

Device at cardeck for vehicles on ships.

5 The present invention relates to an arrangement
for cargo decks for vehicles on ships comprising a number of
hoistable deck sections that are so arranged as to be locked
respectively in a position in which they are vertically moved
apart and in a position in which they are vertically moved
10 together by means of locking devices with the ability to be
disengaged.

 When vehicles are loaded on so-called Ro-Ro
ships, use is also made of hoistable decks to enable vehicles
15 and other cargo on subjacent fixed decks to be loaded without
obstruction by superjacent decks in those cases in which the
cargo is exceptionally tall, as there would otherwise not be
space for it thereon, or if the load is exceptionally heavy so
that only the fixed deck is capable of withstanding the
20 aforementioned heavy load. If there are many low vehicles, which
are nevertheless heavy in weight, it is then not possible to
make effective use of the superjacent hoistable decks.

 The principal object of the present invention is
25 thus, inter alia, to solve the aforementioned problem and find
an arrangement which permits the handling of cargo in ships
regardless of its weight and size, including on hoistable
vehicle decks. It shall also be possible in this respect to
accommodate cargo of varying kinds, i.e. with regard to its size
30 and weight.

 The aforementioned object is achieved by means of
an arrangement in accordance with the present invention, which

is characterized essentially in that pairs or a multiplicity of hoistable deck sections are so arranged as to be accommodated packed closely together with one deck section resting on the subjacent hoistable deck section, whereby the aforementioned
5 closely packed deck sections interact with one another and in so doing increase the strength and reduce the bending flexure of the common deck unit formed in this way.

The invention is described below with reference
10 to the accompanying drawings, in which

Fig. 1 shows a cutaway view of a ship of a previously disclosed kind with the facility for loading and unloading vehicles in the entire internal cargo space of the ship;

15 Fig. 2 shows a schematic sectioned view of a ship with hoistable cargo deck sections in accordance with the present invention.

Fig. 3 shows a part of a cargo deck with hoistable deck sections packed together for the purpose in a
20 position in which they are ready to receive cargo; and

Fig. 4 shows locking means for the aforementioned hoistable deck sections included in the arrangement.

An arrangement 1 in accordance with the present
25 invention for cargo decks 2 for ships 3 comprising a number of vertically hoistable deck sections 4,5, which are so arranged as to be capable of being locked respectively in a position II in which they are vertically moved apart and in a position I in which they are vertically moved together by means of locking
30 devices 6 with the ability to be disengaged, has the pairs of hoistable deck sections 4,5 so arranged as to be capable of

being accommodated in a closely packed cargo position I. More specifically, the aforementioned hoistable deck sections 4,5 are so arranged as to be capable of being accommodated with one deck section 4 resting directly against the subjacent hoistable deck section 5. In this way, the aforementioned closely packed deck sections 4,5 are so arranged as to interact with one another as a common unit for taking up the cargo and, in so doing, increasing the strength and reducing the bending flexure of the common deck unit 7 formed in this way. The aforementioned double deck unit 7 is situated at a distance A from subjacent fixed vehicle cargo decks 2 in order to facilitate the parking of vehicles 100 and/or other cargo thereon beneath the aforementioned double deck unit 7.

Illustrated by arrows in Fig. 1 are different ramps and decks in and respectively on the ship, and broken lines are used in the middle area of the ship to show how hoistable vehicle decks can be arranged.

The packed and mutually interacting deck sections 4,5, which consist of at least two pieces, are in contact with one another in the intended assembled position I, i.e. one on top of the other one at a time at a mutual distance from one another viewed in the horizontal direction H, in conjunction with which the upper deck section 4 is supported on the subjacent deck section 5, for example on half of its beam span, or the upper deck section 4 is supported closely against the subjacent deck section 5 along the whole of its beam span.

Closely packed deck sections 4,5 are so arranged as to be capable of being connected to one another permanently or detachably, for example by welding, riveting, gluing, with bolted joints or with detachable fixing joints of a kind other

than bolts. The aforementioned joints are not shown in the drawings, however.

Each of the aforementioned hoistable deck sections 4,5, which are hoistable by means of cables (also not shown here) and/or a number of jacks, and which are lockable vertically V by means of remotely operated locking devices 6 in the form of stops capable of lateral displacement, can be so arranged as to exhibit its own top plate 8,9. In this case, the deck section 4, which is situated at the top of the stack of the aforementioned mutually interacting deck sections 4,5, preferably exhibits thicker plate than exhibited by the one or more subjacent deck section or deck sections. In this case, the aforementioned deck sections can be formed by beams with connecting plates, and of which at least the plates can consist of aluminium. It is also possible to cause the dimensions of the secondary beams, which support the plate on an upper deck section, to be increased in relation to the secondary beams of the other subjacent deck sections.

Locking devices 6 can preferably be formed from stop heels pivotally mounted about an articulation 10, which heels are attached to cables 11 which run from an attachment 12 on the aforementioned stop heel 6 and around guides 13,14 to the intended operating point 15 at a distance from the aforementioned stop heels 6. Cables are connected by means of attachment devices 16 to attachments 17 on the side of the intended cargo space 18 and the movement path of the cargo deck section.

Through the interaction of two or more vehicle deck sections 4,5 with one another, the strength of the vehicle deck 2 can be increased and the bending flexure can be reduced

in this way. That is to say, the bearing capacity of the vehicle deck sections is increased if they interact. Interaction is achieved by causing a number of points along the upper and lower structural beams to be in close contact with one another. In the event of loading of the upper section 4, the subjacent section 5 thus also obtains support along the entire vehicle deck area.

The degree of interaction is determined by the intensity of the contact of the sections 4,5 with one another and the relative rigidity of the sections 4,5. Let us assume that the upper section 4 will be subjected to an essentially distributed load, and that the subjacent section 5 provides support only on half of the beam span, and that the sections 4,5 have the same relative rigidity. 25% of the total moment will then be absorbed by section 4, and the remaining 75% by section 5. If the structural beams lie close to one another along the entire span, a doubled bearing capacity will be obtained in the case of equally large structural beams in both sections 4,5. The more the points of contact, the greater the transfer of support as a rule.

Total interaction of two or more vehicle deck sections is obtained, as mentioned above, if they are attached to one another along the structural beams by welding, riveting, bolting or locking by some other means. In this case, the construction forms a unit of the kind encountered in a sandwich construction. The consequence of this would be for a new structural beam to have been created with changed cross-sectional values for the moment of resistance and the moment of inertia. The total bearing capacity of such a construction would be further increased in relation to the above-mentioned

detachable interaction. The ability to have such a construction executed in aluminium would significantly reduce the total weight of the formed vehicle deck.

5 The invention is naturally not restricted to the
embodiments described above and illustrated in the accompanying
drawings. Modifications are possible, in particular with regard
to the nature of the various parts, but without departing from
the area of protection afforded to the invention as defined in
10 the Patent Claims.

P a t e n t C l a i m s

5 1. Arrangement (1) for cargo decks (2) for
vehicles (100) on ships (3) comprising a number of hoistable
deck sections (4,5) that are so arranged as to be locked
respectively in a position in which they are vertically moved
apart and in a position in which they are vertically moved
10 together by means of locking devices (6) with the ability to be
disengaged, **characterized in that** pairs or a multiplicity of
hoistable deck sections (4,5) are so arranged as to be
accommodated packed closely together with one deck section (4)
resting on the subjacent hoistable deck section (5), whereby the
15 aforementioned closely packed deck sections (4,5) interact with
one another and in so doing increase the strength and reduce the
bending flexure of the common deck unit (7) formed in this way.

 2. Arrangement in accordance with Patent Claim 1,
characterized in that packed and mutually interacting deck
20 sections (4,5) are in contact with one another one at a time at
a mutual distance from one another viewed in the horizontal
direction.

 3. Arrangement in accordance with Patent Claim 2,
characterized in that the upper deck section (4) is supported on
25 the subjacent deck section (5) on half of its beam span.

 4. Arrangement in accordance with Patent Claim 1,
characterized in that the upper deck section (4) is supported
closely on the subjacent deck section (5) along the whole of its
beam span.

30 5. Arrangement in accordance with one of the
foregoing Patent Claims, **characterized in that** closely packed

deck sections (4,5) are so arranged as to be capable of being connected to one another permanently or detachably, for example by welding, riveting, gluing, with bolted joints or with detachable fixing joints of a kind other than bolts.

5 6. Arrangement in accordance with one of the foregoing Patent Claims, **characterized in that** each of the aforementioned hoistable deck sections (4,5) exhibits its own top plate (8,9), and in that the deck section (4) which is situated at the top of the stack of the aforementioned mutually
10 interacting deck sections (4,5) exhibits thicker plate (8) than the plate (9) of the subjacent deck section (5).

 7. Arrangement in accordance with one of the foregoing Patent Claims, **characterized in that** the deck sections (4,5) are formed by beams with connecting plates (8,9).

15 8. Arrangement in accordance with Patent Claim 7, **characterized in that** at least the plates (8,9) consist of aluminium.

 9. Arrangement in accordance with one of the foregoing Patent Claims, **characterized in that** the deck sections
20 (4,5) are hoistable by means of cables (11) and/or a number of jacks and are lockable vertically (V) by means of remotely operated locking devices (6) in the form of stops (6) capable of lateral (H) displacement.

 10. Arrangement in accordance with Patent Claim
25 9, **characterized in that** the aforementioned locking devices (6) are formed from pivotally mounted stop heels (6) which are attached to cables (11) running down to the intended operating point (15) at a distance from the aforementioned stop heels (6).