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Improvements in Tanks

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Abstract

A tank comprising two or more modules, each of said modules adapted for connection to at least another of said modules.

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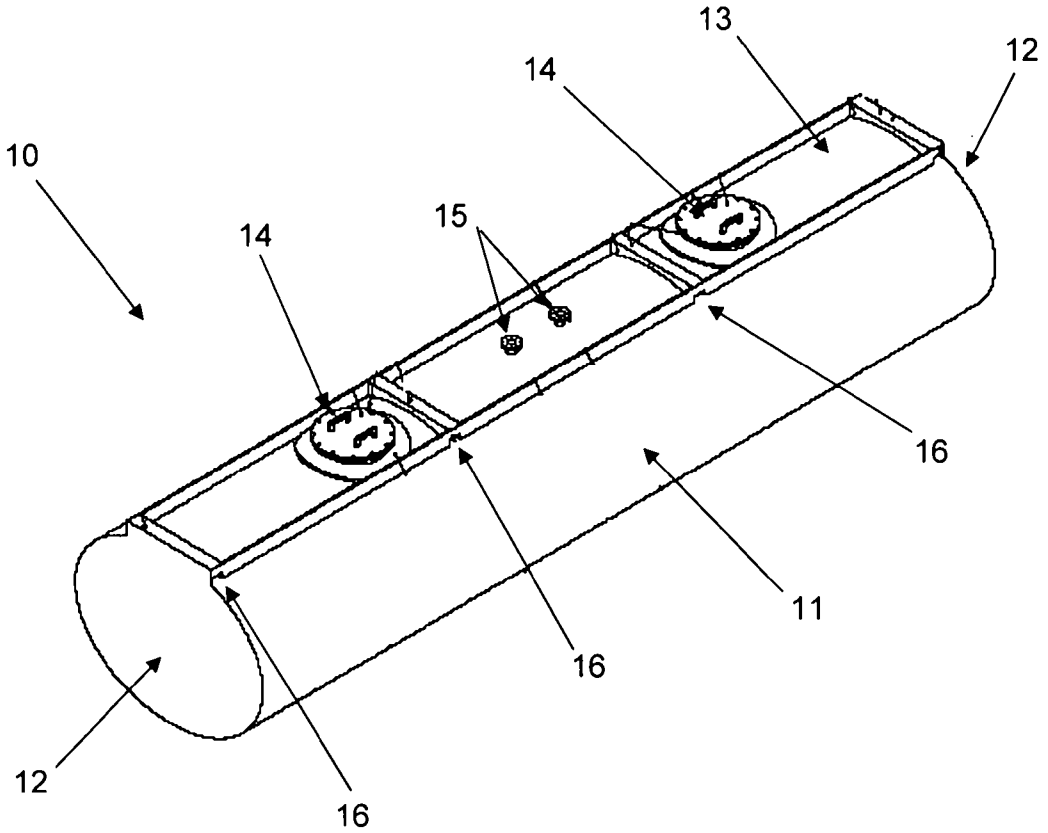

FIG 1

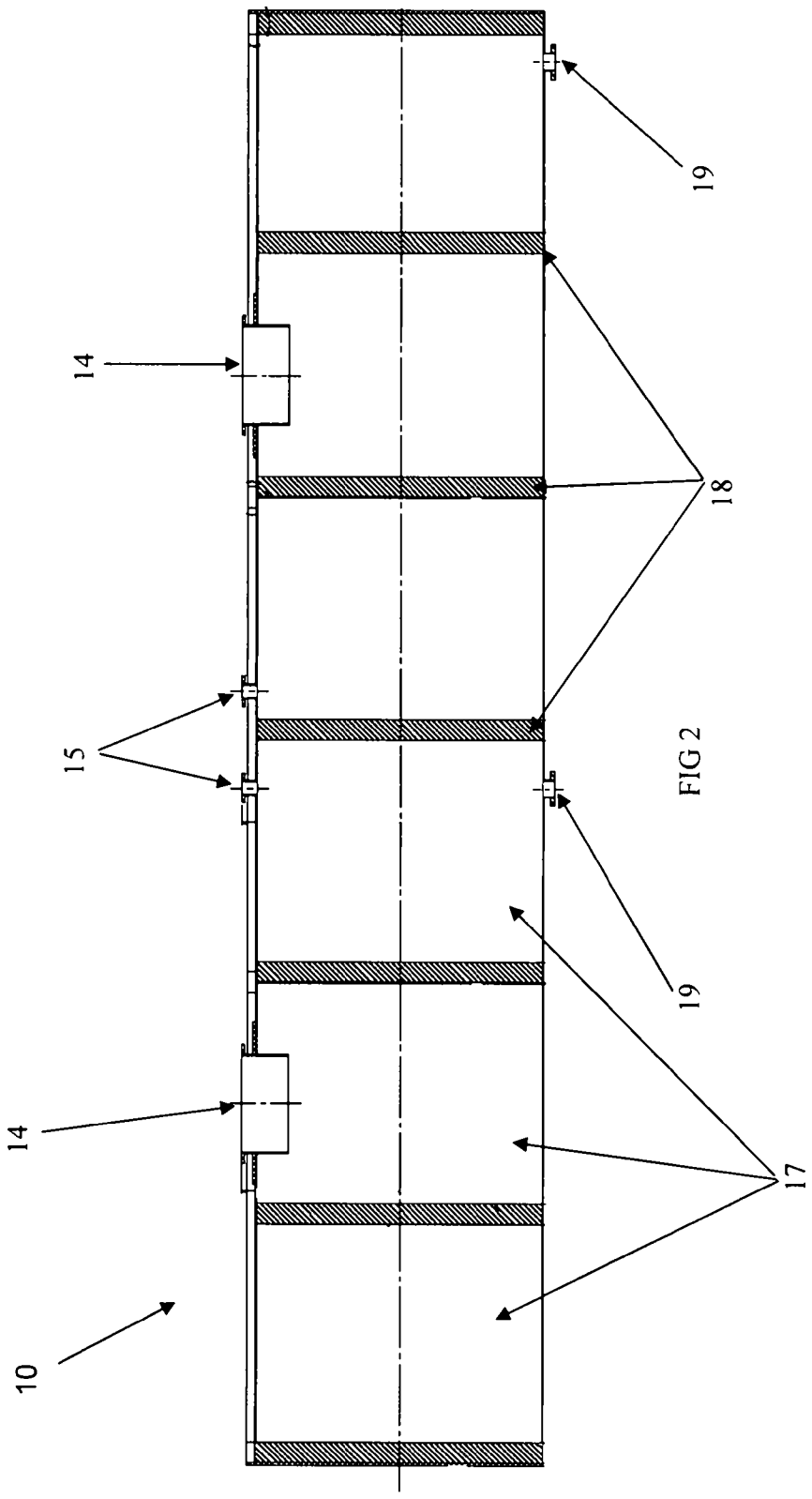

FIG 2

Improvements In Tanks

Field of the Invention.

The present invention relates broadly to improvements in tanks. Specifically, the present invention relates to improvements in the construction of tanks adapted for mounting on a vehicle, such as a tanker.

Background Art.

Vehicles, such as tankers, are typically used when transporting substances such as chemicals, petrol, oil, foodstuffs (such as milk) and the like by road. These tankers are typically a truck with one or more tanks mounted to a trailer, the tanks adapted to contain the substance being transported.

Typically, the one or more tanks mounted to the trailer will be constructed from metals such as aluminium or stainless steel. These metals are selected as they will generally remain inert when in contact with the substances transported within the tanks, as well as providing a degree of corrosion resistance.

However, over time, corrosion of aluminium and stainless steel does take place. This is particularly the case if substances such as halogen salts (such as chlorides) are brought into contact with the metal. In addition, corrosion of conventional tanks may take place galvanically, or via the presence of microorganisms, or through stresses caused by thermal expansion and/or contraction which crack the corrosion resistant coating in the metal.

As well as suffering from corrosion, metal tanks are relatively heavy, meaning that the tanker can only carry a relatively small payload in order to avoid overloading.

Non-metal tanks have been manufactured in the art but the tanks have conventionally been of polyethylene (PE). PE is suitable only for fixed tanks such as water tanks for houses and the like due to their inability to withstand dynamic loads. PE has a tendency to split or crack.

Thus, there would be an advantage if it were possible to provide a tank that provided one or more of the following properties: improved corrosion resistance, reduced weight, improved resistance to stresses caused by fluctuations in temperature or improved strength.

It will be clearly understood that, if a prior art publication is referred to herein, this reference does not constitute an admission that the publication forms part of the common general knowledge in the art in Australia or in any other country.

Throughout this specification, the term "comprising" and its grammatical equivalents shall be taken to have an inclusive meaning unless the context of use indicates otherwise.

Object of the Invention.

It is an object of the present invention to provide a tank which may overcome at least some of the abovementioned disadvantages, or provide a useful or commercial choice.

In one aspect, the invention resides broadly in a tank comprising two or more modules, each of said modules adapted for connection to at least another of said modules.

The tank of the present invention may be of any suitable form or configuration, and may be used for any suitable application. However, in a preferred embodiment of the invention, the tank is adapted for mounting to a structure. In some embodiments of the invention, the structure may comprise the chassis of a vehicle, a trailer, a truck or the like. In a preferred embodiment of the invention, the tank may be adapted for mounting to a truck or truck chassis.

The tank may be constructed from any suitable material. However, it is preferred that the tank of the present invention has one or more of the following properties: is lightweight, strong, has good corrosion resistance properties, is chemical resistant

(such as to acids and alkalis), has relatively low thermal expansion and contraction properties, is non-toxic, non-staining and is constructed from a food grade material. In some embodiments of the invention, the tank may be constructed from plastic. In a preferred embodiment of the invention, the tank may be constructed from polypropylene (PP). Polypropylene is crack resistant and although it will deform under sufficient load, it normally undergoes plastic deformation rather than brittle failure. It also will not cause sparking or be an ignition source if in undergoes impact.

The modules of the present invention may be of any suitable configuration. In some embodiments of the invention, the modules may be identical in size, shape and configuration, while in other embodiments of the invention, the modules may be of different sizes or shapes.

In a preferred embodiment of the invention, the modules may comprise a section of an assembled tank. In a preferred embodiment of the invention, each of the modules may comprise a section taken vertically through the assembled tank (i.e. a portion of the length of the tank), although a skilled addressee will understand that, depending on the shape and orientation of the tank, the modules may also comprise a section taken horizontally through the assembled tank (i.e. a portion of the height of the tank).

When assembled, the tank preferably comprises one or more outer walls with an end wall at each end of the tank. In a preferred embodiment of the invention, each of the modules comprises a section of the one or more outer walls. End modules may be constructed with an end wall attached, or the end walls may be constructed separately and adapted for attachment to one of the modules.

There could alternatively be a number of different modules. There may be provided an end module or "Type A" module, (of which a pair will typically be used to form a tank) and one or more intervening modules. The end modules may be configured as above with a tank wall and an open opposite end. Intervening modules or "Type B" modules may be formed with a pair of open ends adapted for connection with the open ends of the Type A modules to form a closed tank.

Attachment of the modules to one another, and attachment of the end walls to the modules, may be achieved using any suitable technique. In this way, the tank of the present invention may be of a modular nature. For instance, when different size tanks are required, additional modules may be added to or removed from the tank during manufacture. The connection between modules will typically be permanent.

The modules may be connected together using any suitable connection means, such as, but not limited to, screws, bolts, adhesives, straps or the like or other method such as plastic or sonic welding. Alternatively, the modules may be connected together via a screw threaded engagement, a frictional engagement or any other suitable form of engagement. In another embodiment of the invention, a connection piece may be inserted between two modules and the modules may be attached thereto.

In yet another embodiment of the invention, each of the modules (whether Type A or Type B) may be provided with alignment means adapted to facilitate the alignment of adjacent modules during connection of the modules to one another. The alignment means may comprise one or more lugs. The lugs may be located on any suitable part of the module, provided that the lugs serve to assist the user in connecting two adjacent modules together. Lugs may be provided on one or both ends of the modules, such that the connection of an intermediate module to an adjacent module on either side of the intermediate module may be assisted by the presence of lugs on both ends of the intermediate module. A skilled addressee will understand that the exact nature of the connection between the modules is not of critical importance, provided that the connection between the modules forms a substantially watertight seal between the modules.

Such a connection piece may be or include a resilient seal. Normally the seal will be substantially annular in shape.

In some embodiments of the invention, one or more of the modules (whether Type A or Type B) may be provided with one or more inlets and/or outlets. The one or more

inlets and/or outlets may be of any suitable form. In some embodiments of the invention, the inlet may also serve as the outlet, while in other embodiments of the invention, the inlet and the outlet may be separate from one another. The inlet and/or outlet may be located at any suitable location on the module. The inlet and/or outlet may be provided with means to control ingress or egress of material through the inlet and/or outlet. Such means may comprise one or more valves, bungs, stoppers, gates, taps, drains, vents or the like.

In some other embodiments of the invention, one or more of the modules may be provided with access means. The access means may be of any suitable form to allow a user to gain visual and/or physical access to the interior of the tank. Such means may include a hatch, door, peephole, window or the like. A skilled addressee will understand that the access means may be located at any suitable point in the module. However, in a preferred embodiment of the invention, the access means may be located in the upper surface of the module. In this way, a person may be able to quickly and easily check the level of material in the tank.

In some embodiments of the, the tank may be adapted for connection to a vehicle. The vehicle might be of any suitable type, although it is preferred that the vehicle comprises a tanker. In this embodiment of the invention, the tank may be adapted for connection to the chassis of the trailer of the tanker. The tank may be adapted for removable or fixed connection to the chassis of the trailer of the tanker. Any suitable technique for attaching the tank to the vehicle may be used, and a skilled addressee will understand that the exact nature of the method of connecting the tank to the vehicle is not of critical importance.

In another aspect, the invention resides broadly in a tank comprising two or more modules, each of said modules adapted for connection to at least another of said modules, and wherein each of said modules includes one or more strengthening means adapted to increase the rigidity of the tank.

The one or more strengthening means may be of any suitable construction provide that

they serve to increase the rigidity of the tank. The strengthening means may be formed separately from the modules and connected thereto in temporary or permanent engagement, or the strengthening means may be formed integrally with the modules, or the strengthening means may be formed as a combination of the two.

Typically the strengthening means may be baffles which, in addition to strengthen the tank, may also control the movement of the material in the tank. Normally the baffles will be one of the final components added to the tank prior to completion. The number and position of the baffles will normally be dependant upon the material to be carried.

In embodiments of the invention in which connection means are inserted between two modules, the strengthening means may be formed either integrally with the connection means, or may be formed separately therefrom and connected to the connection means using any suitable technique so as to form a fixed or temporary connection. In addition, in embodiments of the invention in which the ends of the tank are formed separately to the modules, the ends of the tank may be provided with strengthening means, either formed integrally with the ends of the tank or formed separately therefrom and connected to the ends of the tank Using any suitable technique so as to form a fixed or temporary connection.

The one or more strengthening means may be of any suitable size, shape and configuration. For instance, the one or more strengthening means may comprise elongate members which interconnect one or more sidewalls, upper walls or lower walls. Alternatively, the one or more strengthening means may comprise baffles which are connected to one or more sides of the tank.

According to a particularly preferred embodiment, the one or more strengthening means will be integrally formed with the modules used to form the tank. According to a particularly preferred embodiment, the one or more strengthening means will extend radially inward toward the centre of the module of which the one or more strengthening means is a part.

Type A modules will preferably include at least one radially extending strengthening means at the open end of the module extending in a direction substantially perpendicularly to the sidewalls of the module. The strengthening means will normally have a substantially annular configuration.

Type B modules will preferably include a radially extending strengthening means at each of the openings of the module, extending in a direction substantially perpendicularly to the sidewalls of the module. Again, each strengthening means will typically have a substantially annular configuration.

Informing the tank, the strengthening means of adjacent modules will normally abut one another, with the option of having a connection piece or resilient seal located between the respective strengthening means.

Once the tank is formed, the abutting or connected strengthening means of the respective modules will typically function as baffles to reduce the movement of the contents of the tank, which will typically be a fluid. The strengthening means were also functioned to provide both longitudinal and transverse strengthening to a tank that is manufactured from a "weaker" material such as a plastic material.

The dimension of the modules will be optimised to provide sufficient wall strength for the length of the module to reduce the amount of bowing which may occur when the tank is filled. For example, a shorter tank with a shorter distance between the strengthening baffles, will be less prone to bowing than a longer tank with a greater distance between the strengthening baffles.

In another embodiment of the invention, the strengthening means may comprise a perforated plate. In this embodiment of the invention, the perforated plate may have a diameter of the same dimensions as the cross sectional diameter of the tank, meaning that the substance contained in the tank can only circulate throughout the tank through the perforations in the plate.

The strengthening means may be constructed from any suitable material. However, in order to reduce the likelihood of corrosion caused by placing different materials adjacent to one another, it is preferred that the strengthening means are constructed from the same material as the modules.

In some embodiments of the, the tank may be adapted for connection to a vehicle. The vehicle might be of any suitable type, although it is preferred that the vehicle comprises a tanker. In this embodiment of the invention, the tank may be adapted for connection to the chassis of the trailer of the tanker. The tank may be adapted for removable or fixed connection to the chassis of the trailer of the tanker. Any suitable technique for attaching the tank to the vehicle may be used, and a skilled addressee will understand that the exact nature of the method of connecting the tank to the vehicle is not of critical importance.

In another aspect, the invention resides broadly in a tank adapted for mounting on a vehicle, the tank comprising two or more modules, each of said modules adapted for connection to at least another of said modules.

In a preferred embodiment of the invention, the vehicle comprises a tanker.

In yet another aspect, the invention resides broadly in a tanker, the tanker including a trailer and a tank mounted to said trailer, wherein the tank comprises two or more modules, each of said modules adapted for connection to at least another of said modules.

The tank of the present invention has a number of significant advantages over that of the prior art. The modular nature of the tank means that the size of the tank can be adjusted (either increased or reduced) quickly and easily when a different sized tank is required. Fabricating the tank from a lightweight material means that the load in the tank can be increased. In addition, the lightweight material of the tank has good corrosion and chemical resistance properties, as well as being resistant to cracking

caused by thermal expansion or contraction. The material of the tank also has a high tensile strength, good impact resistance, good dielectric properties, low moisture absorption, is non-staining and non-toxic while at the same time retaining sufficient stiffness.

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Brief Description of the Drawings.

An embodiment of the invention will be described with reference to the following drawings in which:

Figure 1 illustrates a perspective view of a tank according to an embodiment of the present invention;

Figure 2 illustrates a side view of a tank according to an embodiment of the present invention;

Figure 3 illustrates a cross-sectional view of a tank according to an embodiment of the present invention;

Figure 4 illustrates a cross-sectional view of a tank according to an embodiment of the present invention;

Figure 5 illustrates a cross-sectional view of one end of a tank according to an embodiment of the present invention.

Detailed Description of the Drawings.

It will be appreciated that the drawings have been provided for the purposes of illustrating preferred embodiments of the present invention and that the invention should not be considered to be limited solely to the features as shown in the drawings.

In Figure 1 of the drawings, there is illustrated a tank 10 according to an embodiment of the present invention. The tank 10 comprises an elongate body 11 with a pair of end walls 12, the elongate body comprising a plurality of modules (obscured) connected to one another.

The tank 10 comprises, on its upper surface 13, a pair of hatches 14 adapted to allow access to the interior of the tank 10 and a pair of vents 15 to prevent the build up of potentially toxic or explosive fumes or vapours within the tank 10. In addition, the

upper surface 13 of the tank 10 is provided with a number of slots 16 through which straps (or the like) may be passed in order to allow the tank 10 to be safely and securely tied down, for instance to a truck or trailer (not shown).

In Figure 2 a side view of a tank 10 according to an embodiment of the present invention is shown. The tank 10 comprises a plurality of modules 17 with connecting means in the form of stiffeners 18 inserted between the modules 17 and adapted for connection thereto. A number of the modules 17 are provided with additional features such as access hatches 14 and vents 15 as well as outlets in the form of drains 19.

In Figure 3 there is shown a cross-sectional view through a tank 10 according to an embodiment of the present invention. The tank 10 comprises a plurality of baffles 20 interconnecting the walls of the tank 10 and increasing the rigidity of the tank 10. In the embodiment of the invention shown in Figure 3, the baffles 20 are formed integrally with the stiffeners (obscured). The presence of the baffles 20 serves to increase the resistance of the tank 10 to impact damage, as well as other stresses and strains.

In Figure 4, another cross-sectional view through the tank 10 is shown. This view represents a typical cross section through a stiffener 18 located at an end of the tank 10. The stiffener 18 comprises a plurality of baffles 21 which are located between a module (obscured) and an end plate (not shown).

In Figure 5, a side view of an end of a tank 10 is shown. A module 17 is connected to a stiffener 18, the stiffener comprising a plurality of baffles 21. In order to close the end of the tank 10, an end cap 22 is connected to the stiffener 18.

Those skilled in the art will appreciate that the present invention may be susceptible to variations and modifications other than those specifically described. It will be understood that the present invention encompasses all such variations and modifications that fall within its spirit and scope.

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Claims.

1. A tank comprising two or more modules, each of said modules adapted for connection to at least another of said modules.

2. A tank according to claim 1, wherein one or more connection means are inserted between adjacent modules, the connection means adapted to attach the modules thereto.

3. A tank according to claim 2, wherein the connection means comprise one or more strengthening means.

4. A tank according to claim 3, wherein the one or more strengthening means comprise baffles.

5. A tank according to any one of claims 1 to 4 wherein the tank comprises an end wall at each end of the tank, each of said end walls comprising an end cap.

6. A tank according to any one of claims 1 to 5 wherein the tank is adapted for removable connection to a vehicle.

7. A tank comprising two or more modules, each of said modules adapted for connection to at least another of said modules, and wherein each of said modules includes one or more strengthening means adapted to increase the rigidity of the tank.

8. A tank according to claim 7 wherein the tank is adapted for removable connection to a vehicle.

9. A tank according to claim 7 or claim 8 wherein the tank is constructed from a relatively lightweight material.

10. A tank according to claim 9 wherein the relatively lightweight material is polypropylene.

11. A tank adapted for mounting on a vehicle, the tank comprising two or more modules, each of said modules adapted for connection to at least another of said modules.

12. A tank according to claim 11, wherein the tank is adapted for temporary mounting on a vehicle.

13. A tanker, the tanker including a trailer and a tank mounted to said

trailer, wherein the tank comprises two or more modules, each of said modules adapted for connection to at least another of said modules.

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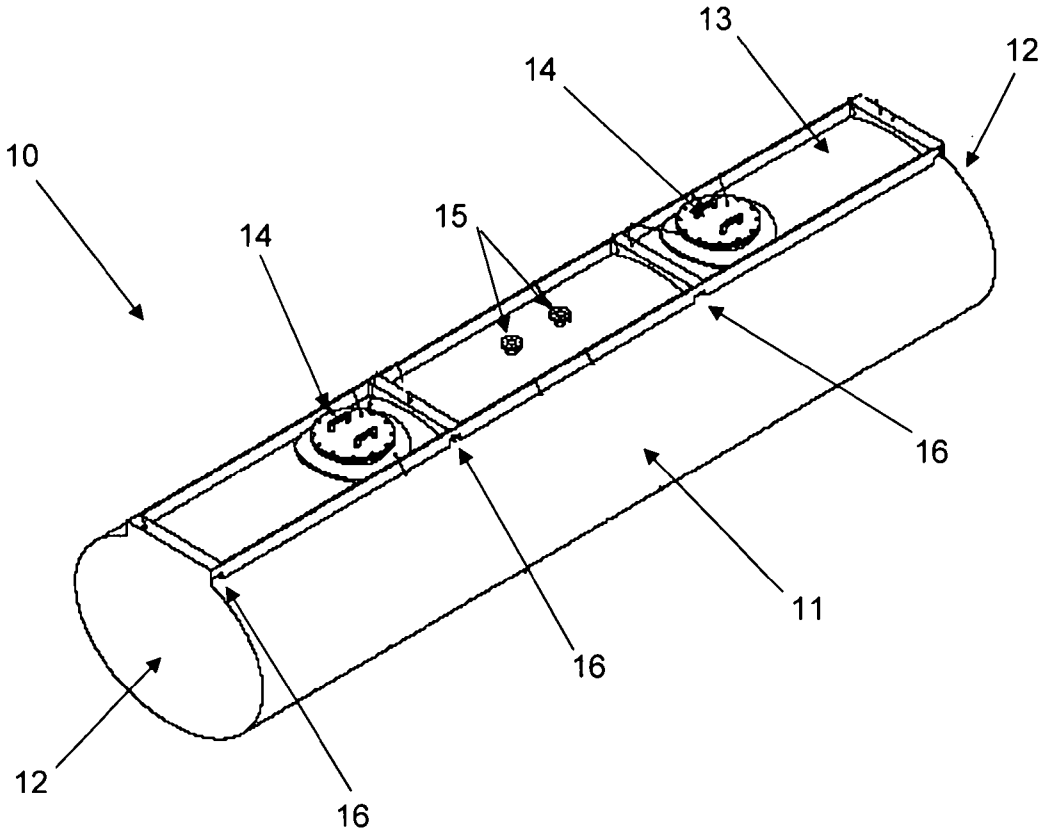

FIG 1

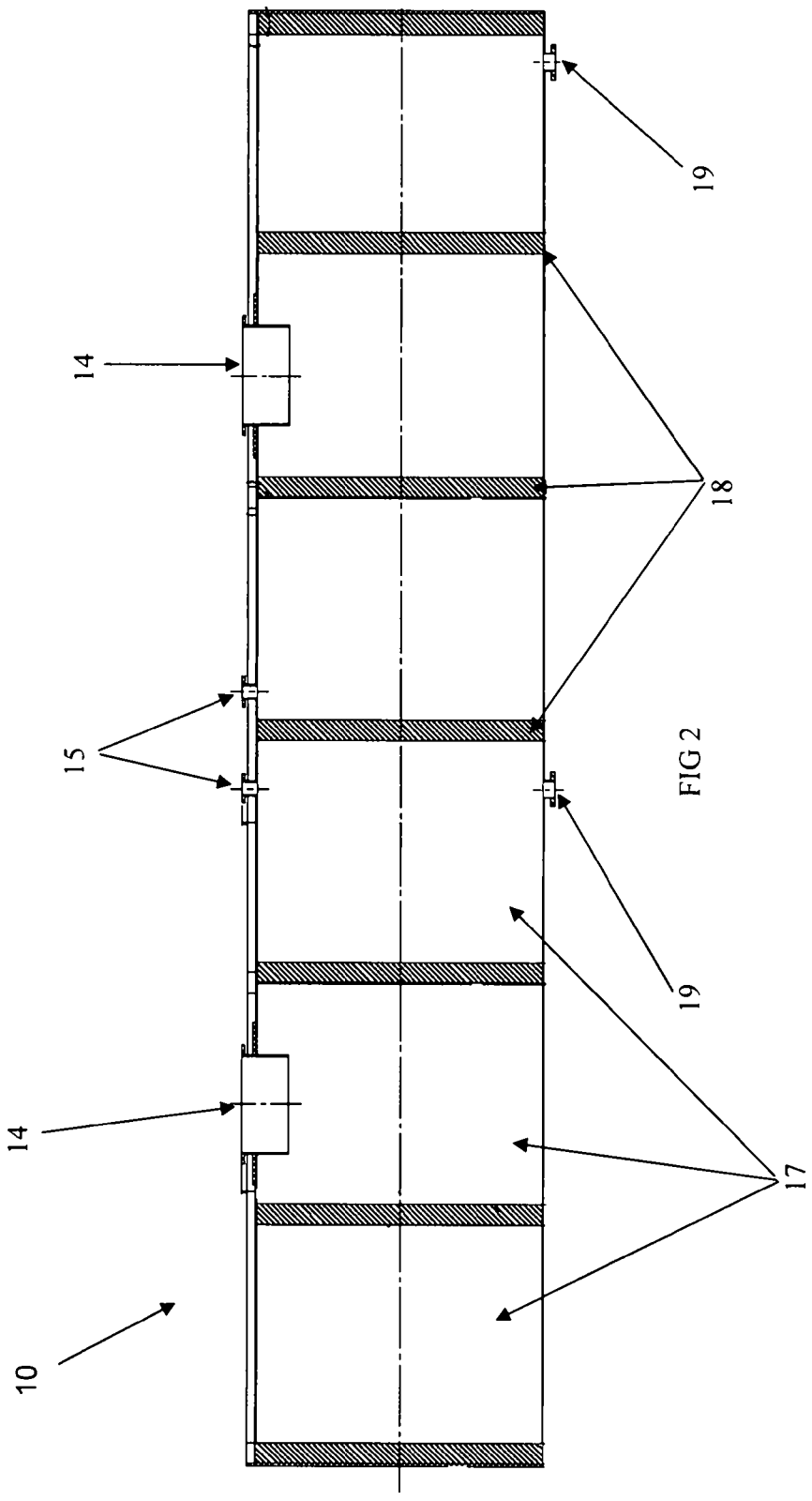

FIG 2

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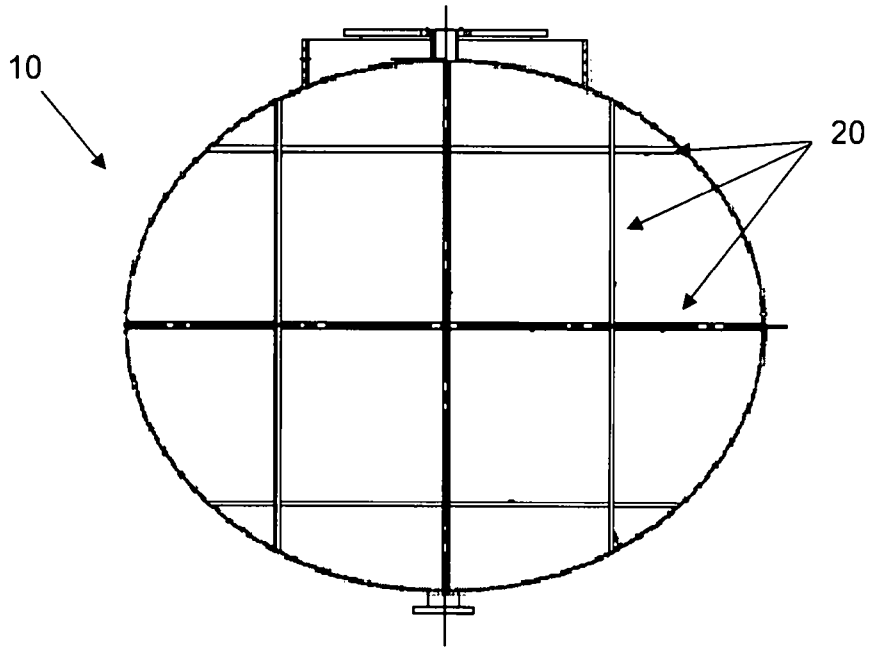

FIG 3

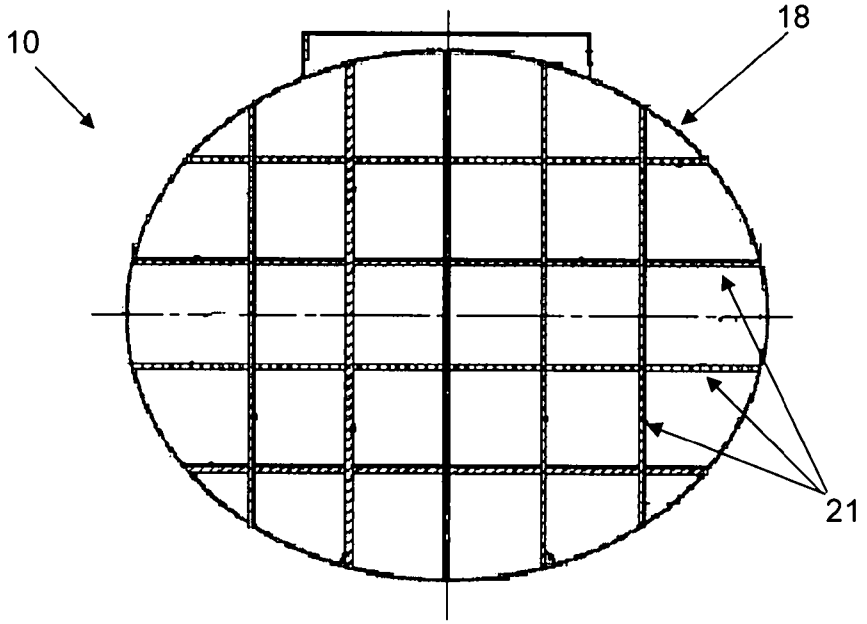

FIG 4

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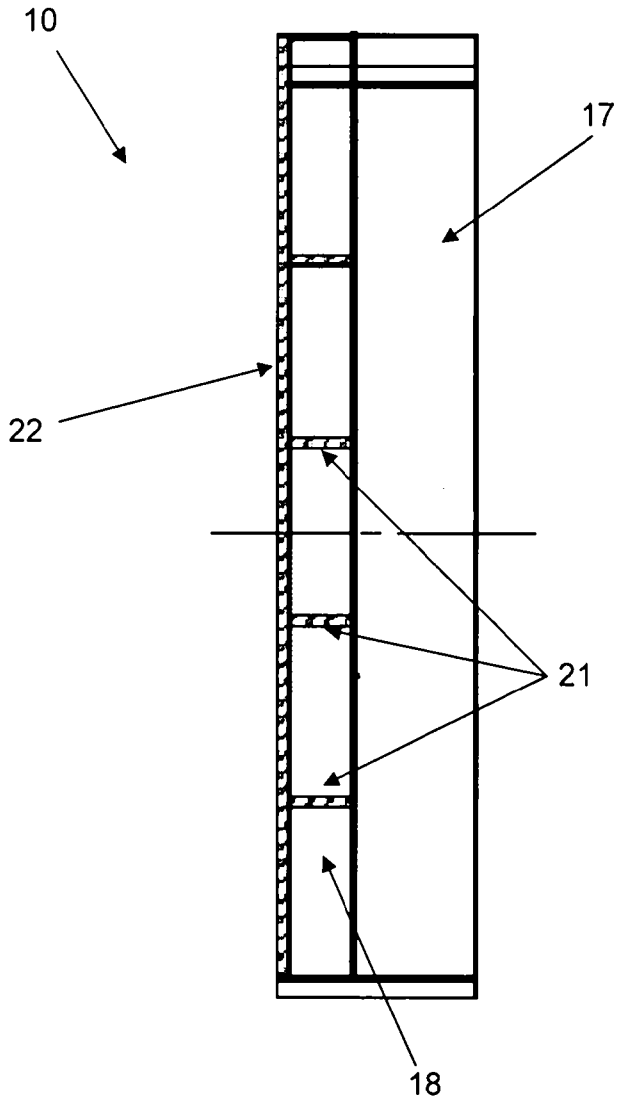

FIG 5