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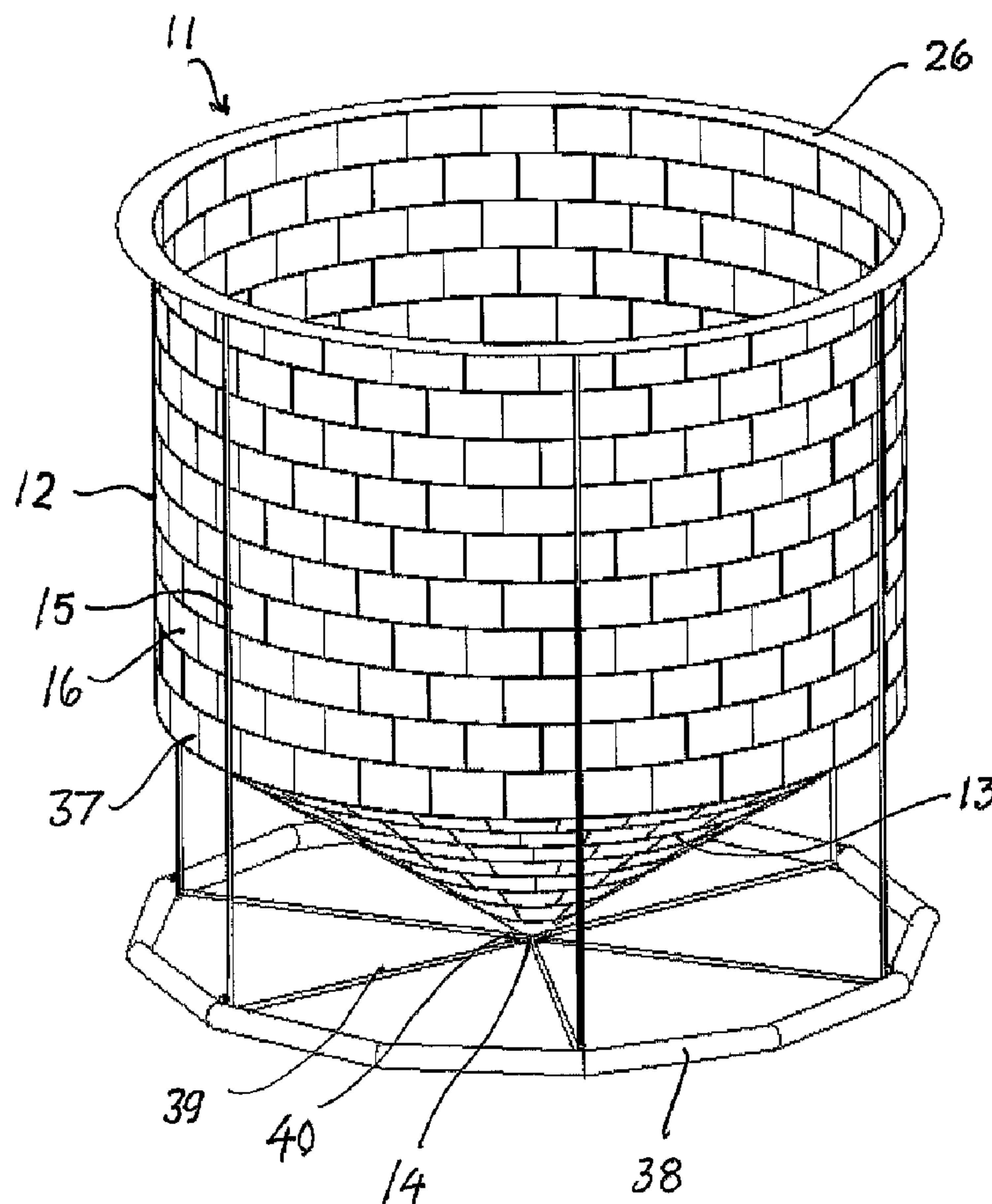
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(54) Titre : RECIPIENT DESTINE A ETRE UTILISE DANS L'EAU ET SON PROCEDE DE CONSTRUCTION

(54) Title: CONTAINER FOR USE IN WATER AND A METHOD FOR CONSTRUCTION OF SUCH CONTAINERS



(57) Abrégé/Abstract:

Container for location in the sea for collection of fluids, masses or mixtures of objects and fluids, with a specific weight which is not substantially different from seawater. The container has a cylindrical shape and is arranged for location with the longitudinal axis in

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vertical direction. The sidewalls (12) of the container are assembled of sheet elements (16) which are joined along their side edges forming a shell construction.

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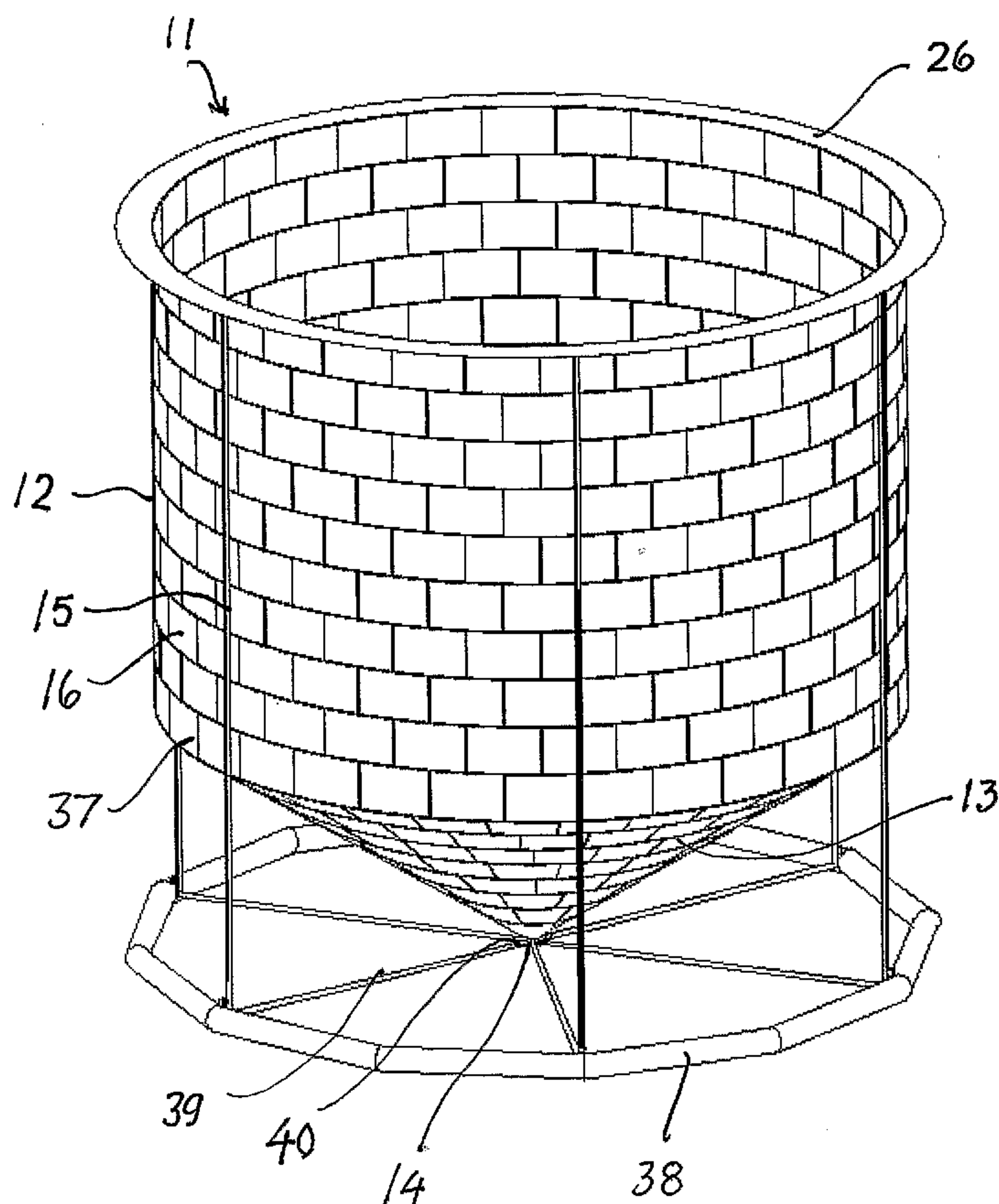
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(54) Title: CONTAINER FOR USE IN WATER AND A METHOD FOR CONSTRUCTION OF SUCH CONTAINERS



(57) Abstract: Container for location in the sea for collection of fluids, masses or mixtures of objects and fluids, with a specific weight which is not substantially different from seawater. The container has a cylindrical shape and is arranged for location with the longitudinal axis in vertical direction. The sidewalls (12) of the container are assembled of sheet elements (16) which are joined along their side edges forming a shell construction.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Container for use in water and a method for construction of such containers

The invention relates to a container as defined in claim 1, for use in water, e.g. for locating in the sea for the enclosure of farmed fish, freshwater, or other medias that can be pumped. The invention
5 also includes a method for construction of such containers.

Background

There is a need for the storage of various substances of large volume in water. An example of this is the need for the collection and storage of freshwater in great amounts in sea areas. For this
10 purpose cylindrical fabric containers which are placed on the surface have been made. Such containers or tanks have limited sturdiness and have been difficult to handle.

For the collection of fish, either for breeding or temporary storage, installations of net cages using a grid of containers in the form of tanks or closed cages, which are held floating in the sea. Existing containers are usually manufactured of seine material, and is thereby often called "farming
15 seine". These are exposed to damage by drift-wood, boat propellers, gnawing by predators, weights, and others. The most common reason of fish escape is installation failure due to wear and tear, and damage. This has resulted in the escape of large amounts of farmed salmon, something that is considered to be one of the most important problems for the industry. In addition, this results in a large financial loss for the breeder. Also escaped farmed salmon are an environmental problem due
20 to the spread of infections, and by the genetic pollution of wild salmon.

To be able to increase the extent of fish farming, it is necessary to improve the containers for farming in such a way that the environmental problems are reduced, and the economics are improved.

25 Object

The main object of the invention is to provide an environmentally friendly and secure container of a large volume for use in water, with low costs of manufacture, good utilisation properties, and low operating costs.

It is a particular object to provide a container for use in water which can be used for farmed fish,
30 or as a cage to contain fish to be slaughtered with a suitable water system, which is closed for avoiding the spread of infections. It must be provided with a stable and relatively sturdy wall material. A further object is to provide a container which provides more secure emptying of living fish, which is easier and more rapid than by prior art containers.

A further object is to provide a container which can be used for the closed storage of fluids,
35 particularly freshwater, or for storing of other substances, such as fish flour and cereals.

A common requirement for these containers is the best possible relationship of strength/weight. They must further be easy to construct, repair and maintain. They must also be able to be dismantled, be height adjustable, and be towable.

5 **The invention**

The invention comprises a container, adapted for location in the sea, for collection of fluids and masses of objects and fluids, having a specific weight which is substantially the same as sea water. The container has a cylindrical shape having a vertical longitudinal axis. The container has sidewalls comprising multiple interconnected sheet elements, and includes at least three vertical columns arranged
10 around the circumference of the container, with respective lifting mechanisms to raise and lower the container from a float ring. A method of assembling the container is also disclosed.

A particular advantage of the invention is the good use of rigid sheers which have the ability to absorbing shearing forces and moments in connection with the circular shape of the container.

Another advantage is that the container can be elevated and lowered, such that it can easily be
15 erected, repaired, and possibly removed. The elevation lowering can also be advantageously utilised in connection with filling and emptying.

Further advantages of the invention will appear of the following example.

Example

20 The invention will, in the following be more closely described with references to the Figures, where;

Figure 1 shows a perspective view of a container according to the invention, without a float ring, and

25 Figure 2 shows, in perspective, a part of a float ring, with the lifting mechanism meshing with a column.

Figure 1 shows a container 11 for fish farming, having a cylindrical sidewall 12 and a funnel-shaped bottom 13. The container may have a diameter of 30 m and a total height of 30 m. At the junction between the sidewall 12 and the bottom 13 there is provided a ring 37 of welded sheets, with a
30 hole 14 in the lower edge of the base.

Around the circumference of the container 11, five vertical tubular columns 15 are arranged with 72° mutual distance. The number of columns 15 can be higher or lower. Each of the columns 15 can be assembled from several sections, which are joined by welding. The columns 15 can have a H-profile, or a different profile.

35 On top of the tubular columns 15 an annular platform 26 is arranged, which forms a walkway during use of the container, at the same time as it ties the columns 15 together at the top.

The sidewall 12 is constructed of sheets 16, which are joined edge to edge. In the example, galvanized expanded metal sheets of steel are used, e.g. with a size of 2 x 3 metres (Height x Width). As an alternative to expanded metal sheets, sheet structures of plastics which are perforated or with a

grid structure can be used. A common property and condition is that the sheets are elastic, but are otherwise stable. For tanks which are to be closed, closed sheets are used.

The sheets 16 can be joined together in several ways, e.g. with edges which are joined two and two, preferably detachable.

5 Figure 2 shows a section of the container 11 at a column 15. Around the container 11, a float ring 27 is provided, e.g. of chained closed sections of plastic tubes, possibly filled with foam material. At each column 15, there is, on the float ring 27, arranged a bracket 28 for the coupling of a hydraulic motor 29, which can be powered from an remote hydraulic drive unit. The motor 29 is connected with a gear 30 with self locking worm gear which has a toothed wheel 31 coupled to an
10 output axle. The toothed wheel 31 meshes with a rack 32, attached so that it protrudes radially out from the column 15.

From the gear 30 protrudes a pressure element 34, capable of sliding, possibly with a roller, which bears against the back of the rack 32, to hold the toothed wheel 31 in a secure mesh with the rack 32.

15 A hydraulic motor 29 with associated gear can alternately power three toothed wheels 31 by means of drive shafts which extend between them. In all cases, the lifting must be done synchronously.

The columns 15 in the example extend down to the plane of the bottom opening. There they are connected with the neighbouring column by means of a tubular girder 39. They are located by
20 means of bars 39, connected with a ring 40, which encloses the bottom opening 14. In this way the columns are not attached to the container wall 12.

The bottom 13 slants down from the container wall 12 with an angle which ensures that dead fish slide down toward the bottom opening 14.

25 **Method of erection**

The parts of a floating net cage with a container according to the invention can be manufactured as elements in a factory. The float ring 27 is assembled from several sections, which each forms a closed unit, and can be jointed with flanges while lying in the water.

The erection of the container 11 starts with the bottom 13 being constructed on shore with grid
30 sheets 16, and the ring 27 jointed together from parts at the location of use. For complementing the bottom 13, in addition to rectangular standard sheets, sheets whose form corresponds to the geometry of the bottom are also needed.

The lower sections of the columns 15 are lined up and attached to the bottom ring 38 and the bars 39.

35 The ring 38 is attached together. In the same manner, the ring 37 which is to form the boundary element between the sidewall 12 and the bottom 13, is attached inside of the columns 15. This bottom structure can now be lifted and placed in the float ring 27, which floats on the water. The

racks 32 are brought in mesh with the toothed wheels 31 such that the hydraulic motor 39 can move the columns up and down in relation to the float ring.

The assembly of the sidewall 12 can now start. Grid sheets 16 are assembled to form a rising sidewall. For each joint, the edges are connected to neighbouring plates in suitable way.

5 As the assembly of the sidewalls 12 proceeds, the finished part of the container 11 is gradually lowered into the sea by operating the hydraulic motor 29. Due to the self locking of the gear 30, the hydraulic motors 29 must be operated actively for all movements of the container.

When the sidewalls 12 are finished, the annular platform 26 is assembled. It includes sections with railing, which are chained together. The platform 26 is attached to the upper edge of the
10 column 15 and the sidewall 12 in a suitable way. The connection tubes for the hydraulic motors 29 are extending to a common connection point which is easy to access from the platform 26.

Use of a net cage with a container according to the invention

To empty the container 11, the hydraulic motors are connected to a hydraulic drive unit. A
15 flexible tube is connected from the bottom hole to a fish pump, and to a requested location for delivery. The emptying of the container can thus start. The fish pump is started and the container is elevated by the hydraulic motors until the density of fish is of the required mass for pumping. When the density of fish decreases so that the amount of pumped fish declines, the container can again be elevated so the density is of the required mass. This process continues until the container is emptied
20 and the bottom opening is above the water surface.

As an alternative to the racks and the hydraulic powered toothed wheels, synchronously powered winches on the float ring can be used, which each have a wire extending down to and connected to the lower end of the columns 15.

25 Modifications

The invention can be used for containment of substances other than farmed fish in water, as long as the contents have a specific weight which does not differ substantially from seawater. It can be water, e.g. freshwater gathered from rivers at a time of year which is rainy or with high amounts melting water which is to be stored for use in dry periods. It can be fish flour, or cereals. In such
30 cases the sheets 16 must be assembled close together, possibly by use of seal lists, sealing material or similar. In such cases, it may also be necessary to provide the container with a cover.

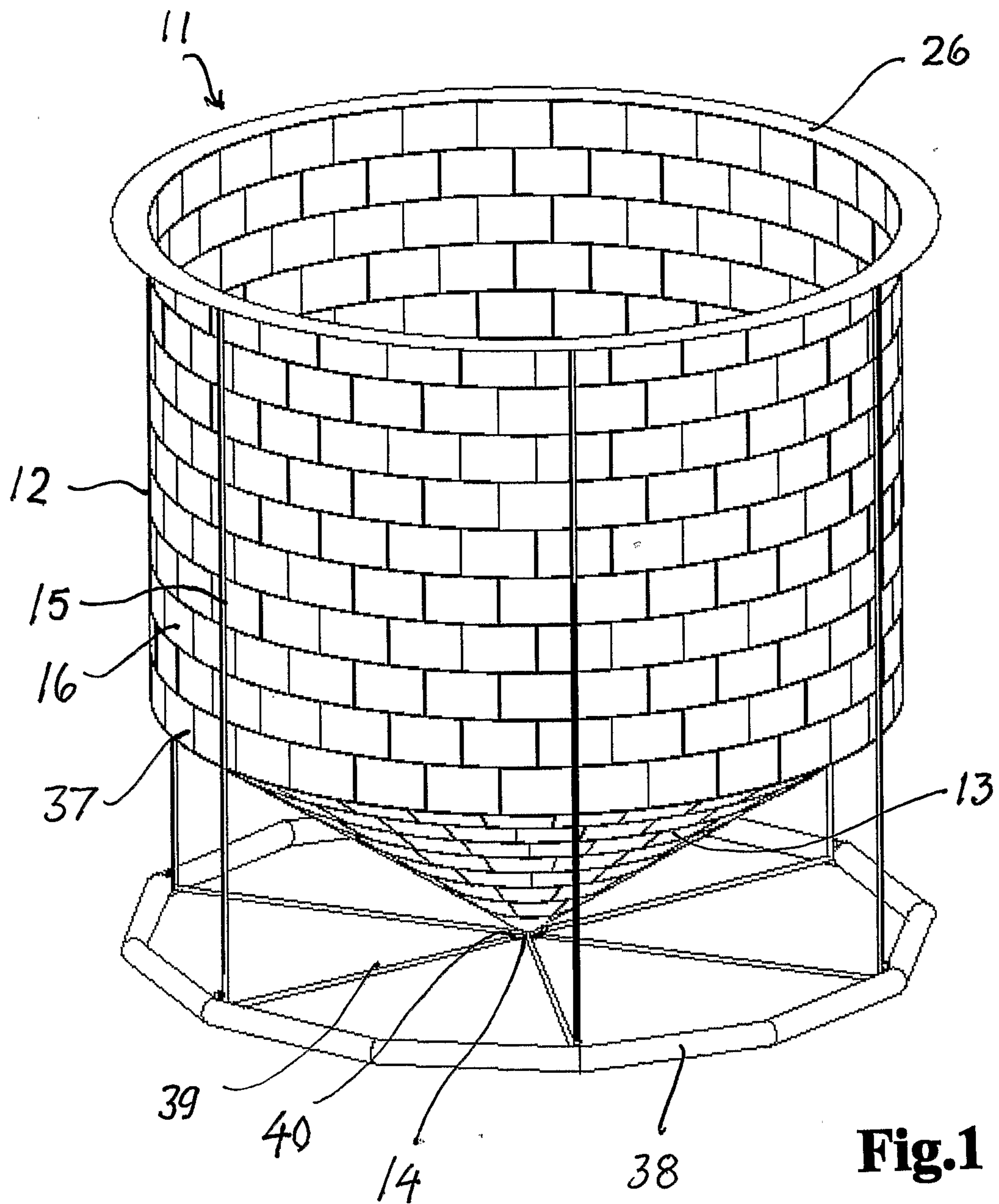
When filling and emptying such a container, you must be sure that the difference in weight between the displaced volume and the contents of the tank is never more than a few tons. Therefore, to fill a container with freshwater, the container must be completely elevated and empty of
35 seawater. As freshwater is added, the container is lowered down to maintain the balance between load and displaced mass. On emptying, the container must be elevated in relation to the fluid level in the container.

CLAIMS:

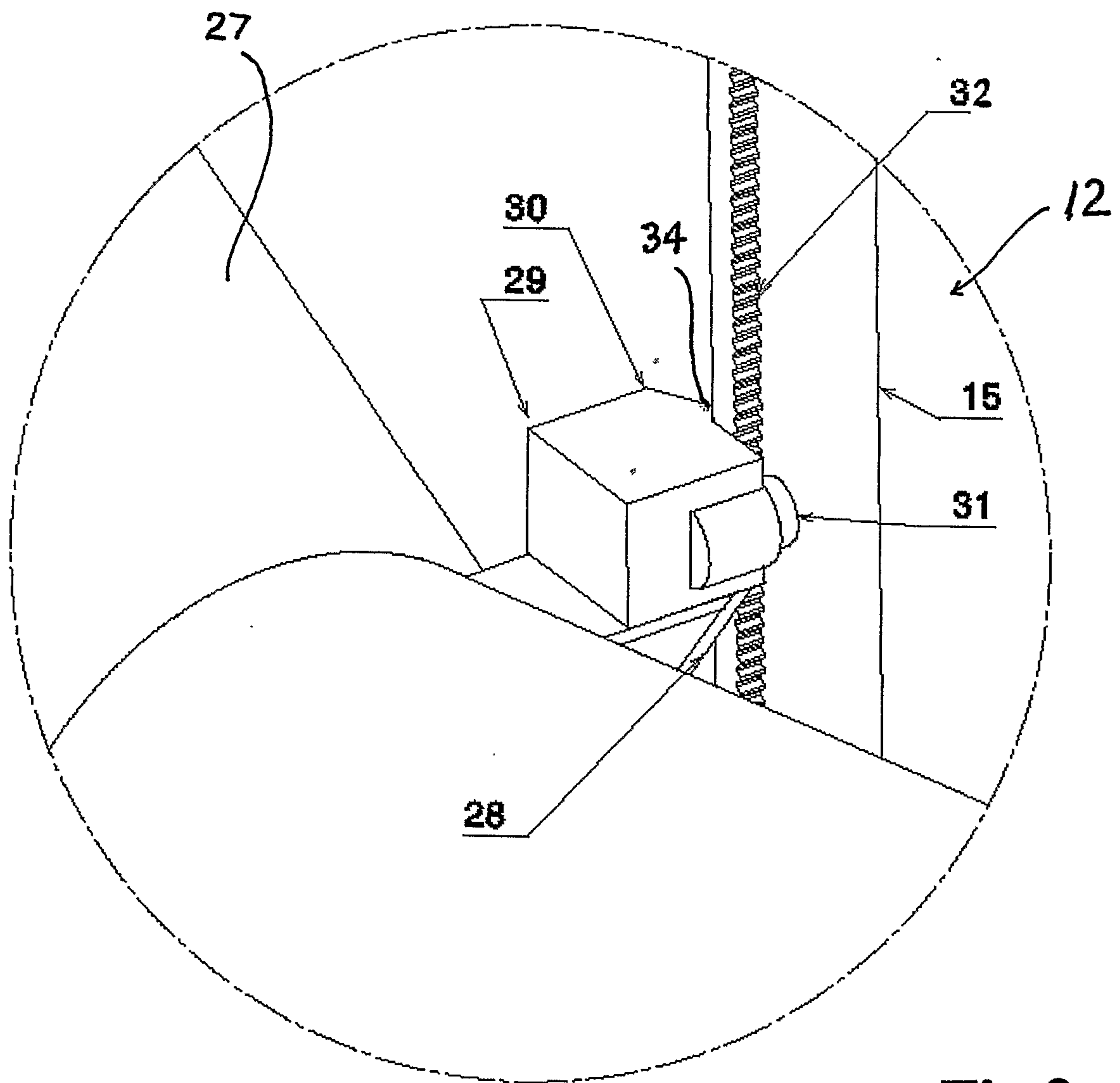
1. A container (11) for location in the sea, for collection of fluids, masses or mixtures of objects and fluids, with a specific weight which is substantially the same as seawater, with a cylindrical shape and arranged with the longitudinal axis in the vertical direction, said container
5 exhibiting sidewalls (12) assembled of sheet elements (16) which are joined along their side edges forming a shell construction, wherein at least three vertical support columns (15) are arranged around the circumference of the container, and lifting mechanisms (31, 32) are arranged with the support columns (15), which can be activated with one or several motors (29) arranged on one float ring (27), which encloses the container.
- 10 2. The container of claim 1, wherein the sheet elements are rectangular.
3. The container according to claim 1, wherein the support columns (15) exhibit a tubular profile or an H-profile.
4. The container according to any one of claims 1 to 3, wherein an annular platform (26) is attached to the upper edge of the support columns (15).
- 15 5. The container according to any one of claims 1 to 4, wherein the sheet elements (16) have connecting edges (17, 18), preferably plastic.
6. The container according to claim 5, wherein the connecting edges are made of plastic.
7. The container according to any one of claims 1 to 6, wherein it is assembled of
20 perforated or grid-shaped sheets.
8. The container according to claim 7, wherein the sheets are expanded metal.
9. The container according to any one of claims 1 to 8, used for fish farming.

10. A method for construction of a container according to any one of claims 1 to 9,
wherein:

- 5 • a bottom ring (38) and bottom sheets (16) together with at least lower parts of support columns (15) are assembled on a support,
- float ring (27), on which motors (29) and lifting mechanism (31) are assembled, is placed on the water,
- the bottom ring (38) with the support columns (15) is lifted and placed in the float ring (27) and the lifting mechanism is brought in to mesh with the lower part of
10 the container (11), and
- that the container (11) is lowered into the sea by means of the lifting mechanism as the side walls are gradually extended.

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**Fig.2**

