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MULTIPLE-hulled marine craft

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The invention relates to a multiple-hulled marine craft comprising at least two hulls which extend in the direction of travel of the craft, said hulls being arranged spaced apart from and substantially parallel to one another; a connection structure which connects the floats together at the top, and which has, at a bottom thereof, a transverse deck disposed above the waterline; and at least one closable opening located in the transverse deck and closable in a water-tight and gas-tight manner by a movable plate arrangement.

A multiple hulled marine craft of this kind is known from US Patent 3 677 212 which is principally concerned with a submersible craft.

The present invention is however particularly concerned with a catamaran-type air cushion craft comprising two hulls or floats which extend in the direction of travel and are arranged spaced apart parallel to one another, with the cross-section of the floats becoming broader from the bottom upwardly, and with the floats being connected rigidly together at the top via a deck structure; front and rear resilient skirts arranged between the floats which extend at least approximately to the water surface and, together with the floats, bound an air chamber between the base of the deck structure and the water surface; main propulsion units which drive thrust means arranged in the stern region of the floats; and fans which blow air sucked in from the outside into the bounded air chamber beneath the base of the deck structure to lift the marine craft from travel in the displacement mode to travel in the hovercraft mode.

With catamaran type air cushion craft of this kind the

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problem frequently exists of dropping articles, for example oceanographic probes or buoys from the interior of the ship into the water. Under certain circumstances the requirement can also exist to take articles from the surface of the water into the interior of the ship.

The object of the present invention is to provide a multiple hulled marine craft of the initially named kind which is formed as an air cushion craft operatable both in a displacement mode and in a hovercraft mode in which articles can be dropped without problem and substantially invisibly from the outside into the water, or optionally taken out of the water, and indeed both in the displacement mode and in the hovercraft mode without disadvantageously affecting the air cushion pressure in the hovercraft mode.

In order to satisfy this object the invention provides that the craft is an air cushion craft, that the dimensions of said opening correspond to the horizontal cross-section of a container which has an open base, which is arranged above the opening in vertical alignment therewith and which contains an air-tight chamber, and that said container is connected at its lower edge with support parts of the connection structure via releasable sealing means.

The inventive thought is thus to be seen in the fact that one provides a closable opening opening in the lowermost deck between the floats with the opening into the air chamber above the water surface between the floats. In this way articles can be conveyed in the vertical direction from the body of the craft into the water, or in the opposite direction, without being visible from the outside, and largely unhindered by movements of the water surface which are too strong or by adverse weather. When the plate arrangement is closed the hovercraft mode of operation is

not hindered in any way.

Moreover, it is also possible to open the plate arrangement and to drop articles into the water during operation of the craft in the hovercraft mode, i.e. not only during travel in the displacement mode, since the air-tight chamber which is open at the base is provided above the opening, with the lower edge of the chamber being sealingly connected all around the opening with the marginal regions of the transverse deck which surround the opening. In other words, in this embodiment, the chamber containing the articles which are to be dropped or are to be picked-up is included in the air cushion pressure chamber beneath the craft.

Furthermore, the releasable nature of the sealing means makes it possible to interchange the container containing the droppable articles without problem.

In order to have adequate free space available the opening should in particular be rectangular. Its preferred cross-section amounts approximately from 3 to 7 m x 2 to 3m.

The invention is in particular preferably used in an air cushion craft such as is described in the simultaneously filed patent application entitled "Catamaran-type marine craft" of the same applicants, i.e. British Patent Application No. 86 11011, publication number GB-A-2 174 956. Here the two floats are connected rigidly at the top by trussed girders on which standardised containers containing the inbuilt structure of the ship and passage elements are suspended. In this arrangement the entire connection structure lies above the floats.

A practical embodiment of the invention is characterised in that said sealing means comprise an inflatable sealing hose

which extends all around and surrounds said lower edge of the container, is arranged in a peripheral groove of said support parts surrounding the opening, and in an inflated state, sealingly contacts all around an outer peripheral sealing counterflange of the lower edge of the container.

Moreover, bearing blocks are preferably provided which hold the container at a front and a rear end thereof on said connection structure.

By releasing the sealing means and the securing of the container to the bearing blocks the container can easily be removed from the body of the ship and replaced with another correspondingly constructed container with droppable articles suspended therein.

The bearing blocks are preferably shock-damped. Thus, apart from the sealing means special securing means are also provided, which are preferably constructed in the same way as in the afore mentioned parallel application of the same date.

In a particularly advantageous constructional embodiment the plate arrangement consists of two flaps which are preferably pivotable downwardly and outwardly about pivot axles pointing in the longitudinal direction of the craft. As a result of this construction the air and if required also the water resistance of the outwardly pivoted flaps is negligible so that the travelworthiness of the marine craft is not impaired when the flaps are pivoted outwardly.

Since the chamber cannot normally be entered from the outside because of the pressure prevailing therein, and because of the continuous opening at the base a further embodiment of the invention provides that suspension

devices, which are preferably releasable by a control device arranged outside of the chamber, are provided in the chamber for articles which can be dropped through the opening.

The articles which are to be dropped and which have already been inserted prior to installing the container in the craft can thus be released without problem from outside of the chamber from the suspension devices after the flaps closing the opening have been moved away.

An opening is advantageously only arranged in the sternmost third of the craft, where the water surface between the floats is in general already very calm. Moreover, the opening should be arranged in a catamaran at the centre of the craft.

It is particularly preferred for the floats to have adequate height above the displacement waterline so that in the downwardly pivoted state the pivotal flaps are still spaced by a substantial distance of for example 2 m from the water surface. The outwardly pivoted flaps should thus only come into contact with the water surface in exceptional cases during travel in the displacement mode, i.e. with very heavy seas, but not otherwise.

The invention will now be described in the following with reference to the drawings which show:

Fig. 1 a schematic cross-section of a multiple hulled marine craft in accordance with the invention equipped with two floats or hulls, and

Fig. 2 the section II of Fig. 1 to an enlarged scale.

As seen in Fig. 1 the catamaran-type air cushion craft of

the invention, which has air cushion sealing skirts which are not shown at the stem and at the stern, has two hulls or floats 311 extending parallel to one another. During hovercraft operation the floats have the hovercraft waterline 327, which lies near to the bottom end of the floats 311. During displacement operation the floats 311 submerge into the water up to the displacement waterline 328. In the region of the displacement waterline 328 the floats have an inwardly directed step 329 so that in the upper half they are approximately twice as broad as they are beneath it.

The air cushion chamber 310 is thus bounded by the floats 311, by the non-illustrated skirts which extend between the floats, by the transverse deck 312 and by the waterlines 327 and 328 respectively.

The floats 311 are fixedly connected together at specific longitudinal spacings by transverse trussed girders between which standardised containers 318' are secured. The transverse trussed girders 330 lie with their lower side on the upper side of the floats 311 and are in particular rigidly connected with the bulkheads of the floats. Moreover, passageway elements 331 representing horizontal communication paths extend in and between the transverse trussed girders 330, but are only schematically illustrated in Fig. 1.

Inside the containers 318' one finds the usual inbuilt structures of a ship including the crews chambers. Auxiliary engines or other units 333 can be accommodated in the lateral regions alongside the standardised containers 318' arranged above the floats 311. The main propulsion units are located in the upper broader region of the floats 311. A bridge module 334 is mounted at the top on the connection

structure formed by the transverse trussed girders 330.

As seen in Figs. 1 and 2 a rectangular opening 313 is located in the transverse deck 312 in the sternmost third of the connection structure between two sequential transverse trussed girders 330. The transverse deck 312 closes off the connection structure formed by the transverse trussed girders 330 at the bottom in water-tight and air-tight manner. Pivot axles 324, on which pivotal flaps 314 are arranged, point in the longitudinal direction of the ship and are disposed at both sides of the opening 313. The flaps 314 can be selectively pivoted by hydraulic cylinders 335 braced against the transverse deck 312 into the sealed closed position illustrated in solid lines in Fig. 2, or can be pivoted downwardly into the open position shown in broken lines in Fig. 2 in which they project downwardly away from the transverse deck 312.

Support parts 321 are arranged on the transverse trussed girders 330 all around the opening 313 with the transverse deck 312 being arranged beneath the support parts 321. The support parts 321 surround the rectangular opening 313.

A peripheral groove 322 is provided at the inner periphery of the support parts 321 and an inflatable sealing hose 320 is located all around the peripheral groove and can be connected via pneumatic or hydraulic lines 336 and non-illustrated valves to a pressure source.

The lower edge 316 of a standardised container 318 is arranged above the opening 313 within the chamber defined by the ring seal hose and is distinguished from the other containers 318' in that its base 319 is open. Seal counter-surfaces 323 are provided all around the lower edge 316 and come to lie horizontally opposite to the ring seal

hose 320 in the installed state of the container 318. The container 318 is held at the front and at the rear on the connecting structure via bearing blocks (not shown) which are shock-damped.]

In the illustrated installed position of the container 318 its internal chamber 315 is sealed off in pressure-tight manner against the remaining parts of the connection structure. The chamber 315 is connected pressurewise with the air cushion chamber 310 between the floats 311 and below the transverse deck 312.

The pivot axles 324 of the pivotable flaps 314 are secured to the marginal regions 317 of the transverse deck 312 which surround the rectangular opening 313.

Suspension devices 325 on which articles, for example measuring buoys 337 or measuring probes 338, are suspended are provided inside the container 318, preferably in the region of its ceiling. The suspension devices 325 can be remotely operated from outside of the container 318 so that the articles 337, 338 are released from them and can fall through the freed opening 313 past the outwardly pivoted pivotal flaps 314 into the water.

If required lifting devices could also be provided inside the container 318 by means of which sensitive articles could be slowly dropped through the opening 313 into the water, or could if necessary also be picked-up out of the water.

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claims:

1. A multiple-hulled marine craft, comprising: at least two hulls which extend in the direction of travel of the craft, said hulls being arranged spaced apart from and substantially parallel to one another; a connection structure which connects the floats together at the top, and which has, at a bottom thereof, a transverse deck disposed above the waterline; and at least one closable opening located in the transverse deck and closable in a water-tight and gas-tight manner by a movable plate arrangement, characterised in that the craft is an air cushion craft; in that the dimensions of said opening correspond to the horizontal cross-section of a container which has an open base, which is arranged above the opening in vertical alignment therewith and which contains an air-tight chamber; and in that said container is connected at its lower edge with support parts of the connection structure via releasable sealing means.
2. A marine craft in accordance with claim 1, characterised in that said opening is rectangular.
3. A marine craft in accordance with claim 1 or claim 2, characterised in that said sealing means comprise an inflatable sealing hose which extends all around and surrounds said lower edge of the container, is arranged in a peripheral groove of said support parts surrounding the opening, and in an inflated state, sealingly contacts all around an outer peripheral sealing counterflange of the lower edge of the container.
4. A marine craft in accordance with claim 1, characterised



by bearing blocks which hold the container at a front and a rear end thereof on said connection structure.

5. A marine craft in accordance with claim 4, characterised in that said bearing blocks are shock-damped.
6. A marine craft in accordance with claim 1, characterised by suspension devices in said container for articles to be dropped through the opening, and a control device arranged outside said chamber for releasing said suspension devices.
7. A marine craft in accordance with one of the preceding claims, characterised in that the plate arrangement consists of two flaps which are preferably pivotable about pivot axles disposed parallel to the longitudinal direction of the craft.
8. A marine craft in accordance with claim 7, characterised in that the pivotable flaps still have a substantial distance from the water surface in the outwardly pivoted state.
9. A marine craft in accordance with one of the claims 7 or 8, characterised in that both flaps are of the same size and sealingly contact one another at the centre of the opening in the closed state.
10. A marine craft in accordance with one of the preceding claims, characterised in that the opening is arranged in the sternmost third of the craft.
11. A marine craft in accordance with one of the preceding claims, characterised in that in a catamaran the opening is arranged at the centre of the craft.



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12.A marine craft substantially as herein described with reference to and as illustrated in the accompanying drawings.
