



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
29.09.2010 Bulletin 2010/39

(51) Int Cl.:
B65D 88/12 (2006.01) B63B 25/00 (2006.01)
B65D 90/00 (2006.01)

(21) Application number: **07859698.8**

(86) International application number:
PCT/JP2007/073190

(22) Date of filing: **30.11.2007**

(87) International publication number:
WO 2009/069226 (04.06.2009 Gazette 2009/23)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

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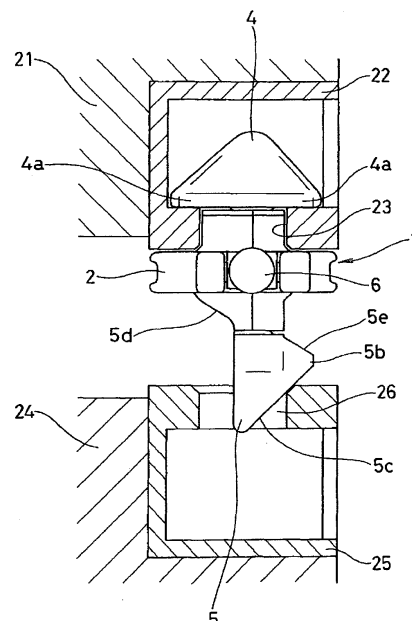
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(54) **CONTAINER CONNECTOR**

(57) A container connector having cones at upper and lower parts of a shaft of the connector. The lower cone can be detached from an upper corner casting of a lower container or a socket on a deck board without manually rotating the lower cone. The construction enhances workability of load discharging and provides sufficient fastening force required in different situations. To achieve the above, the lower cone has a rotation engagement structure and a non-rotatable second engagement structure. The rotation engagement structure allows the lower cone to engage with an inner edge of an engagement hole when the lower cone is inserted into the upper corner casting or the socket and rotated from a disengagement position to an engagement position. The second engagement structure allows a projection-like engagement section, which is provided on a side face of the lower cone, to engage with the inner edge of the engagement hole even if the lower cone is not rotated when it is inserted into the upper corner casting or the socket.

FIG. 9



Description**BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present invention relates to a container connector in accordance with a container loading and fastening technique. The connector in accordance with the present invention is used in the case of loading a plurality of containers vertically, or the case of fixing the containers on a deck panel of a ship.

Description of the Conventional Art

[0002] Conventionally, as described in the following patent document 1 and the like, there has been known a container connector provided with an upper cone engaging with a lower corner casting provided in a lower surface of an upper container (in the case of loading a plurality of containers vertically), or a lower corner casting provided in a lower surface of the container (in the case of fixing the containers onto a deck panel of a ship), and a lower cone engaging with an upper corner casting provided in an upper surface of a lower container (in the case of loading a plurality of containers vertically) or a socket provided on the deck board of the ship (in the case of fixing the containers on the deck board of the ship), and structured such that the upper and lower cones are provided respectively at an upper end or a lower end of rotation shaft, and are inserted to the corner casting or the socket from an engagement hole of the corner casting or the socket, whereby the cone is engaged with an inner edge of the engagement hole at a time of rotating to an engagement position from an engagement release position. Therefore, in accordance with this structure, extremely powerful container fastening force is achieved. On the contrary, since the cone can not be detached from the corner casting or the socket until the cone is rotated in accordance with a manual operation, a load discharging work of the container involves a lot of trouble.

Patent Document 1: Japanese Utility Model Publication No. 5-23514

SUMMARY OF THE INVENTION**Problem to be Solved by the Invention**

[0003] The present invention is made by taking the point mentioned above into consideration, and an object of the present invention is to provide a container connector which can detach a lower cone from an upper corner casting of a lower container or a socket on a deck board without rotating the lower cone in accordance with a manual operation, whereby it is possible to improve a workability of load discharging. In addition, an object of the present invention is to provide a container connector

which can achieve fastening force which is equal to the conventional cone rotation engagement structure as occasion demands.

Means for Solving the Problem

[0004] In order to achieve the object mentioned above, in accordance with claim 1 of the present invention, there is provided a container connector comprising:

a case integrally formed with fit portions which are fitted and inserted to upper and lower sides of a plate-like support panel portion arranged so as to be sandwiched between a lower corner casting of an upper container and an upper corner casting of a lower container or between a lower corner casting of a container and a socket on a deck board in a state of being prevented from rotating with respect to an engagement hole of the corner casting or the socket respectively;

a shaft inserted rotatably into the cases;

an upper cone provided at an upper end of the shaft and inserted into the lower corner casting;

a lower cone provided at a lower end of the shaft and inserted into the upper corner casting or the socket;

a shaft rotation operating means rotating the shaft in one rotating direction in accordance with a manual operation;

a restoring spring rotating the shaft so as to restore; and

a shaft rotation stopping means stopping the shaft at a predetermined rotational position in accordance with a manual operation,

wherein the upper cone has a rotation engagement structure in which the upper cone engages with an inner edge of an engagement hole at a time when the upper cone is inserted into the lower corner casting so as to rotate from an engagement release position to an engagement position,

wherein the lower cone has a rotation engagement structure in which the lower cone engages with the inner edge of the engagement hole at a time when the lower cone is inserted to the upper corner casting or the socket so as to rotate from an engagement release position to an engagement position, and a non-rotatable second engagement structure in which a projection-like engagement portion provided in one side surface of the cone engages with the inner edge of the engagement hole even if it does not rotate at a time of being inserted into the upper corner casting or the socket,

wherein a lower portion of the engagement portion is provided with an inclined surface shaped first guide surface allowing the engagement portion to pass through the engagement hole by sliding with respect to an outer edge of the engagement hole of the upper corner casting or the socket at a time of installing so as to actuate the second engagement

structure, thereby displacing the lower cone on a plane with respect to the engagement hole, wherein a lower fit portion is provided with an inclined surface shaped second guide surface moving the engagement portion to a position at which it engages with the inner edge of the engagement hole by sliding with respect to the outer edge of the engagement hole of the upper corner casting or the socket after passing through the engagement portion so as to restore and move the displaced lower cone, wherein an upper portion of the engagement portion is provided with an inclined surface shaped third guide surface allowing the engagement portion to pass through the engagement hole by sliding with respect to the inner edge of the engagement hole of the upper corner casting or the socket at a time of detaching so as to displace the lower cone on a plane with respect to the engagement hole, wherein the shaft is structured such as to be stoppable at a first rotation stop position and a second rotation stop position having different angles of rotation from each other, wherein the rotation engagement structure of the upper cone exists at the engagement position, the rotation engagement structure of the lower cone exists at an engagement release position, and the second engagement structure is capable of actuating while the engagement portion is opposed forward to the engagement hole, at the first rotation stop position, wherein both the rotation engagement structure of the upper cone and the rotation engagement structure of the lower cone exists at the engagement position, at the second rotation stop position, wherein at a time of a stationary use of the connector, the shaft stops at the first rotation stop position, and the lower cone automatically engages with the upper corner casting or the socket by the second engagement structure, and automatically disengages therefrom, and wherein at a time of reinforcing fastening force of the connector, the shaft stops at the second rotation stop position, and the lower cone engages with the upper corner casting or the socket by the rotation engagement structure.

[0005] Further, in accordance with claim 2 of the present invention, there is provided a container connector as recited in claim 1 mentioned above, wherein the restoring spring is set to a neutral state at the first rotation stop position of the shaft.

[0006] Further, in accordance with claim 3 of the present invention, there is provided a container connector as recited in claim 1 mentioned above, wherein the second engagement structure of the lower cone is structured such that the projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, and the shaft

is arranged so as to be eccentric in a direction coming close to the edge with respect to the center of the engagement hole, in a state in which the fit portion is fitted to the engagement hole, for setting a depth of engagement of the engagement portion with respect to the edge large.

[0007] Further, in accordance with claim 4 of the present invention, there is provided a container connector as recited in claim 1 mentioned above, wherein the second engagement structure of the lower cone is structured such that a projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, the shaft is arranged so as to be eccentric in a direction coming close to the edge with respect to the center of the engagement hole in a state in which the fit portion is fitted to the engagement hole, for setting a depth of engagement of the engagement portion with respect to the edge large, the rotation engagement structure of the upper cone is structured such that one end portion in a longitudinal direction of the upper cone engages with one longitudinal edge of the engagement hole and the other end portion in the longitudinal direction engages with the other longitudinal edge of the engagement hole, and a length from the center of the shaft to one end portion in a longitudinal direction of the upper cone and a length from the center of the shaft to the other end portion in a longitudinal direction of the upper cone are set such that the one arranged at the opposite side is set larger than the one arranged in an eccentric direction of the shaft at a time of engaging, for setting engagement areas of both end portions with respect to both the edges large.

[0008] Further, in accordance with claim 5 of the present invention, there is provided a container connector as recited in claim 1 mentioned above, wherein the second engagement structure of the lower cone is structured such that a projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, the shaft is arranged so as to be eccentric in a direction coming close to the edge with respect to the center of the engagement hole in a state in which the fit portion is fitted to the engagement hole, for setting a depth of engagement of the engagement portion with respect to the edge large, the rotation engagement structure of the upper cone is structured such that one endportion in a longitudinal direction of the upper cone engages with one longitudinal edge of the engagement hole and the other end portion in the longitudinal direction engages with the other longitudinal edge of the engagement hole, and a length from the center of the shaft to one end portion in a short axial direction of the upper cone and a length from the center of the shaft to the other endportion in a short axial direction of the upper cone are set such that the one arranged at the opposite side is set larger than the one arranged in an eccentric direction of the shaft at a time of engaging, for

setting engagement areas of both end portions with respect to both the edges large.

[0009] Further, in accordance with claim 6 of the present invention, there is provided a container connector as recited in claim 1 mentioned above, wherein the second engagement structure of the lower cone is structured such that a projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, the shaft is arranged so as to be eccentric in a direction coming close to the edge with respect to the center of the engagement hole in a state in which the fit portion is fitted to the engagement hole, for setting a depth of engagement of the engagement portion with respect to the edge large, the rotation engagement structure of the lower cone is structured such that one end portion in a longitudinal direction of the lower cone engages with one longitudinal edge of the engagement hole and the other end portion in the longitudinal direction engages with the other longitudinal edge of the engagement hole, and a length from the center of the shaft to one end portion in a longitudinal direction of the lower cone and a length from the center of the shaft to the other end portion in a longitudinal direction of the lower cone are set such that the one arranged at the opposite side is set larger than the one arranged in an eccentric direction of the shaft at a time of engaging, for setting engagement areas of both end portions with respect to both the edges large.

[0010] The connector in accordance with the present invention having the structure mentioned above has two different engagement structures including the rotation engagement structure engaging the lower cone with the upper corner casting or the socket by rotating, and the non-rotatable second engagement structure engaging the lower cone with the upper corner casting or the socket without rotating, with regard to the structure for engaging the lower cone with the upper corner casting of the lower container or the socket on the deck board.

[0011] The former rotation engagement structure is structured such that the lower cone engages with the inner edge of the engagement hole at a time when the lower cone is inserted into the upper corner casting or the socket and rotates from the engagement release position to the engagement position, extremely powerful fastening force can be achieved in the same manner as the prior art mentioned above, however, on the other hand, the lower cone can not be detached from the upper corner casting or the socket until the lower cone is rotated in accordance with a manual operation.

[0012] On the other hand, the latter non-rotatable second engagement structure is structured such that the projection shaped engagement portion provided in the side surface of the cone engages with the inner edge of the engagement hole even if the lower cone does not rotate at a time when it is inserted into the upper corner casting or the socket, and fastening force is smaller than the former rotation engagement structure. However, on the

contrary, the lower cone can be automatically detached from the upper corner casting or the socket even if the lower cone is not rotated in accordance with a manual operation.

[0013] Accordingly, it is possible to improve a workability of load discharging work and secure fastening force required in response to a condition, by selectively using the latter second engagement structure having a good workability of load discharging in spite of comparatively small fastening force at a stationary time, and using the former rotation engagement structure having great fastening force only at an emergency time when a swing of a ship is large such as a heavy weather time or the like, for example.

[0014] A mechanism for engaging and disengaging the latter second engagement structure is structured as follows.

[0015] In this case, the connector in accordance with the present invention is used in the case of loading a plurality of containers vertically or fixing the containers on the deck board as mentioned above, however, a description will be given below of the former case that a plurality of containers are loaded vertically, in the following description of "means for solving the problem". In the latter case that the containers are fixed onto the deck board, "container", "lower corner casting of the container", "on the deck board" and "socket on the deck board" are substituted for "upper container", "lower corner casting of the upper container", "lower container" and "upper corner casting of the lower container" in the following description, respectively.

[0016] In particular, the lower cone is provided at the lower end of the rotation shaft, and the lower cone is arranged below the lower fit portion of the case. The lower cone is structured such as to be activated as the rotation engagement structure by being rotated, and is provided with the following second engagement structure which is activated without rotating at an engagement release position thereof.

[0017] First of all, a projection shaped engagement portion is provided in one end surface of the lower cone, and the engagement portion engages with the edge of the engagement hole of the upper corner casting of the lower container from its inner side, whereby the lower cone is prevented from coming off with respect to the upper corner casting of the lower container. The engagement portion is a projection protruding in a lateral direction, and an upper surface thereof engages with the inner edge of the engagement hole.

[0018] Further, an inclined surface shaped first guide surface is provided in a lower portion of the engagement portion, and an also inclined surface shaped second guide surface is provided in the lower fit portion. The first and second guide surfaces are activated as follows at a time when the upper cone is engaged with the lower corner casting of the upper container, the connector is installed to the upper container, the upper container is suspended by a crane, and the lower cone is engaged with

the upper corner casting of the lower container.

[0019] Since the projection shaped engagement portion provided in the one side surface of the lower cone engages with the edge of the engagement hole of the upper corner casting of the lower container from its inner side as mentioned above, the engagement portion interferes with the outer edge of the engagement hole in the case of being brought down from the position which is straightly above the engagement position. Accordingly, the lower cone can not be inserted to the upper corner casting of the lower container. Therefore, the first guide surface is provided in the lower portion of the engagement portion, and the first guide surface slides with respect to the outer edge of the engagement hole of the upper corner casting of the lower container, thereby displacing the lower cone on the plane with respect to the engagement hole so as to allow the engagement portion to pass through the engagement hole. Accordingly, the engagement portion passes through the engagement hole, and the lower cone is inserted into the upper corner casting of the lower container. Further, the second guide surface is provided in the lower fit portion, and the second guide surface slides with respect to the outer edge of the engagement hole of the upper corner casting of the lower container after passing through the engagement portion, thereby restoring the displaced lower cone so as to move the engagement portion to a position at which it engages with the inner edge of the engagement hole. Accordingly, the engagement portion gets into under the edge of the engagement hole, and can engage with the edge of the engagement hole from its inner side.

[0020] Further, a third guide surface formed in an inclined surface shape is provided in an upper portion of the engagement portion, and the third guide surface is activated as follows at a time of detaching the lower cone from the upper corner casting of the lower container.

[0021] If a come-off load having a magnitude which is equal to or more than a predetermined value is applied to the lower cone, by drawing up the upper container by the crane, the third guide surface slides with respect to the inner edge of the engagement hole of the upper corner casting of the lower container, thereby displacing the lower cone on a plane with respect to the engagement hole so as to allow the engagement portion to pass through the engagement hole. Accordingly, the engagement portion passes through the engagement hole in a come-off direction, and the lower cone comes off from the upper corner casting of the lower container.

[0022] As is known from the actuation mentioned above, the engagement made by the second engagement structure is set such that it does not come off at a time when the come-off load having the magnitude which is less than the predetermined value is applied, but comes off at a time when the come-off load having the magnitude which is equal to or more than the predetermined value is applied. Accordingly, comparatively small fastening force as mentioned above is achieved.

[0023] The connector having two different engage-

ment structures with regard to the lower cone is used as follows.

Stationary time

[0024] The connector is installed to the lower corner casting of the lower surface of the upper container in the state in which it is suspended by the crane by means of the upper cone in accordance with a manual operation. When this work is started, the shaft exists, for example, at the first rotation stop position or the second rotation stop position. A description will be given below of the case that the shaft exists at the first rotation stop position. In the case that the shaft exists at the first rotation stop position, the upper cone exists at the engaged position and the lower cone exists at the engagement release position with regard to the rotational positions of the upper and lower cones. Next, the upper container is moved just above the lower container and is brought down straightly, by operating the crane as the work. Then, a sliding motion of the first guide surface and a sliding motion of the second guide surface in the second engagement structure are sequentially carried out, and the lower cone is automatically engaged with the upper corner casting of the lower container. Accordingly, the loading work is finished, and the upper and lower containers are coupled by comparatively small fastening force. The coupled state of the upper and lower containers is kept as long as a navigation of the container loaded ship is favored by good weather or the like, and does not fall on an emergency such as a heavy weather or the like. Next, the upper container is drawn upward straightly from the lower container by the crane at a time when the ship arrives at a destination so as to discharge the load. Then, the sliding motion of the third guide surface in the second engagement structure is carried out, and the lower cone is automatically detached from the upper corner casting of the lower container. Accordingly, since it is not necessary to manually operate to rotate the lower cone as is different from the prior art mentioned above, it is possible to make the load discharging work easy at this degree. Next, the upper cone is detached manually from the lower corner casting in the lower surface of the upper container in a state of being suspended by the crane.

Emergency time

[0025] In the case of falling on the emergency time, for example, the heavy weather or the like during the course mentioned above, the coupled state of the upper and lower containers is changed from the comparatively smaller fastening force generated by the second engagement structure to the comparatively larger fastening force generated by the rotation coupling structure, in accordance with a judgment of a crew member. In particular, the crew member manually operates the shaft rotation operating means so as to rotate the shaft in one rotating direction, and stops the shaft at the second rotation stop

position by the shaft rotation stopping means. Then, the upper cone rests at the engaged position, and on the other hand, the lower cone is changed from the engagement release position to the engaged position, thereby achieving extremely powerful fastening force by which the lower cone engages with the inner edge of the engagement hole. Accordingly, even if the ship swings widely, it is possible to prevent a load collapse, a loss of flow accident of the container and the like from being caused. Next, after finishing the emergency time or after reaching the destination, the shaft rotation stopping means is released manually, the shaft is rotated so as to restore by the restoring spring, and the lower cone is returned to the engagement release position. If the upper container is pulled upward straightly from the lower container by a crane in this state, the sliding motion of the third guide surface in the second engagement structure is carried out, and the lower cone is automatically detached from the upper corner casting of the lower container. Next, the upper cone is detached from the lower corner casting in the lower surface of the upper container in the state of being suspended by the crane in accordance with a manual work.

[0026] Accordingly, it is possible to improve a workability of load discharging work in accordance with an intended purpose and secure fastening force required in response to a condition, by selectively using them as mentioned above.

[0027] In the case that the shaft exists at the second rotation stop position as an initial motion position, at a time of starting the work at the stationary time mentioned above, there is added a work for rotating the shaft from the second rotation stop position to the first rotation stop position in such a manner that the lower cone automatically engages with the upper corner casting of the lower container on the basis of the second engagement structure, in a stage of installing the connector to the lower corner casting in the lower surface of the upper container.

[0028] As shown by the actuations at the stationary time and the emergency time, the state in which the shaft stops at the first rotation stop position is set to a basic state, a time for which the shaft is left in this state is long. Accordingly, with regard to the restoring spring rotating so as to restore the shaft, it is possible to lower a load applied to the restoring spring by setting a neutral state (a free state in which the shaft does not elastically deform) at a time when the shaft is at the first rotation stop position (claim 2).

[0029] Further, since the second engagement structure of the lower cone is structured such that the projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting of the lower container as mentioned above, it is possible to set the depth of engagement of the engagement portion with respect to the one longitudinal edge large, by arranging the shaft so as to be eccentric in the direction coming close to the one longitudinal edge with respect

to the center of the engagement hole, in the installed state, that is, in the state in which the fit portion of the case is fitted to the engagement hole of the corner casting. Accordingly, engagement force of the projection-shaped engagement portion with respect to the corner casting is increased (claim 3).

[0030] In this case, if the shaft is arranged so as to be eccentric in the direction coming close to the one longitudinal edge of the engagement hole as mentioned above, the upper cone is arranged eccentrically in accordance with this. Therefore, in the rotation engagement structure of the upper cone, if the length from the center of the shaft in the planar shape of the upper cone to the one end portion in the longitudinal direction of the upper cone is equal to the length from the center of the shaft to the other end portion in the longitudinal direction of the upper cone, there is a case that an area of engagement with respect to the corner casting of the upper cone can not be set large. Then, in accordance with the present invention, as described in claim 4 as the further preferable structure, with regard to the dimensional relationship in the longitudinal direction in the planar shape of the upper cone, the length from the center of the shaft to the one end portion in the longitudinal direction of the upper cone and the length from the center of the shaft to the other end portion in the longitudinal direction of the upper cone are set such that the one arranged at the opposite side is larger than the one arranged in the eccentric direction of the shaft at a time of engaging, thereby enlarging the area of engagement.

[0031] Further, same applies to the dimensional relationship in the short axial direction in the planar shape of the upper cone, the length from the center of the shaft to the one end portion in the short axial direction of the upper cone and the length from the center of the shaft to the other end portion in the short axial direction of the upper cone are set such that the one arranged at the opposite side is larger than the one arranged in the eccentric direction of the shaft at a time of engaging, thereby enlarging the area of engagement, as described in claim 5.

[0032] Further, same applies to the rotation engagement structure of the lower cone, the length from the center of the shaft to the one end portion in the longitudinal direction of the lower cone and the length from the center of the shaft to the other end portion in the longitudinal direction of the lower cone are set such that the one arranged at the opposite side is larger than the one arranged in the eccentric direction of the shaft at a time of engaging, thereby enlarging the area of engagement, as described in claim 6.

[0033] Therefore, in accordance with these structures, since the area of engagement is enlarged with respect to the corner castings of the upper and lower cones, it is possible to increase the engaging force, that is, the container fastening force.

Effect of the Invention

[0034] The present invention achieves the following effects.

[0035] In accordance with the present invention having the structure mentioned above, as mentioned above, with regard to the structure in which the lower cone is engaged with the upper corner casting of the lower container or the socket on the deck board, it is possible to improve the workability of the load discharging work and secure the fastening force required in response to the condition, by having two different engagement structures including the rotation engagement structure rotating the lower cone, and the non-rotatable second engagement structure which does not rotate the lower cone, and selectively using them.

[0036] Further, in addition to this, in accordance with the structure of claim 2, it is possible to lower the load applied to the restoring spring. In accordance with the structures of claims 3 to 6, it is possible to increase the force of engagement with respect to the corner castings of the upper and lower cones, and consequently increase the container fastening force.

BRIEF EXPLANATION OF DRAWINGS

[0037]

Fig. 1 is a front view of a container connector in accordance with a first embodiment of the present invention;

Fig. 2 is a plan view of the container connector;

Fig. 3 is a right side view of the container connector;

Fig. 4 is a left side view of the container connector;

Fig. 5 is a plan sectional view of the container connector;

Fig. 6 is an explanatory view of a rotation position of upper and lower cones;

Fig. 7 is an explanatory view of a rotation position of the upper and lower cones;

Fig. 8 is an explanatory view of a rotation position of the upper and lower cones;

Fig. 9 is an explanatory view of an operating state of the container connector;

Fig. 10 is an explanatory view of an operating state of the container connector;

Fig. 11 is an explanatory view of an operating state of the container connector;

Fig. 12 is an explanatory view of an operating state of the container connector;

Figs. 13A and 13B are explanatory views of an engagement area of the upper cone;

Figs. 14A and 14B are explanatory views of an engagement area of the lower cone;

Fig. 15 is an explanatory view of a rotation position of upper and lower cones in accordance with a second embodiment of the present invention;

Fig. 16 is an explanatory view of a rotation position

of the upper and lower cones in accordance with the embodiment;

Fig. 17 is an explanatory view of a rotation position of upper and lower cones in accordance with a third embodiment of the present invention; and

Fig. 18 is an explanatory view of a rotation position of the upper and lower cones in accordance with the embodiment.

[0038] Description of Reference Numerals

1	connector
2	case
2a	support panel portion
2b, 2c	fit portion
2d	stopper portion
3	shaft
3a	contact portion
4	upper cone
4a, 5a	engagement end portion
4b	cam surface
4c, 4d, 5f, 5g	end portion in longitudinal direction
4e, 4f	end portion in short axial direction
5	lower cone
5b	engagement portion
5c	first guide surface
5d	second guide surface
5e	third guide surface
6	shaft rotation operating means
7	wire
8	grip
9	piece member
10	restoring spring
11	shaft rotation stopping means
12	mouth piece member
12a, 12b	notch
13	compression spring
21	upper container
22	lower corner casting
23, 26	engagement hole
24	lower container
25	upper corner casting

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0039] Next, a description will be given of embodiments in accordance with the present invention with reference to the accompanying drawings.

First Embodiment

[0040] Fig. 1 shows a front view of a container connector in accordance with a first embodiment of the present invention, Fig. 2 shows a plan view, Fig. 3 shows a right side view, Fig. 4 shows a left side view, and Fig. 5 shows a plan sectional view, respectively. Further, Figs. 6 to 8 show explanatory views of rotation positions of upper and

lower cones, and Figs. 9 to 12 show explanatory views of operating states of the container connector, respectively. The connector may be called as a container fastening twist lock on the basis of its function and construction. In this case, the following description in a column "embodiment" will be given of a case that a plurality of containers are loaded vertically. Accordingly, in the case that the container is fixed on a deck board, "container", "lower corner casting of the container", "on the deck board" and "socket on the deck board" are substituted for "upper container", "lower corner casting of the upper container", "lower container" and "upper corner casting of the lower container" in the following description, respectively.

[0041] As shown in Figs. 1 to 5, first of all, a connector 1 has, as a basic structure, a case 2 in which upper and lower fit portions 2b and 2c fitted into engagement holes 23 and 26 of corner castings 22 and 25 in a rotation prevented state are integrally formed respectively at upper and lower sides of a plate-like support panel portion 2a arranged in such a manner as to be sandwiched between the lower corner casting 22 of an upper container 21 and the upper corner casting 25 (refer to Fig. 9) of a lower container 24, a shaft (a rotation shaft) 3 which is inserted to the case 2 so as to be rotatable in a vertical direction, an upper cone 4 which is provided at an upper end of the shaft 3 and is inserted into the lower corner casting 22 of the upper container 21, a lower cone 5 which is provided at a lower end of the shaft 3 and is inserted into the upper corner casting 25 of the lower container 24, a shaft rotation operating means 6 which rotates the shaft 3 in one rotating direction (a counterclockwise direction as seen from the above) in accordance with a manual operation, a restoring spring 10 which rotates the shaft 3 in a restoring direction (a clockwise direction as seen from the above), and a shaft rotation stopping means 11 which stops the shaft 3 at a predetermined rotated position (a second rotation stop position (Fig. 7) and a third rotation stop position (Fig. 8) described below in this embodiment) in accordance with a manual operation.

[0042] The lower corner casting 22 of the upper container 21 is attached to a lower surface of the upper container 21 in the upper and lower containers 21 and 24 which are loaded together, as shown in Fig. 9, and is formed hollow in its inner portion as well as having an engagement hole 23 which is open to a lower surface. The engagement hole 23 is formed in a rectangular shape (a shape in which a length in one direction on a plane is longer than a length in an orthogonal direction thereto, such definition being applied hereunder too) in its opening shape so as to have a directionality with regard to an installation of the connector 1 (insertion of the fit portion 2b and the cone 4) as shown in Fig. 6 by a broken line, and an upper fit portion 2b of the case 2 which is also formed in a rectangular shape on a plane is fitted thereto in a state in which it is aligned in the direction so as to be prevented from rotating.

[0043] The upper corner casting 25 of the lower con-

tainer 24 is structured such as to be attached to an upper surface of the lower container 24 in the upper and lower containers 21 and 24 which are loaded together, as shown also in Fig. 9, and is formed hollow in its inner portion as well as having an engagement hole 26 which is open to an upper surface. The engagement hole 26 is formed in a rectangular shape in its opening shape and has a directionality with regard to an installation of the connector 1, as shown by a dotted line in Fig. 6, and a lower fit portion 2c of the case 2 which is also formed in a rectangular shape on a plane is fitted thereto in a state in which it is aligned in the direction so as to be prevented from rotating.

[0044] The case 2 integrally provided with the support panel portion 2a and the upper and lower fit portions 2b and 2c is divided into two right and left pieces as seen from a front face as a part, and the right and left halves are fastened to each other by bolts.

[0045] The shaft 3 rotatably inserted to the case 2 stops on the basis of a contact of an arm-shaped contact portion 3a provided on an outer peripheral surface thereof with a stopper portion 2d provided in an inner surface of the case 2, in an inner portion of the case 2 as shown in Fig. 5, and a stop position in a state in which the contact portion 3a comes into contact with the stopper portion 2d is a first rotation stop position of the shaft 3 and is set to an initial motion position (Fig. 6) thereof. Since the case 2 is structured such as to be divided into two right and left pieces as mentioned above, a shape of the shaft 3 is simplified, and is accordingly formed by a forging having a high strength instead of a casting.

[0046] The upper cone 4 is formed by using a plane rectangular shape as a keynote, and has a directionality with regard to the insertion to the engagement hole 23. Further, the upper cone 4 has a rotation engagement structure in which engagement end portions 4a at both ends in the longitudinal direction of the cone 4 respectively engage with edges of the engagement hole 23 from an inner side thereof at a time of being inserted to the lower corner casting 22 of the upper container 21 so as to rotate from an engagement release position (an open position, Fig. 8) to an engagement position (a lock position, Fig. 6 or 7). Further, an upper portion of the upper cone 4 is provided with a cam surface 4b which automatically rotates the cone 4 from an engagement position (an initial motion position, Fig. 6) to an engagement release position (Fig. 8) by sliding with an outer edge of the engagement hole 23 at a time of pressing the cone 4 existing at the engagement position (the initial motion position, Fig. 6) to the outer edge of the engagement hole 23 of the lower corner casting 22 of the upper container 21, in the case of installing the upper cone 4 to the lower corner casting 22 of the upper container 21.

[0047] The lower cone 5 is formed by using a plane rectangular shape as a keynote, and has a directionality with regard to the insertion to the engagement hole 26. Further, the lower cone 5 has a rotation engagement structure in which engagement end portions 5a at both

ends in the longitudinal direction of the cone 5 respectively engage with edges of the engagement hole 26 from an inner side thereof at a time of being inserted to the upper corner casting 25 of the lower container 24 so as to rotate from an engagement release position (which is an engagement release position of the rotation engagement structure but is not an engagement release position of a second engagement structure, Fig. 6) to the engagement position (Fig. 7), and further has a non-rotatable second engagement structure in which a projection-shaped engagement portion 5b provided in one side surface (one longitudinal side surface) of the cone 5 engages with the edge (one longitudinal edge) of the engagement hole 26 from an inner side thereof, even if it does not rotate at a time of being inserted to the upper corner casting 25 of the lower container 24.

[0048] In order to actuate the second engagement structure, a lower portion of the projection-shaped engagement portion 5b is provided with an inclined surface shaped first guide surface 5c which displaces the lower cone 5 on a plane with respect to the engagement hole 26 so as to allow the engagement portion 5b to pass through the engagement hole 26, by sliding with respect to the outer edge of the engagement hole 26 of the upper corner casting 25 of the lower container 24 at a time of installing. Further, a side surface at an opposite side to the lower fit portion 2c is provided with an inclined surface shaped second guide surface 5d which returns the displaced lower cone 5 so as to move the engagement portion 5b to a position engaging with the inner edge of the engagement hole 26, by sliding with respect to the outer edge of the engagement hole 26 of the upper corner casting 25 of the lower container 24 after the engagement portion 5b passes through the engagement hole 26. Further, an upper portion of the engagement portion 5b is provided with an inclined surface shaped third guide surface 5e which again displaces the lower cone 5 on a plane with respect to the engagement hole 26 so as to allow the engagement portion 5b to pass through the engagement hole 26 in a come-off direction, by sliding with respect to the inner edge of the engagement hole 26 of the upper corner casting 25 of the lower container 24 at a time of detaching. These guide surfaces 5c, 5d and 5e are all formed in a flat shape, and accordingly slide in a line contact state with respect to the linear edge of the engagement hole 26.

[0049] Comparing the rotation engagement structure in the lower cone 5 with the non-rotatable second engagement structure, they have such a relationship that engagement force (fastening force) is larger in the former rotation engagement structure, and the engagement force (the fastening force) is smaller in the latter second engagement structure. In comparison with the engagement in accordance with the former rotation engagement structure, since the engagement portion with the upper corner casting 25 of the lower container 24 is biased to one side and the engagement area is small in the latter second engagement structure, the corner casting 25 be-

comes a bottle neck on a structure strength, and a yield point of changing from an elastic deformation to a plastic deformation and a breaking load become lower than those of the rotation engagement structure. Accordingly, a possibility that a residual deformation is caused in the corner casting 25 at a time of falling on a heavy weather during a ship operation becomes higher in comparison with the rotation engagement structure. In this case, the former rotation engagement structure requires a manual operation for rotating the cone 5 at a time of detaching, however, the latter second engagement structure does not require any manual operation, but has an operational advantage that it is automatically detached at a time of lifting the upper container 21 by a crane.

[0050] With regard to the rotation positions of the upper and lower cones 4 and 5, when the shaft 3 exists at the first rotation stop position as shown in Fig. 6, the rotation engagement structure of the upper cone 4 is at the engagement position, the rotation engagement structure of the lower cone 5 is at the engagement release position, and the second engagement structure of the lower cone 5 can be actuated in a state in which the engagement portion 5b is opposed forward to the edge (one longitudinal edge) of the engagement hole 26. Further, when the shaft 3 is at the second rotation stop position by the shaft rotation stopping means 11 as shown in Fig. 7, the rotation engagement structure of the upper cone 4 is at the engagement position, and the rotation engagement structure of the lower cone 5 is at the engagement position.

[0051] The shaft rotation operating means 6 is constructed by a wire structure, and is formed by arranging one end of the wire 7 around the shaft 3 so as to fix to the shaft 3 and drawing out the other end of the wire 7 to an outer portion of the case 2 as shown in Fig. 5, for manually rotating the shaft 3 and the upper and lower cones 4 and 5, and the shaft 3 and the upper and lower cones 4 and 5 rotate in one rotating direction (a counter-clockwise direction as seen from the above) against an elasticity of the restoring spring 10 (Fig. 6 → Fig. 7 → Fig. 8), by gripping and pulling the grip 8 attached to the other end of the wire 7. Further, if the pulling force is released, the shaft 3 and the upper and lower cones 4 and 5 restore and rotate in an opposite direction (a clockwise direction as seen from the above) on the basis of the elasticity of the restoring spring 10 (Fig. 8 → Fig. 7 → Fig. 6).

[0052] The restoring spring 10 is constructed by a coil spring arranged around the shaft 3 in the inner portion of the case 2, is locked to the case 2 side with its one end and locked to the shaft 3 side with the other end, and restores and rotates the shaft 3 rotated in one rotating direction by the shaft rotation operating means 6 as mentioned above. If the shaft 3 restores and rotates, the wire 7 is drawn into the case 2 in accordance with this.

[0053] The shaft rotation stopping means 11 is constructed by a wire lock structure, has a mouth piece member 12 and a compression spring 13 pressure fixing it to

the case 2 for stopping the shaft 3 and the upper and lower cones 4 and 5 at a second rotation stop position (Fig. 7) or a third rotation stop position (Fig. 8) against the elasticity of the restoring spring 10, and stops the wire 7 in a drawing out state by engaging a piece member 9 provided in the middle of the wire 7 with notches 12a and 12b provided in an opening portion of the mouth piece member 12. Since the notches 12a and 12b are provided at two positions above and below the opening portion of the mouth piece member 12, and distances from the shaft 3 are set to be different from each other, the upper and lower cones 4 and 5 stop in the state in Fig. 7 (the second rotation stop position) if the piece member 9 is engaged with one near notch 12a (refer to Fig. 5), and the upper and lower cones 4 and 5 stop in the state in Fig. 8 (the third rotation stop position, that is, the engagement release position of the upper cone 4) if the piece member 9 is engaged with the other far notch 12b (refer to Fig. 2) (this third rotation stop position is used at a time of detaching the connector from the lower corner casting 22 of the upper container 21).

[0054] The connector 1 having the structure mentioned above is used as follows, and operates as follows. Stationary time No. 1 (container loading time)

[0055] When loading the upper container 21 onto the lower container 24, first of all, the connector 1 is installed to the lower corner casting 22 of the lower surface of the upper container 21 in a state of being suspended by the crane by the upper cone 4 in accordance with a manual work. At the beginning of the work, the shaft 3 is at the first rotation stop position (Fig. 6) as the initial motion position thereof, and, with regard to the rotation positions of the upper and lower cones 4 and 5, the upper cone 4 is at the engagement position, and the lower cone 5 is at the engagement release position. As the work, the upper cone 4 in the state in Fig. 6 is pressed strongly to the outer edge of the engagement hole 23 of the lower corner casting 22 of the upper container 21. Then, since the cam surface 4b slides with the outer edge of the engagement hole 23, the upper cone 4 automatically rotates from the engagement position (Fig. 6) to the engagement release position (Fig. 8), passes through the engagement hole 23, and restores and rotates on the basis of the elasticity of the restoring spring 10 so as to return to the engagement position (Fig. 6) after passing. Accordingly, since the engagement end portion 4a of the upper cone 4 engages with the edge of the engagement hole 23 from the inner side thereof so as to come to a state of being prevented from coming off, connector 1 comes to a state in which it is suspended to the lower corner casting 22 of the upper container 21.

[0056] Next, as shown in Fig. 9, the upper container 21 is moved just above the lower container 24 and is brought down straightly by operating the crane. Then, the first guide surface 5c in the second engagement structure of the lower cone 5 comes into contact with the outer edge of the engagement hole 26 of the upper corner casting 25 of the lower container 24 so as to slide, where-

by the lower cone 5 displaces in one direction (a direction of an arrow x in the drawing) on a plane with respect to the engagement hole 26 so as to allow the projection-shaped engagement portion 5b to pass through the engagement hole 26, as shown in Fig. 10. Since the connector 1 is in the state in which it is suspended by the lower corner casting 22 of the upper container 21 as mentioned above, a whole of the connector 1, the lower corner casting 22 suspending it and the upper container 21 to which it is attached simultaneously displace, if the lower cone 5 displaces in the one direction (the direction of the arrow x in the drawing) on the plane with respect to the engagement hole 26. In this case, since the corner castings 22 and 25 are installed at four corners on a plane of the containers 21 and 24 in the case of loading the containers 21 and 24, four connectors 1 are used. In this case, planar shapes of the containers 21 and 24 are formed in a rectangular shape, two connectors 1 used at both ends of one long side are arranged so as to direct the protruding direction of the projection-shaped engagement portion 5b toward one of the longitudinal directions, and the remaining two connectors 1 used in both ends of the other long side are arranged so as to direct the protruding direction of the projection-shaped engagement portion 5b toward the other of the longitudinal directions. Accordingly, since the former two connectors 1 and the latter two connectors 1 displace and operate with respect to the engagement hole 26 in the opposite directions to each other, the upper container 21 rotates with respect to the lower container 24 insofar as this operation. Since this rotation is a point symmetrical movement around the center of suspended portion by the crane, a rotational balance is good.

[0057] If the upper container 21 is moved down further from the state in Fig. 10, the projection-shaped engagement portion 5b of the lower cone 5 completely passes through the engagement hole 26 as shown in Fig. 11, and next, the second guide surface 5d in the second engagement structure of the lower cone 5 comes into contact with the outer edge at the opposite side to the engagement hole 26 of the upper corner casting 25 of the lower container 24 so as to slide, whereby the displaced lower cone 5 restores in an opposite direction (a direction of an arrow y in the drawing) to the one direction on a plane as shown in Fig. 12, and the projection-shaped engagement portion 5b moves to a position at which it engaged with the edge of the engagement hole 26 from the inner side thereof. Accordingly, since the projection-shaped engagement portion 5b engages with the edge of the engagement hole 26 by an upper surface thereof (that is, a third guide surface 5e) from the inner side thereof so as to come to a state in which it is prevented from coming off, even if the lower cone 5 is going to come off upward from the upper corner casting 25 of the lower container 24, the lower cone 5 does not come off. In this case, the engagement of the projection-shaped engagement portion 5b with the inner edge of the engagement hole 26 is set so that it does not come off at a time when

a come-off load having a magnitude which is less than a predetermined value is applied, and if the predetermined value or more come-off load is applied by the crane or the like such as a time of a load discharging work mentioned below, this engagement automatically comes off. Therefore, the container fastening force by the second engagement structure is comparatively small.

[0058] The container loading work at the normal time is finished in accordance with the procedure mentioned above, and the upper and lower containers 21 and 24 are connected by comparatively small fastening force. As mentioned above, the installation of the lower cone 5 to the upper corner casting 25 of the lower container 24 on the basis of the second engagement structure is totally carried out automatically by the sliding motion of the first and second guide surfaces 5c and 5d.

Stationary time No. 2 (load discharging time)

[0059] The connection state of the upper and lower containers 21 and 24 is kept in the procedure finish state (the state in Fig. 12), unless the ship operation of the container loading ship falls on an emergency time such as the heavy weather, with being favored by good weather. Accordingly, the lower cone 5 engages with the upper corner casting 25 of the lower container 24 on the basis of the second engagement structure. Next, when the ship arrives at a destination to discharge the upper container 21, the upper container 21 is drawn upward straightly from the lower container 24 by the crane without any particular manual operation of the connector 1. At this time, the come-off load having a magnitude which is equal to or more than the predetermined value mentioned above is applied to the lower cone 5. Then, the third guide surface 5e in the second engagement structure of the lower cone 5 slides with respect to the inner edge of the engagement hole 26 of the upper corner casting 25 of the lower container 24, whereby the lower cone 5 again displaces in one direction on a plane with respect to the engagement hole 26 so as to allow the projection-shaped engagement portion 5b to pass through the engagement hole 26, as shown in Fig. 11. Accordingly, as shown in Fig. 10, the projection-shaped engagement portion 5b passes through the engagement hole 26 in the come-off direction, and the lower cone 5 is automatically detached from the upper corner casting 25 of the lower container 24. Therefore, since it is not necessary to rotationally operate the lower cone 5 manually as is different from the prior art mentioned above, it is possible to make the load discharging work easier at this degree. Next, the upper cone 4 is detached from the lower corner casting 22 in the lower surface of the upper container 21 in the state of being suspended by the crane in accordance with a manual operation (the shaft 3 is stopped at a third rotation stop position (Fig. 8) by the shaft rotation stopping means 11).

Emergency time No. 1 (fastening force reinforcing time)

[0060] For example, in the case that the ship falls on the heavy weather in the process of the course mentioned above, or in the case that it has a risk of falling on the heavy weather, the connected state of the upper and lower containers 21 and 24 is changed from the state having the comparatively small fastening force on the basis of the second engagement structure to the state having the comparatively large fastening force on the basis of the rotation connection structure, in accordance with a judgment of a crew member. In other words, the crew member manually operates the shaft rotation operating means 6 so as to pull the wire 7, rotates the shaft 3 from the initial motion position (Fig. 6) to the one rotating direction (the counterclockwise direction as seen from the above), and stops at the second rotation stop position (Fig. 7) by the shaft rotation stopping means 11. Accordingly, the upper cone 4 rests at the engagement position, and on the other hand, the lower cone 5 is changed from the engagement release position to the engagement position, thereby achieving extremely powerful fastening force by which the lower cone 5 engages with the edge of the engagement hole 26 from its inner side by its engagement end portion 5a. The powerful fastening force is set such that the lower cone 5 does not come off from the upper corner casting 25 even if the come-off load having a magnitude which is equal to or more than the predetermined value is applied. Accordingly, it is possible to prevent a load collapse and a loss of flow accident of the container from being caused even if the ship swings greatly.

Emergency time No. 2 (container discharging time)

[0061] Next, after finishing the emergency time or after arriving at the destination, the shaft rotation stopping means 11 is manually released, the shaft 3 is returned on the basis of the elasticity of the restoring spring 10, and the lower cone 5 is returned to the engagement release position (Fig. 6). Accordingly, the lower cone 5 returns to the state in which it engages with the upper corner casting 25 of the lower container 24 on the basis of the second engagement structure. Next, at a time of moving down the upper container 21, the upper container 21 is pulled upward straightly from the lower container 24 by the crane without any particular manual operation of the connector 1. At this time, the come-off load having a magnitude which is equal to or more than the predetermined value is applied to the lower cone 5. Accordingly, the third guide surface 5e in the second engagement structure of the lower cone 5 slides with respect to the inner edge of the engagement hole 26 of the upper corner casting 25 of the lower container 24, whereby the lower cone 5 again displaces in one direction on a plane with respect to the engagement hole 26 so as to allow the projection-shaped engagement portion 5b to pass through the engagement hole 26, as shown in Fig. 11. Therefore, the projection-

shaped engagement portion 5b passes through the engagement hole 26 in the come-off direction as shown in fig.10, and the lower cone 5 is automatically detached from the upper corner casting 25 of the lower container 24. Accordingly, since it is not necessary to rotationally operate the lower cone 5 manually after releasing the shaft rotation stopping means 11 as is different from the prior art, it is possible to make the load discharging work of the upper container 21 easy at this degree. Next, the upper cone 4 is detached from the lower corner casting 22 in the lower surface of the upper container 21 in the state of being suspended by the crane in accordance with a manual operation (the shaft 3 is stopped at the third rotation stop position (Fig. 8) by the shaft rotation stopping means 11).

[0062] Accordingly, since it is not necessary to manually operate the connector 1 at a time of moving down the upper container 21 by selective use as mentioned above, it is possible to improve a workability of the load discharging work of the container, and it is possible to secure the fastening force which is necessary in response to the condition.

[0063] In this case, as shown by the operations at the stationary time and the emergency time, the state in which the shaft 3 stops at the first rotation stop position (Fig. 6) is set to a basic state, and a time for which the shaft 3 is set to this state is longest in actual work. Accordingly, with regard to the restoring spring 10 restoring and rotating the shaft 3, it is possible to reduce the load applied to the restoring spring 10 by setting a neutral state (a free state in which the restoring spring hardly deforms elastically) to be at a time when the shaft 3 is at the first rotation stop position (Fig. 6).

[0064] Further, since the second engagement structure of the lower cone 5 is the structure in which the projection-shaped engagement portion 5b provided in one side surface of the lower cone 5 engages with the one long edge of the engagement hole 26 formed in the rectangular shape in a plane without rotating, as mentioned above, it is possible to set an engagement depth of the engagement portion 5b with respect to the one long edge large by arranging the shaft 3 so as to be eccentric in a direction (a rightward direction in Fig. 6) coming close to the one long edge (the right long edge in Fig. 6) with respect to a center O_1 of the engagement hole 26 (a position at which a center line in a longitudinal direction of the engagement hole 26 intersects a center line in a short axial direction), as shown in Fig. 6 in the installed state, that is, in the state in which the fit portion 2c of the case 2 fits to the engagement hole 26 of the corner casting 25. Accordingly, in the present embodiment, the shaft 3 is arranged so as to be eccentric in the direction (the rightward direction in Fig. 6) coming close to the one long edge (the right long edge in Fig. 6) with respect to the center O_1 of the engagement hole 26 from this point of view, whereby the engagement force of the projection-shaped engagement portion 5b is increased with respect to the corner casting 25.

[0065] Further, if the shaft 3 is arranged so as to be eccentric in the direction coming close to the one long edge of the engagement hole 26 as mentioned above the upper cone 4 is also arranged eccentrically in accordance with this. Accordingly, if a length L_1 from a center O_2 of the shaft 3 in a plane shape of the upper cone 4 to one end portion 4c in the longitudinal direction of the upper cone 4 is set to be equal to a length L_2 from the center O_2 of the shaft 3 to the other end portion 4d in the longitudinal direction of the upper cone 4 ($L_1 = L_2$) as shown in Fig. 13A, with regard to the rotation engagement structure of the upper cone 4, it is impossible to set an engagement area (a contact area at the engaging time) with respect to the corner casting 22 of the upper cone 4 sufficiently large, and since the engagement areas become unbalanced at both ends in the longitudinal direction of the upper cone 4, there is a case that the engagement state becomes unstable. Accordingly, in the present embodiment, as a further preferable structure, as shown in Fig. 13B, with regard to a dimensional relationship in the longitudinal direction in the plane shape of the upper cone 4, comparing the length L_1 from the center O_2 of the shaft 3 to the one end portion 4c in the longitudinal direction of the upper cone 4 and the length L_2 from the center O_2 of the shaft 3 to the other end portion 4d in the longitudinal direction of the upper cone 4, the length L_1 arranged at the opposite side to an eccentric direction (a rightward direction in the drawing) of the shaft 3 in the engagement state (the first or second rotation stop position) is set larger than the length L_2 arranged in the eccentric direction ($L_1 > L_2$), whereby the engagement area is enlarged.

[0066] Further, similarly, if a length from the center O_2 of the shaft 3 in the plane shape of the upper cone 4 to one end portion in the short axial direction of the upper cone 4 is set to be equal to a length from the center O_2 of the shaft 3 to the other end portion in the short axial direction of the upper cone 4 (not shown), with regard to the rotation engagement structure of the upper cone 4, it is impossible to set an engagement area (a contact area at the engaging time) with respect to the corner casting 22 of the upper cone 4 sufficiently large, and since the engagement areas become unbalanced at both ends in the longitudinal direction of the upper cone 4, there is a case that the engagement state becomes unstable. Accordingly, in the present embodiment, as a further preferable structure, as shown in Fig. 13B, with regard to a dimensional relationship in the short axial direction in the plane shape of the upper cone 4, comparing a length L_3 from the center O_2 of the shaft 3 to the one end portion 4e in the short axial direction of the upper cone 4 and a length L_4 from the center O_2 of the shaft 3 to the other endportion 4f in the short axial direction of the upper cone 4, the length L_3 arranged at the opposite side to the eccentric direction (the rightward direction in the drawing) of the shaft 3 in the engagement state (the first or second rotation stop position) is set larger than the length L_4 arranged in the eccentric direction ($L_3 > L_4$), whereby the engagement area is enlarged.

[0067] Further, similarly, if a length L_5 from the center O_2 of the shaft 3 in a plane shape of the lower cone 5 to one end portion 5f in the longitudinal direction of the lower cone 5 is set to be equal to a length L_6 from the center O_2 of the shaft 3 to the other end portion 5g in the longitudinal direction of the lower cone 5 ($L_5 = L_6$), as shown in Fig. 14A, with regard to the rotation engagement structure of the lower cone 5, it is impossible to set an engagement area (a contact area at the engaging time) with respect to the corner casting 25 of the lower cone 5 sufficiently large, and since the engagement areas become unbalanced at both ends in the longitudinal direction of the lower cone 5, there is a case that the engagement state becomes unstable. Accordingly, in the present embodiment, as a further preferable structure, as shown in Fig. 14B, with regard to a dimensional relationship in the longitudinal direction in the plane shape of the lower cone 5, comparing the length L_5 from the center O_2 of the shaft 3 to the one end portion 5f in the longitudinal direction of the lower cone 5 and the length L_6 from the center O_2 of the shaft 3 to the other end portion 5g in the longitudinal direction of the lower cone 5, the length L_5 arranged at the opposite side to the eccentric direction (the rightward direction in the drawing) of the shaft 3 in the engagement state (the second rotation stop position) is set larger than the length L_6 arranged in the eccentric direction ($L_5 > L_6$), whereby the engagement area is enlarged.

[0068] Accordingly, in accordance with the structure mentioned above, since the engagement areas (the contact areas at the engaging time) with respect to the corner castings 22 and 25 of the upper and lower cones 4 and 5 are enlarged respectively, it is possible to increase the engagement force, that is, the container fastening force, and it becomes easy to secure the area of 800 mm² prescribed in ISO. Further, since the balance of the magnitudes of the engagement areas becomes improved at both end portions in the longitudinal direction of the upper and lower cones 4 and 5, it is possible to stabilize the engagement state at this degree.

Second Embodiment

[0069] In this case, in the first embodiment mentioned above, the initial motion position of the shaft 3 is set to the first rotation stop position (Fig. 6) at which the rotation engagement structure of the upper cone 4 is at the engagement position, the rotation engagement structure of the lower cone 5 is at the engagement release position, and the second engagement structure is set operable, however, is not limited to this, but may be structured, for example, such that it is set to the second rotation stop position at which both the rotation engagement structure of the upper cone 4 and the rotation engagement structure of the lower cone 5 are at the engagement position.

[0070] From this point of view, in the second embodiment, as shown in Fig. 15, the initial motion position of the shaft 3 is set to the second rotation stop position at which both the rotation engagement structure of the up-

per cone 4 and the rotation engagement structure of the lower cone 5 are at the engagement position, and if the piece member 9 of the shaft rotation stopping means 11 is engaged with the one notch 12a at the near side by drawing out the wire 7 of the shaft rotation operating means 6 from this state, it is changed to the first rotation stop position at which the rotation engagement structure of the upper cone 4 is at the engagement position, the rotation engagement structure of the lower cone 5 is at the engagement release position and the second engagement structure is set operable as shown in Fig. 16. Further, if the piece member 9 of the shaft rotation stopping means 11 is engaged with the other notch 12b at the far side by further drawing out the wire 7 of the shaft rotation operating means 6, it is changed to the third rotation stop position at which the rotation engagement structure of the upper cone 4 comes to the engagement release position. In this case, in this embodiment, since the restoring spring 10 is set to be in a neutral state at the second rotation stop position (Fig. 15), the invention in accordance with claim 2 of the present invention which is characterized by the neutral state at the first rotation stop position is outside its scope.

[0071] Further, in the first embodiment mentioned above, the planar shapes of the upper and lower cones 4 and 5 are arranged in the directions in which the respective longitudinal directions are approximately orthogonal as shown in Fig. 6, however, the angle at which the longitudinal directions of the planar shapes of the upper and lower cones 4 and 5 intersect is not limited to a right angle, but is not particularly limited.

[0072] From this point of view, in the second embodiment shown in Figs. 15 and 16, an angle θ_1 at which the longitudinal directions of the planar shapes of the upper and lower cones 4 and 5 intersect is set to about 33 degrees (the longitudinal direction of the lower cone 5 displaces approximately at 33 degrees in the shaft rotating direction (the counterclockwise direction in the drawing) on the basis of the longitudinal direction of the upper cone 4).

Third Embodiment

[0073] Further, in a third embodiment shown in Figs. 17 and 18, an angle θ_2 at which the longitudinal directions in the planar shapes of the upper and lower cones 4 and 5 intersect is set to about 110 degrees (the longitudinal direction of the lower cone 5 displaces approximately at 110 degrees in the shaft rotating direction (the counterclockwise direction in the drawing) on the basis of the longitudinal direction of the upper cone 4). In accordance with a verification by the inventors of the present invention, in the case that the planar shapes of the upper and lower cones 4 and 5 are those shown in Figs. 17 and 18, it is possible to set the engagement areas (the contact areas at the engaging time) with respect to the corner castings 22 and 25 of the cones 4 and 5 largest by setting the angle mentioned above. Generally, it is preferable

that the angle at which the longitudinal directions in the planar shapes of the upper and lower cones 4 and 5 intersect is set to a range between 100 and 120 degrees (the longitudinal direction of the lower cone 5 displaces about 100 to 120 degrees in the shaft rotating direction (the counterclockwise direction in the drawing) on the basis of the longitudinal direction of the upper cone 4).

[0074] The other structures, and operations and effects in the second and third embodiments are the same as those of the first embodiment. Further, in the second and third embodiments, the second engagement structure of the lower cone 5 is structured such that the projection-shaped engagement portion 5b provided in one side surface of the lower cone 5 engages with one longitudinal edge of the engagement hole 26 without rotating as shown in Fig. 16 or 18, and the shaft 3 is arranged so as to be eccentric in the direction coming close to the one longitudinal edge with respect to the center O_1 of the engagement hole 26, in the state in which the fit portion is fitted to the engagement hole 26, for setting the engagement depth of the engagement portion 5b with respect to the one longitudinal edge large. Further, with regard to the dimensional relationship in the longitudinal direction in a plane shape of the upper cone 4, comparing the length L_1 from the center O_2 of the shaft 3 to the one end portion 4c in the longitudinal direction of the upper cone 4 and the length L_2 from the center O_2 of the shaft 3 to the other end portion 4d in the longitudinal direction of the upper cone 4, the length L_1 arranged at the opposite side to the eccentric direction of the shaft 3 in the engagement state is set larger than the length L_2 arranged in the eccentric direction ($L_1 > L_2$), whereby the engagement area is enlarged. Further, with regard to the dimensional relationship in the short axial direction in a plane shape of the upper cone 4, comparing the length L_3 from the center O_2 of the shaft 3 to the one end portion 4e in the short axial direction of the upper cone 4 and the length L_4 from the center O_2 of the shaft 3 to the other end portion 4f in the longitudinal direction of the upper cone 4, the length L_3 arranged at the opposite side to the eccentric direction of the shaft 3 in the engagement state is set larger than the length L_4 arranged in the eccentric direction ($L_3 > L_4$), whereby the engagement area is enlarged. Further, with regard to the dimensional relationship in the longitudinal direction in a plane shape of the lower cone 5, comparing the length L_5 from the center O_2 of the shaft 3 to the one end portion 5f in the longitudinal direction of the lower cone 5, and the length L_6 from the center O_2 of the shaft 3 to the other end portion 5g in the longitudinal direction of the lower cone 5, the length L_5 arranged at the opposite side to the eccentric direction of the shaft 3 in the engagement state is set larger than the length L_6 arranged in the eccentric direction ($L_5 > L_6$), whereby the engagement area is enlarged.

Claims

1. A container connector comprising:

a case integrally formed with fit portions which are fitted and inserted to upper and lower sides of a plate-like support panel portion arranged so as to be sandwiched between a lower corner casting of an upper container and an upper corner casting of a lower container or between a lower corner casting of a container and a socket on a deck board in a state of being prevented from rotating with respect to an engagement hole of said corner casting or socket respectively;

A shaft inserted rotatably into the case;

an upper cone provided at an upper end of said shaft and inserted into said lower corner casting;

a lower cone provided at a lower end of said shaft and inserted into said upper corner casting or socket;

a shaft rotation operating means rotating said shaft in one rotating direction in accordance with a manual operation;

a restoring spring rotating said shaft so as to restore; and

a shaft rotation stopping means stopping said shaft at a predetermined rotational position in accordance with a manual operation,

wherein said upper cone has a rotation engagement structure in which said upper cone engages with an inner edge of an engagement hole at a time when said upper cone is inserted into the lower corner casting so as to rotate from an engagement release position to an engagement position,

wherein said lower cone has a rotation engagement structure in which said lower cone engages with the inner edge of the engagement hole at a time when said lower cone is inserted to the upper corner casting or the socket so as to rotate from an engagement release position to an engagement position, and a non-rotatable second engagement structure in which a projection-like engagement portion provided in one side surface of said cone engages with the inner edge of the engagement hole even if it does not rotate at a time of being inserted into the upper corner casting or the socket, wherein a lower portion of the engagement portion is provided with an inclined surface shaped first guide surface allowing the engagement portion to pass through the engagement hole by sliding with respect to an outer edge of the engagement hole of the upper corner casting or the socket at a time of installing so as to actuate the second engagement structure, thereby displacing the lower cone on a plane with respect to the engagement hole,

- wherein a lower fit portion is provided with an inclined surface shaped second guide surface moving the engagement portion to a position at which it engages with the inner edge of the engagement hole by sliding with respect to the outer edge of the engagement hole of the upper corner casting or the socket after passing through said engagement portion so as to restore and move said displaced lower cone, wherein an upper portion of the engagement portion is provided with an inclined surface shaped third guide surface allowing the engagement portion to pass through the engagement hole by sliding with respect to the inner edge of engagement hole of the upper corner casting or the socket at a time of detaching so as to displace the lower cone on a plane with respect to the engagement hole,
- wherein said shaft is structured such as to be stoppable at a first rotation stop position and a second rotation stop position having different angles of rotation from each other, wherein the rotation engagement structure of the upper cone exists at the engagement position, the rotation engagement structure of the lower cone exists at an engagement release position, and the second engagement structure is capable of actuating while the engagement portion is opposed forward to the engagement hole, at the first rotation stop position, wherein both the rotation engagement structure of the upper cone and the rotation engagement structure of the lower cone exists at the engagement position, at the second rotation stop position,
- wherein at a time of a stationary use of the connector, the shaft stops at the first rotation stop position, and the lower cone automatically engages with the upper corner casting or the socket by the second engagement structure, and automatically disengages therefrom, and wherein at a time of reinforcing fastening force of said connector, the shaft stops at the second rotation stop position, and the lower cone engages with the upper corner casting or the socket by the rotation engagement structure.
2. The container connector as claimed in claim 1, wherein the restoring spring is set to a neutral state at the first rotation stop position of the shaft.
 3. The container connector as claimed in claim 1, wherein the second engagement structure of the lower cone is structured such that the projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, and the shaft is arranged so as to be eccentric in a direction coming close to said edge with respect to the center of the engagement hole, in a state in which the fit portion is fitted to the engagement hole, for setting a depth of engagement of the engagement portion with respect to said edge large.
 4. The container connector as claimed in claim 1, wherein the second engagement structure of the lower cone is structured such that a projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, the shaft is arranged so as to be eccentric in a direction coming close to said edge with respect to the center of the engagement hole in a state in which the fit portion is fitted to the engagement hole, for setting a depth of engagement of the engagement portion with respect to said edge large, and wherein the rotation engagement structure of the upper cone is structured such that one end portion in a longitudinal direction of the upper cone engages with one longitudinal edge of the engagement hole and the other end portion in the longitudinal direction engages with the other longitudinal edge of the engagement hole, and a length from the center of the shaft to one end portion in a longitudinal direction of the upper cone and a length from the center of the shaft to the other end portion in a longitudinal direction of the upper cone are set such that the one arranged at the opposite side is set larger than the one arranged in an eccentric direction of the shaft at a time of engaging, for setting engagement areas of both end portions with respect to both the edges large.
 5. The container connector as claimed in claim 1, wherein the second engagement structure of the lower cone is structured such that a projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, the shaft is arranged so as to be eccentric in a direction coming close to said edge with respect to the center of the engagement hole in a state in which the fit portion is fitted to the engagement hole for setting a depth of engagement of the engagement portion with respect to said edge large, and wherein the rotation engagement structure of the upper cone is structured such that one end portion in a longitudinal direction of the upper cone engages with one longitudinal edge of the engagement hole and the other end portion in the longitudinal direction engages with the other longitudinal edge of the engagement hole, and a length from the center of the shaft to one end portion in a short axial direction of the upper cone and a length from the center of the

shaft to the other end portion in a short axial direction of the upper cone are set such that the one arranged at the opposite side is set larger than the one arranged in an eccentric direction of the shaft at a time of engaging, for setting engagement areas of both end portions with respect to both the edges large. 5

6. The container connector as claimed in claim 1, wherein the second engagement structure of the lower cone is structured such that a projection shaped engagement portion provided in one side surface of the lower cone engages with one longitudinal edge of the engagement hole of the upper corner casting or the socket, the shaft is arranged so as to be eccentric in a direction coming close to said edge with respect to the center of the engagement hole in a state in which the fit portion is fitted to the engagement hole, for setting a depth of engagement of the engagement portion with respect to said edge large, and 10 15 20
- wherein the rotation engagement structure of the lower cone is structured such that one end portion in a longitudinal direction of the lower cone engages with one longitudinal edge of the engagement hole and the other end portion in the longitudinal direction engages with the other longitudinal edge of the engagement hole, and a length from the center of the shaft to one end portion in a longitudinal direction of the lower cone and a length from the center of the shaft to the other end portion in a longitudinal direction of the lower cone are set such that the one arranged at the opposite side is set larger than the one arranged in an eccentric direction of the shaft at a time of engaging, for setting engagement areas of both end portions with respect to both the edges large. 25 30 35

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FIG. 1

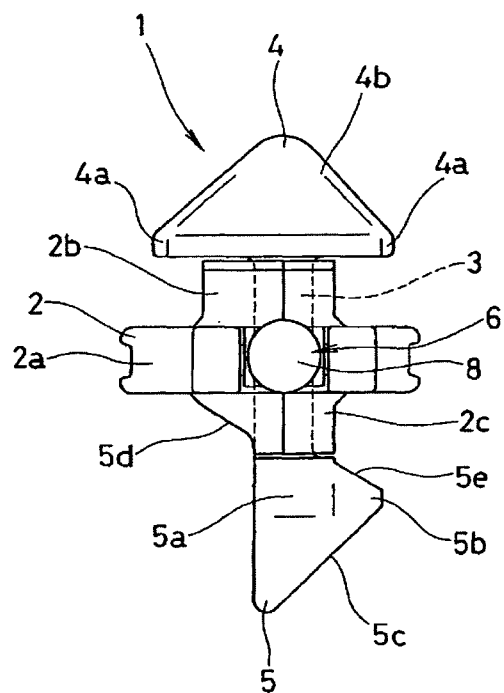


FIG. 2

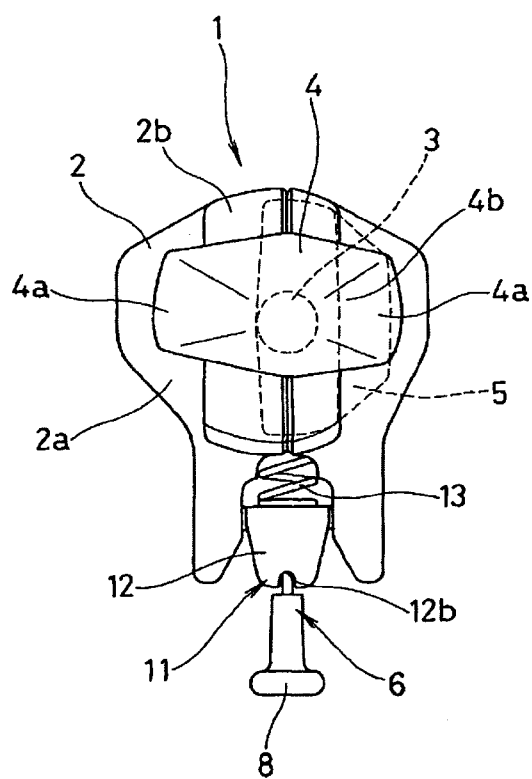


FIG. 3

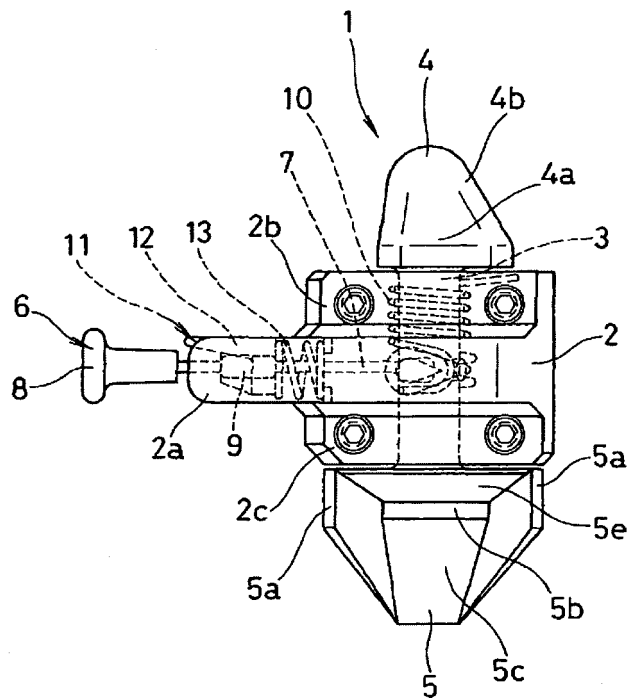


FIG. 4

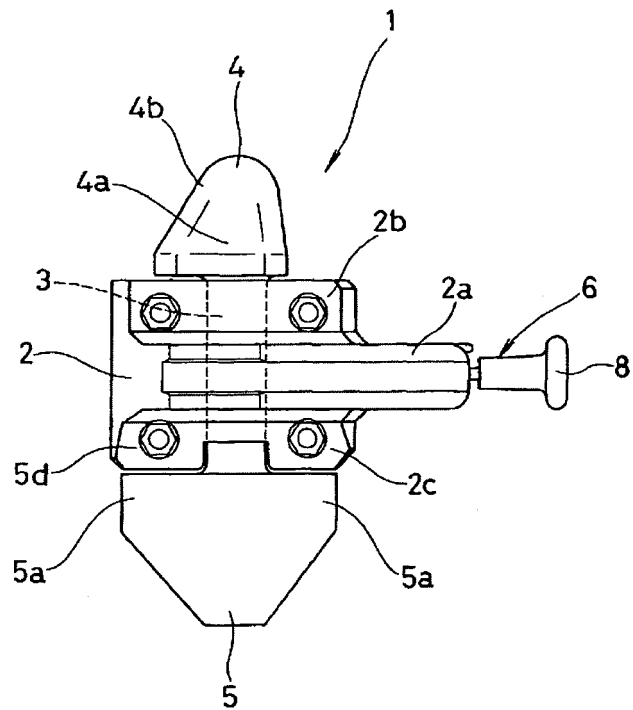


FIG. 5

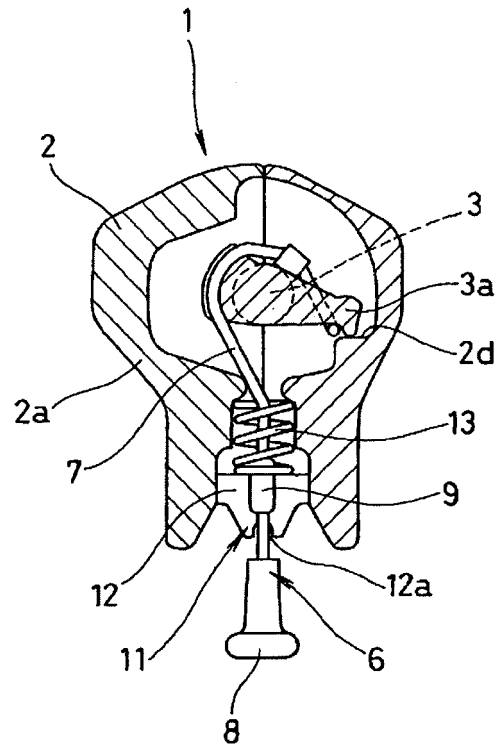


FIG. 6

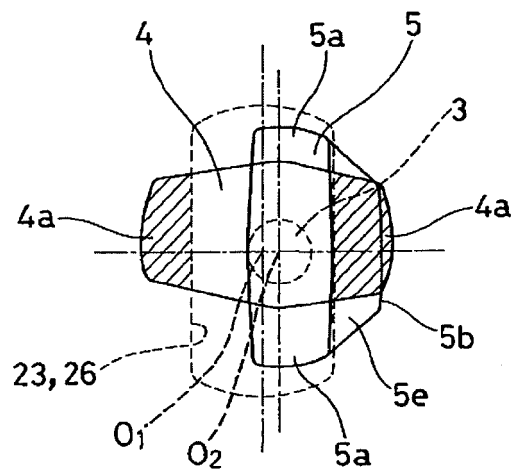


FIG. 7

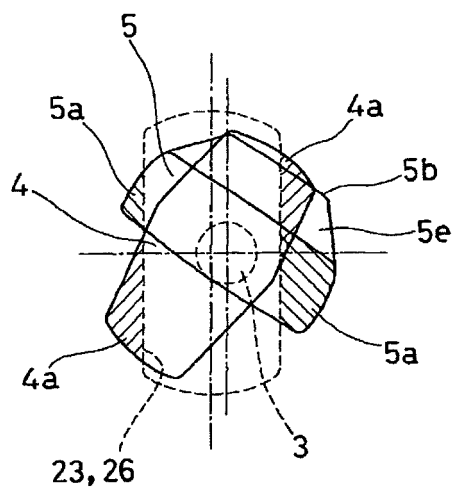


FIG. 8

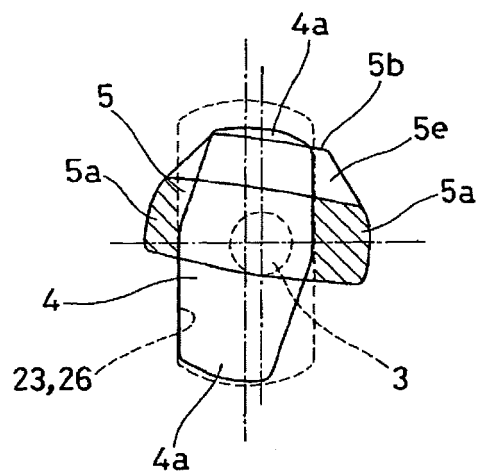


FIG. 9

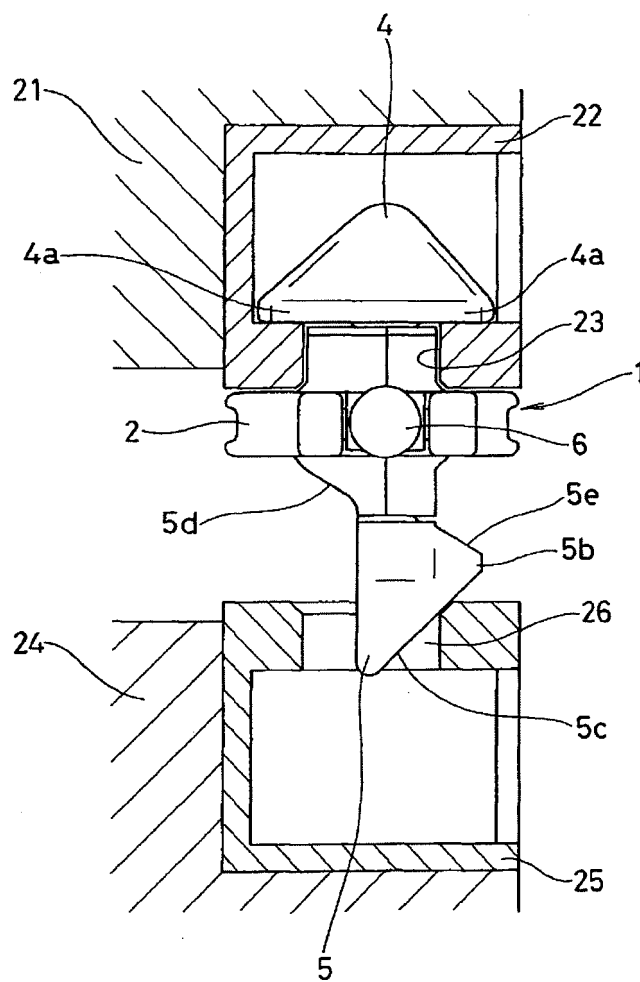


FIG. 10

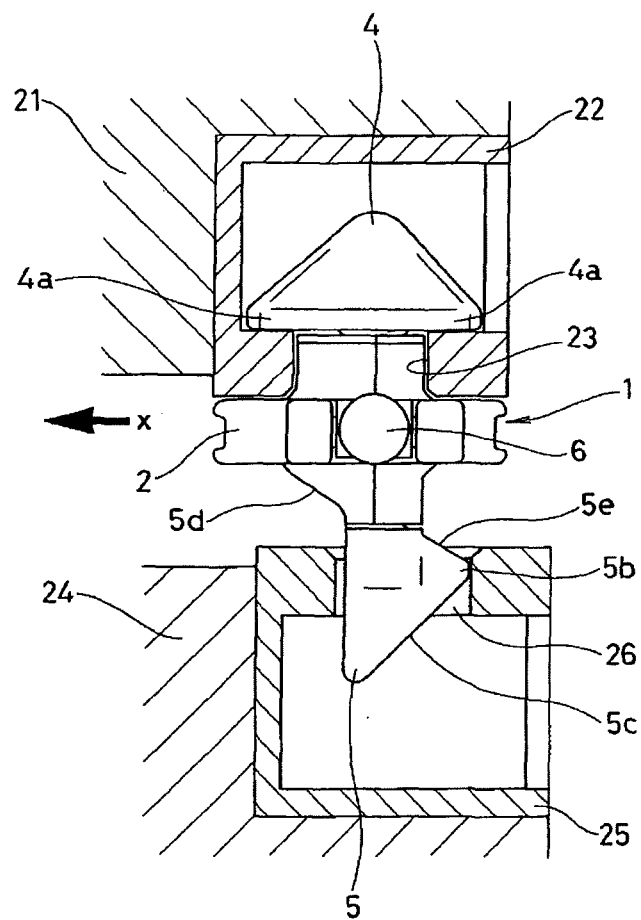


FIG. 11

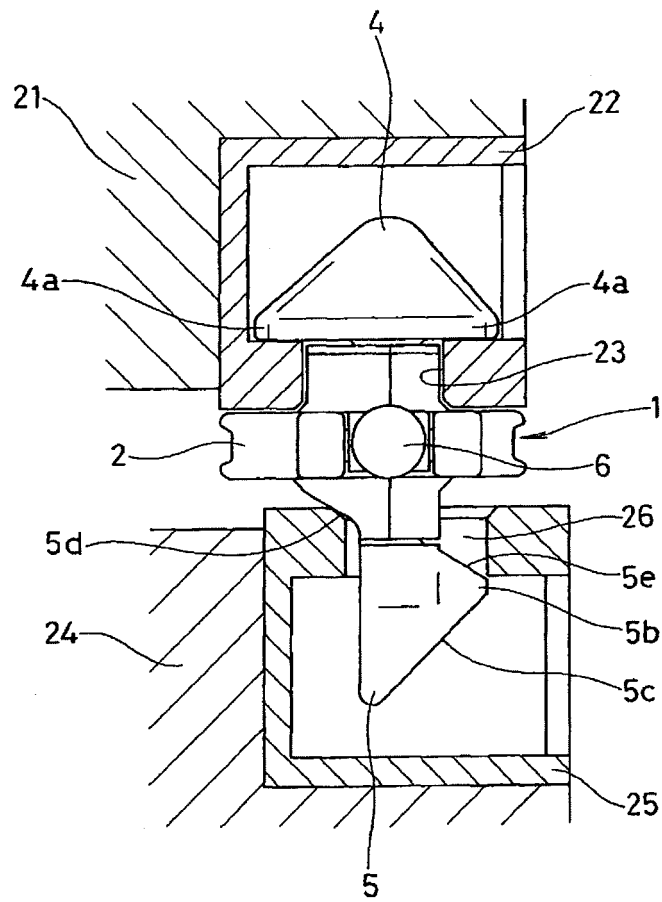


FIG. 12

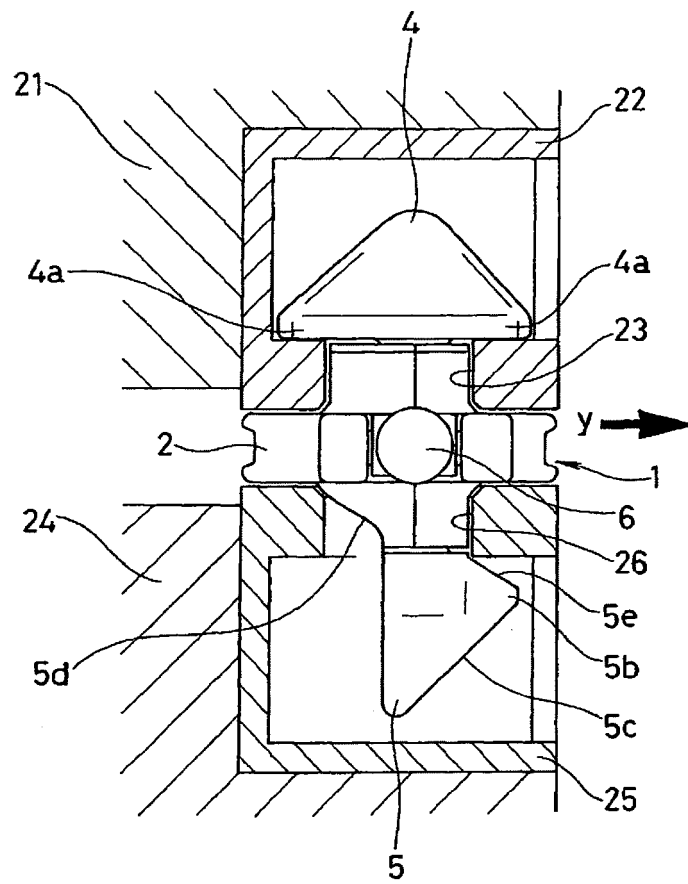


FIG. 13(A)

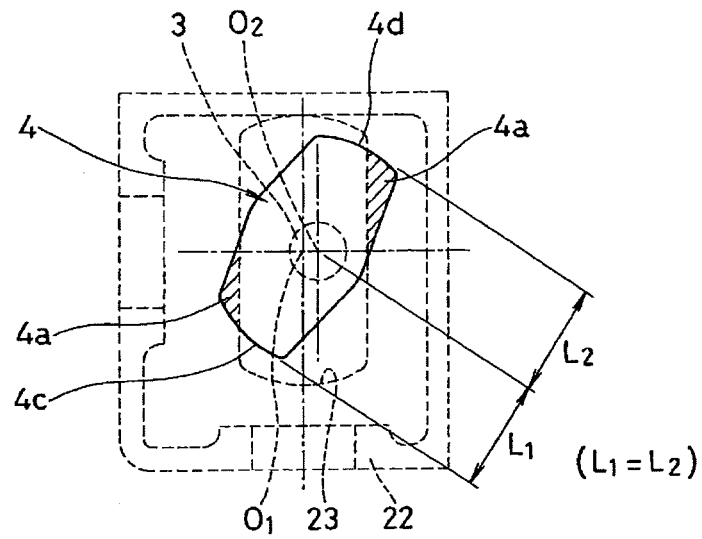


FIG. 13(B)

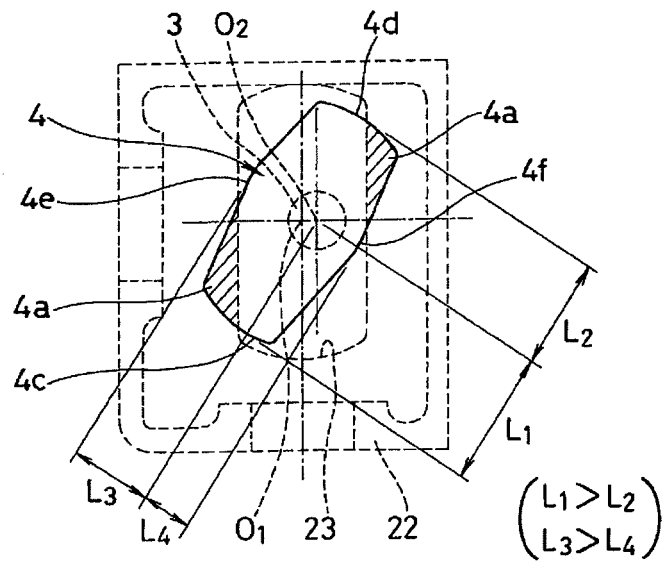


FIG. 14(A)

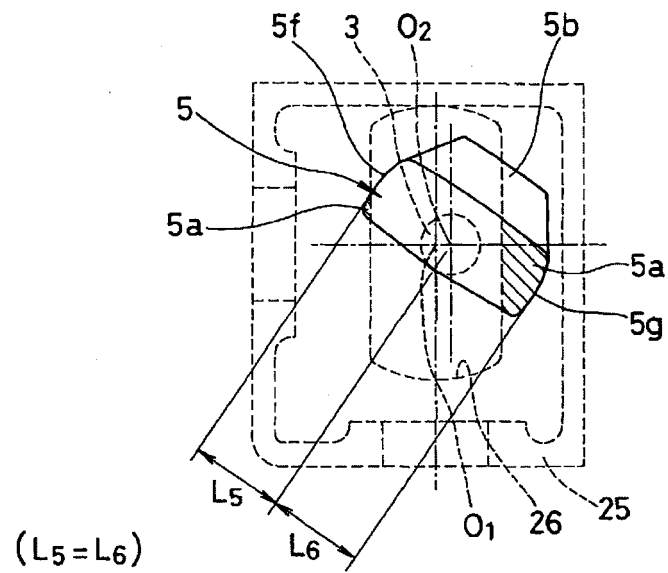


FIG. 14(B)

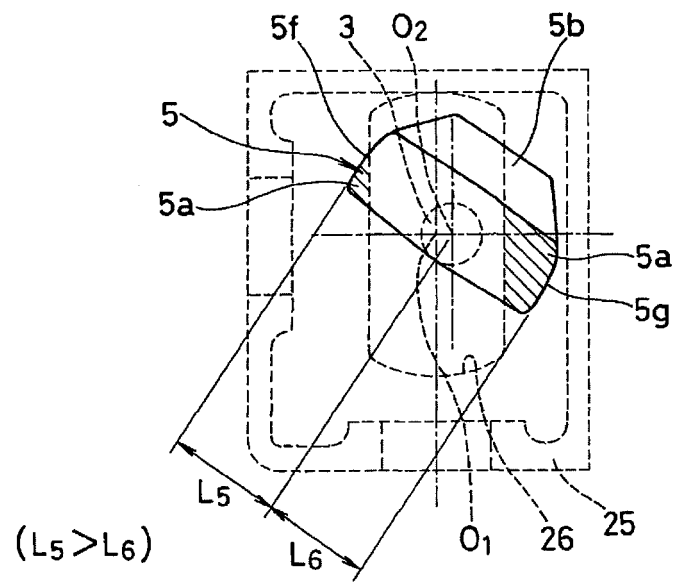


FIG. 15

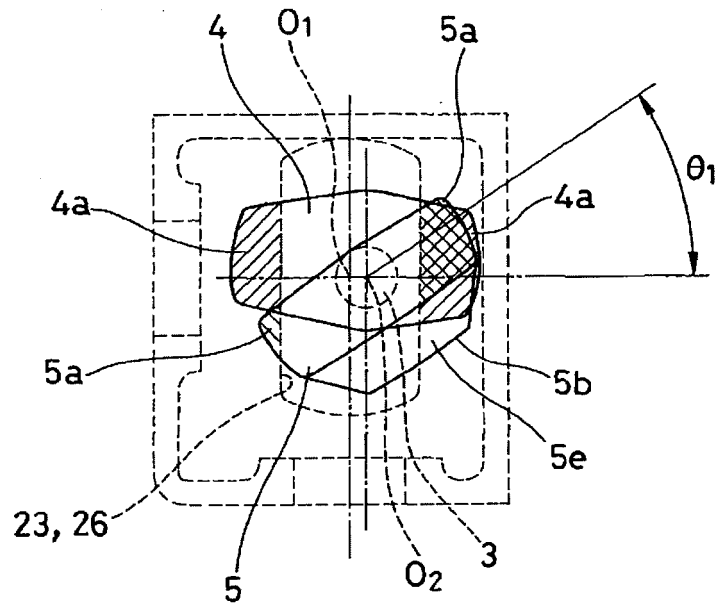


FIG. 16

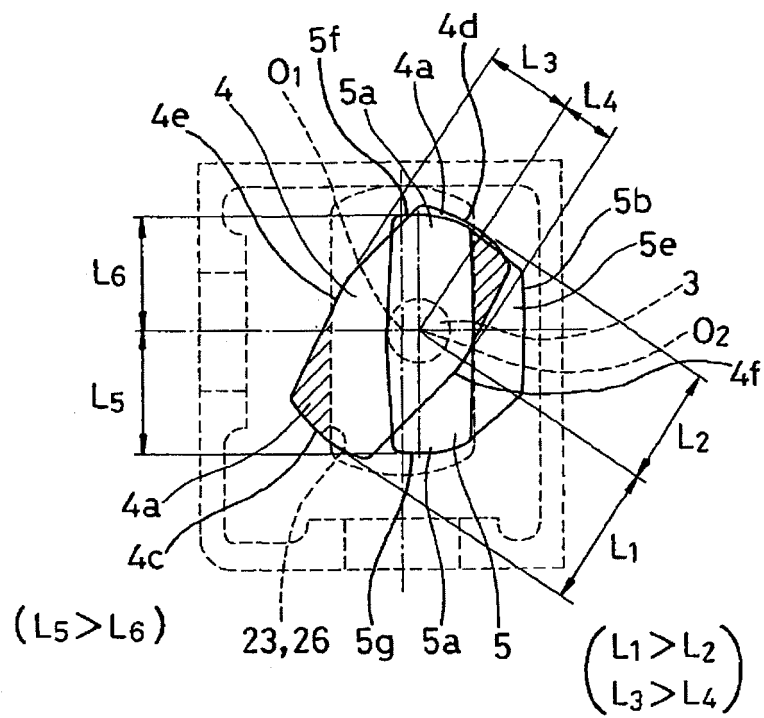


FIG. 17

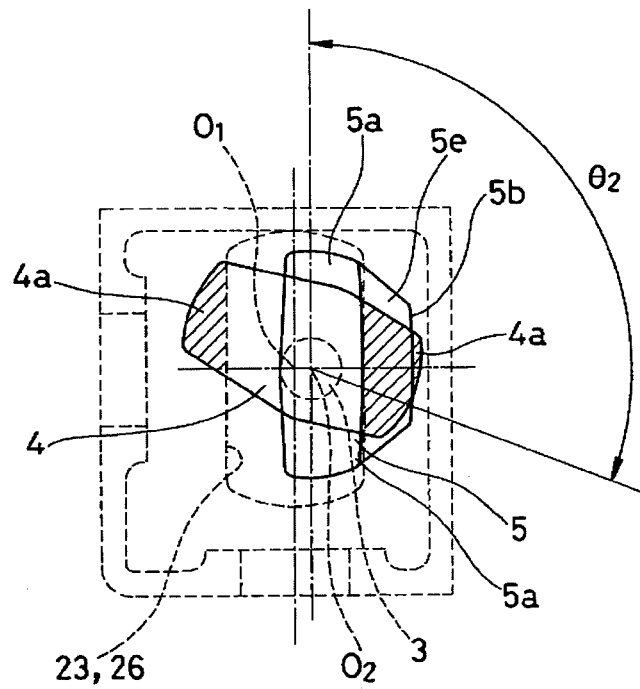
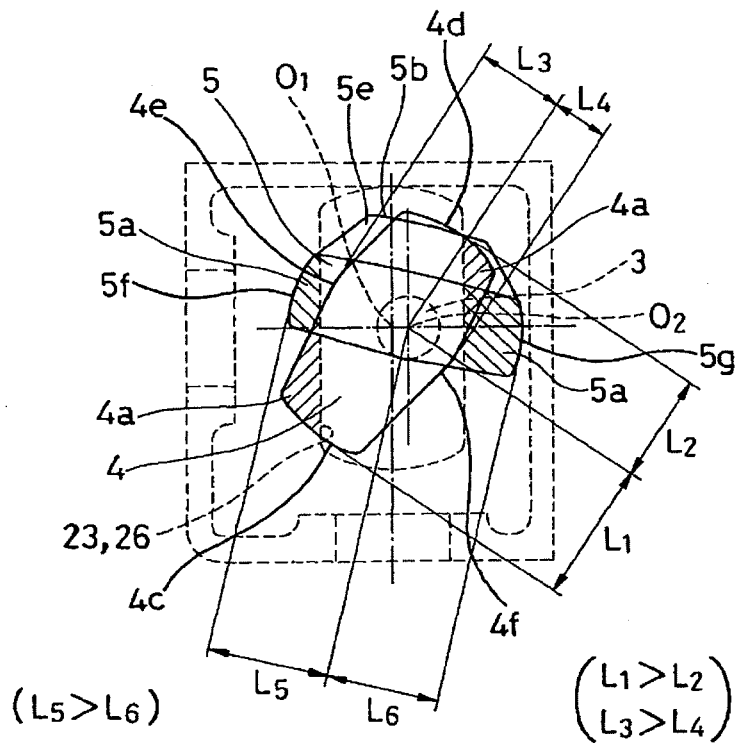


FIG. 18



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/073190

A. CLASSIFICATION OF SUBJECT MATTER

B65D88/12(2006.01)i, B63B25/00(2006.01)i, B65D90/00(2006.01)i

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)

B65D88/12, B63B25/00, B65D90/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2008
Kokai Jitsuyo Shinan Koho	1971-2008	Toroku Jitsuyo Shinan Koho	1994-2008

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.
A	JP 2006-76636 A (Taiyo Seiki Iron Works Co., Ltd.), 23 March, 2006 (23.03.06), Par. Nos. [0026] to [0034]; Figs. 1 to 9 (Family: none)	1-6
A	WO 2006/051781 A1 (Taiyo Seiki Iron Works Co., Ltd.), 18 May, 2006 (18.05.06), Par. Nos. [0004] to [0005], [0049] to [0059]; Figs. 10, 12 to 13 (Family: none)	1-6

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search
07 January, 2008 (07.01.08)Date of mailing of the international search report
15 January, 2008 (15.01.08)Name and mailing address of the ISA/
Japanese Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/073190

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 1996/015052 A1 (ALL SET MARINE LASHING AB.), 23 May, 1996 (23.05.96), Page 7, line 7 to page 9, line 14; Figs. 1, 4 to 6 & WO 1996/015053 A1	1-6
A	US 3368838 A (W. R. GRACE & CO.), 13 February, 1968 (13.02.68), Column 3, lines 4 to 67; all drawings & BE 699231 A & DE 1581134 B1 & FR 1524839 A & GB 1113549 A & NL 6707466 A	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 5023514 A [0002]