

METHOD AND COUPLING MEANS FOR LOCKING TOGETHER INTERMODAL CONTAINERS BEING TRANSPORTED ON A SHIP

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The object of the present invention is a method for locking together intermodal containers being transported on a ship, by means of the corner castings on the intermodal containers, whereby containers one above another are locked to each other by means of twistlocks to be fastened into the corner castings.

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On a cargo ship, intermodal containers are transported in a hold below hatch covers and also on deck on top of the hatch covers in a number of parallel rows and lines and also in a number of tiers one on top of the other. On deck are detachable hatch covers, with which the hold below is closed. The containers above deck are transported on top of the hatch covers. This application focuses on the transportation of intermodal containers on the deck of a cargo ship, but it is not limited to this.

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Intermodal containers have corner castings on all their eight corners, by means of which castings the containers can be locked to each other. Typically, two containers one above the other are locked to each other with twistlocks installed into the corner castings of the container. Twistlocks are disposed between the corner castings of two containers that are one above the other, and the twistlocks are locked into the holes in the horizontal surfaces of the corner castings.

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30 Twistlocks known in the art are disclosed in, *inter alia*, the following publications: EP0776302B1, DE10200401A1 and WO8907079A1.

Intermodal containers that are one beside another are not generally locked to each other at all. For special situations, however, devices for supporting against each other containers that are one beside another do exist. One possible solution is disclosed in specification EP 1194353 B1.

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At sea, large compression and tension forces are exerted on the twistlocks and on the corner castings of a container when the ship, and correspondingly a stack of containers on its deck, inclines. To
5 increase the transportation capacity of ships, it is endeavored to transport increasingly higher and heavier stacks of containers on deck on ships. The strength of twistlocks is, however, limited. A typical maximum permitted tension force in twistlocks is 250 kN. This imposes a limit on increasing the container stack size and also
10 on improving the efficient use of the ship.

The aim of the present invention is to provide a method for locking intermodal containers to each other in such a way that the locking will withstand a greater seaway-induced tension force than before,
15 in which case the number of intermodal containers being transported on a cargo ship can be increased. The method according to the invention is characterized by what is defined in independent claim 1. Preferred embodiments of the method are defined in the dependent claims 2-6.

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The aim of the present invention is to provide a coupling means implementing the method. The coupling means is characterized by what is defined in independent claim 7. Preferred embodiments of the coupling means are defined in the dependent claims 8-17.

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In the invention, therefore, the locking of two or more intermodal containers, which are one above another, one beside another and/or end-to-end, to each other at their corner castings is implemented with simultaneously two or more separate coupling
30 devices for increasing the total locking force.

The coupling method can be applied in such a way that between the corner castings of two intermodal containers that are one on top of the other is a twistlock installed according to current
35 practice, in addition to which a separate coupling means is installed into the gripping holes in the vertical front surfaces of the corner castings.

Alternatively, the coupling method can be applied in such a way that between the corner castings of two intermodal containers that are one on top of the other is a twistlock installed according to current practice, in addition to which a separate coupling means is installed into the gripping holes in the side surfaces of the corner castings.

Alternatively, the coupling method can be applied in such a way that between the corner castings of two intermodal containers that are one on top of the other is a twistlock installed according to current practice, in addition to which separate coupling means are installed into the gripping holes in the front surfaces and the side surfaces of the corner castings.

It is also possible to couple two containers one beside another and two containers one above another (four corner castings) together in such a way that twistlocks are installed between the corner castings of the containers that are one above the other, and in addition to this a separate coupling means is installed in the same corner castings, which coupling means is fastened into the gripping holes in the vertical surfaces of all four corner castings.

The operation of the method is contingent on the clearance between the twistlock and the support surfaces of the corner casting of the container being of substantially the same magnitude as the clearance between the coupling means and the support surfaces of the corner casting of the container, taking into account the structural flexibility and deformations of all these components, in particular when under tension loading. The dimensioning of the coupling means is therefore determined according to the dimensions of the twistlock and of the corner castings of the intermodal container. In this case the lifting force exerted from the upper container onto the lower container is distributed as evenly as possible between the twistlock and the coupling means.

The invention thus relates also to a coupling means that is fastened between the corner castings of intermodal containers that are one above another, one beside another and/or end-to-end in such a way that the coupling means bears the load between the corner castings, typically tensile stress, together with a second locking piece connected between the corner castings.

Alternatively, the object of the invention is a coupling means that is fastened between corner castings that are one above another in such a way that the coupling means bears the load between the corner castings, typically tensile stress, together with a twistlock connected between the corner castings.

One of the advantages of the invention that can be mentioned is that it enables the transportation of larger container loads than before on the deck of a ship, in which case the cargo capacity and cargo efficiency of the ship can be improved. The invention can be used with the intermodal containers and twistlocks currently in use. The coupling means according to the invention is structurally simple and operationally reliable.

In the following, the invention will be described in detail by the aid of some examples of its preferred embodiments with reference to the attached drawings, wherein

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Fig. 1 presents the corner castings of two containers that are one on top of the other, the castings being locked to each other with a twistlock in the conventional manner.

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Fig. 2 presents the same as Fig. 1, but now the corner castings are locked to each other also with a coupling means according to the invention via the gripping holes in the front surfaces of the corner castings.

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Fig. 3 presents the same as Fig. 1, but now the corner castings are locked to each other also with a coupling

means according to the invention via the gripping holes in the side surfaces of the corner castings.

5 Fig. 4 presents an embodiment wherein coupling means are installed into the gripping holes in both the front and the side surfaces.

10 Fig. 5 presents a cross-section of two corner castings one above the other, in the idle state, which castings are locked with a conventional twistlock and with a coupling means according to the invention.

15 Fig. 6 presents the same as Fig. 5, but when under tension loading.

Fig. 1 thus presents the corner castings of two intermodal containers that are one above the other. The upper corner casting 1 belongs to the upper container and the lower corner casting 2 to the lower container. The actual containers are not presented in these drawings but, as is known in the art, intermodal containers have a corner casting on each corner, by means of which casting the containers can be locked together by using a twistlock 3. The twistlock is used by means of an operating wire 4 in a manner that is *per se* known in the art. The twistlock 3 thus locks together the container corner castings 1, 2 that are one above another.

30 In addition, there are so-called gripping holes 5, 5'; 6, 6' in the flanks of the corner castings. The gripping holes marked with the reference number 5, 5' are situated on the ends of the container, in the so-called front surfaces, and the gripping holes marked with the reference number 6, 6' are situated on the long sides of the container, in the so-called side surfaces.

35 In Fig. 2 the corner castings 1, 2 are locked with a coupling means 7 according to the invention as well as with a conventional twistlock 3. The coupling means 7 has been installed between

gripping hole 5 in the front surface of the upper corner casting 1 and the gripping hole 5' in the front surface of the lower corner casting 2.

5 Also in Fig. 3 the corner castings 1, 2 are locked with a coupling means 7 according to the invention as well as with a conventional twistlock 3. In this case, the coupling means 7 has been installed between the gripping hole 6 in the side surface of the upper corner casting 1 and the gripping hole 6' in the side surface of the lower corner casting 2.
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Fig. 4, for its part, presents a combination of the solutions of Figs. 2 and 3, i.e. there are two units of coupling means 7, one between the gripping holes 5, 5' of the front surface, and one between the gripping holes 6, 6' of the side surface.
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Fig. 5 presents a cross-section wherein the corner casting 1 of the bottom corner of the upper container rests in the idle state on top of the body 8 of the twistlock, which in turn rests on top of the corner casting 2 of the top corner of the lower container. A coupling means 7 is installed into the gripping holes 6, 6' in the side surfaces of the corner castings 1, 2. The coupling means 7 rests supported on the inside surface 11 of the upper corner casting 1.
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In the idle state, a clearance A remains between the upper retaining clip 9 of the twistlock and the inside surface 11 of the upper corner casting and, correspondingly, a clearance B remains between the lower retaining clip 10 of the twistlock and the inside surface 12 of the lower corner casting 2. These clearances make the locking and opening of the twistlock in harbor possible. Furthermore, in the idle state, a clearance C remains between the bottom part of the coupling means 7 and the inside surface 12 of the lower corner casting 2. The dimensioning of the coupling means 7 is such that the clearance C equals the sum of the clearances A and B.
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Fig. 6 presents the tension loading of the arrangement according to Fig. 5, wherein tension is thus exerted in the direction of the arrow V. Tension loading can be produced e.g. when a ship inclines a sufficient amount at sea and the second edge of the upper container starts to rise upwards (container stack starts to fall). In such a case, the upper corner casting 1 lifts the twistlock 3 and the coupling means 7 upwards until they collide with the inside surface 12 of the lower corner casting 2. In this situation, the clearances A, B and C presented in Fig. 5 no longer exist, and movement of the upper corner casting 1 in relation to the lower corner casting 2 is prevented. The coupling means 7 is thus fastened between the corner castings 1, 2 in such a way that it bears the load between the corner castings, such as tensile stress, together with the twistlock 3 connected between the corner castings 1, 2. Since both the twistlock 3 and the coupling means 7 bear the load simultaneously, it is possible to increase the height and/or weight of a stack of containers compared to a conventional arrangement in which only a twistlock is used.

Presented above are embodiments in which the coupling means 7 is installed in the front surface or the side surface of the corner castings 1, 2, or in both these surfaces. There is also an option whereby two containers one beside another and two one above another are coupled together, in which case there are four units of corner castings in the same group, in such a way that between the corner castings of the containers that are one on top of the other is a twistlock installed according to current practice, and in addition to that a separate coupling means is installed into the same corner castings, which coupling means is fastened into the gripping holes on the vertical surfaces of all four corner castings.

The coupling means 7 according to the invention can thus be installed between the corner castings of intermodal containers that are one above another, one beside another and/or end-to-end. A coupling means can be fastened into the gripping holes 5, 5'; 6, 6' of a corner casting of an intermodal container by means of turnable locking elements or by means of fixed locking claws (not presented

in the drawings). The fastening can also be effected by means of magnets.

Furthermore, it is possible to provide the coupling means 7 with a support arm facilitating handling (not presented in the figures). The support arm can be fastened at one of its ends directly or indirectly to hull structures of the ship or to a lashing bridge. A coupling means provided with a support arm can transmit forces between an intermodal container and the hull structures of the ship or a lashing bridge.

A coupling means 7 is essentially a U-shaped part, the free ends of which are fastened into the gripping holes 5, 5'; 6, 6' of the corner castings of intermodal containers.

It is obvious to the person skilled in the art that the invention is not limited to the embodiments described above, but that it can be varied within the scope of the claims presented below. The need for using a coupling means 7 in different points of a stack of containers is determined, *inter alia*, on the basis of the height of the container stack and on the basis of the weight of the containers. Instead of steel, a coupling means can also be fabricated from a more flexible material, which must be taken into account when dimensioning the magnitudes of the clearances A, B and C. Furthermore, a coupling means can include a clearance adjustment property, implemented e.g. with a screw-like structure.

The characteristic features possibly presented in the description in conjunction with other characteristic features can also, if necessary, be used separately to each other.

CLAIMS

1. Coupling means (7) for locking to each other the corner
5 castings (1, 2) of intermodal containers being
transported on a ship, whereby intermodal containers
that are one on top of the other are locked to each other
with twistlocks (3), the coupling means (7) being
10 fastened into the gripping holes (5, 5'; 6, 6') in corner
castings, between the corner castings (1, 2) of
containers that are one above another and/or one
beside another, **characterized** in that in the idle state
the clearance between the twistlock (3) and the support
15 surfaces of the corner castings (1, 2) of the container is
of substantially the same magnitude as the clearance
between the coupling means (7) and the support
surfaces of the corner castings (1, 2) of the container.
2. Coupling means according to claim 1, **characterized** in
20 that between the upper retaining clip (9) of the twistlock
(3) and the inside surface (11) of the upper corner
casting (1) is a clearance (A), in that between the lower
retaining clip (10) of the twistlock (3) and the inside
surface (12) of the lower corner casting (2) is a
25 clearance (B), and in that between the bottom part of
the coupling means (7) and the inside surface (12) of
the lower corner casting is a clearance (C), in which case
the clearance (C) is substantially equal to the total of
clearances (A) and (B).
3. Coupling means according to claims 1 or 2,
30 **characterized** in that the coupling means (7) is
fastened between the corner castings (1, 2) in such a
way that it bears the load between the corner castings,
such as tensile stress, together with the twistlock (3)
35 connected between the corner castings (1, 2).

4. Coupling means according to any of claims 1-3, **characterized** in that the coupling means (7) is provided with a support arm for facilitating the handling of the coupling means.
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5. Coupling means according to claim 4, **characterized** in that the support arm is fastened at one of its ends directly or indirectly to hull structures of the ship or to a lashing bridge, whereby the coupling means (7) provided with the support arm transmits forces between an intermodal container and the hull structures of the ship or a lashing bridge.
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