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(54) **SUBMERSIBLE DEVICE FOR LIFTING A BOAT OVER WATER**

(57) A submersible device for lifting a boat over water has a couple of pneumatic containers (1, 2) and an air compressor (27) for their inflation and deflation through valves (25) arranged in the pneumatic containers (1, 2).

The pneumatic containers (1, 2) of the couple are interconnected by means of flexible cross members (3) supporting the boat when the pneumatic containers (1, 2) are inflated.

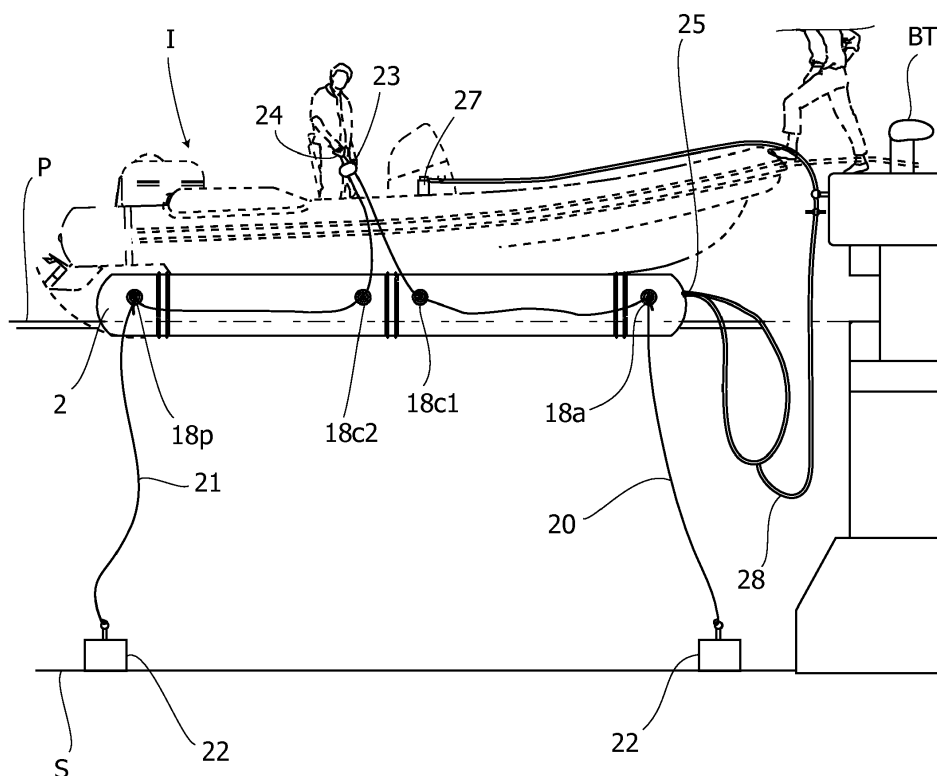


Fig. 10

Description

[0001] The present invention relates to a submersible device for lifting a boat over water. In particular, the invention relates to a device having components capable of modifying their trim in the water to allow a boat to be lifted out of water when the boat is not used; these components sink to free the boat when it is to be used.

[0002] It is known that the use of boats especially at sea causes the growth of vegetation and animals on the submerged parts of the hull. This build-up, which adversely affects boat performance, is difficult to remove. Boat owners try various expedients to remove their boat from the water when it is not used, but this operation is laborious and requires expensive equipment, specialized personnel and space for landing the boat on the beach or mooring at a dock. For this reason, many patents teach how to solve this problem. Some previous documents are mentioned below. EP 1 431 175 A1 describes a boat lifter comprising two pontoons capable of sinking and emerging from the water. The pontoons are provided with pneumatic chambers that support transversely oriented saddles, valves and pressurization means in order to operate in mutual coordination. The saddles are provided with a deep concave central part that is open at the top and able to receive keels of overlying motor boats and sail boats.

[0003] US 4,763,592 describes a pontoon system with two floats that are filled with air through a pump by a radio remote control in order to raise and lower a pontoon.

[0004] US 3,603,276 describes a floating dry dock to support boats out of water when not being used. The dry dock includes cradle means to support the boat and pontoons connected to the cradle means. The pontoons sink when they are depleted of air under the boat to free it and instead they lift the boat by filling the pontoons with air when the boat is positioned again on them.

[0005] The dry dock described in WO 97/00807 works similarly. This dry dock includes a couple of interconnected primary floating bodies that are mutually spaced by means of rigid crossbeams adjustable in length, and a plurality of components adapted to form a cradle to support a boat. These cradle components are partially deformable and rigidly connected to the primary floating bodies by means of cup joints. The primary floating bodies are normally filled with water. When the boat has to be lifted, air is pumped into them to send the water out, and the primary floating bodies rise up and with them the whole dry dock. There are also secondary floating bodies that limit the depth to which the dry dock is submerged when it does not keep the boat lifted.

[0006] US 7,421,963 is to be considered the document closest to the present invention. It discloses a submersible device for raising a boat above the water, comprising a couple of pneumatic containers connected transversely to each other, and an air compressor for inflating and deflating them through valves that are provided in the pneumatic containers. The pneumatic containers of the

couple are connected to one another by means of flexible cross members which support the boat when the pneumatic containers are inflated.

[0007] The aforementioned devices have substantially rigid structures for connecting to each other the floating bodies and separate components used to support the boat, by matching the profile of the boat keel in some cases. The mentioned devices are complex and expensive. Furthermore, there is no reliable connection between the flexible cross members and the pneumatic containers, especially when the latter are deflated.

[0008] An object of the invention is to provide a lifting device for boats that is reliable in the connection between the flexible cross members and the pneumatic containers.

[0009] A further object of the invention is to provide a lifting device for boats that is simple both in the construction, because it is equipped with a limited number of components, and in its use.

[0010] Another object of the invention is to provide a lifting device for boats that is easily adaptable by the same user for his/her boat.

[0011] A further object of the invention is to allow the user to assemble the lifting device on his own, starting from simple base components, without the need for complex instruments and apparatus.

[0012] Yet, another object of the invention is to provide a lifting device that can be maneuvered directly from the boat.

[0013] These and other objects and advantages are achieved by a submersible device for lifting a boat above the water, comprising a couple of pneumatic containers connected transversely to one another and an air compressor for their inflation and deflation through valves arranged in the pneumatic containers, the pneumatic containers of the couple being connected to one another by means of flexible cross members that support the boat when the pneumatic containers are inflated, wherein

- a plurality of containment sleeves is circumferentially bound at regular intervals on both pneumatic containers,
- each containment sleeve has a pair of projecting edges provided with coaxial holes for forming a C-shaped seat, and
- a connecting band is housed in said seat and is kept by means of bolts passing through the coaxial holes of the pair of the projecting edges, the connecting band having two end wings being side-by-side and coaxial drilled.

[0014] It is understood that in the submersible device according to the present invention the flexible cross members between the pneumatic containers or floating bodies serve both to connect them and to support the boat after being inflated.

[0015] Conveniently, the flexible cross members are metal strips coated with a gasket intended for contact

with the boat and connected to corresponding connecting bands of the two pneumatic containers.

[0016] Advantageously, each connecting band is held on a containment sleeve that is circumferentially glued at regular distances on both pneumatic containers.

[0017] The containment sleeves are made of plastic material and the connecting bands are made of elastomeric material, but preferably of steel.

[0018] Each pneumatic container is provided with a pair of front and rear ropes passing through respective front, central and rear rings, which are fixed on them, with a pair of dead body anchors to keep the pneumatic containers always in the same position and of a buoy which detects the position of each pneumatic container when it is sunk.

[0019] One embodiment thereof is set forth in the detailed description that follows, referring to the attached drawings wherein:

- Figure 1 and Figure 2 are a top plan view and a rear view, respectively, of the device according to the present invention;
- Figures 3 and 4 are front and side views of a containment sleeve for a pneumatic container according to the present invention;
- Figures 5 and 6 are front and side views of a connecting band designed to be retained by the containment sleeve in Figures 3 and 4;
- Figures 7 and 8 are top and front views of two enlarged end details of the pneumatic container in Figures 1 and 2;
- Figure 9 is an enlarged exploded partial perspective view of a cross member in Figure 1; and
- Figures 10 to 13 are schematic lateral views of the device in Figure 1 in operation and at rest with respect to a boat.

[0020] Reference is made initially to Figures 1 and 2, which are a top plan view and a rear view, respectively, of the device of the submersible device for lifting a boat over water according to the present invention. It comprises substantially two pneumatic containers 1, 2 mutually coupled with flexible cross members generally indicated as 3. The pneumatic containers 1, 2 are inflated and deflated by means of an air compressor 27 through valves 25 arranged in the pneumatic containers 1, 2. In the described and illustrated embodiment, the pneumatic containers 1, 2 are similar in their shape to towing rollers. However, it should be understood that the pneumatic containers may take different shapes depending on the boat being lifted. The flexible cross members 3 will be described in detail below.

[0021] A plurality of containment sleeves 4, made of plastic material, preferably PVC, is preferably glued circumferentially at regular and, preferably, constant distances over both pneumatic containers 1, 2. As shown in greater detail in Figures 3 and 4, which are front and lateral views of a containment sleeve 4, it has a circum-

ferential element 5 and a pair of projecting edges 6, also circumferential, to form a C-shaped seat 7. The projecting edges 6 have a plurality of coaxial holes for inserting bolts 8 adapted to retain a connecting band 9 shown in Figures 5 and 6, which are front and side views thereof. The connecting band 9, made of rubber or other high strength elastomeric material, but preferably made of steel, is substantially a split ring 10 having two end wings 11 side by side and drilled with coaxial holes 15. The end wings 11 are preferably reinforced with a plate for fixing bolts 12 for the connection with a flexible cross member 3 as shown in Figures 7 and 8, which are top and front views of two enlarged end details of the device according to the invention. Reference is made also to figure 9, which is an enlarged exploded partial perspective view of a cross member in Figure 1. The flexible cross members 3 are preferably metal strips 13 having opposite ends 14 provided with holes 15 for connection with the end wings 11 of the corresponding connecting band 9 of the two pneumatic containers 1 and 2. The holes 15 are designed to receive the bolts 12 as shown in Figures 7 and 8. Each metal strip 13, preferably of steel, is coated with a gasket 16 intended for contact with the boat. The gasket 16 has a cavity 17 for passing the metal strip 13. The cavity 17 has a central extension 17a for allowing a pair of metal strips 13 to be inserted together by means of bolts passing through holes 29 so as to adjust, as necessary, the distance between the pneumatic containers 1 and 2 of the pair of metal strips 13. It should be evident that the distance between the pneumatic containers 1 and 2 differs according to the width of the keel of the boat.

[0022] As shown in the figures, particularly in Figures 7 and 8, each pneumatic container 1, 2 laterally has a plurality of rings, generally indicated with 18, preferably of steel, integral with the pneumatic containers 1, 2 by means of ring bases 19 substantially on the side opposite the flexible cross members 3.

[0023] Reference is made now to figures 10 to 13, which are schematic lateral views of the device in Figure 1 in operation and at rest with respect to a boat I.

[0024] Referring to figure 10, the boat I is shown suspended above the free surface of the water P by the device according to the present invention. The device, in addition to the parts already described, comprises, as shown also in Figure 1, for each pneumatic container 1, 2 a pair of front and rear ropes 20, 21. The plurality of rings 18 comprises front rings 18a, central rings 18c1, 18c2 and rear rings 18p. The pair of front ropes 20 are passed through the front rings 18a and the front center rings 18c1, and the pair of rear ropes 21 are passing through the rear central rings 18c2 and the rear rings 18p.

[0025] Moreover, each pneumatic container 1, 2 has a pair of mooring anchors 22 and a buoy 23. Each rope 20, 21 is attached, at one end thereof, to a mooring anchor, and at the other end thereof to a handle 24, preferably located in the center of the device according to the present invention. The buoy 23 is provided slidable in the rope tracts 20, 21 between the handle 24 and the

central rings 18c1, 18c2 so as to keep the handle 24 afloat to be conveniently grasped when mooring.

[0026] In summary, each rope 20, 21 is attached at one end to a mooring anchor 22 for example located at a depth of 3.50 m. Each rope 20, 21, at the other end thereof, is joined in a same handle 24. The buoy 23, sliding in the rope tract between the handle 24 and a central ring 18c1, 18c2 allows the handle 24 to remain afloat even when the pneumatic container 1, 2 goes to the bottom, after its deflation. As said previously, it should be understood that, even if not shown in the figures, the same arrangement of ropes and mooring anchors is provided for the pneumatic container 1.

[0027] At least one air passage tube 28 is connected on one side to a valve 25 of each pneumatic container and on the other side is fixed to the quay B with a tap 26 for connection to the air compressor. The air compressor 27 can be mounted on both the same boat to be lifted or the quay.

[0028] Assume that the boat I, moored to a bollard BT, wants to take off from the raised position shown in Figure 10. The pneumatic containers 1, 2 (only the pneumatic container 2 is visible in Figures 10 to 13) must be sunk by sucking the air therein through the air compressor 27 and the air passage tube 28 which branches off to the valves 25 of each pneumatic container 1, 2. Figure 11 shows the pneumatic container 2 while being deflated but still on the water surface P. Figure 12 shows the pneumatic container 2 at half depth, while in Figure 13, it is completely deflated, on the bottom S. Now, the boat I is free to put out into the deep, after having disconnected the pipe 28 from the air compressor 27.

[0029] It should be understood that the sinking can be accelerated by an adequate ballast not shown in the figures. Furthermore, it is evident that the air compressor 27 could be provided on the quay instead of on the boat I. The device according to the present invention has the advantage of being substantially universal, because it is adaptable to each boat. In fact, as shown in Figure 9, the length of the cross members can be adjusted by superimposing at least two metal strips 13 joined together by bolts in their coaxial holes 29. The dimensions and the shapes of the pneumatic containers 1, 2, as well as those of the containment sleeves 4 and of the connecting bands 9, can be chosen according to the displacement of the boat to be lifted.

[0030] Obviously, all the suitable materials for the above described components of the device according to the invention can be selected. Given the simplicity of the operations to be performed, it can be the same owner of the boat to use, according to his/her needs, the components and assemble the device according to the present invention alone.

Claims

1. Submersible device for lifting a boat over water, com-

prising a couple of pneumatic containers (1, 2) transversely connected to one another, and an air compressor (27) for their inflation and deflation through valves (25) arranged in the pneumatic containers (1, 2), the pneumatic containers (1, 2) of the couple being interconnected by means of flexible cross members (3) supporting the boat when the pneumatic containers (1, 2) are inflated, **characterized in that:**

- a plurality of containment sleeves (4) is circumferentially bound at regular intervals on both pneumatic containers (1, 2),
- each containment sleeve (4) has a pair of projecting edges (6) provided with coaxial holes for forming a C-shaped seat (7), and
- a connecting band (9) is housed in said C-shaped seat (7) and is kept by means of bolts (8) passing through the coaxial holes of the pair of the projecting edges (6).

2. Device according to claim 1, wherein the containment sleeves (4) are made of plastic, and the connecting bands (9) are made of an elastomeric material.
3. Device according to claim 1, wherein the connecting bands (9) are made of steel.
4. Device according to claim 1, wherein the connecting band (9) has two end wings (11) that are flanked and coaxially bored.
5. Device according to claim 4, wherein the flexible cross members (3) are metal strips (13) having opposite ends provided with holes for the connection by bolts (12) with the end wings (11) of the respective connecting bands (9) of the two pneumatic containers (1, 2), each metal strip (13) being coated with a gasket (16) for the contact with the boat (I).
6. Device according to claim 5, wherein each flexible cross member (3) is formed by at least a pair of metal strips (13) joined together by means of bolts inserted in through holes (29) for adjusting a distance between the pneumatic containers (1, 2) of the couple, as necessary.
7. Device according to claim 1, wherein each pneumatic container (1, 2) has laterally a plurality of rings (18) that are integral with it on the side of the pneumatic container (1, 2) opposite to the flexible cross members (3).
8. Device according to claim 7, wherein the plurality of rings (18) comprises front rings (18a), central rings (18c1, 18c2) and rear rings (18p).
9. Device according to claim 8, wherein provided for

each pneumatic container (1, 2) is a pair of front ropes (20) and rear ropes (21) passing through the front rings (18a) and the central rings (18c1), and the central rings (18c2) and the rear rings (18p) respectively, a pair of mooring anchors (22) and a buoy (23), each rope (20, 21) being attached at one end to a mooring anchor (22) and at other end to a handle (24), the buoy (23) being slidable in tracts of the rope (20, 21) between the handle (24) and the central rings (18c1, 18c2).

10. Device according to claim 1, wherein at least one air pipe (28) is connected to at least one valve (25) of each pneumatic container (1, 2) on one side and, on the other side, is secured to a quay (B) with a tap (26) for the connection to the air compressor (27).

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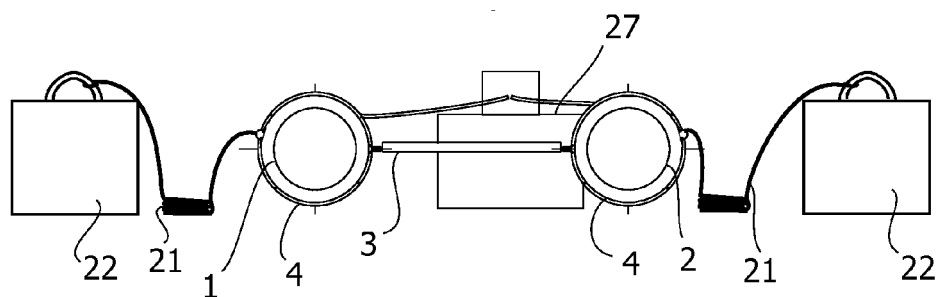


Fig. 2

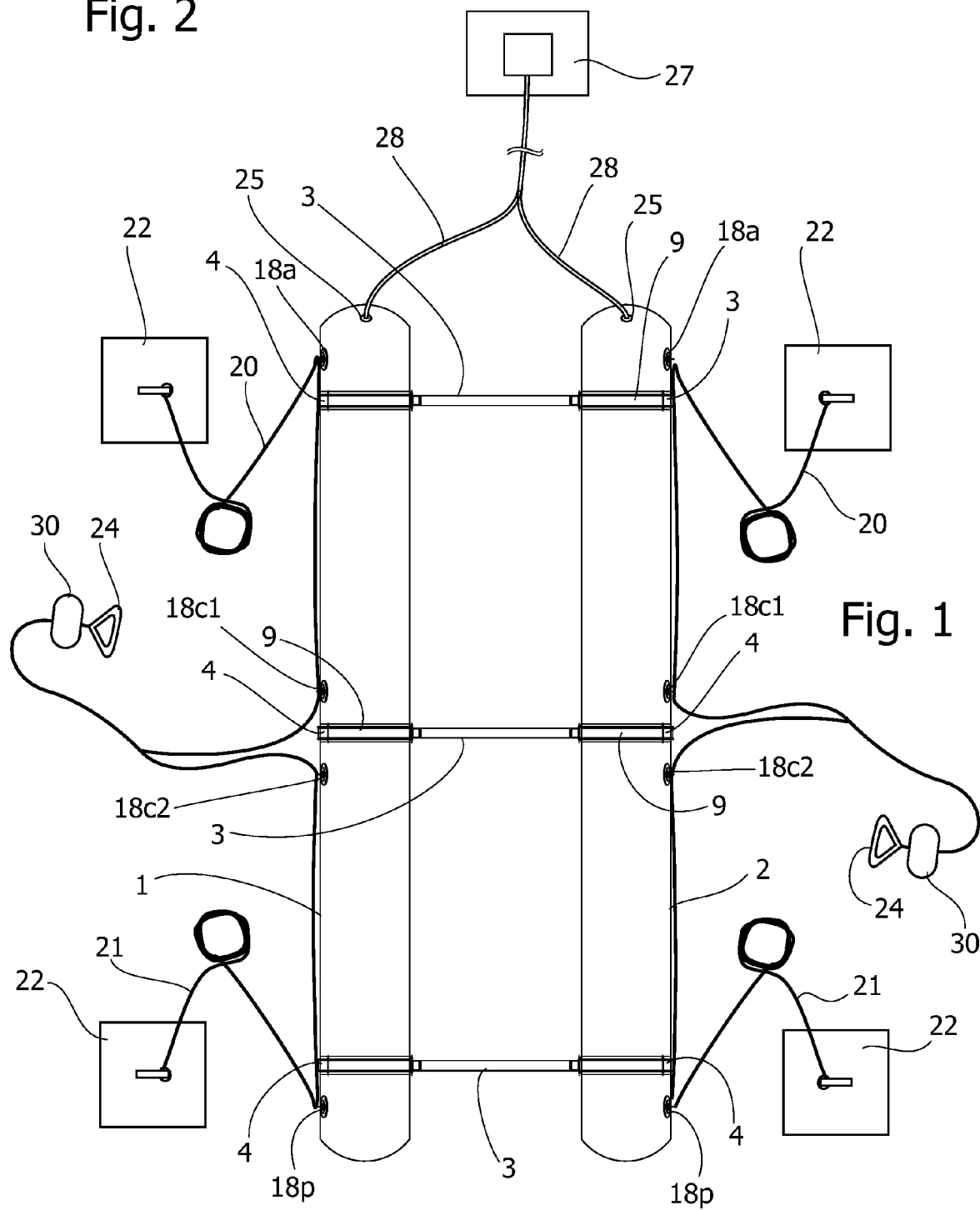


Fig. 1

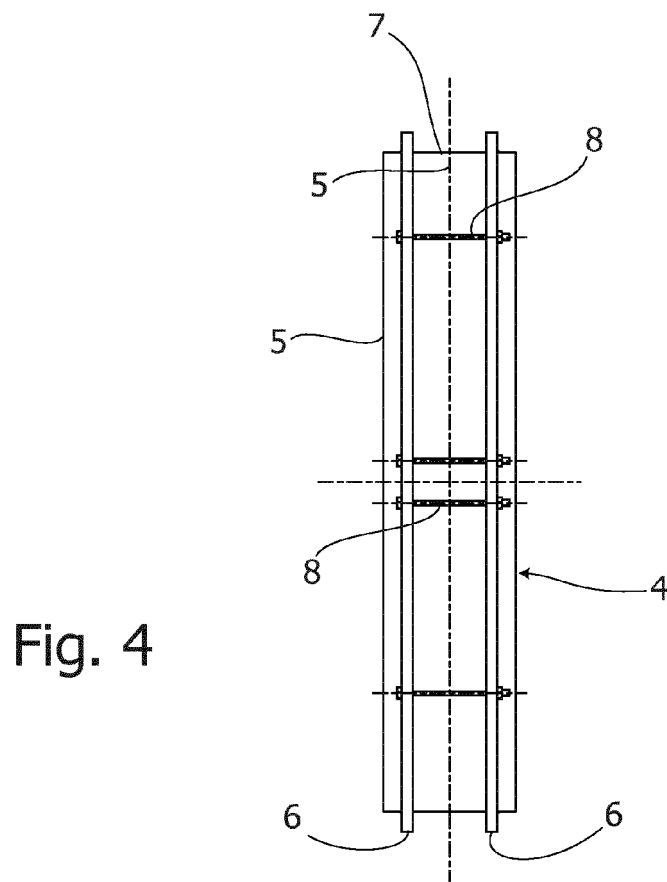
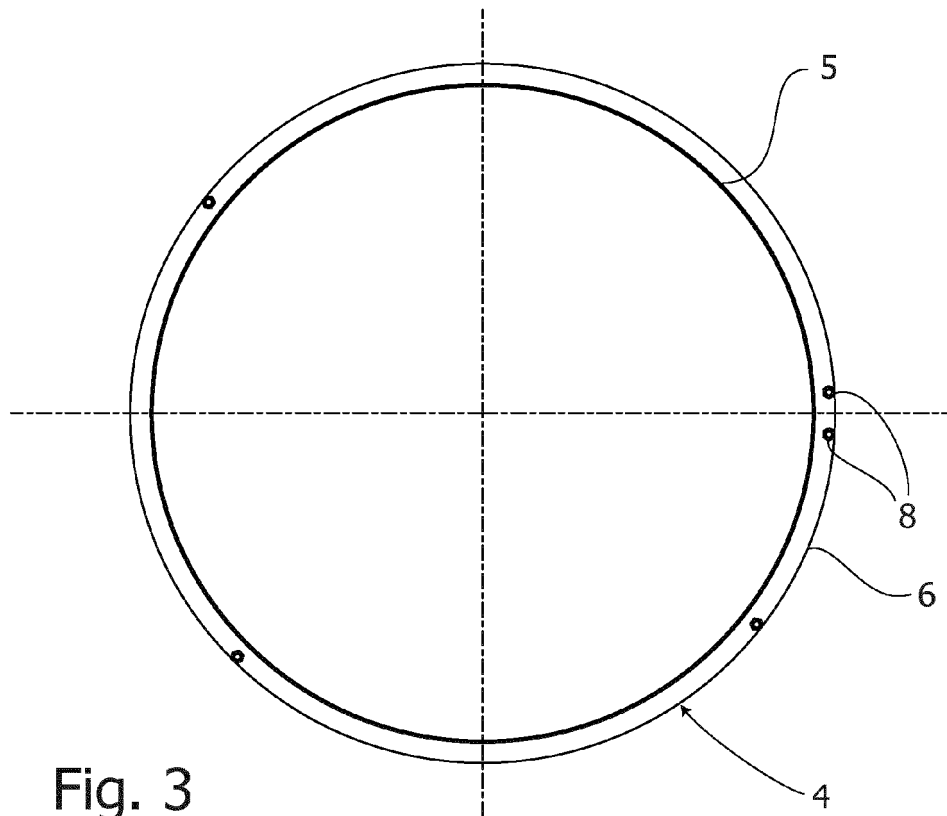


Fig. 5

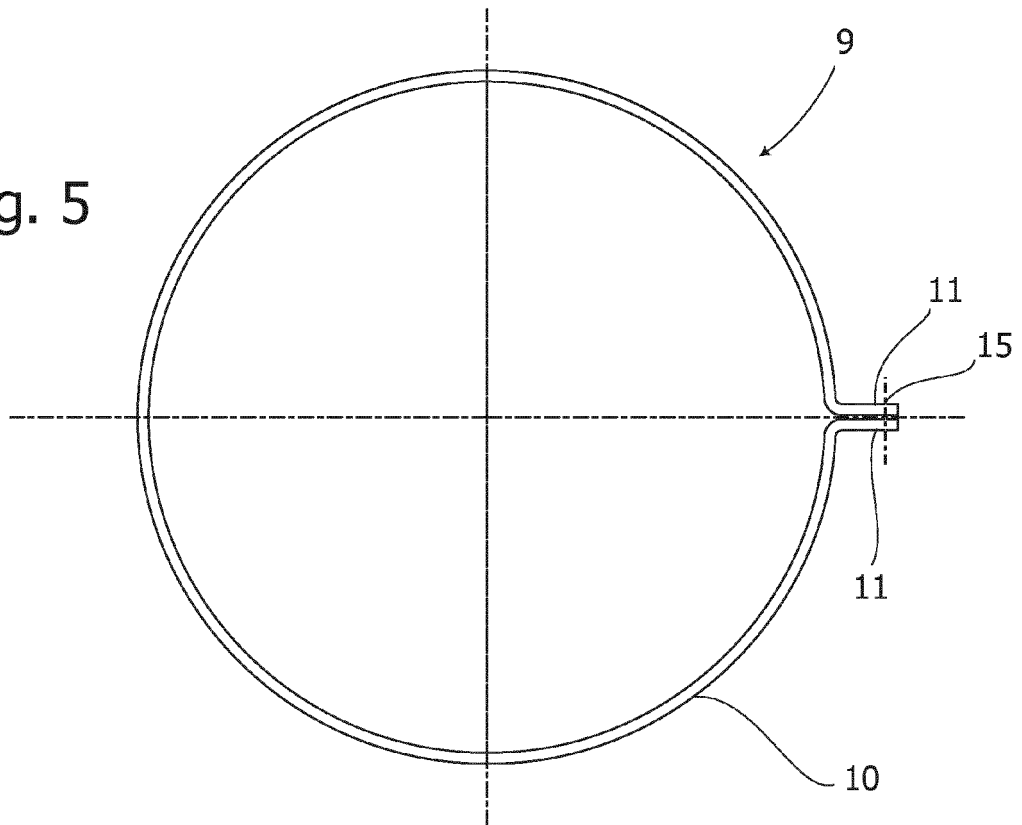
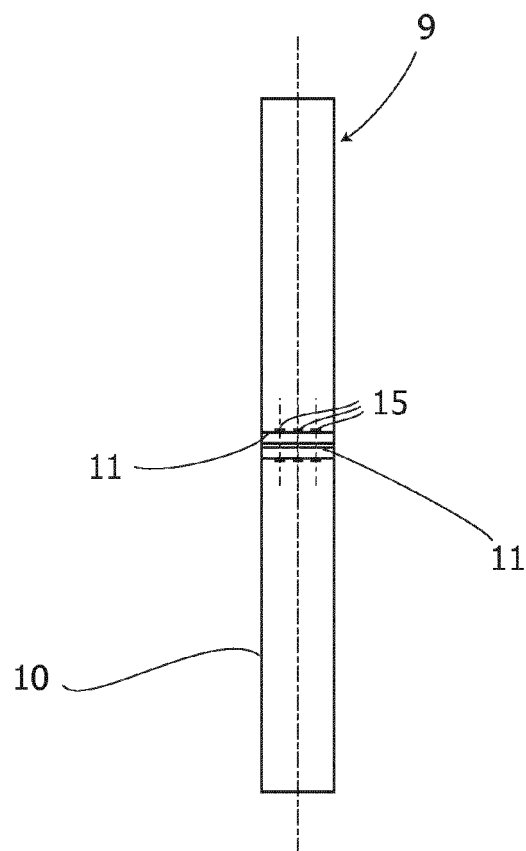
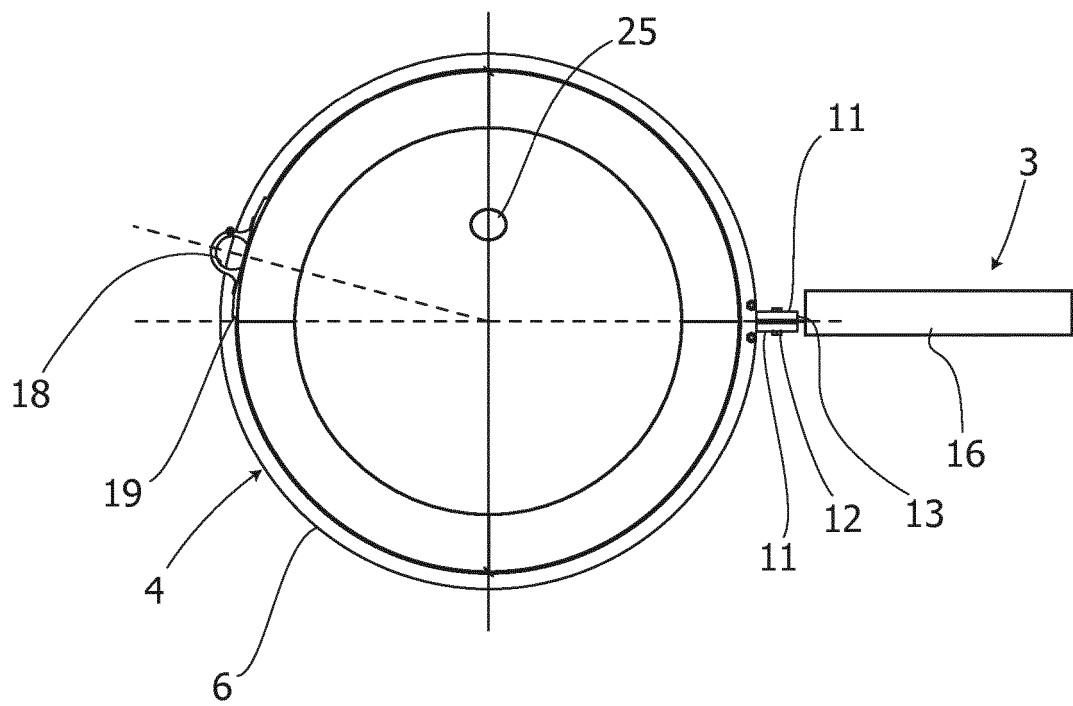
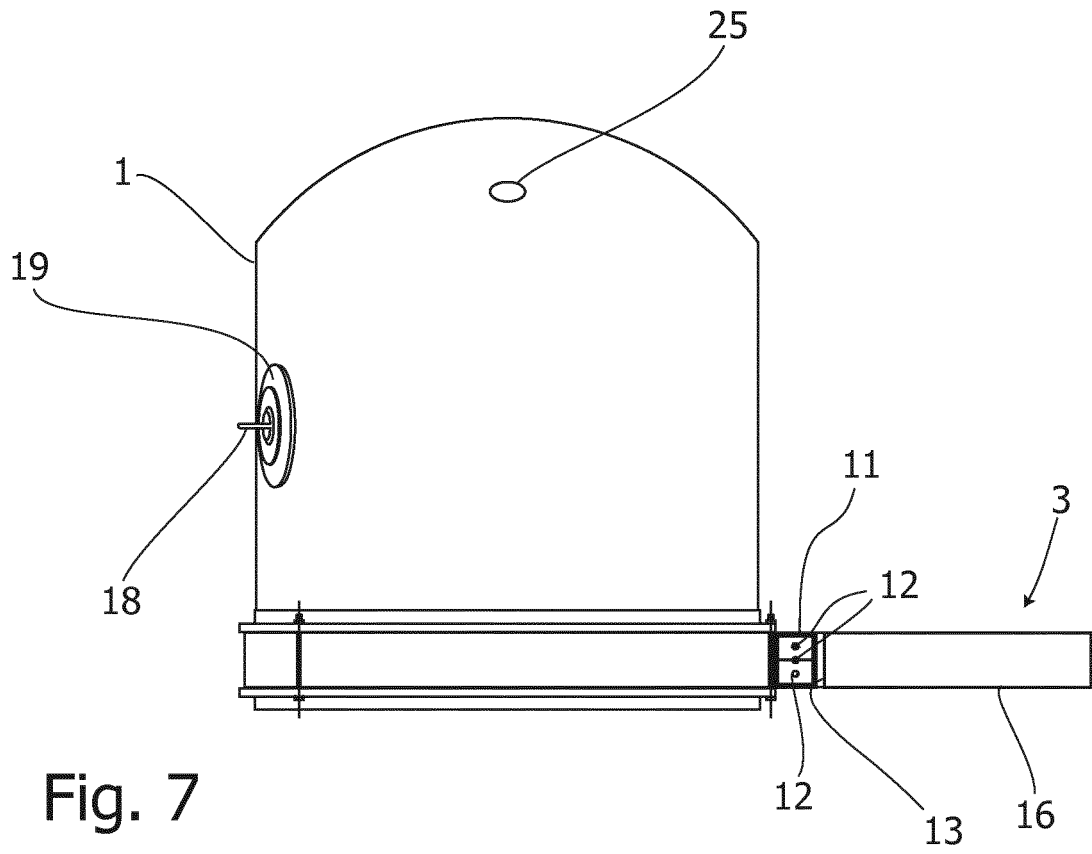


Fig. 6





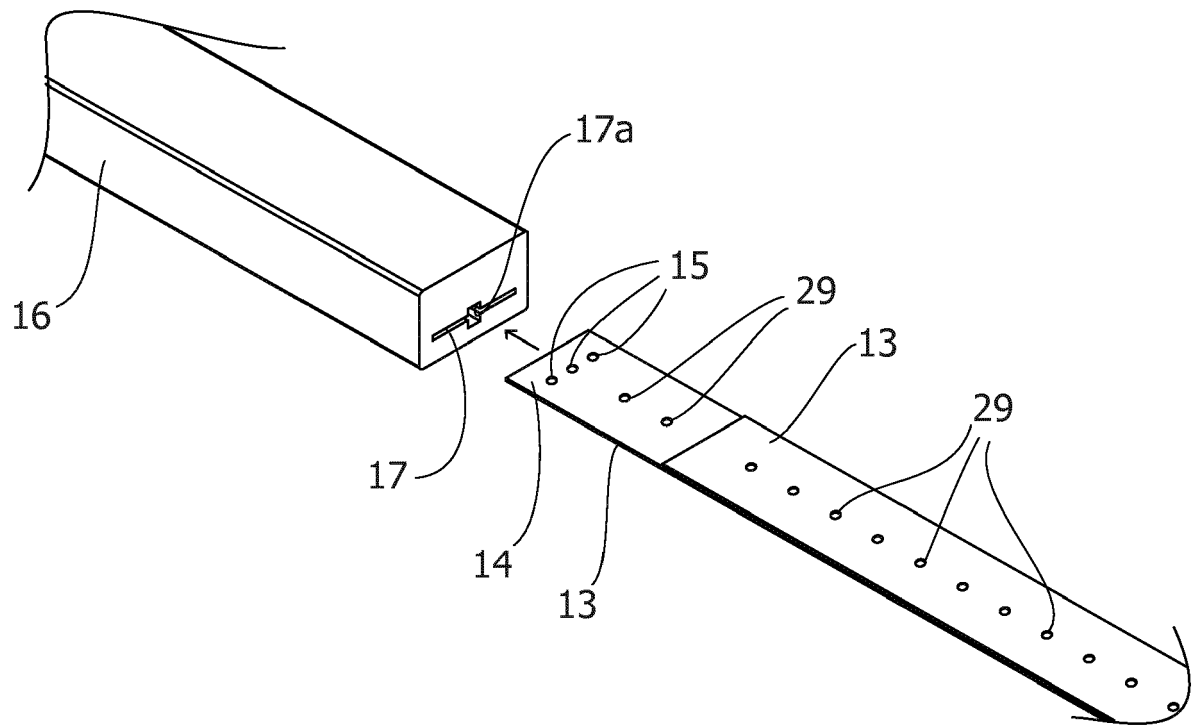


Fig. 9

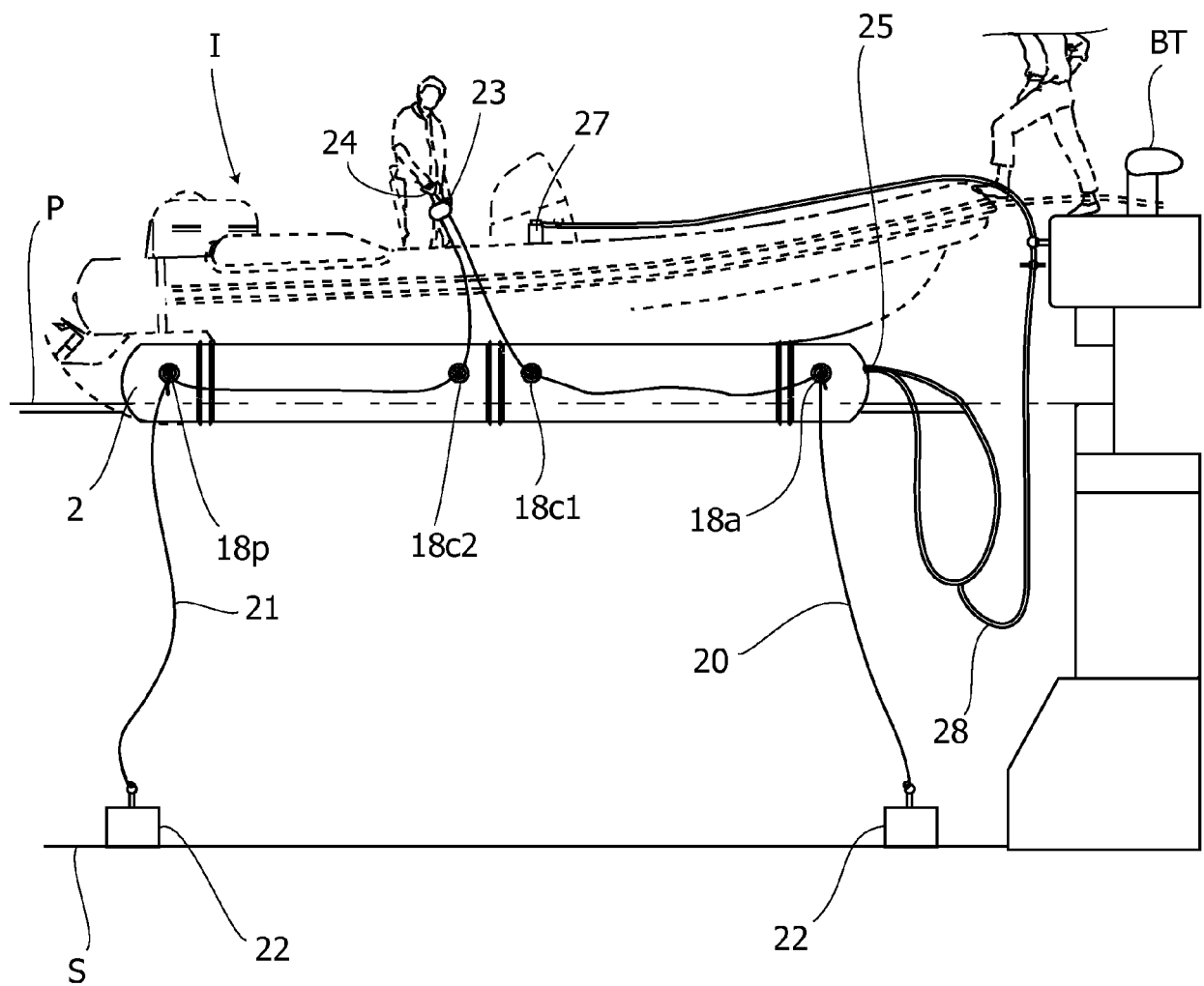


Fig. 10

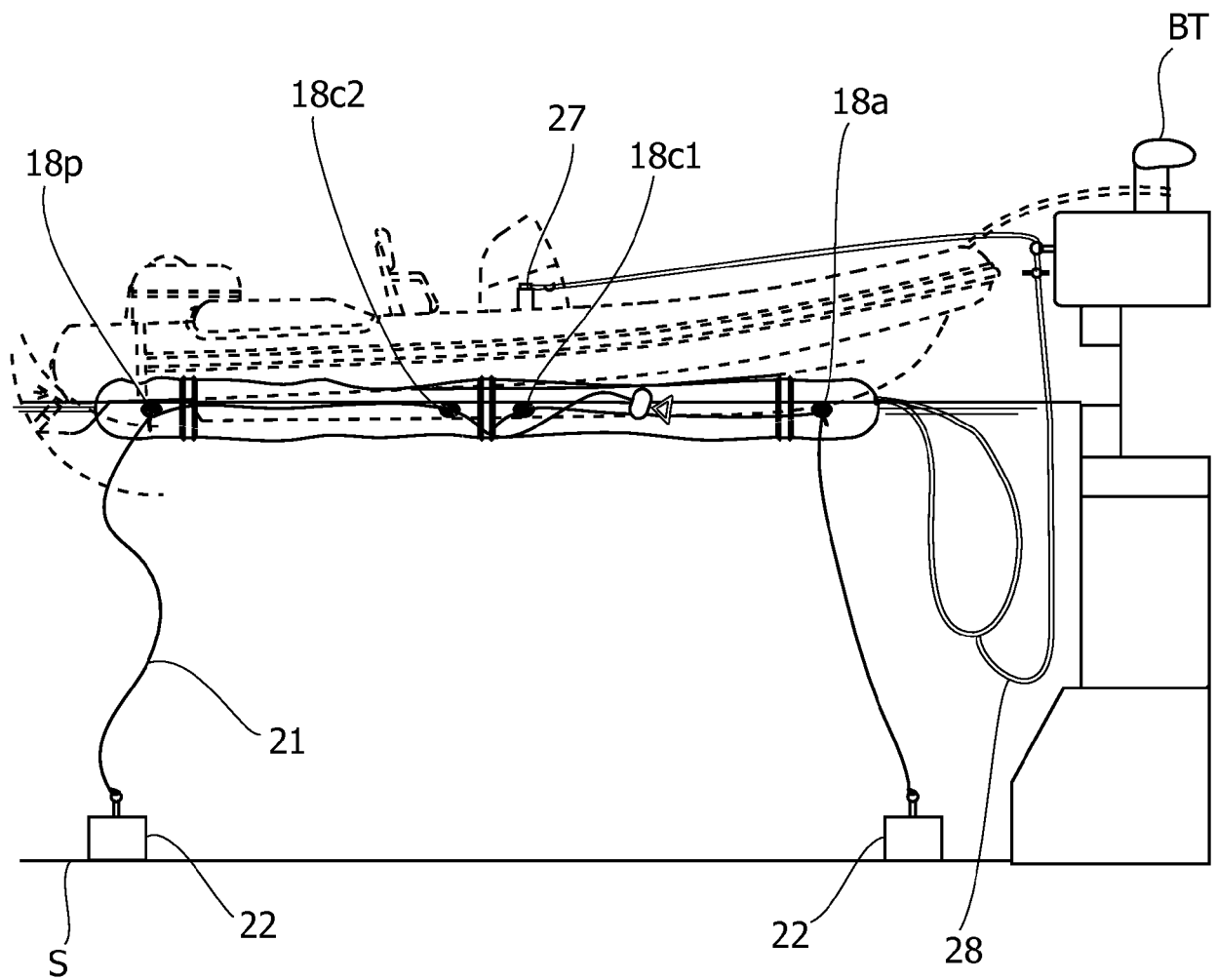


Fig. 11

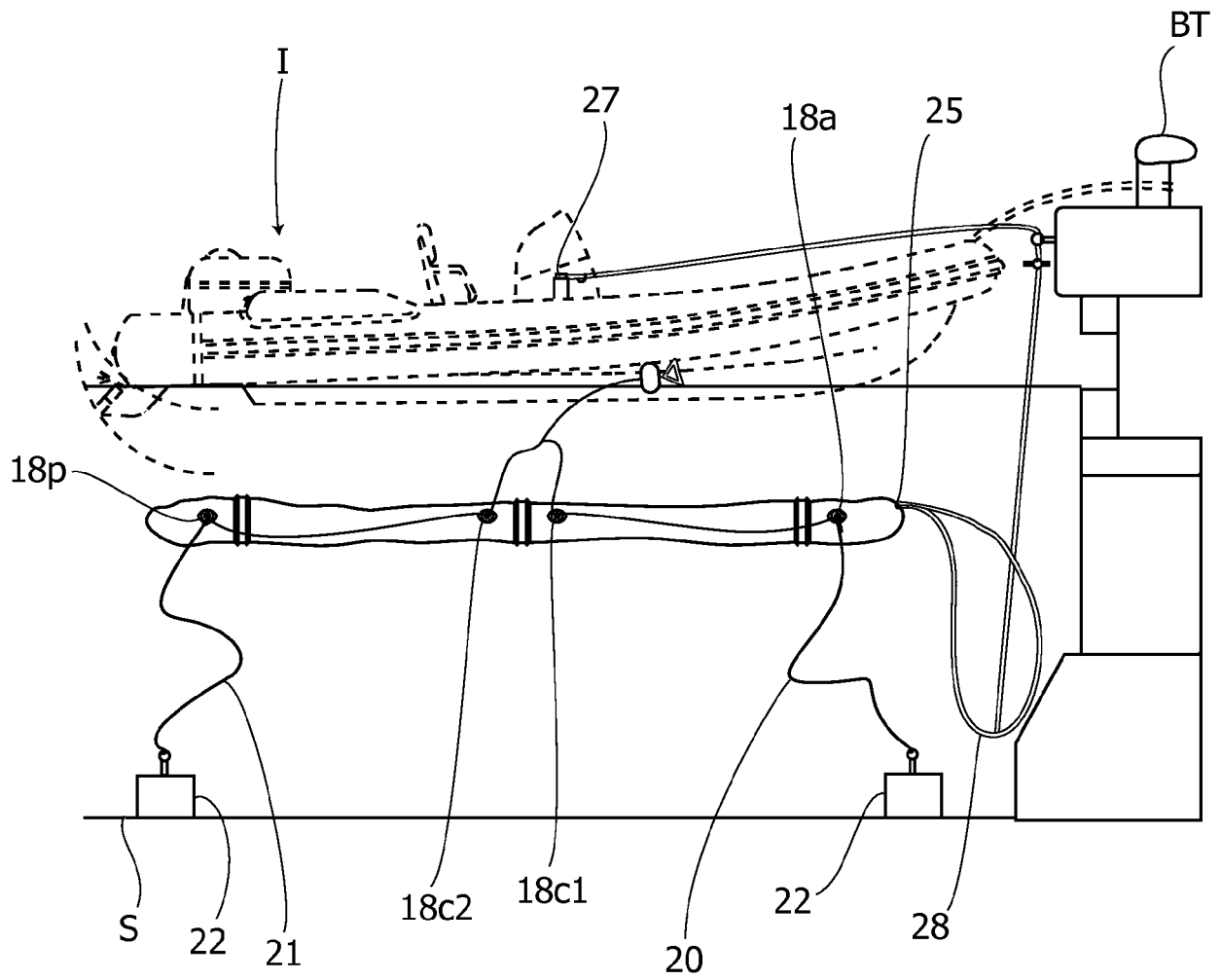


Fig. 12

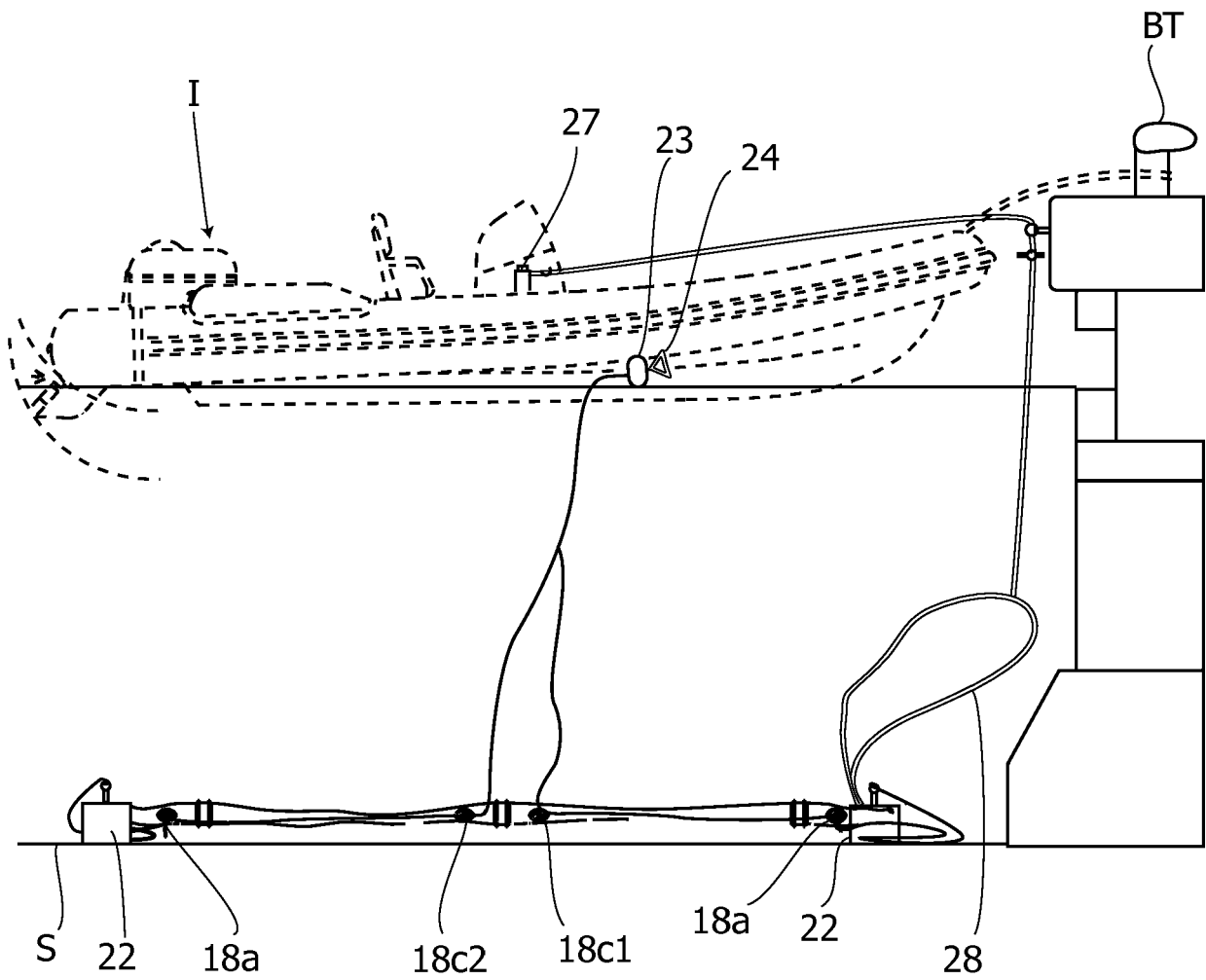


Fig. 13



EUROPEAN SEARCH REPORT

 Application Number
 EP 18 02 0194

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 2005/268837 A1 (MEARS TONY W [US]) 8 December 2005 (2005-12-08) * abstract; figures *	1	
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			TECHNICAL FIELDS SEARCHED (IPC)
			B63C B63B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 July 2018	Examiner Balzer, Ralf
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EP 18 02 0194

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