five tiers too, the vertically adjacent containers are fastened together with container positioning tools and container coupling tools as described with reference to Fig. 2.

[0045] The fifth embodiment of Fig. 7 differs from the fourth embodiment of Fig. 6 in that in addition to the first and second pairs of tie-down tools, a third pair of tie-down tools are used which are stretched obliquely between the top corner fittings A of each of the third containers C3 on both sides of each end face thereof and the pair of fittings provided on the top edge of each lashing bridge to obliquely pull the top corner fittings A of the third containers C3.

[0046] The sixth embodiment of Fig. 8 differs from the fourth embodiment in that in addition to the first and second pairs of tie-down tools, another pair of tie-down tools are used which are substantially horizontally stretched between the bottom corner fittings A of each of the third containers C3 on both sides of each end face thereof and the pair of fittings provided on the top edge of each lashing bridge to horizontally pull the bottom corner fittings A of the third containers C3.

[0047] The seventh embodiment of Fig. 9 differs from the fifth embodiment of Fig. 7 in that another pair of tie-down tools are used which are substantially horizontally stretched between the bottom corner fittings A of each of the third containers C3 on both sides of each end face thereof and the pair of fittings provided on the top edge of each lashing bridge to horizontally pull the bottom corner fittings A of the third containers C3.

[0048] The eighth embodiment of Fig. 10 differs from the fourth embodiment of Fig. 6 in that another pair of tie-down tools are used which are substantially horizontally stretched between the bottom corner fittings A of each of the third containers C3 on both sides of each end face thereof and the pair of fittings provided on the top edge of each lashing bridge to horizontally pull the bottom corner fittings A of the third containers C3.

[0049] The ninth embodiment of Fig. 11 differs from the eighth embodiment of Fig. 10 in that another pair of tie-down tools are used which are substantially horizontally stretched between the bottom corner fittings A of

each of the third containers C3 on both sides of each end face thereof and the pair of fittings provided on the top edge of each lashing bridge to horizontally pull the bottom corner fittings A of the third containers C3.

[0050] In any of the embodiments of Figs. 5 to 11, since the second and/or third containers C2, C3 are tied down substantially horizontally, they are supported with high rigidity. This makes it unnecessary to tie down at least the topmost containers.

[0051] In the present invention, tie-down tools are stretched substantially horizontally between the top edges of the lashing bridges and the bottom and/or top corner fittings of containers stacked one on the other and having bottom and top surfaces that are substantially at the same level as the top edges of the lashing bridges. They can thus be rigidly supported. This makes it unnecessary to tie down at least the topmost containers. Containers stacked in tiers can thus be tied down easily in a short time with less fatigue of operators.

Claims

1. A method of tying down containers on a deck of a ship, comprising the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent ones of said lashing bridges so as to extend in the longitudinal direction of the ship, engaging one end of expandable tie-down tools to corner fittings provided at bottom of each end face of a container having its bottom at substantially the same level as the top of said lashing bridge, coupling the other end of said tie-down tools to the top of said lashing bridge, tightening said tie-down tools to tie down said corner fittings at the bottom of said container substantially horizontally, stretching a pair of tie-down tools between the top of said lashing bridge and corner fittings provided at bottom of a container stacked on said container so as to cross each other at each end face of said container, and tightening said pair of tie-down tools to tie down said corner fittings at bottom of said container in an oblique direction.
2. A method as claimed in claim 1 further comprising the steps of stretching another pair of expandable tie-down tools, coupling one end of said tie-down tools to the two top corner fittings of said second container on both sides of each end face thereof, coupling the other ends of each pair of said tie-down tools to the top of said lashing bridge such that each pair of said tie-down tools extend obliquely so as to cross each other, and tightening said pairs of tie-down tools to tie down said corner fittings at top of said container in an oblique direction.
3. A method of tying down containers on a deck of a ship, comprising the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent ones of said lashing bridges so as to extend in the longitudinal direction of the ship, engaging one end of expandable tie-down tools to corner fittings provided at bottom of each end face of a container having its bottom at substantially the same level as the top of said lashing bridge, coupling the other end of said tie-down tools to the top of said lashing bridge, tightening said tie-down tools to tie down said corner fittings at the bottom of said container substantially horizontally, stretching a pair of tie-down tools between the top of said lashing bridge and corner fittings provided at top of said container so as to cross each other at each side of said container, and tightening said pair of tie-down tools to tie-down said corner fittings at top of said container in an oblique direction.
4. A method of tying down containers on a deck of a ship, comprising the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent ones of said lashing bridges so as to extend in the longitudinal direction of the ship, engaging one end of expandable tie-down tools to corner fittings provided at bottom of each end face of a container having its bottom at substantially the same level as the top of said lashing bridge, coupling the other end of said tie-down tools to the top of said lashing bridge, tightening said tie-down tools to tie down said corner fittings at the bottom of said container substantially horizontally, stretching a pair of tie-down tools between the top of said lashing bridge and corner fittings provided at bottom of a container stacked on a container stacked on said container so as to cross each other at each side of said container, and tightening said pair of tie-down tools to tie down said corner fittings at bottom of said container in an oblique direction.
5. A method as claimed in claim 4 further comprising the steps of stretching another pair of expandable tie-down tools, coupling one end of said tie-down tools to the two top corner fittings of said second container on both sides of each end face thereof, coupling the other ends of each pair of said tie-down tools to the top of said lashing bridge such that each pair of said tie-down tools extend obliquely so as to cross each other, and tightening said pairs of tie-

down tools to tie down said corner fittings at top of said container in an oblique direction.

other end adapted to be detachably coupled to the top edge of said lashing bridge.

6. A method as claimed in claim 4 or 5 further comprising the steps of stretching another pair of expandable tie-down tools, coupling one ends of said tie-down tools to top corner fittings at bottom of a container stacked on said container on both sides of each end face thereof, coupling the other ends of said tie-down tools to the top of each lashing bridge such that each pair of said tie-down tools extend obliquely crossing each other, and tightening said tie-down tools to tie down said corner fittings at top of said container obliquely.
7. A method of tying down containers on a deck of a ship, comprising the steps of providing lashing bridges on the deck so as to extend in a direction transverse to the longitudinal direction of the ship, spaced from each other in the longitudinal direction of the ship, stacking on the deck a plurality of containers in a plurality of tiers between adjacent ones of said lashing bridges so as to extend in the longitudinal direction of the ship, engaging one end of expandable tie-down tools to corner fittings provided at bottom of each end face thereof of a container having its bottom at substantially the same level as the top of said lashing bridge, coupling the other end of said tie-down tools to the top of said lashing bridge, tightening said tie-down tools to tie down said corner fittings at the bottom of said container substantially horizontally, stretching a pair of tie-down tools between the top of said lashing bridge and corner fittings provided at top of a container stacked on said container so as to cross each other at each side of said container, and tightening said pair of tie-down tools to tie down said corner fittings at bottom of said container in an oblique direction.
8. A method as claimed in claim 7 further comprising the steps of stretching another pair of expandable tie-down tools each having first and second ends, coupling the first ends of said tie-down tools to the two top corner fittings of said second container on both sides of each end face thereof, coupling the second ends of each pair of said tie-down tools to the top edge of each lashing bridge such that each pair of said tie-down tools extend obliquely crossing each other, and tightening said pairs of tie-down tools to pull said top corner fittings of said container obliquely downwardly.
9. A method as claimed in any of claims 1-8 wherein each of said tie-down tools comprises a lashing rod having at one end thereof a head adapted to be engaged in a hole formed in a corner fitting provided on a container, and a turnbuckle having one end coupled to another end of said lashing rod and an-

Fig. 1

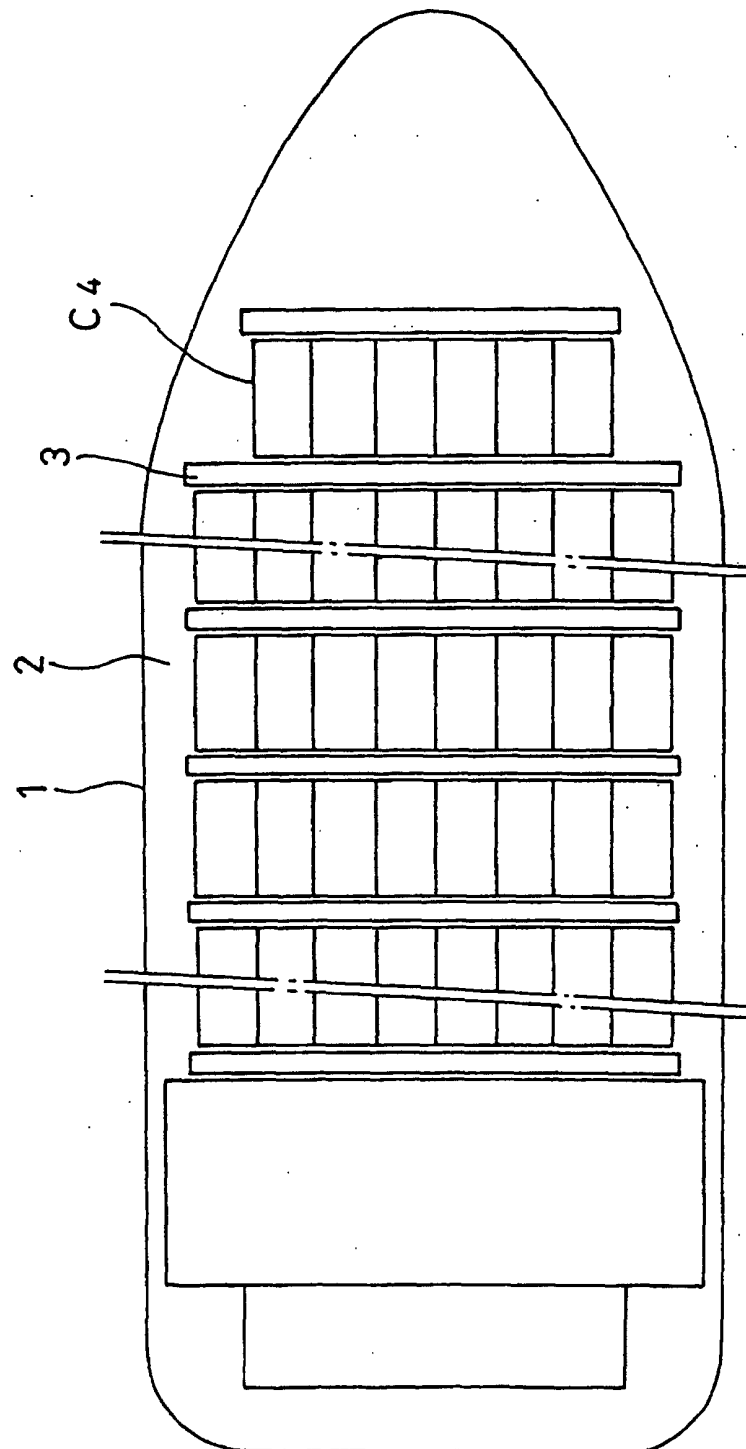


Fig. 2

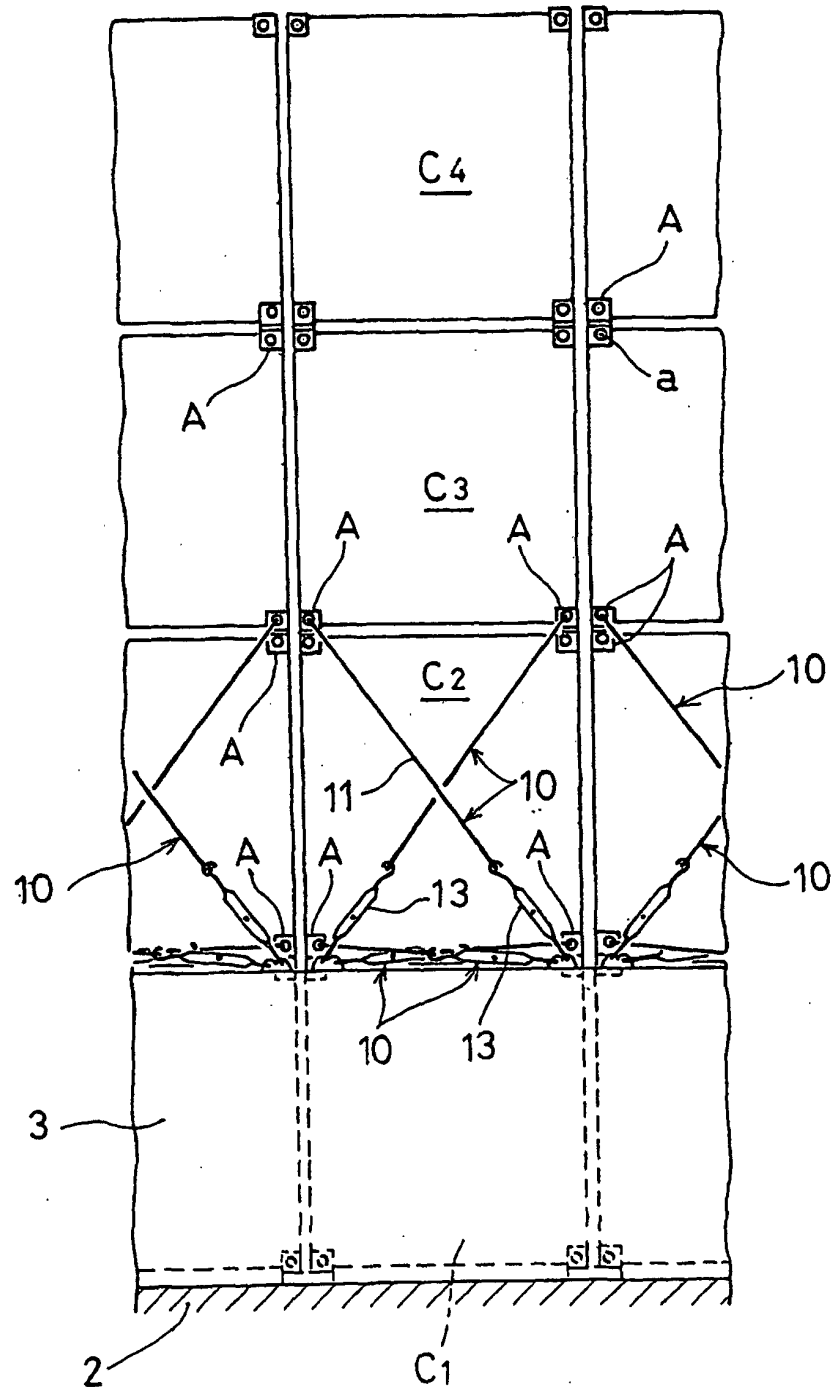


Fig. 3

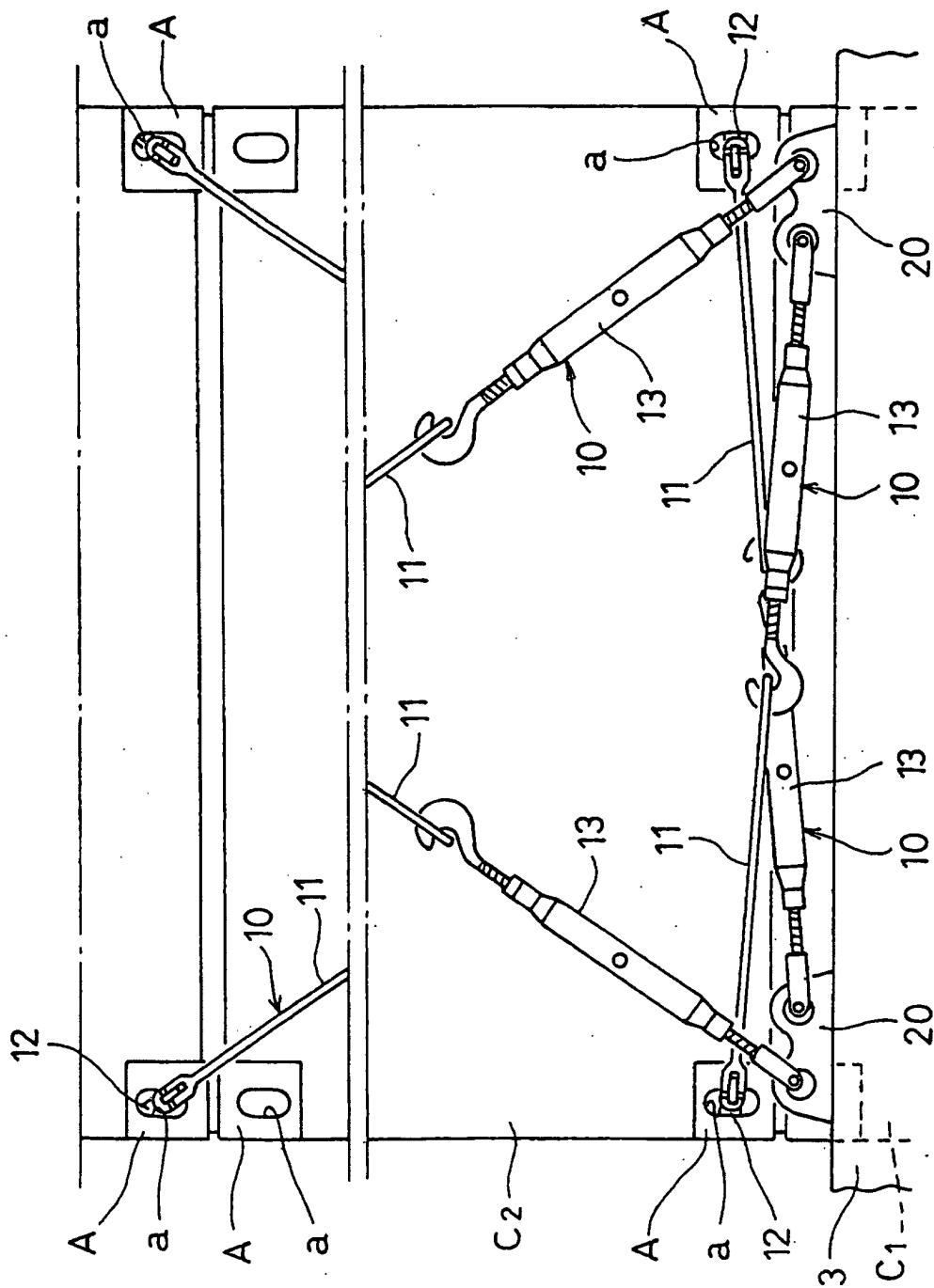


Fig. 4

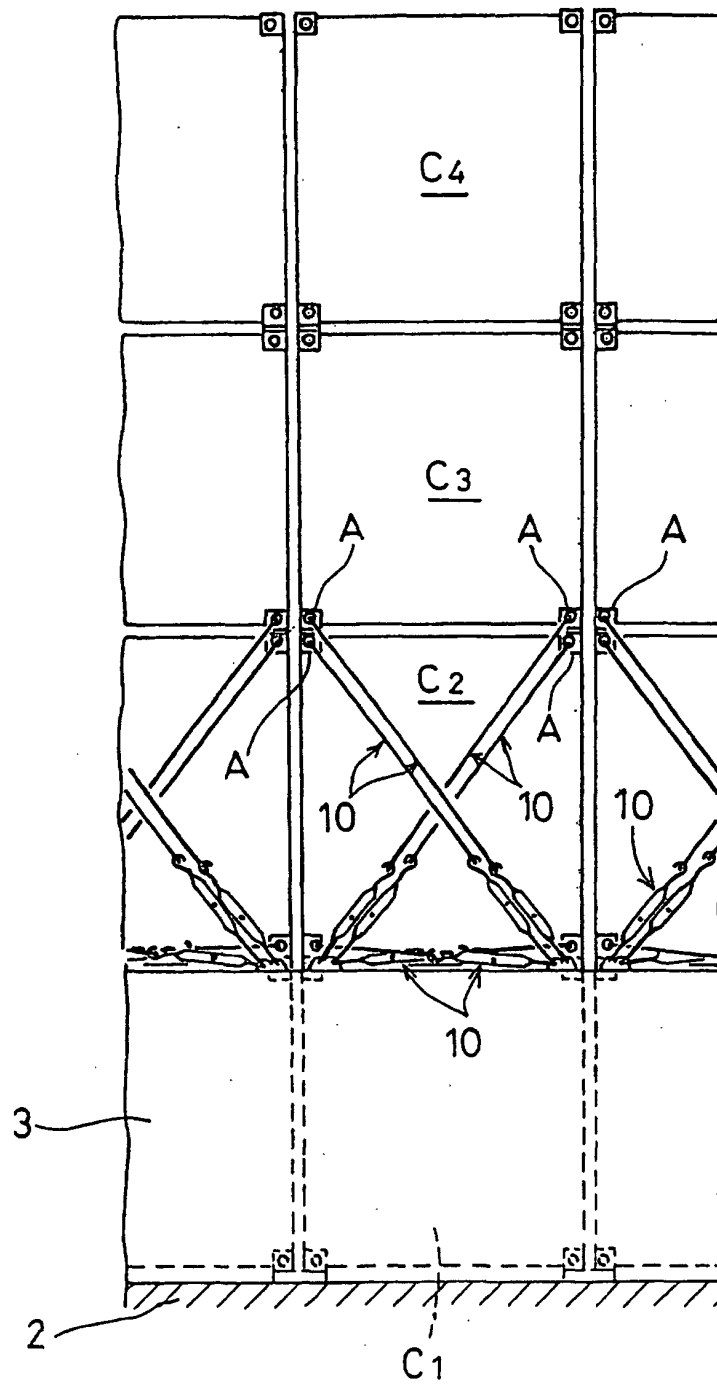


Fig. 5

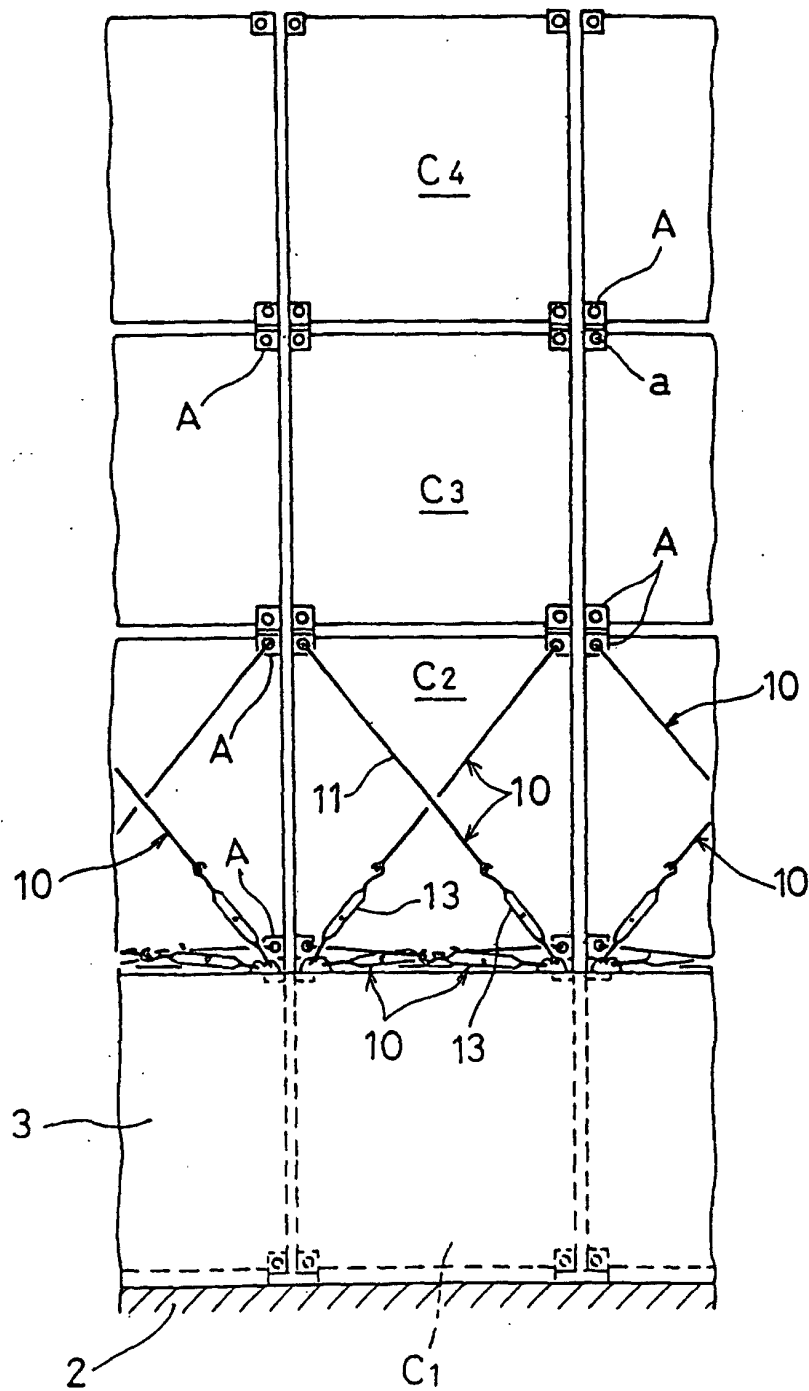


Fig. 6

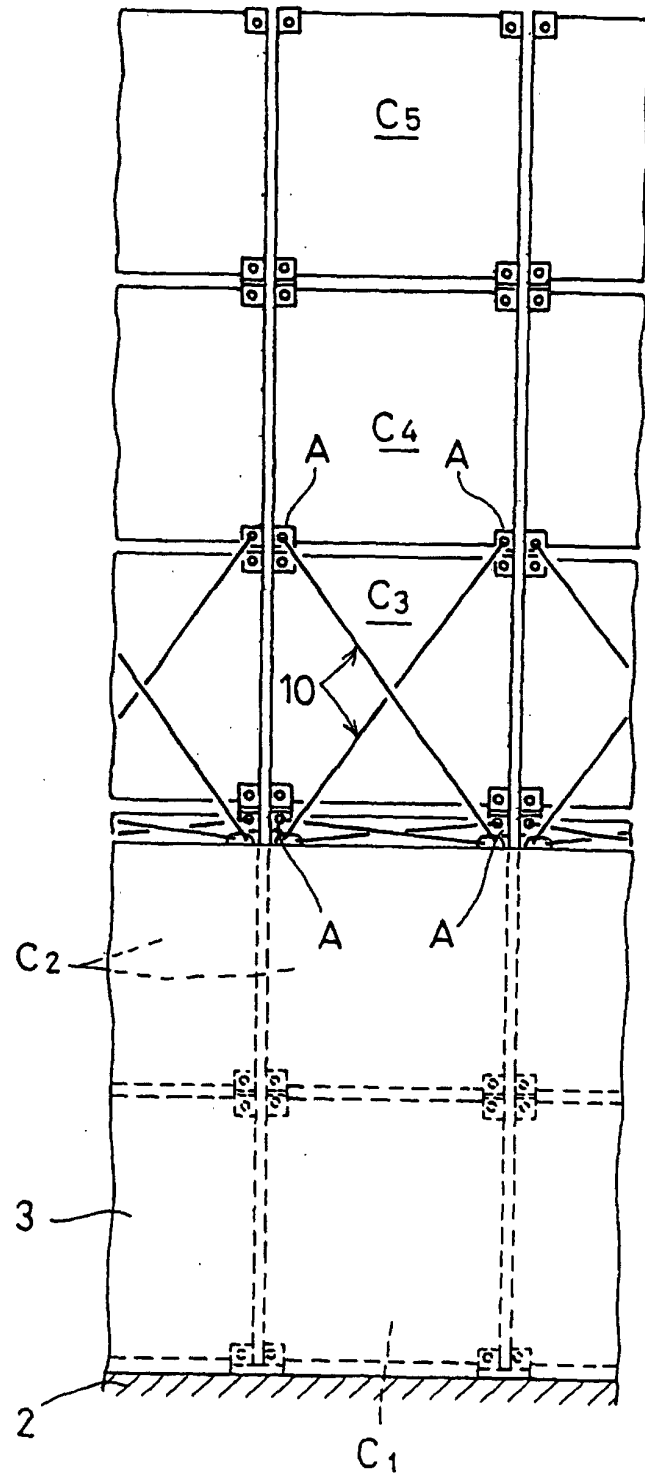


Fig. 7

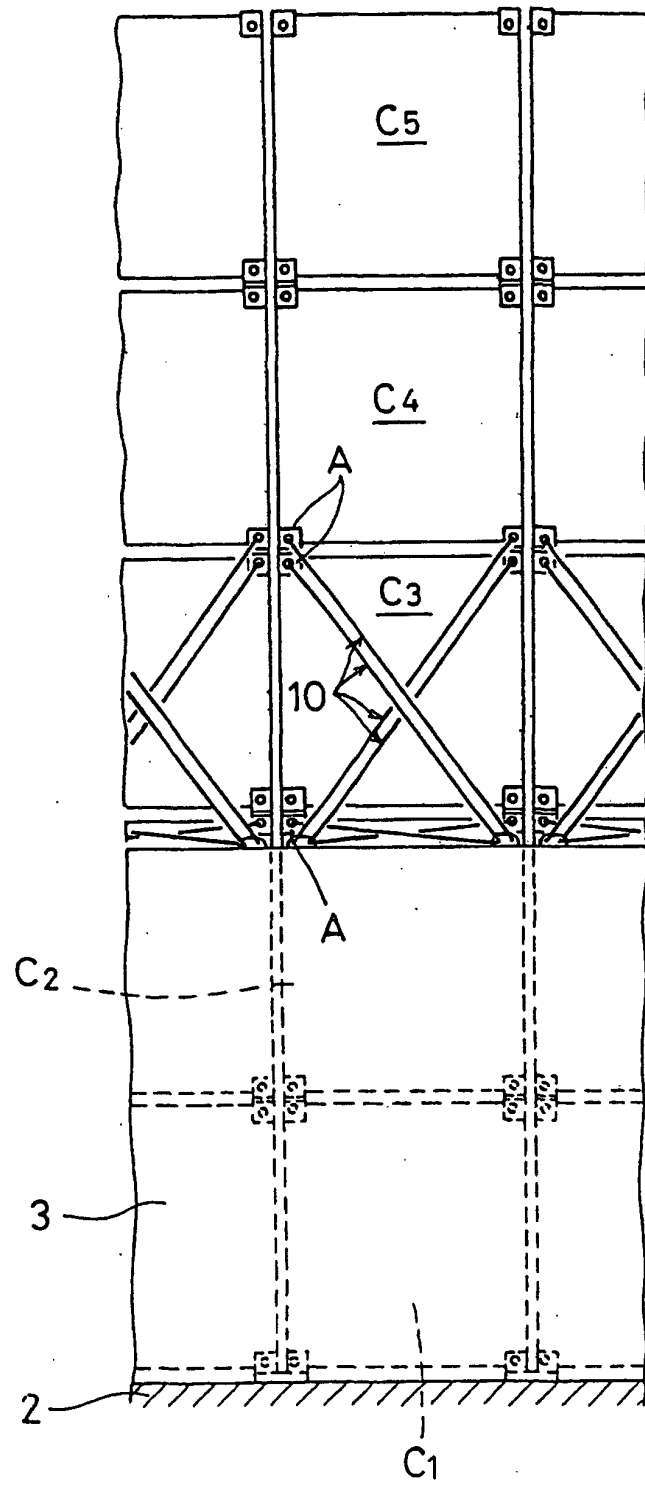


Fig. 8

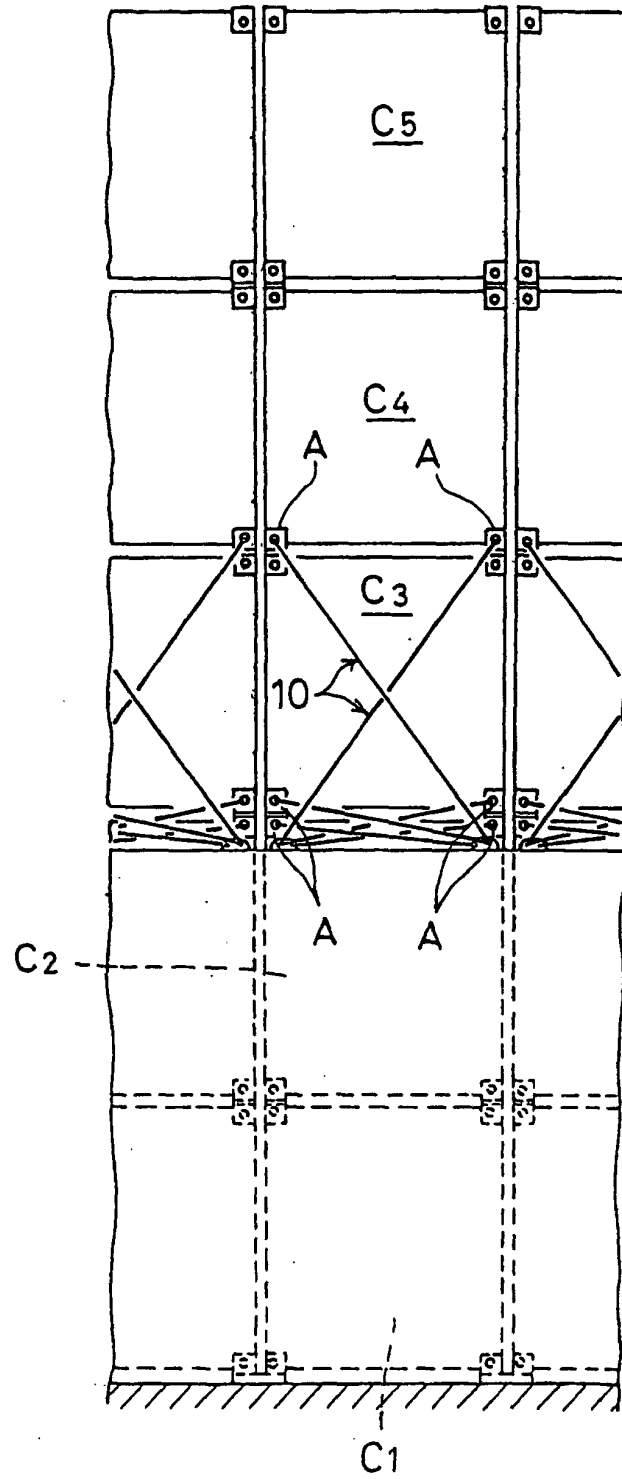


Fig. 9

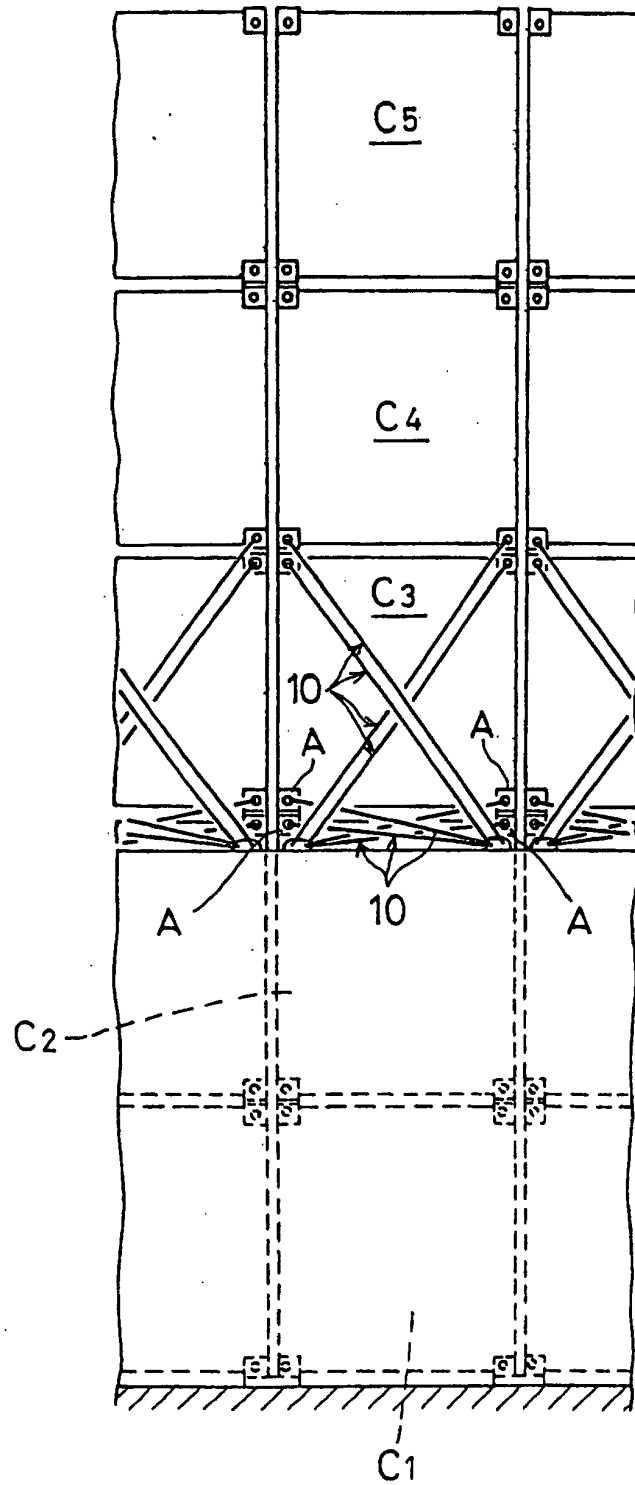


Fig. 10

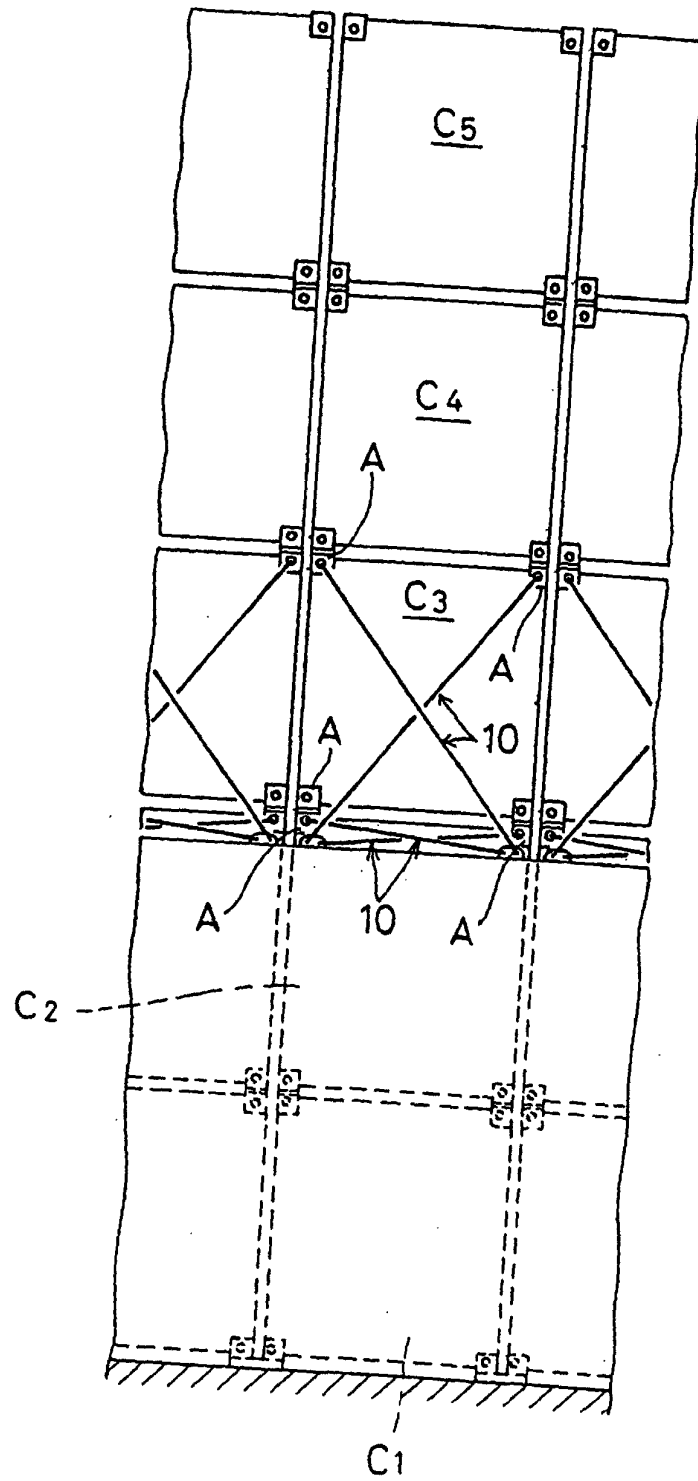


Fig. 11

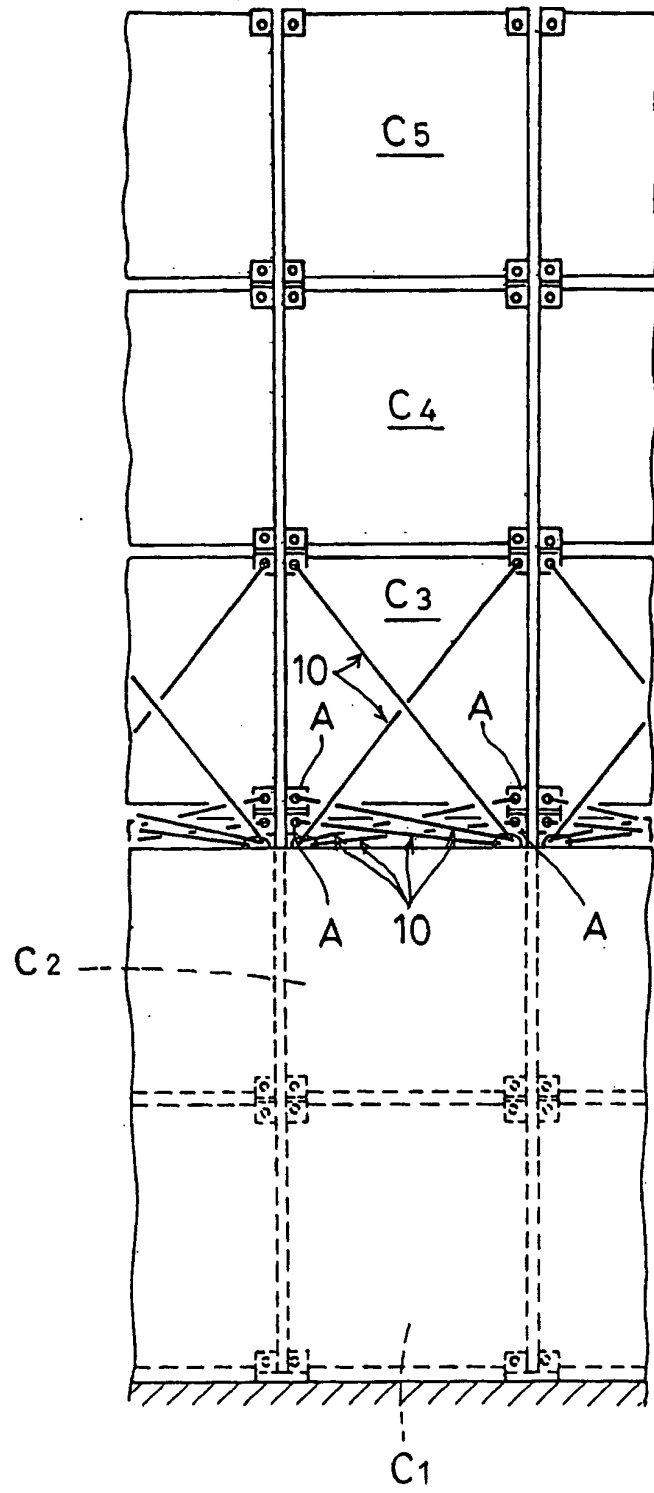


Fig. 12

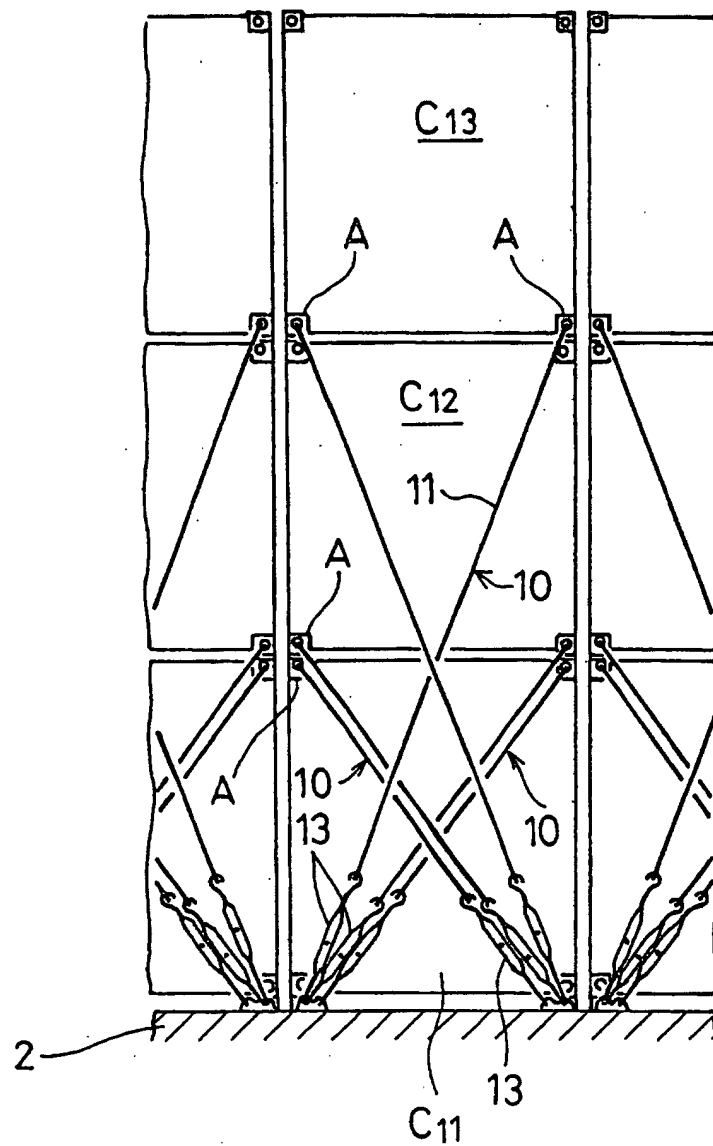


Fig. 13

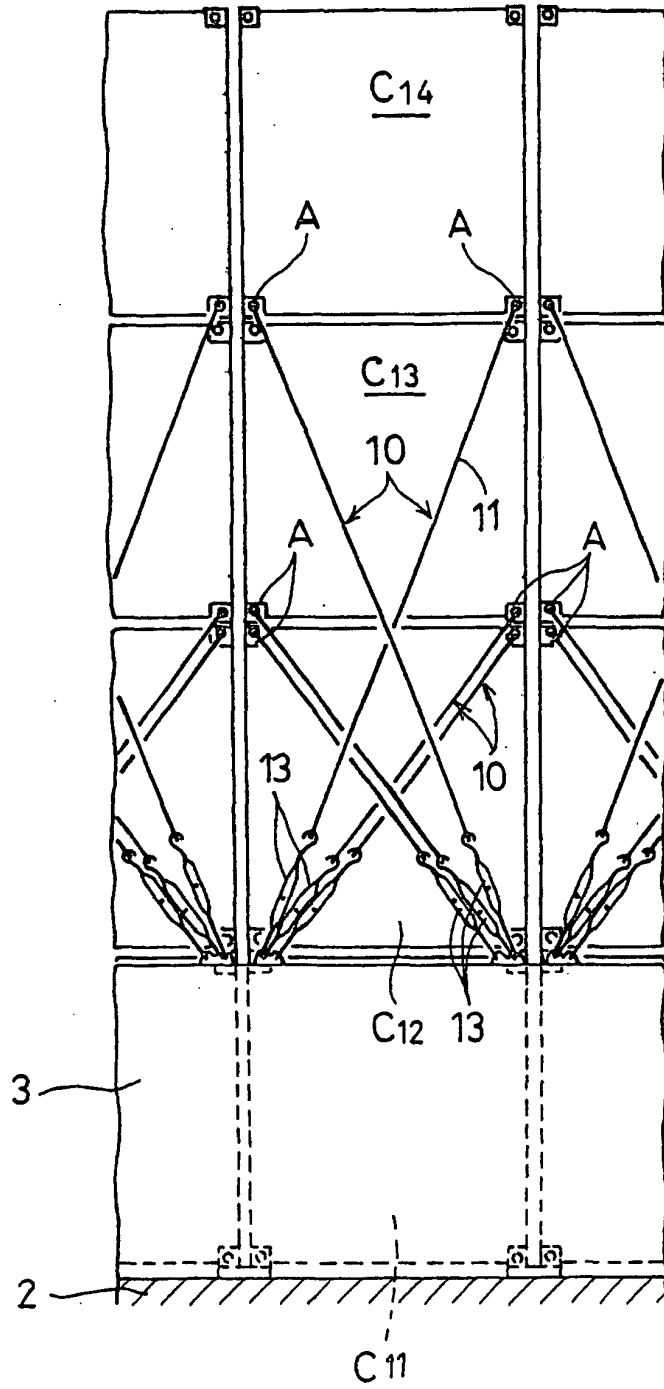
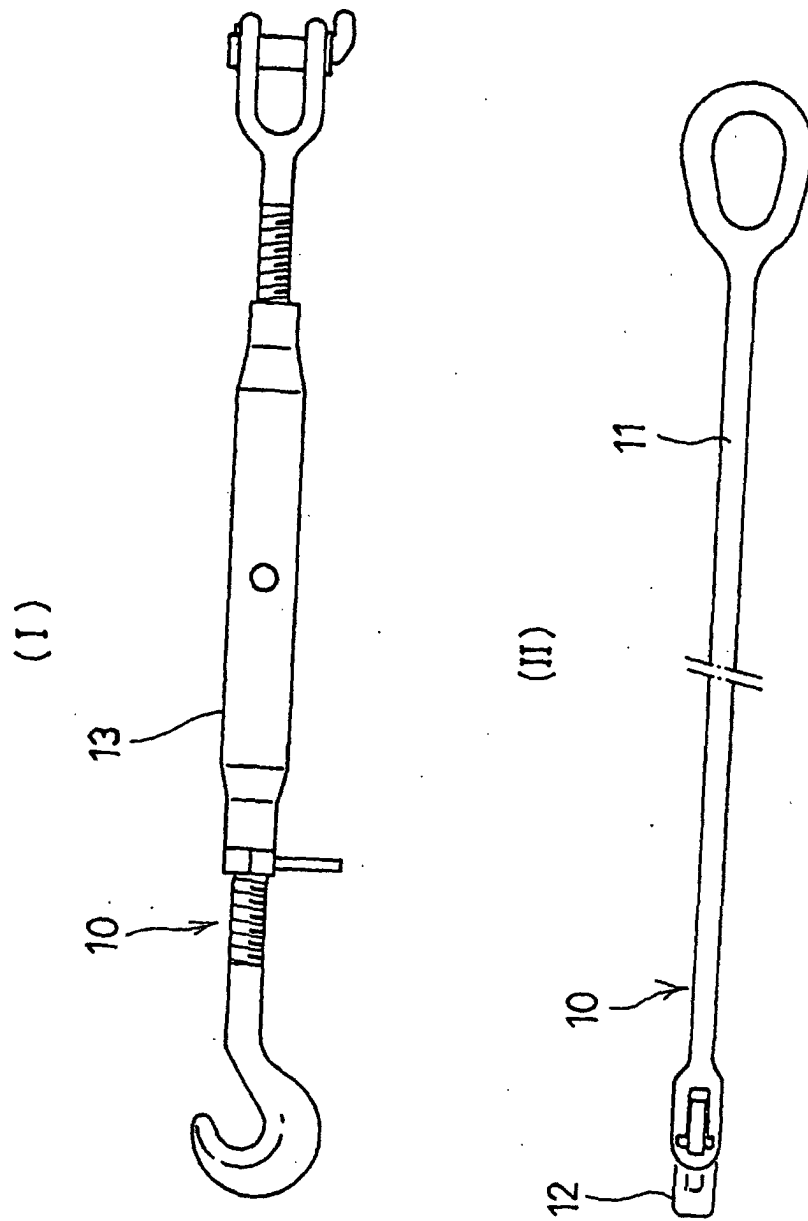


Fig. 14



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/04001

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ B63B25/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl. ⁷ B63B25/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2002 Kokai Jitsuyo Shinan Koho 1971-2002 Jitsuyo Shinan Toroku Koho 1996-2002		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 96/30255 A1 (Odense Staalskibsvaerft A/S), 03 October, 1996 (03.10.96), Full text; Figs. 1 to 3 & JP 11-502484 A Full text; Figs. 1 to 3 & WO 96/30256 A1 & JP 11-502485 A & AU 4329896 A & AU 4329996 A & NO 974451 A & NO 974452 A & EP 815003 B1 & EP 815004 B1 & CN 1179756 A & CN 1179757 A	1-8 9
Y	JP 4-39838 Y2 (Taiyo Seiki Iron Works Co., Ltd.), 17 September, 1992 (17.09.92), Full text; Figs. 1 to 5 (Family: none)	9
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 05 July, 2002 (05.07.02)		Date of mailing of the international search report 16 July, 2002 (16.07.02)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/04001

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 3-11444 Y2 (Shosen Mitsui Kogyo Kabushiki Kaisha), 19 March, 1991 (19.03.91), Full text; Figs. 1 to 6 (Family: none)	9

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