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• **DE LEON GARCIA, Alfonso**
E-15004 A Coruña (ES)
• **LÓPEZ PEREA LLOVERES, Vicente**
E-15004 A. Coruña (ES)

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(74) Representative: **de Justo Vázquez, Jorge M. et al**
Jacobacci & Partners
M. & J. de Justo
Castellana 128
28046 Madrid (ES)

(71) Applicant: **Kafloat S.L.**
15004 Coruña (ES)

(72) Inventors:
• **ALONSO ORMAECHEA, Victor**
E-28760 Madrid (ES)

(54) **FLOTATION DEVICE, METHOD OF MOUNTING SAME AND OPERATION THEREOF**

(57) Flotation device which comprises an exterior receptacle which is designed to be supported on the external surface of a ship, cargo container or floating structure in such a manner that it extends substantially within the ship, cargo container or floating structure, leaving its open end oriented toward the outside; and, inside of said exterior receptacle, an interior receptacle whose open end corresponds to the open end of said exterior receptacle and which houses inflatable means and expulsion means for expelling said inflatable means from the open end of said interior receptacle following the activation of the flotation device of the present invention.

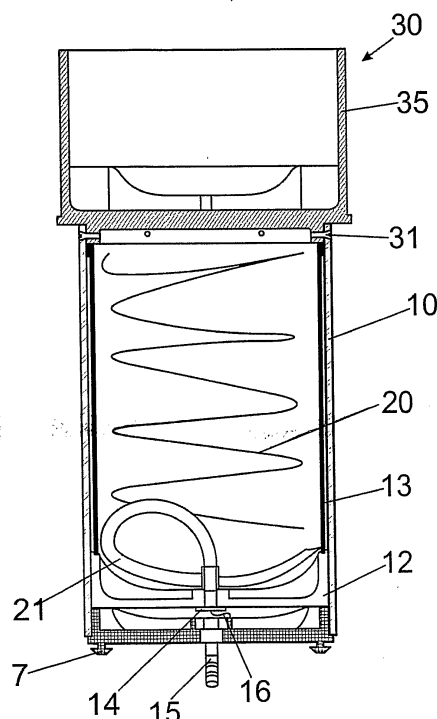


FIG.3

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a flotation device and to a method of mounting same, as well to the operation of same.

[0002] Said flotation device is designed to be housed in the interior of ships, cargo containers or floating structures in such a manner that, in emergency situations in water, the activation of said flotation device reduces the danger of sinking of the ship, cargo container or floating structure while significantly improving its buoyancy.

[0003] More particularly, the invention is such that it comprises inflatable means housed in the interior of a receptacle integrated in the body of the ship, cargo container or floating structure. The inflatable means are expelled to the exterior by means of thrust means following the breaking of an external cover of said receptacle, with the inflatable means being inflated subsequently in order to improve the buoyancy of the ship, cargo container or floating structure to be protected.

[0004] The field of application of the invention lies primarily within the maritime and fluvial industry, with one or more of the flotation devices being used to protect vessels such as ships, recreational and/or fishing vessels and the like or floating structures such as oil platforms, piers and the like.

[0005] The flotation device according to the invention is also designed for the cargo containers usually carried on the aforementioned ships and floating structures.

[0006] Likewise, said floating device optionally forms part of a more complex global system designed, to keep a ship, cargo container or floating structure afloat, comprising, for example, in addition to the flotation device according to the invention, a module for detecting hazardous situations and/or an activation control module.

[0007] Use of the flotation device of the present invention in non-aquatic means of transport such as airships is not ruled out.

BACKGROUND OF THE INVENTION

[0008] The sea, lakes and some riverbeds are and have been widely used for such activities as fishing and the transport of people and goods.

[0009] Nonetheless, being on and moving across waters is not without hazards, with the most important danger being that of the sinking of the vessel and the cargo as a consequence of the appearance of a water opening or inlet, collision, leaks, running aground, capsizing, etc.

[0010] For this reason, various devices have been developed recently which are designed to reduce these risks, primarily by activating mechanisms which, in certain hazardous situations, increase the buoyancy of the ship, cargo container or floating structure to be protected, making it more difficult for it to sink. The majority of these devices function in a mechanical and/or hydraulic man-

ner.

[0011] In particular, flotation devices which turn out to be of particular interest are ones that are constituted by mechano-hydraulic elements that are housed in the interior of a ship, cargo container or floating structure to be protected and that, in the event of an emergency, improve the buoyancy by inflating some inflatable means, with said inflatable means being arranged initially in the interior of a receptacle.

[0012] The devices described in the previous paragraph are relatively novel. What is more, the majority of the studies carried out in this area are more of a theoretical than practical nature, and there is still the need to develop flotation devices which overcome the primary disadvantages and difficulties associated with the current technology, namely:

First of all, in order to achieve the necessary watertightness, the flotation devices need to be adapted in a precise manner to the specific contours of the ships or cargo containers in which they are to be housed, with said ships or cargo containers taking on a great variety of different practical forms.

[0013] Accordingly, it is necessary in many cases that said devices be designed specifically for each ship, cargo container or floating structure in which they are to be housed. Moreover, in the case of ships, the design of the flotation device does not only vary as a function of the ship in question, but rather it also depends on the exact location in which the flotation device is to be housed within the hull of same. All of this makes difficult the industrial-scale production of versatile flotation devices applicable to ships or cargo containers of very different profiles.

[0014] Another significant problem arises upon achieving an effective inflation of the inflatable means of the flotation device. In order to optimize the inflation, it is important that said procedure take place only once the process of the expulsion of the inflatable means has been completed and that said inflatable means are located outside the device. Otherwise, premature inflation of the inflatable means on the inside of the structural receptacle may lead to undesired results such as, for example, possible deformations of the inflatable means.

[0015] On the other hand, there is still the problem of guaranteeing that, once inflated, the pressure in the inflatable means will be maintained for an adequate period of time in order to avoid a poor functioning of the system. Accordingly, if the pressure in the interior is too low, the buoyancy of the device is compromised. By contrast, if said pressure is too high, the risk of damage to the inflatable means and even a possible deformation or rupture of same increases.

[0016] A system for maintaining ships afloat which includes, among other components, one or more buoyancy devices, is described in ES2163958, in the name of this same applicant. In this document, the question of how to achieve a versatile device which is applicable to multiple

ships and/or cargo containers of different shapes is not addressed specifically, nor how to achieve the correct pressure of the pressurized fluid inside the inflatable means. Moreover, the thrust means of said buoyancy device, which expel the inflatable means to the exterior, are activated by means of a first feed circuit, whereas the inflation of the inflatable means is performed using a second feed circuit different from the aforementioned, one.

SUMMARY OF THE INVENTION

[0017] The present invention addresses the difficulties described in the foregoing by providing a new flotation device.

[0018] Basically, the flotation device of the present invention comprises an exterior receptacle which is designed to be supported on the external surface of the ship, cargo container or floating structure to be protected such that it extends substantially inside the ship, cargo container or floating structure to be protected, leaving its open end oriented toward the outside of the ship, cargo container or floating structure to be protected; and inside of said exterior receptacle, the flotation device of the present invention comprises an interior receptacle whose open end corresponds to the open end of said exterior receptacle and which houses inflatable means and expulsion means in order to expel said inflatable means from the open end of said interior receptacle following the activation of the flotation device of the present invention.

[0019] The flotation device of the present invention shall be supplemented with a source of pressurized fluid which can be connected to said exterior receptacle by means of one-way valve means in order to provide fluid to said inflatable means following the activation of the flotation device of the present invention and hence to inflate them in order to increase the buoyancy of the ship, cargo container or floating structure to be protected.

[0020] To be precise, in the flotation device of the present invention, said exterior receptacle comprises fastening means which fix said interior receptacle in position, and said interior receptacle comprises anchoring means for the anchoring of said fastening means, closure means which close off the open end of said interior receptacle, expulsion means capable of sliding toward the exterior of the open end of said interior receptacle and making said closure means break, inflatable means taken up in the cavity of said expulsion means and feeding means designed to conduct fluid to the interior of said inflatable means; with the following special features:

- said exterior receptacle comprises perimetral signaling means that delimit two parts longitudinally, a first part corresponding with its open end which, during the mounting of the flotation device, is designed to protrude at least partially from the external surface of the ship, cargo container or floating structure to

be protected when said exterior receptacle is supported on said external surface and to be subsequently trimmed to level, and a second part corresponding to its closed end which, during the mounting of the flotation device, is necessarily designed to be disposed in its entirety on the interior of said external surface when said exterior receptacle is supported on it in such a manner that said signaling means extend toward the interior of said external surface in tangential relationship therewith,

- said closure means of said interior receptacle comprise a trimmable perimetral projection designed to be trimmed during the mounting of the flotation device with the purpose of ending up level with said external surface and of being able to contain hardenable mass for the streamlining of said external surface,
- said exterior receptacle, said interior receptacle and said inflatable means each have a single inlet for pressurized fluid, and
- said inflatable means are supplemented with sealing means which, in the deactivated state, close their inlet for pressurized fluid and are calibrated to open with a predetermined displacement of said expulsion means within said interior receptacle in such a manner that, following the activation of the flotation device, said one-way valve means open and the pressurized fluid enters into said exterior receptacle and subsequently into said interior receptacle, pushing said expulsion means toward the exterior of the open end of said interior receptacle until, once sufficient displacement has occurred in order for said closure means to break, said sealing means open and the pressurized fluid enters into said inflatable means.

[0021] In this manner, the present invention provides a method which is different from those currently used in engineering which makes it possible for the inflation of the inflatable means to occur only when the inflatable means are already on the outside.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] These and other characteristics and advantages of the invention will be made clear on the basis of the following detailed description of a preferred embodiment thereof, provided solely for the purpose of illustrative and not limiting exemplification, with respect to the enclosed drawings, in which identical numerical references correspond to same or like elements:

Figure 1 is a plan view, an axial sectional view along line A-A of said plan view and a transverse section along line B-B of a detail of said axial sectional view which show an exterior receptacle in a first embodiment of the device of the invention.

Figure 2 is a plan view and an axial sectional view

along line A-A of said plan view which show an interior receptacle of said first embodiment of the device of the invention, complementary to the exterior receptacle of Figure 1.

Figure 3 is an axial sectional view that shows an interior receptacle of said first embodiment of the device of the invention which corresponds to that of Figure 2 but is provided with the rest of the components and is therefore ready for mounting in a complementary exterior receptacle.

Figure 4 is an axial sectional view that shows said first embodiment of the device of the invention which includes said exterior receptacle of Figure 1 and said interior receptacle of Figure 3, installed but in deactivated condition.

Figure 5 shows a partial schematic view of said first embodiment of the device of the invention, installed and in activated condition.

Figure 6 is a plan view and an axial sectional view along line A'-A' of said plan view which show an exterior receptacle of a second embodiment of the device of the invention.

Figure 7 is a plan view and an axial sectional view along line A'-A' of said plan view which show an interior receptacle of said second embodiment of the device of the invention, complementary to the exterior receptacle of Figure 6.

Figure 8 is an axial sectional view which shows an interior receptacle of said second embodiment of the device of the invention which corresponds to that of Figure 7 but which is provided with the rest of the components and is therefore ready for mounting in a complementary exterior receptacle.

Figure 9 is an axial sectional view which shows said second embodiment of the device of the invention which includes said exterior receptacle of Figure 6 and said interior receptacle of Figure 8, installed but in deactivated condition.

Figure 10 shows a partial schematic sectional view of said second embodiment of the device of the invention, installed and in activated condition.

DETAILED DESCRIPTION OF THE INVENTION

[0023] In the following, a detailed description is given of the invention in making reference to the enclosed drawings (in all of which same or analogous components have been indicated with the same reference number) in accordance with some particular embodiments of same which refer to the application to a ship of the flotation

device of the invention, with the understanding that it can also be applied to any other ship, to a cargo container or a floating structure.

[0024] In these enclosed drawings, when a part is composed of various equal elements, a reference has been indicated for only one of them for the sake of clarity. Likewise, in Figures 5 and 10, references that are not essential have been omitted, also for the sake of clarity.

[0025] Figures 1 and 3 conjointly form a first embodiment of the flotation device of the invention, which is additionally illustrated by means of Figures 2, 4 and 5.

[0026] More specifically, Figure 1, shows an exterior receptacle 1 which has fastening means which comprise positioning lugs 5 and a lug crown 3 with fastening grooves 4. In addition, said exterior receptacle 1 has locking means 17 which comprise a positioning lug 17A and a locking guide 17B.

[0027] Said exterior receptacle 1 also comprises signaling means which consist of a line 6.

[0028] In this embodiment, said exterior receptacle 1 is provided with one-way valve means which consist of a non-return valve 2, although these means may be provided at any point of the fluid supply circuit, whether inside or outside of the flotation device of the invention.

[0029] Figure 2 shows an interior receptacle 10, formed in this embodiment by a lateral cylindrical wall 10A and a bottom 10B, with anchoring means 7 which cooperate with said fastening grooves 4 of said exterior receptacle 1 in order to fix in position said interior receptacle in combination with the rest of said fastening means, which is to say said lug crown 3 and said positioning lugs 5. On the other hand, said interior receptacle 10 is also provided with a mooring clasp 11 designed to be immobilized in said locking means 17, particularly within said locking guide 17B.

[0030] said mooring clasp 11 includes a mooring halyard 22 which is not visible in this figure.

[0031] As shown in Figure 3, said interior receptacle 10 is closed with closure means formed by a cover 30 which includes a perimetral projection 35, and said interior receptacle 10 houses inflatable means 20 (joined to said mooring halyard 22, not visible in this figure) and expulsion means formed by a piston 12 and tiles 13.

[0032] Said cover 30 is joined to the walls of said interior receptacle 10 by means of low-resistance screws 31.

[0033] Figure 3 also shows feeding means which comprise tubing 15 for letting fluid in from the exterior to the inside of said interior receptacle 10 and a hose 21 emerging from the inlet of said inflatable means 20 and disposed on the inside thereof in order to direct the fluid directly to its dome.

[0034] Said tubing 15 is represented as straight rigid tubing, but it is also possible for said tubing to be flexible tubing of longer length that would remain coiled during use, for example in a spiral, in the space that is present between said exterior receptacle 1 and said interior receptacle 10.

[0035] In this latter case, the ends of said tubing 15

could be connected to both bends connected in a detachable, fixed or even integral manner to said exterior receptacle 1 and said interior receptacle 10, respectively.

[0036] Optionally, said hose 21 is provided with reinforcement (not shown), for example a helicoid metallic reinforcement, which prevents it from being crushed and consequently being blocked, or at least makes this more difficult.

[0037] The inlet of said inflatable means 20 is closed with sealing means which comprise a plug 14 and a cord 16 which joins said plug 14 to the bottom of said interior receptacle 10.

[0038] Both the bottom of said interior receptacle 10 and the cover 30 and the piston 12 have reinforcing ribs to which no reference has been assigned, as they are not essential to the invention.

[0039] Now referring to Figure 4, shown there is the group formed by said exterior receptacle 1 such as is represented in Figure 1 and the subgroup of components that are represented in Figure 3. Said group is shown here already installed in the hull of a ship.

[0040] It is shown in this figure that the exterior receptacle 1 has been supported on the hull 8 of the ship in such a manner that said line 6 is inside the ship, at most touching the plane of the surface of the hull but never passing it; that the protruding part of said exterior receptacle 1 has been trimmed to be level with the hull 8 of the ship; that said interior receptacle 10 has been fastened to said exterior receptacle 1 using said fastening means 3, 4, 5; that said perimetral projection 35 has also been trimmed to be level with the hull 8 of the ship; and that the cover 30 has been filled with hardenable mass 37 until it is streamlined with the hull 8 of the ship.

[0041] It should also be pointed out that said tubing 15 is inserted in said non-return valve 2.

[0042] As will readily be understood, the flotation device of the invention shall be provided in a conventional manner with the relevant joints of which only a sealing ring 9 is shown in this embodiment as an example.

[0043] Turning to Figure 5, it schematically shows the flotation device of the invention after its activation, connected by means of said non-return valve 2 to an external fluid source 40 (which is normally a container of pressurized fluid).

[0044] As can be seen, in this condition, the inflatable means 20, expelled and inflated, remain moored to said exterior receptacle 1 by means of said mooring halyard 22 and said mooring clasp 11, which bear the tension. In this manner, the mooring tension in said inflatable means 20 is eliminated, and the resistance of the connection between said inflatable means 20 and the rest of the device of the invention is increased, hence reducing the risk of said inflatable means 20 coming loose.

[0045] Said inflatable means 20 are provided with a safety valve 23 in such a manner that, if the pressure inside said inflatable means 20 rises above a maximum threshold (due, for example, to the partial sinking of the vessel), said safety valve 23 opens and permits the ex-

pulsion of fluid until a pressure below said maximum threshold is reached.

[0046] On the other hand, in order to prevent the inflatable means 20 from being at a pressure lower than a minimum threshold (for example if, after a partial sinking of the vessel and the subsequent expulsion of fluid from said inflatable means 20, the vessel is refloated and said inflatable means 20 lose pressure upon approaching the surface), said non-return valve 2 is calibrated to always supply fluid when the pressure is below said minimum threshold.

[0047] In this manner, the pressure within the inflatable means 20 is always maintained within an optimum range.

[0048] With respect to the method of activation, once the non-return valve 2 is open, the fluid enters under pressure through said tubing 15 and pushes said piston 12. Said piston 12, in turn, pushes said tiles 13 which, in their course, break the cover 30 with said hardenable mass 37. said cord 16 is calibrated to tension at such a distance that said piston 12 has still not reached the end of said internal receptacle but has expelled essentially all of the inflatable means 20 to the outside. In this moment, the plug 14 pops out, opening the fluid inlet to said inflatable means 20 and permitting said inflatable means 20 to inflate.

[0049] In this manner, the same fluid circuit used for the expulsion of the inflatable means 20 is also used for the inflation of said inflatable means 20.

[0050] Figures 6 and 8 conjointly form a second embodiment of the flotation device of the invention, which is additionally illustrated by means of Figures 7, 9 and 10.

[0051] For this second embodiment, only the points of distinction with respect to the already discussed first embodiment will be indicated in the following, with the purpose of avoiding unnecessary redundancies.

[0052] Here, in accordance with the possibility pointed out previously, the tubing 15 is a flexible tubing having a certain length which would remain coiled during use, for example in a spiral, in the space present between said exterior receptacle 1 and said interior receptacle 10.

[0053] The ends of said tubing 15 are coiled externally and connected to both bends connected in a detachable, fixed or even integral manner to said exterior receptacle 1 and said interior receptacle 10, respectively.

[0054] With this configuration, during the mounting of the device, the operator connects said tubing 15 to said exterior receptacle 1 and to said interior receptacle 10 separately by means of the coil of the tubing 15 in the respective bends, and then introduces said interior receptacle 10 into said exterior receptacle 1.

[0055] This method of mounting eliminates the need for providing the inlets of said exterior receptacle 1 and said interior receptacle 10 with highly precise tolerances in order to achieve perfect mutual alignment, even permitting said inlets to be misaligned among themselves and/or disposed at decentralized points in relation to the bottoms of said receptacles 1, 10.

[0056] Moreover, the inlet of said inflatable means 20

is closed by means of sealing means which comprise a group formed by a mechanical shunt device 50 and direct-fill tubing 52 (in place of the plug 14 of the first embodiment) and a cord 16 which joins said group 50, 52 to the bottom of said interior receptacle 10.

[0057] Said direct-fill tubing 52 is connected at one end to said mechanical shunt device 50 and at the other end to the fluid inlet to said inflatable means 20. In this case, the mechanical shunt device 50 directs the entry of fluid toward the space present between said interior receptacle 10 and said piston 12 until the pulling of the cord 16 is achieved, the pulling of which actuates said mechanical shunt device 50 such that it directs the entering fluid to said direct-fill tubing 52 so that the fluid enters directly into said inflatable means 20.

[0058] Finally, said locking means 17 comprise a recess 17A arranged in the lateral wall of said exterior receptacle 1, a groove 17B which covers the exterior of said recess 17A and a shoe 17C with an H-shaped cross-section. Said recess 17A extends from the free edge of said exterior receptacle 1 initially in the axial direction and finally in the transverse direction, thus forming two portions which form a 90° angle between them.

[0059] In this second embodiment, during the mounting of the device, the operator aligns said mooring clasp 11 with said recess 17A and slides said interior receptacle 10 inside said exterior receptacle 1. Subsequently, said mooring clasp 11 remains immobilized in said locking means 17A, particularly in the bottom of said recess 17A, by virtue of the insertion of said shoe 17C into said recess 17A. Specifically, said shoe 17C is inserted into said recess 17A in such a manner that the central portion of the H-section slides along said recess 17A and the wing portions of the H-section overlap with the external and internal face of said exterior receptacle 1, respectively. Once the device is mounted, said groove 17B can be closed by means of a rigid cover joined to said groove 17B, for example by means of bolts.

[0060] In all of the foregoing, the present invention has been described and illustrated in accordance with some embodiments thereof. Naturally, in keeping with the principle of the invention, the embodiments and the constructional details can be varied over a broad range with respect to what has been described and illustrated without going beyond the scope of the present invention.

[0061] Specifically, for the sake of illustration and not of limitation, the valve means can be disposed at another point upstream or downstream from the location indicated above, or they can be constituted by a plurality of individual valves which produce the required effects.

[0062] In the same manner, the inflatable means can also have an asymmetrical geometric shape, that is, with the joint between the mooring halyard and the inflatable means shifted with respect to the longitudinal axis of the latter, or have a geometrical shape with one horizontal section that has a predominant face, or even both of these things. In this manner, in the activated state, a specific surface of the inflatable means tends to remain in contact

with the external surface of the ship, cargo container or floating structure to be protected, which prevents the halyard and the hose 21 from getting tangled or at least makes it more difficult, and allows for lighter inflatable means, since they would only need to be reinforced partially (by said specific surface) in order to tolerate the friction.

[0063] Moreover, the sealing means described and illustrated here (purely mechanical) may be substituted by electronic assemblies of the type which used Hall sensors, for example, calibrated to open the inlet to the inflatable means when a predetermined displacement of the piston is produced.

[0064] The geometric form of the inflatable means may of course be modified without this implying an alteration of the invention. In the same manner, the components of the flotation device represented as single pieces in the specific embodiments described may be modular or vice-versa: for example, the interior receptacle which is described in the embodiments as being formed by a cylindrical lateral wall and a bottom could very well be formed by a single piece.

[0065] Finally, the flotation device of the present invention may include any accessory devices that improve the efficiency of the device, in addition to a module for detecting hazardous situations and/or a module for controlling the already-mentioned activation, which even make possible the remote and independent activation of each one of the flotation devices of the present invention mounted in the ship, cargo container or floating structure.

[0066] In this respect, the flotation device of the present invention may comprise: a motor-driven compressor which feeds fluid to the inflatable means in the event that the pressure in them needs to be increased and the pressurized fluid container used initially as an external fluid source is not being used due to depletion, breakdown, etc.; and/or at least one moisture sensor on the interior of the interior receptacle in deactivated condition to facilitate the monitoring of the preservation of the inflatable means; and/or at least one pressure sensor in activated condition which allows for measurement with sufficient notice in situations such as the depletion of the pressurized fluid source; and/or at least one device for destroying the inflatable means which can be actuated in the event that the maintenance of said activated inflatable means represents a risk or an inconvenience; and/or an inflation group using a motor-driven compressor to supply pressurized fluid to the inflatable means over an extended period as necessary; and/or even a top-refillable buoy which permits pressurized fluid to be fed to the inflatable means from outside the ship, cargo container or floating structure, optionally through the safety valve provided that its configuration is adequately planned.

[0067] Even additional loose inflatable means which, by virtue of the flotation device of the invention, can be joined together using plungers should be understood, as accessory devices. In such situations, the plunger is submerged with additional empty and folded inflatable

means, and they are moored to the mooring halyard and then secured to the opening for passing the fluid from the piston in substitution of the already unfolded inflatable means, proceeding them to inflate it. Such additional loose inflatable means can be connected not only in substitution of those already unfolded but also as a supplement to them, although the opening for passing the fluid from the piston must be configured appropriately beforehand, and the structural limitations of the design of the ship, cargo container or floating structure to be protected must have been confirmed.

Claims

1. Flotation device designed to be housed on the interior of ships, cargo containers or floating structures in such a manner that, in emergency situations in water, the activation of said flotation device reduces the danger of sinking of the ship, cargo container or floating structure while significantly improving its buoyancy, which comprises inflatable means housed on the interior of a receptacle integrated into the body of the ship, cargo container or floating structure, to be expelled to the exterior by means of respective thrust means following the breaking of an external cover of said receptacle, with the inflatable means being inflated in order to improve the buoyancy of the ship, cargo container or floating structure to be protected, **characterized in that** it comprises:

an exterior receptacle (1) which is designed to be supported on the internal face of an external surface (8) of a ship, cargo container or floating structure, leaving its open end oriented toward the outside of said ship, cargo container or floating structure,

- inside of said exterior receptacle (1), an interior receptacle (10) whose open end corresponds to the open end of said exterior receptacle (1),
- closure means (30, 35) which close the open end of said interior receptacle (10),
- inside of said interior receptacle (10), inflatable means (20) and expulsion means (12, 13) which can be slid along said interior receptacle (10) in order to break said closure means (30, 35) and expel said inflatable means (20) from the open end of said interior receptacle (10),
- feeding means (15, 21) designed to conduct fluid to the interior of said inflatable means (20),
- a pressurized fluid source which can be connected to said feeding means (15, 21),
- valve means (2) interposed between said pressurized fluid source and said inflatable means (20), and
- sealing means (14, 16; 50, 52) disposed at the inlet of said inflatable means (20), calibrated to allow fluid to pass to said inflatable means (20)

only after a predefined displacement of said expulsion means (12, 13) which causes the substantially complete expulsion of said inflatable means (20) from the open end of said interior receptacle (10) ;

wherein:

- said exterior receptacle (1) comprises fastening means (3, 4, 5) and said interior receptacle (10) comprises anchoring means (7) for the locking thereof,
- said exterior receptacle (1) comprises locking means (17, 17) and said interior receptacle (10) comprises mooring means (11) for the interlocking thereof,
- said inflatable means (20) are secured to said mooring means (11) and, consequently, to said locking means (17, 17),
- said exterior receptacle (1) comprises peripheral signaling means (6) which signal the degree of minimum embedding of said exterior receptacle (1) in the external surface (8) of the ship, cargo container or floating structure,
- said closure means (30, 35) of said interior receptacle (10) comprise a trimmable projection, and
- said exterior receptacle (1), said interior receptacle (10) and said inflatable means (20) each have a single inlet for pressurized fluid.

2. Flotation device as set forth in claim 1, **characterized in that** said valve means (2) are disposed in said exterior receptacle (1).
3. Flotation device as set forth in either of claims 1 and 2, **characterized in that** said valve means are one-way valve means (2).
4. Flotation device as set forth in claim 3, **characterized in that** said one-way valve means comprise a non-return valve (2).
5. Flotation device as set forth in any of the foregoing claims, **characterized in that** said fastening means comprise positioning lugs (5) and a lug crown (3) with fastening grooves (4).
6. Flotation device as set forth in any of the foregoing claims, **characterized in that** said locking means (17) comprise a positioning lug (17A) and a locking guide (17B).
7. Flotation device as set forth in any of claims 1 to 5, **characterized in that** said locking means (17) comprise a recess (17A) arranged in the lateral wall of said exterior receptacle (1), a groove (17B) which covers the exterior of said recess (17A), and a shoe (17C) having an H-section, with said recess (17A) extending from the free edge of said exterior recep-

tacle (1) initially in the axial direction and finally in the transverse direction, thus forming two portions which establish a 90° angle between them.

8. Flotation device as set forth in any of the foregoing claims, **characterized in that** said signaling means include a line (6). 5
9. Flotation device as set forth in any of the foregoing claims, **characterized in that** said inflatable means (20) are fastened to said mooring means (11) and, consequently, to said locking means (17) by means of a mooring halyard (22). 10
10. Flotation device as set forth in any of the foregoing claims, **characterized in that** said mooring means comprise a mooring clasp (11) with a profile that is complementary to said locking means (17). 15
11. Flotation device as set forth in any of the foregoing claims, **characterized in that** said closure means comprise a cover (30) that includes a perimetral projection (35). 20
12. Flotation device as set forth in claim 11, **characterized in that** said cover (30) is joined to said interior receptacle (10) by means of low-resistance screws (31). 25
13. Flotation device as set forth in any of the foregoing claims, **characterized in that** said expulsion means comprise a piston (12) and tiles (13). 30
14. Flotation device as set forth in any of the foregoing claims, **characterized in that** said feeding means comprise tubing (15) for the conduction of fluid from the exterior of said interior receptacle (10) and a hose (21) emerging from the inlet of said inflatable means (20) and disposed on the inside thereof. 35
15. Flotation device as set forth in claim 14, **characterized in that** said hose (21) is provided with reinforcement. 40
16. Flotation device as set forth in claim 15, **characterized in that** said reinforcement is a metallic helicoid reinforcement. 45
17. Flotation device as set forth in any of the foregoing claims, **characterized in that** said sealing means comprise a plug (14) and a calibrated cord (16) which joins said plug (14) to the bottom of said interior receptacle (10). 50
18. Flotation device as set forth in any of claims 1 to 16, **characterized in that** said sealing means comprise a group formed by a mechanical shunt device (50) and direct-fill tubing (52), and a calibrated cord (16) 55

which joins said group (50, 52) to the bottom of said interior receptacle (10).

19. Flotation device as set forth in any of claims 1 to 16, **characterized in that** said sealing means (14, 7.6; 50, 52) comprise an electronic Hall sensor assembly.
20. Flotation device as set forth in any of the foregoing claims, **characterized in that** said interior receptacle (10) is provided with water-sealing means (9) applied to said closure means (30, 35).
21. Flotation device as set forth in claim 20, **characterized in that** said water-sealing means include a sealing ring (9).
22. Flotation device as set forth in any of the foregoing claims, **characterized in that** said inflatable means (20) are provided with a safety valve (23).
23. Flotation device as set forth in any of the foregoing claims, **characterized in that** said inflatable means (20) have an asymmetrical geometric shape, with the point of union to said mooring means (11) being displaced with respect to the longitudinal axis of said inflatable means (20).
24. Flotation device as set forth in any of the foregoing claims, **characterized in that** said inflatable means (20) have a geometric shape with a horizontal section which has a predominant face.
25. Flotation device as set forth in any of the foregoing claims, **characterized in that** it comprises a module for detecting hazardous situations and/or a module for controlling the activation.
26. Flotation device as set forth in any of the foregoing claims, **characterized in that** said pressurized fluid source comprises a pressurized fluid container.
27. Flotation device as set forth in any of the foregoing claims, **characterized in that** said fluid source comprises a motor-driven compressor.
28. Flotation device as set forth in any of the foregoing claims, **characterized in that** said interior receptacle (10) comprises at least one internal moisture sensor in deactivated condition.
29. Flotation device as set forth in any of the foregoing claims, **characterized in that** said flotation device comprises at least one internal pressure sensor in activated condition.
30. Flotation device as set forth in any of the foregoing claims, **characterized in that** said flotation device comprises at least one device for the destruction of

the inflatable means (20).

31. Flotation device as set forth in any of the foregoing claims, **characterized in that** said flotation device comprises a top-refillable buoy for feeding pressurized fluid to said inflatable means (20).

32. Flotation device as set forth in claim 31, **characterized in that** the feeding of pressurized fluid to said inflatable means (20) occurs via the safety valve (23).

33. Method for the mounting of a flotation device as set forth in any of the foregoing claims, **characterized in that** it comprises the following steps:

- providing an orifice in an external surface (8) of a ship, cargo container or floating structure,
- supporting said exterior receptacle (1) to the internal face of said external surface (8) of said ship, cargo container or floating structure, leaving the open end of said exterior receptacle (1) oriented toward the outside of said ship, cargo container or floating structure, protruding beyond said exterior receptacle (1) from said external surface (8) of said ship, cargo container or floating structure according to the degree of minimum embedding signaled by said signaling means (6),
- trimming the protruding part of said exterior receptacle (1) to be level with said external surface (8) of said ship, cargo container or floating structure,
- joining said interior receptacle (10) and said closure means (30, 35) in order to form a group of interior receptacle (10) and closure means (30, 35),
- inserting said group of interior receptacle (10) and closure means (30, 35) into said exterior receptacle (1) and fastening said group to said exterior receptacle (1) using said fastening means (3, 4, 5), said anchoring means (7), said locking means (17) and said mooring means (11), with said closure means (30, 35) protruding from said external surface (8) of said ship, cargo container or floating structure, and
- trimming the protruding part of said closure means (30, 35) to be level with said external surface (8) of said ship, cargo container or floating structure.

34. Method of mounting as set forth in claim 33, **characterized in that** it comprises the following additional step:

- filling said closure means (30, 35) with hardenable mass (37) until they are streamlined with said external surface (8) of said ship, cargo con-

tainer or floating structure.

35. Method of mounting as set forth in claim 33 and 34, **characterized in that** it comprises the following additional step:

- connecting said pressurized fluid source to said feeding means (15, 21).

36. Method of mounting as set forth in any of claims 33 to 35, **characterized in that**, prior to the step of inserting said group of interior receptacle (10) and closure means (30, 35) into said exterior receptacle (1) and fastening said group to said exterior receptacle (1), it comprises the following step:

- connecting said tubing (15) to said interior receptacle (10) and to said exterior receptacle (1) separately.

37. Operation of a flotation device as set forth with any of claims 1 to 32, **characterized in that** it comprises the following steps:

- said valve means (2) open up and allow pressurized fluid to pass through to said exterior receptacle (1) and to said interior receptacle (10),
- said expulsion means (12, 13) are pushed by said pressurized fluid, breaking said closure means (30, 35) and expelling said inflatable means (20),
- said sealing means (14, 16; 50, 52) open up and allow pressurized fluid to pass through to said inflatable means (20), and
- said inflatable means (20) inflate.

38. Operation as set forth in claim 37, **characterized in that** it comprises the following additional step:

- untying said inflatable means (20) from said mooring means (11).

39. Operation as set forth in either of claims 37 and 38, **characterized in that** it comprises the following additional step:

- tying at least some new inflatable means (20) to said mooring means (11).

40. Operation of a flotation device as set forth in any of claims 22 and 23 to 32 when they are subordinate to claim 22, **characterized in that** it comprises the following steps:

- said valve means (2) open up and allow pressurized fluid to pass through to said exterior receptacle (1) and to said interior receptacle (10),
- said expulsion means (12, 13) are pushed by

said pressurized fluid, breaking said closure means (30, 35) and expelling said inflatable means (20),

- said sealing means (14, 16; 50, 52) open up and allow pressurized fluid to pass through to said inflatable means (20),
- said inflatable means (20) inflate, and
- said safety valve goes off and allows pressurized fluid to exit from said inflatable means (20).

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- 41.** Operation as set forth in claim 40, **characterized in that** it comprises the following additional step:

- said valve (2) open up again and allow pressurized fluid to pass through to said inflatable means (20).

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- 42.** Operation as set forth in either of claims 40 and 41, **characterized in that** it comprises the following additional step:

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- untying said inflatable means (20) from said mooring means (11).

- 43.** Operation as set forth in any of claims 40 to 42, **characterized in that** it comprises the following additional step:

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- tying at least some new inflatable means (20) to said mooring means (11).

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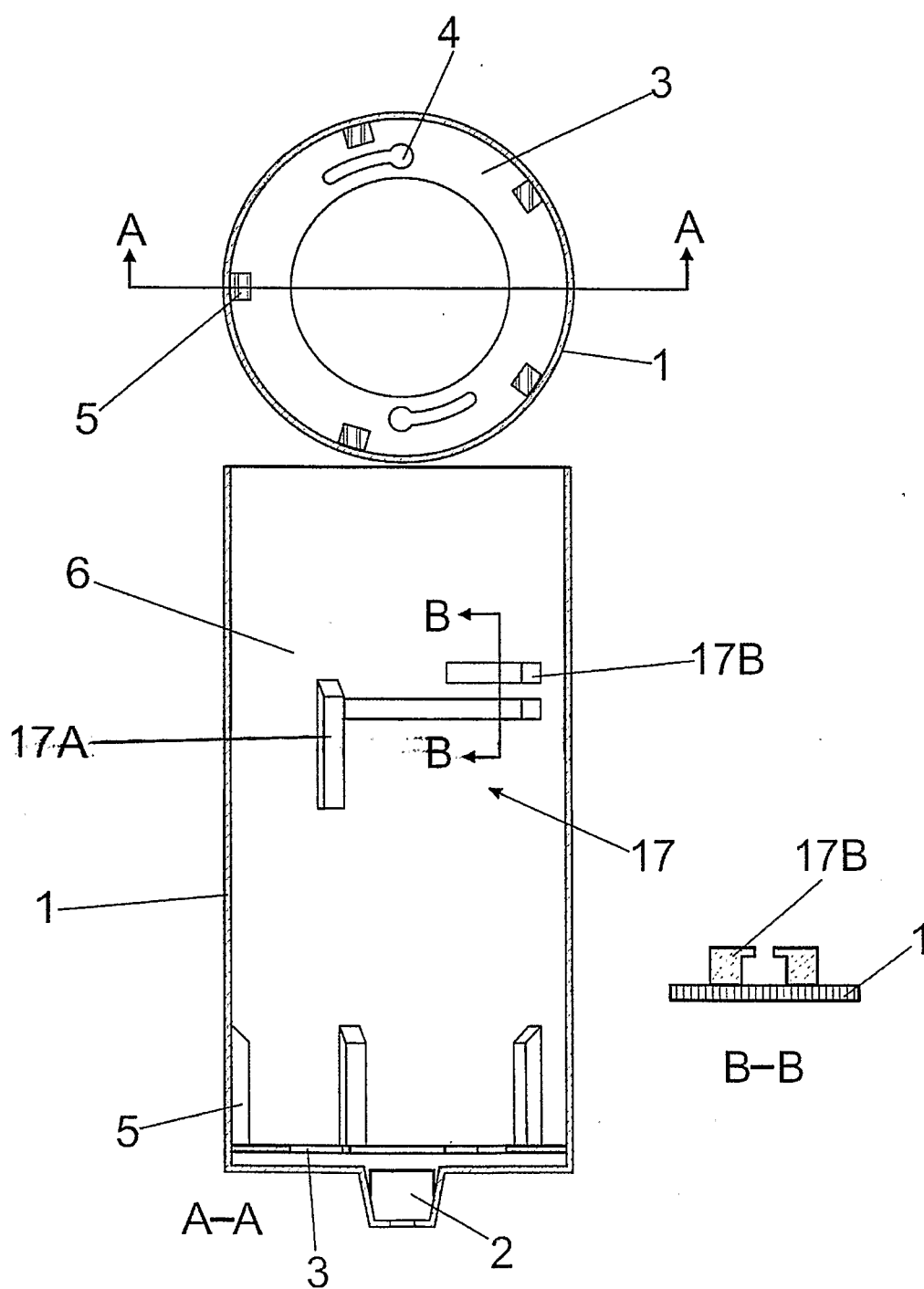


FIG.1

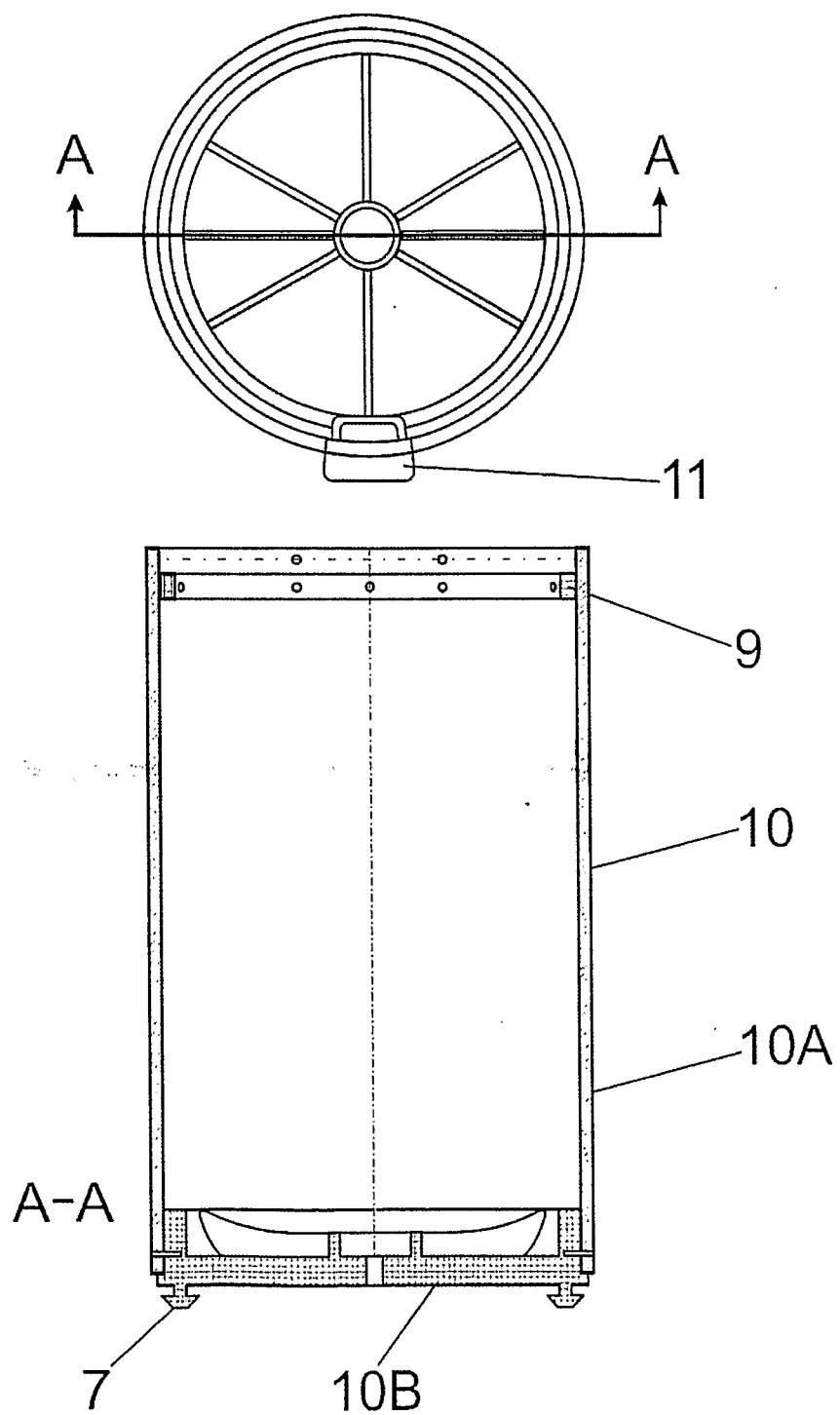


FIG.2

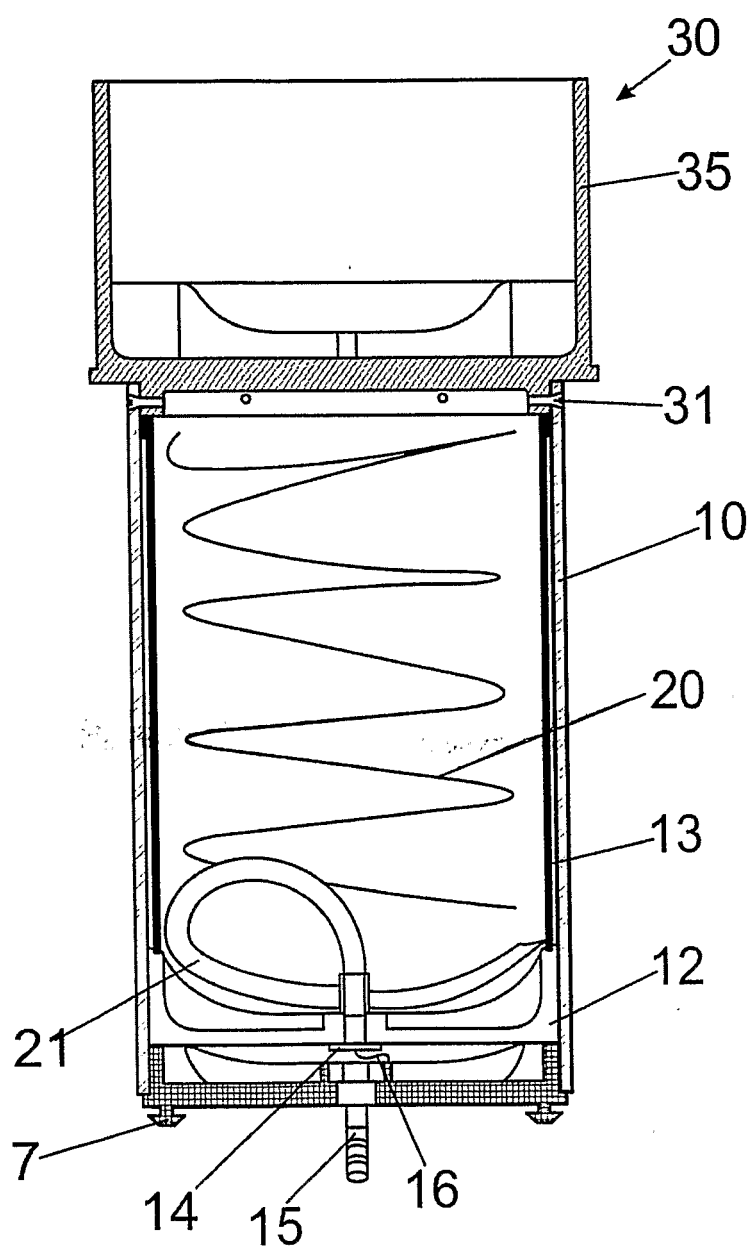


FIG.3

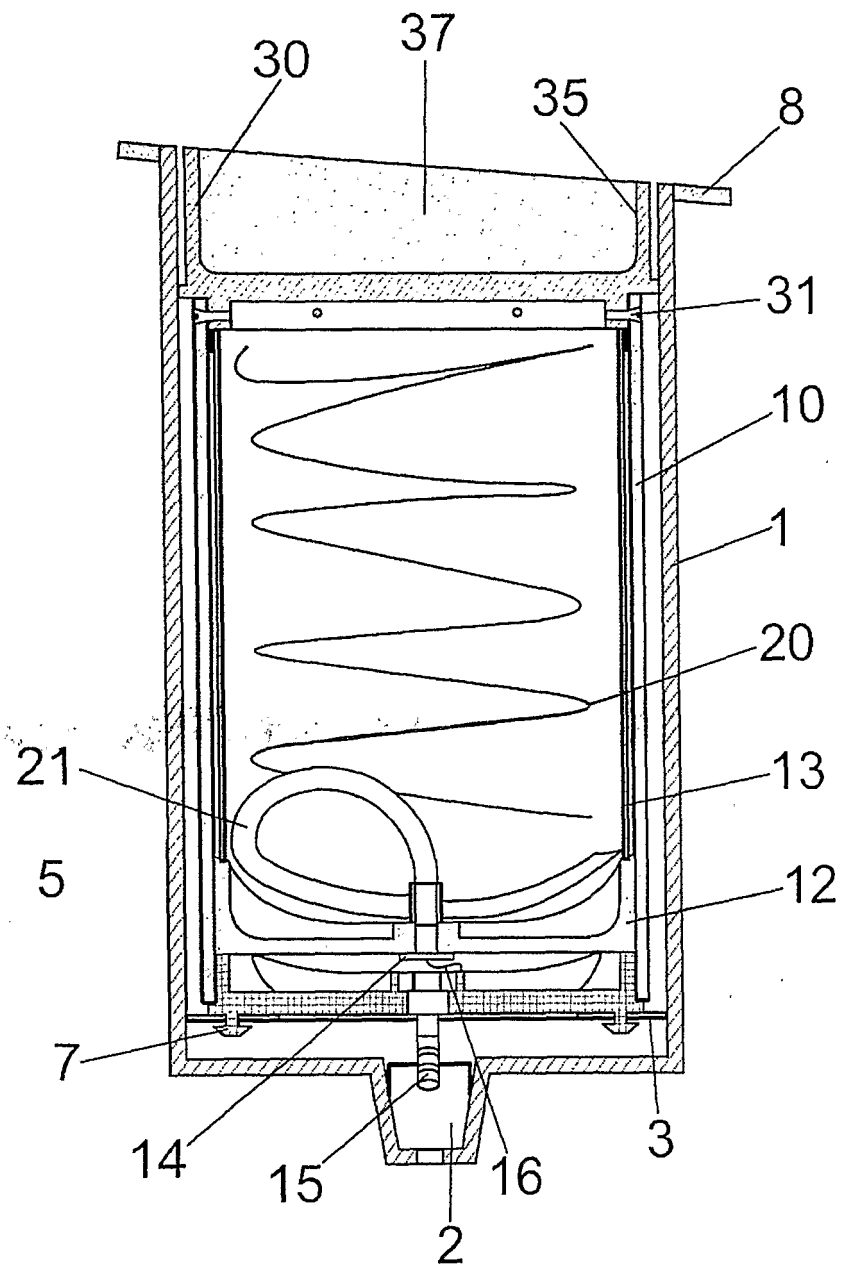
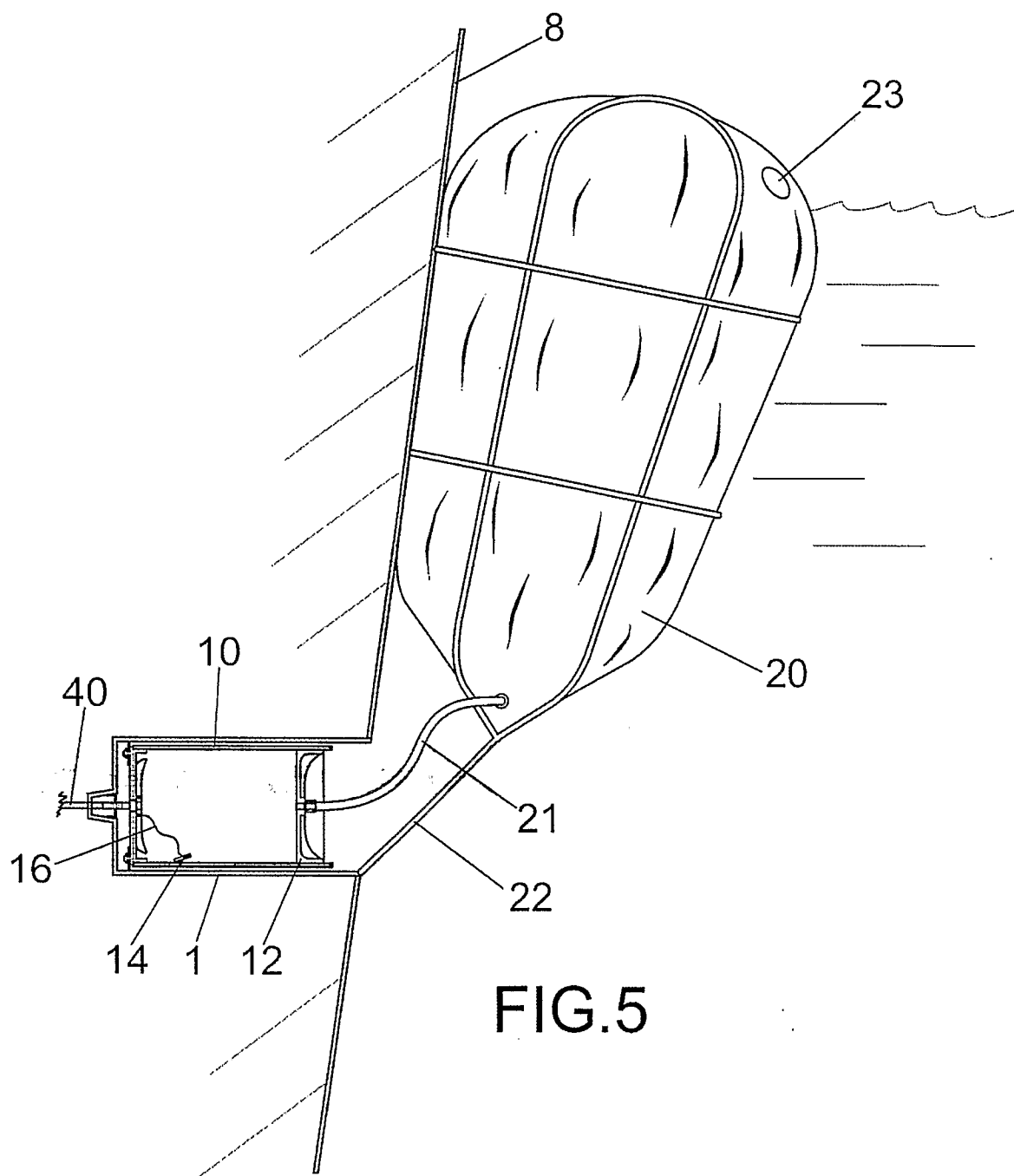


FIG.4



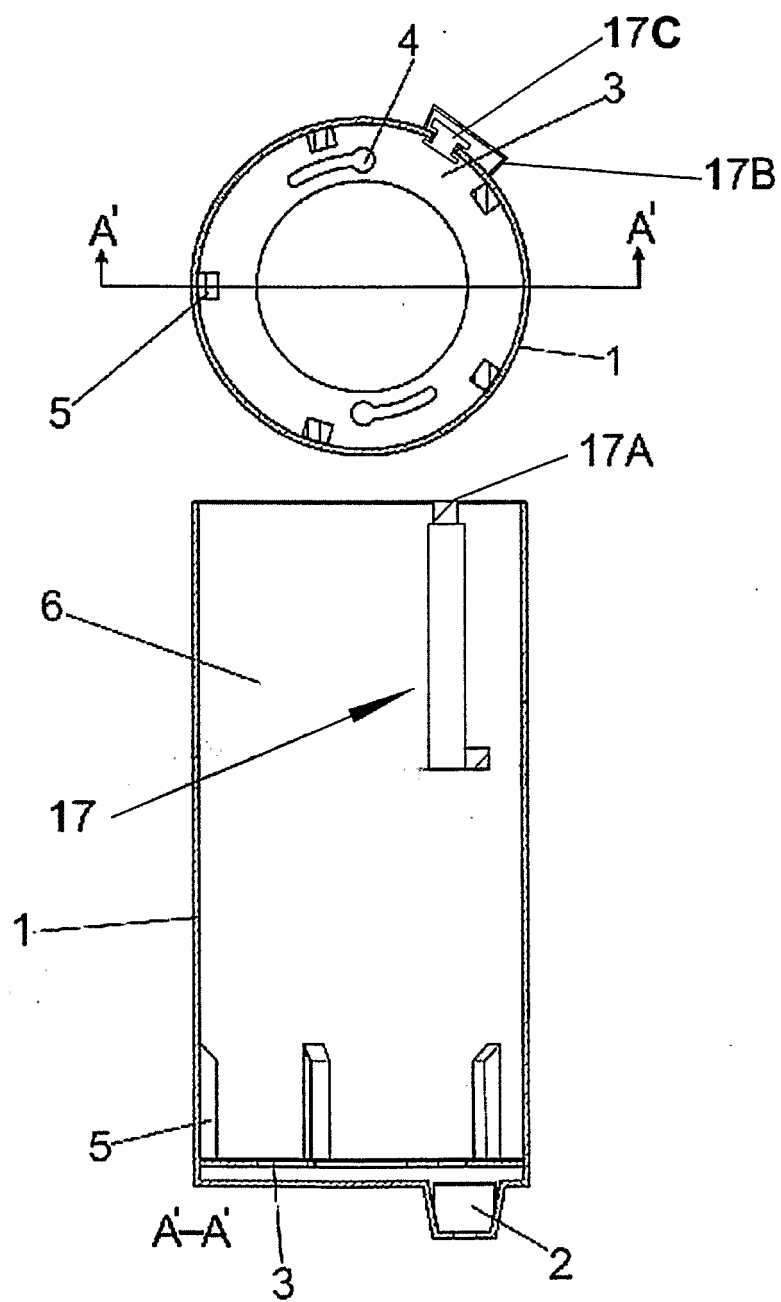


FIG. 6

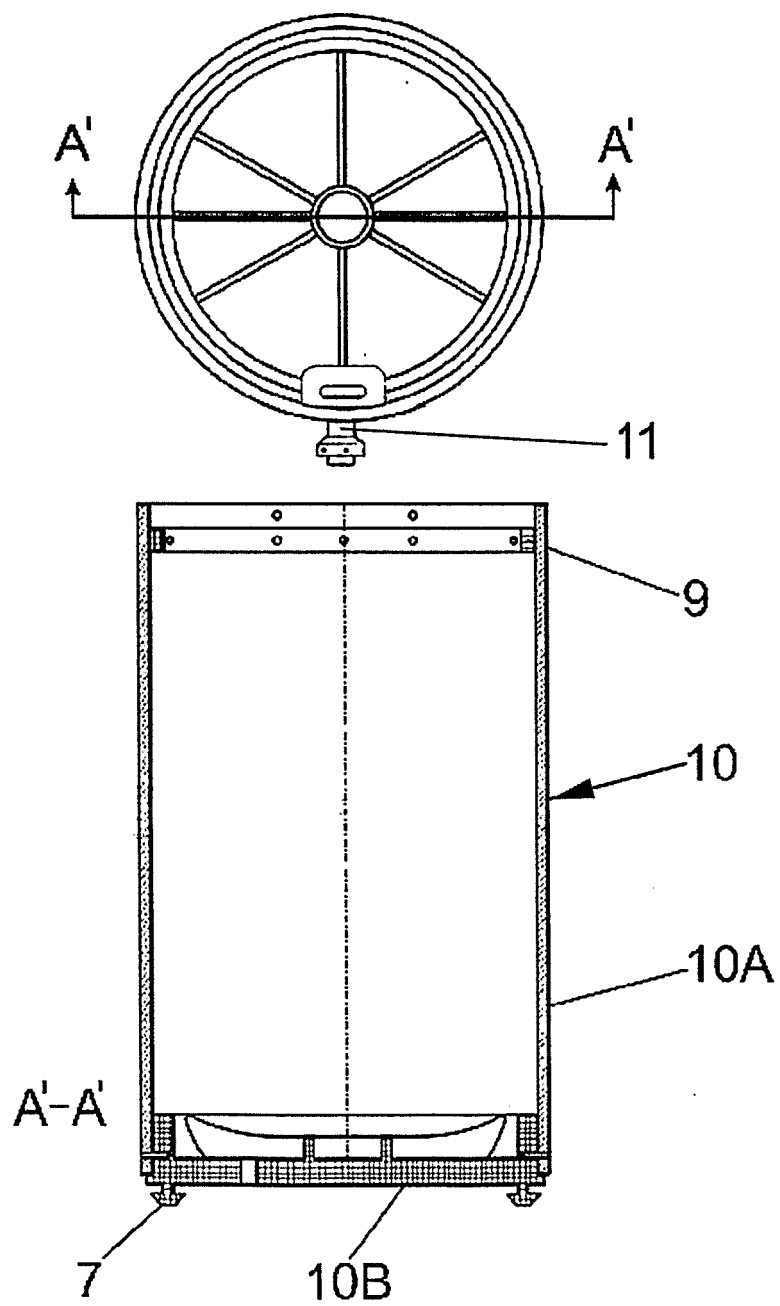


FIG. 7

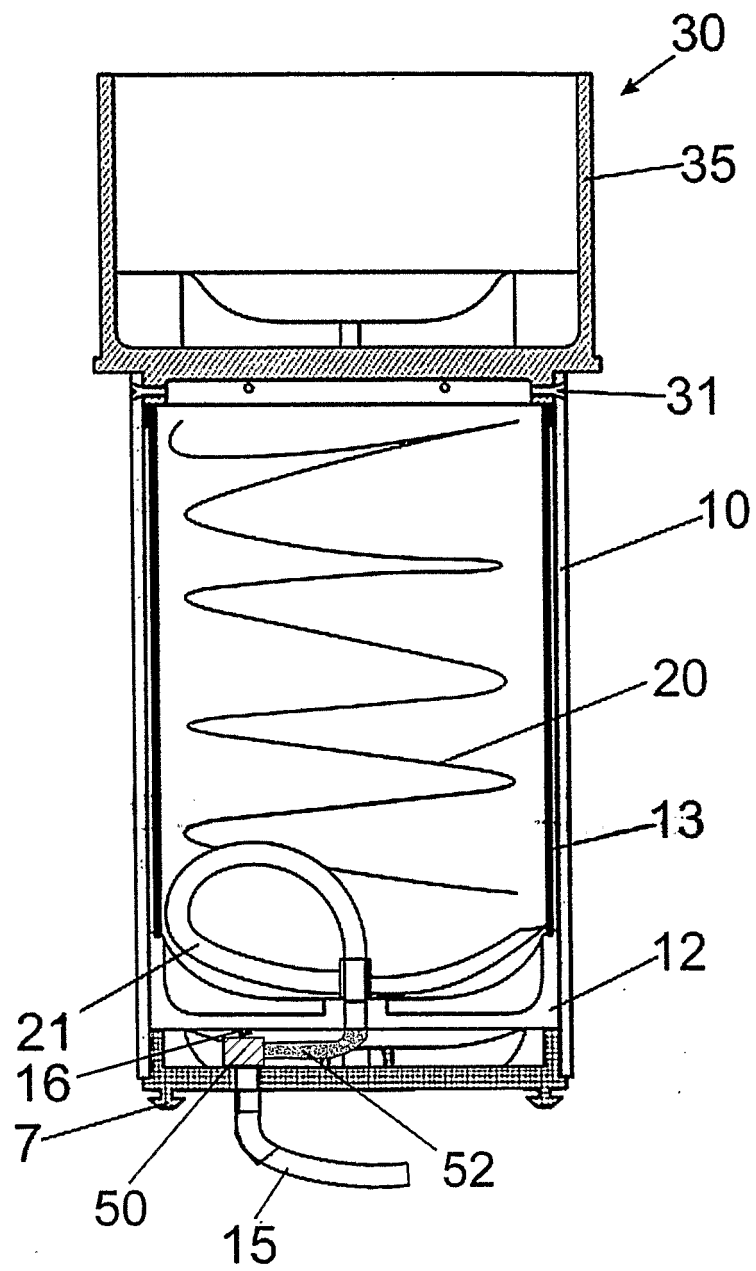


FIG. 8

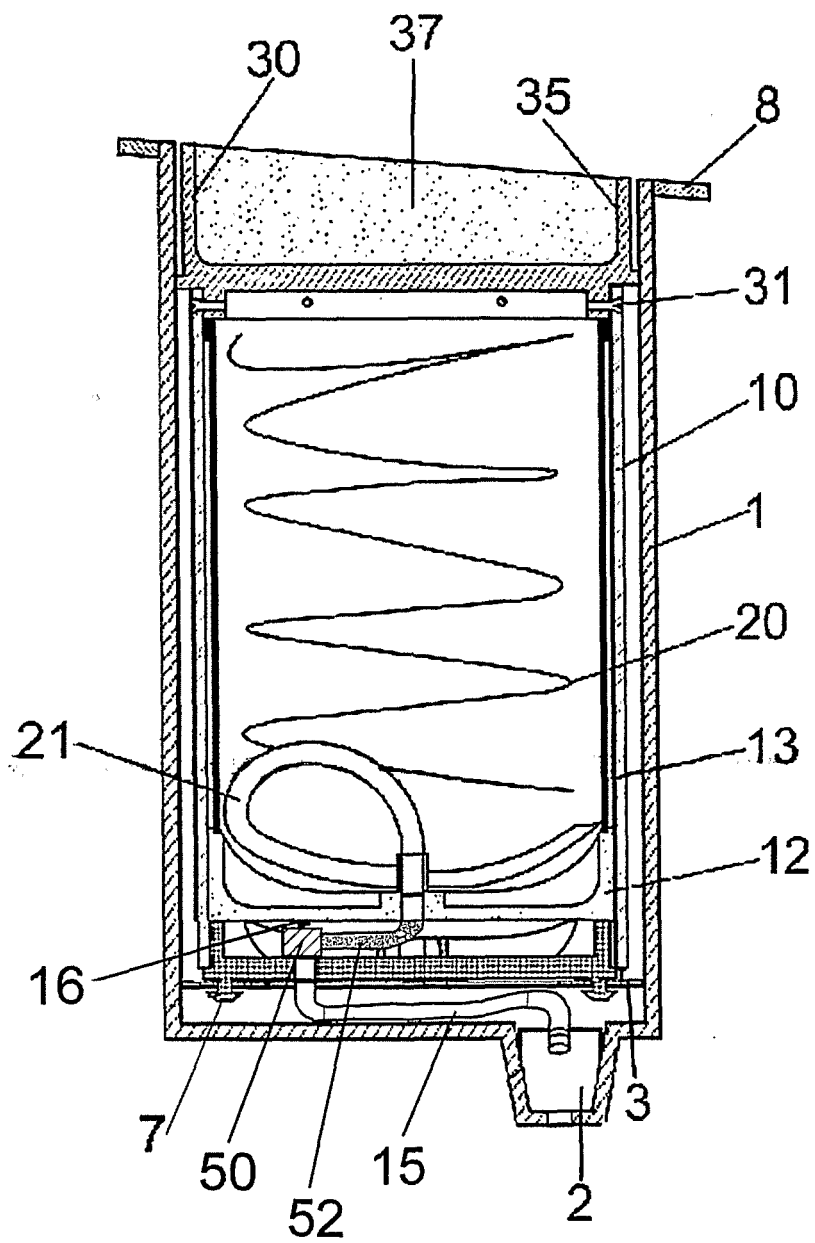


FIG. 9

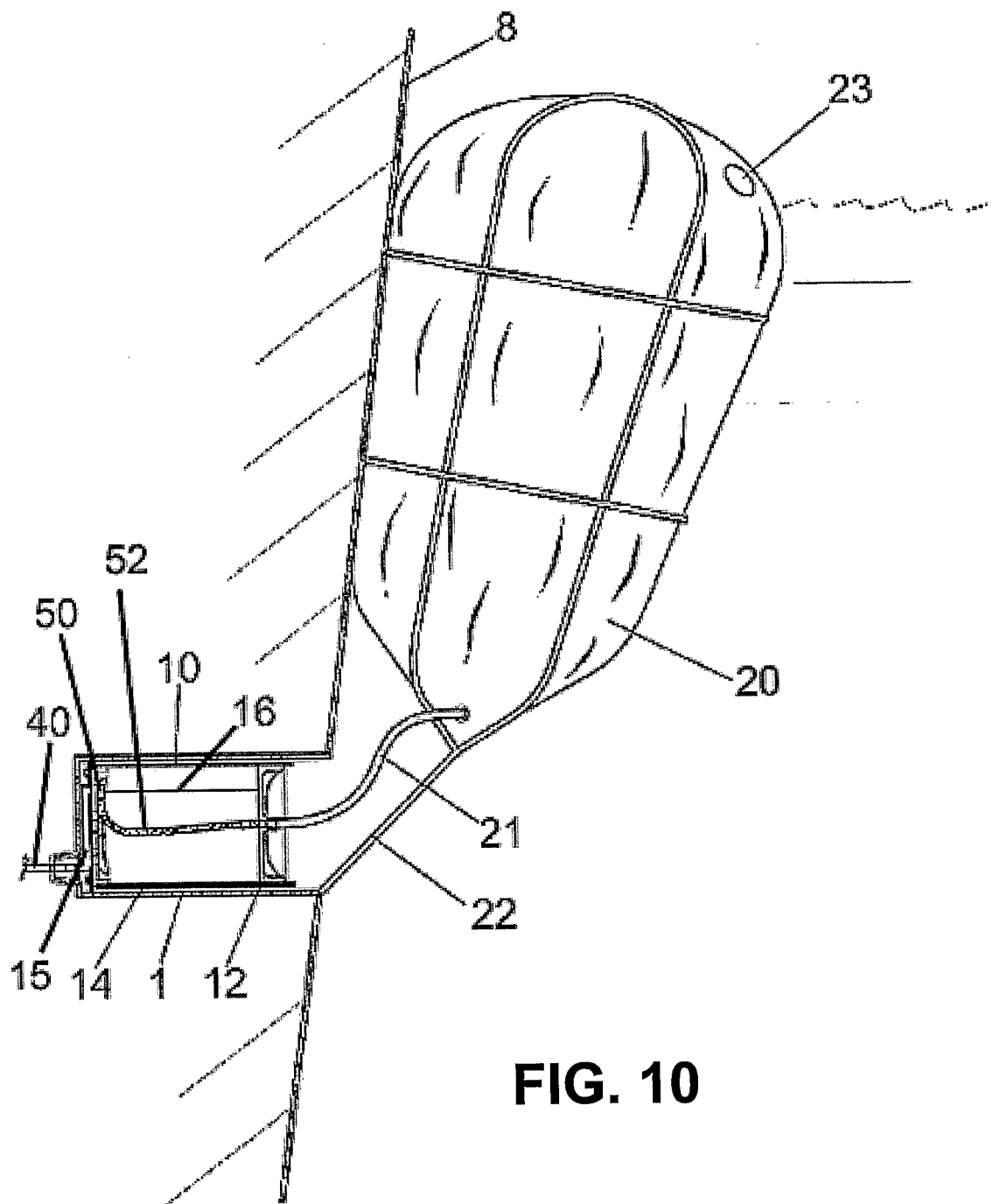


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ ES 2006/000508

A. CLASSIFICATION OF SUBJECT MATTER

B63B 43/14 (2006.01)

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)

B63B+, B63C+

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CIBEPAT, EPODOC, WPI, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003015129 A1 (LLOVERES et al.) 23.01.2003, paragraphs [44-49]; figure 2.	1, 37, 40
A	ES 2163958 A1 (LOPEZ-PEREA LLOVERES VICENTE ; GOMEZ PORTELA CESAR) 01.02.2002, column 4, line 65 - column 6, line 6; figure 2.	1, 37, 40
A	US 3016858 A (JOHNSON et al.) 16.01.1962, column 2, line 49 - column 3, line 28; figures.	

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

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance.	
"E" earlier document but published on or after the international filing date	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"O" document referring to an oral disclosure use, exhibition, or other means	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents, such combination being obvious to a person skilled in the art
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search

29 January 2007 (29.01.2007)

Date of mailing of the international search report

(02-02-2007)

Name and mailing address of the ISA/
O.E.P.M.Paseo de la Castellana, 75 28071 Madrid, España.
Facsimile No. 34 91 3495304

Authorized officer

J. Merello Arvilla

Telephone No. +34 91 349 84 52

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EP 1 932 755 A1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ ES 2006/000508

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Form PCT/ISA/210 (patent family annex) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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- ES 2163958 [0016]