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(54) **TANK**
TANK
RESERVOIR

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26.06.2002 Bulletin 2002/26

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GB-A- 2 216 152 **US-A- 3 612 329**
US-A- 3 784 012 **US-A- 4 475 662**
US-A- 4 790 472 **US-A- 5 628 420**

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Description

[0001] The invention relates to a tank according to the preamble of claim 1.

[0002] Tanks, such as sewage holding tanks, usually have a cylindrical or spherical form. The prior art also shows a sewage holding tank in the shape of a ball with spherical indentations removed from opposite sides thereof. It is rather difficult to provide a cylindrical sewage holding tank with sufficient strength properties. On the other hand, it is difficult to transport spherical sewage holding tanks, which require for example separate legs or some other corresponding supports during the transportation in order not to fall over. Further, a problem that is common to all sewage holding tanks is that their depth of installation is rather great, i.e. installation of the tanks requires the excavation of quite a deep pit. Also, it is rather difficult to anchor especially plastic sewage holding tanks in place so that they will not be moved by soil frost or ground water.

[0003] US-A-5 628 420 discloses a rollable container. The container comprises a hollow enclosed substantially cylindrical rigid body. The body is provided with an elongate passageway extending through the body along the cylindrical axis thereof. The container is provided with a handling device for retaining the container rotatably about the cylindrical axis.

[0004] US-A-4 475 662 discloses a toroidal pressure vessel of compound material. The pressure vessel has an inner core, which is very lightweight and made of rubber for example. The core has an inner toroidal shape and an outer cylindrical contour. A first plurality of filament windings is wrapped in a meridian direction around the core and an additional plurality of filament windings is wrapped equatorially on the vessel around the cylindrical contour.

[0005] The purpose of the present invention is to provide a tank where at least some of the aforementioned disadvantages can be avoided.

[0006] The tank according to the invention is characterized by the characterizing part of claim 1.

[0007] The basic idea of the invention is that the inner surface of the tank is substantially torus-shaped. The idea of a preferred embodiment is that also the outer surface of the tank is substantially torus-shaped. The idea of another preferred embodiment is that the surface of the tank is provided with ribs that reinforce the tank structure. The idea of a third preferred embodiment is that the ribs provided on the surface of the tank are made such that grooves are formed on the outer surface of the tank. The idea of a fourth preferred embodiment is that the tank is provided with at least one preformed opening in order that a separate pipe fitting can be arranged to be used as an inlet/outlet fitting or as a rising pipe. The idea of a fifth preferred embodiment is that the tank is converted into a septic tank through the installation of partitions inside the torus-shaped tank.

[0008] An advantage of the invention is that when the

tank is laid in the ground, it does not require a very deep pit. For example, the tank of the invention does not require as deep a pit as is required for the same volume in a spherical or cylindrical shape. Further, the structure of the tank is rather strong and it can be made such that it does not contain long horizontal surfaces but, for example, mainly curved surfaces. Due to the curved surfaces the loads stressing the structure are distributed advantageously with respect to the strength properties. Further, the tank can be anchored to the ground rather easily if the outer surface of the tank is also torus-shaped, since the anchoring can be implemented utilizing a hole that is situated in the middle of the tank outside it. Also, during the transportation the tank remains in an upright position without the need to use separate legs or other special arrangements to support the tank. By means of the ribs the structure can be strengthened further. When the ribs are positioned such that grooves are formed outside the tank, the grooves can be utilized as guides for ropes that anchor the tank in place. When a separate pipe fitting is used as an inlet/outlet fitting or as a rising pipe, a pipe can be installed and fastened from any direction of the tank. Installation of partitions in the torus-shaped tank provides a compact septic tank in a simple and easy manner.

[0009] The invention will be described in greater detail in the accompanying drawings, in which

Figure 1 is a schematic top view, from an oblique angle, of a tank according to the invention,

Figure 2 is a side view of the tank of Figure 1,

Figure 3 is a sectional side view of the tank of Figure 1,

Figure 4 is a top view of the tank of Figure 1,

Figure 5 is a bottom view of the tank of Figure 1,

Figure 6 is a sectional bottom view of another tank according to the invention, and

Figure 7 is a sectional side view of a detail of the tank of Figure 1,

Figure 8 is a schematic sectional bottom view of a third tank according to the invention,

Figure 9 is a schematic sectional side view of a fourth tank according to the invention,

Figure 10 is a schematic sectional side view of a fifth tank according to the invention,

Figure 11 is a schematic sectional side view of a sixth tank according to the invention,

Figure 12 is a schematic sectional side view of a seventh tank according to the invention,

Figure 13 is a schematic sectional side view of an eighth tank according to the invention, and

Figure 14 shows, in a sectional view, a detail of a wall of a tank according to the invention.

[0010] Figure 1 shows a tank 1, which is made of a plastic material, for example a polyolefin, such as polyethylene PE, polypropylene PP or crosslinked polyethylene PEX. The tank 1 shown in the figure can be formed

as a single piece for example through rotational casting. The tank 1 can be used as a fluid tank for storing for example water or, for example, a sewage holding tank for storing waste water or some other waste liquid. Further, the tank can also be used as a septic tank or a part thereof. The tank is thus pressureless and intended to be used buried in the ground. The inner surface of the tank 1 is substantially torus-shaped so that the height of the tank is smaller than the height of a spherical tank for the same volume. The definition "substantially torus-shaped" means that the inner surface of the tank 1 has a similar shape as a surface formed by a closed curve which has revolved around the axis on the same level. Further, the definition "substantially torus-shaped" means that the closed curve can be for example circular but it can also be oval and it may comprise straight sections in the upper and lower parts thereof and on each side, and the curve may even be rectangular, as shown in greater detail in Figures 2 and 3, and 9 to 12. In the embodiment shown in Figure 1, the outer surface of the tank 1 is also substantially torus-shaped, and there is a hole 2 situated outside the container of the tank 1 intended for storing liquid, the hole being also positioned in the middle of the tank 1. Therefore the walls of the tank 1 do not comprise long unsupported horizontal sections and the walls can be made rather thin.

[0011] The walls of the tank 1 can be provided with ribs 3 that support the walls. The ribs 3 are preferably formed such that the wall of the tank 1 is shaped so that it is provided with grooves which are directed inwards. The grooves formed by the ribs 3, and the hole 2 of the tank 1 can be utilized when the tank 1 is being anchored in place. The number and shape of the ribs 3 may vary according to the needs. The tank 1 can be laid in the ground, but if desired, it can also be installed indoors. Despite the rather great volume of the tank 1 the tank is not very high, wherefore it does not require a very deep pit in order to be installed. For the sake of clarity, the ribs 3 are not shown in Figures 2 and 3.

[0012] The tank 1 is provided with three preformed openings 4, at least one of which is opened when the tank 1 is taken into use. There must be at least one preformed opening 4 and the number thereof may vary depending on the size and intended use of the tank 1. A separate inlet or outlet fitting or a rising pipe is to be connected to the opened preformed opening 4. Instead of a preformed opening 4 and a separate fitting, the tank 1 can also be provided with a desired number of fixed fittings. The upper part of the tank 1 is also provided with anchor fasteners 5, which can be used to anchor the tank 1 in place. The anchor fasteners 5 can also be utilized as lifting lugs so that the tank 1 can be fastened easily to a lifting apparatus.

[0013] The tank 1 is shown in Figure 4 in a top view and in Figure 5 in a bottom view. Figure 5 shows recesses 6 formed in the ribs 3 and placed at the bottom of the tank 1 to ensure that a segment between two ribs 3 will not contain any liquid after the tank 1 has been emptied.

[0014] Figure 6 shows an arrangement where the tank 1 is converted by means of partitions 7 into a septic tank with three chambers. The septic tank comprises separate chambers through which waste water flows. Water is arranged to flow as slowly as possible from the upper part of a preceding chamber to the next chamber in order that the greatest particles in each chamber have time to fall to the bottom of the chamber to form precipitate. When the waste water has passed through the last chamber, all the solids that might interfere with the subsequent cleaning have been separated from the water. With two partitions 7 it is possible to provide a two-chamber septic tank. As shown in Figure 6, the volume of the first chamber is most preferably about half of the total volume of the tank 1. A preformed opening 4 provided in connection with each chamber is opened and a rising pipe is placed in the opened preformed opening for the purpose of emptying the chamber. The first chamber can be provided, for example, with a fitting 8 shown in Figure 7, the horizontal part 8a of the fitting 8 forming the inlet fitting and the vertical part 8b forming the rising pipe intended for emptying. In the direction of flow of waste liquid, i.e. between the first and the second chamber, and correspondingly between the second and the third chamber, the upper part of the partition 7 comprises one or several holes via which the waste liquid is able to flow to the next chamber. The last chamber in the direction of flow of the waste liquid is provided with an outlet fitting directed sideways, as shown for example in Figure 2 by a broken line.

[0015] Figure 7 shows a separate fitting 8, which is placed in connection with the opened preformed opening 4, and which may be an inlet fitting or an outlet fitting or a rising pipe used for emptying. The fitting 8 is sealed to the tank 1 by seals 9. The use of a separate fitting 8 enables, for example, the fastening of an inlet pipe to the tank 1 from any direction. Therefore, when the tank 1 is being laid in the ground, the direction of the inlet pipe does not have to be known exactly and the position of the tank 1 can thus be selected rather freely during the installation. The diameter of the preformed opening 4 and the fitting 8 can vary depending on the needs.

[0016] Figure 8 shows a tank 1 comprising one partition 7. The tank 1 also comprises an inlet fitting 10 and an outlet fitting 11. The partition 7 most preferably extends continuously from the bottom to the top. Therefore the liquid flowing into the tank 1 enters through the inlet fitting 10 and is discharged through the outlet fitting 11, and it flows in the tank 1 in the manner shown by arrow A and it settles in the tank 1. Therefore the tank 1 operates as a settlement tank in the embodiment shown in Figure 8.

[0017] Figure 9 shows a tank 1 the outer surface of which resembles a flattened sphere. However, since the inner surface of the tank 1 is substantially torus-shaped, the tank 1 comprises in the middle a supporting section, wherefore the tank 1 does not comprise long horizontal unsupported parts. For example compared to the ar-

rangement shown in Figure 3, the solution of Figure 9 does not comprise a hole 2 situated in the middle of the tank outside it, but the hole is replaced in the tank of Figure 9 with the supporting section. The tank 1 of Figure 9 can be made, for example, by manufacturing through injection molding two tank halves that are joined.

[0018] Figure 11 shows a tank where the outer and inner surfaces are substantially torus-shaped, and the torus surfaces are formed by circles that have revolved around the axis on the same level. The torus surfaces of the tank shown in Figure 10 are formed by ovals which have revolved around the axis on the same level. Also in the arrangement of Figure 3 the torus surfaces are formed by ovals, but therein the area of the horizontal surface is smaller than the area of the vertical surface, whereas in Figure 10 the area of the horizontal surface is, in turn, greater than the area of the vertical surface. In Figure 12, the torus surfaces of the tank are formed by rectangles which have revolved around the axis on the same level. If desired, the rectangles may have rounded corners.

[0019] Figure 13 shows a tank 1, which is provided with a rising pipe 12 substantially in the middle of the tank 1. The diameter of the rising pipe 12 is greater than the diameter of a hole 2 or, for example, the diameter of the supporting section of the tank shown in Figure 9. Further, on the section inside the rising pipe 12 the tank 1 comprises openings 13, so that the interior of the tank 1 is connected to the rising pipe 12. Also, if there is a hole 2 in the middle of the tank 1, the hole 2 is provided with a bottom 14. Further, it is possible to provide one or more openings in the tank 1, for example in the lower part thereof, as shown with a broken line in Figure 13.

[0020] Figure 14 shows a detail of a wall of a tank, the wall consisting of several layers. The innermost layer 15a is preferably lighter than the other layers. This facilitates checking and maintenance of the tank. For example, less light is needed inside the tank during maintenance and checking when the innermost layer 15a is light compared to a situation where the innermost layer 15a is dark. Further, when the wall comprises more than one layer, one of the layers can be made of closed cell polyolefin. Closed cell polyolefin acts as heat insulation, providing thus a thermally insulated tank. For example in the embodiment of Figure 14, the middle layer 15b is preferably made of closed cell polyolefin, whereas the innermost layer 15a and the outermost layer 15c are made of normal polyolefin.

[0021] The drawings and the related description are only intended to illustrate the inventive idea. The details of the invention may vary within the scope of the claims. Therefore the tank 1 can be provided with a spirit level with which the horizontal position of the tank 1 can be checked easily during the installation. The tank 1 is typically mounted in a horizontal position as accurately as possible in order to prevent for example the formation of air pockets in the tank 1. Naturally, the tank 1 can also

be installed in some other position than horizontally. Further, the tank 1 can be provided with an alarm, which identifies the boundary between air and water and indicates that the tank is full. The alarm indicating the filling of the tank is most preferably installed in a rising pipe so that it can be easily replaced and handled in connection with breakage and/or maintenance.

10 Claims

1. A tank for storing water or waste liquid or for use as a septic tank, the tank (1) being pressureless, intended to be used buried in the ground and made of a plastic material, the tank (1) comprising at least one opening for conducting liquid into the tank (1) and the tank (1) having a volume, **characterized in that** the inner surface of the tank (1) is substantially torus-shaped so that the height of the tank (1), when the tank (1) is in its normal position when it is in use, is smaller than the height of a spherical tank for the same volume.
2. A tank according to claim 1, **characterized in that** the outer surface of the tank is substantially torus-shaped.
3. A tank according to claim 1 or 2, **characterized in that** in use the tank is a sewage holding tank.
4. A tank according to any one of the preceding claims, **characterized in that** the surface of the tank (1) is provided with ribs (3).
5. A tank according to claim 4, **characterized in that** the ribs (3) are formed such that the outer surface of the tank (1) is provided with grooves.
6. A tank according to any one of the preceding claims, **characterized in that** the tank (1) comprises at least one preformed opening (4) for arranging a separate fitting (8) in connection with the tank (1).
7. A tank according to any one of the preceding claims, **characterized in that** the tank comprises at least one inlet fitting (10) and at least one outlet fitting (11) and at least one partition (7), and in use liquid is arranged to flow from the inlet fitting to the outlet fitting so that the tank (1) is arranged to operate as a settlement tank.
8. A tank according to any one of the preceding claims, **characterized in that** the tank (1) is provided with at least two partitions (7) in order to divide the tank (1) into chambers such that the tank (1) can be used as a septic tank.
9. A tank according to claim 8, **characterized in that**

there are at least three partitions (7), such that the tank is divided into at least three chambers.

10. A tank according to claim 9, **characterized in that** the partitions (7) are arranged such that the volume of the first chamber is about half of the total volume of the tank (1). 5
11. A tank according to any one of the preceding claims, **characterized in that** the upper part of the tank (1) is provided with anchor fasteners (5). 10
12. A tank according to any one of the preceding claims, **characterized in that** the torus shape corresponds to a shape defined by a rectangle that has revolved around an axis on the same level. 15
13. A tank according to any one of claims 1 to 11, **characterized in that** the torus shape corresponds to a shape defined by an oval that has revolved around an axis on the same level. 20
14. A tank according to any one of the preceding claims, **characterized in that** the area of the horizontal surface of the torus is greater than the area of the vertical surface. 25
15. A tank according to any one of claims 1 to 13, **characterized in that** the area of the vertical surface of the torus is greater than the area of the horizontal surface. 30
16. A tank according to any one of claims 1 to 11, **characterized in that** the torus shape corresponds to a shape defined by a circle that has revolved around an axis on the same level. 35
17. A tank according to any one of the preceding claims, **characterized in that** the tank (1) comprises a rising pipe (12) arranged substantially in the middle of the tank (1). 40
18. A tank according to any one of the preceding claims, **characterized in that** the wall of the tank (1) consists of at least two layers (15a - 15c). 45
19. A tank according to claim 18, **characterized in that** the innermost layer (15a) of the tank (1) wall is lighter than the other layers (15b, 15c). 50
20. A tank according to claim 18 or 19, **characterized in that** at least one layer (15a - 15c) is made of closed cell polyolefin. 55

Patentansprüche

1. Tank zum Speichern von Wasser oder Abwasser-

Flüssigkeit oder zur Verwendung als septischer Tank, wobei der Tank (1) drucklos ist, im Erdboden vergraben verwendbar ist und ein Kunststoffmaterial aufweist, und wobei der Tank (1) mindestens eine Öffnung zum Leiten von Flüssigkeit in den Tank (1) aufweist und der Tank (1) ein Volumen hat, **dadurch gekennzeichnet, dass** die Innenfläche des Tanks (1) im wesentlichen torusförmig ist, derart, dass die Höhe des Tanks (1), wenn sich der Tank (1) bei Benutzung in seiner normalen Position befindet, kleiner ist als die Höhe eines kugelförmigen Tanks für das gleiche Volumen.

2. Tank nach Anspruch 1, **dadurch gekennzeichnet, dass** die Außenfläche des Tanks (1) im wesentlichen torusförmig ist.
3. Tank nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Tank als Abwasseraufnahmetank verwendbar ist.
4. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** die Oberfläche des Tanks (1) mit Rippen (3) versehen ist.
5. Tank nach Anspruch 4, **dadurch gekennzeichnet, dass** die Rippen (3) derart ausgebildet sind, dass die Außenfläche des Tanks (1) Nuten aufweist.
6. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der Tank (1) mindestens eine vorgeformte Öffnung (4) aufweist, um einen separaten Fitting (8) in Verbindung mit dem Tank (1) anzuordnen.
7. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der Tank (1) mindestens einen Einlass-Fitting (10), mindestens einen Auslass-Fitting (11) und mindestens eine Trennwand (7) aufweist, und bei Benutzung die Flüssigkeit derart geführt wird, dass sie von dem Einlass-Fitting zu dem Auslass-Fitting strömt, so dass der Tank (1) als Absetztank arbeiten kann.
8. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der Tank (1) mit mindestens zwei Trennwänden (7) versehen ist, um den Tank (1) derart in Kammern zu unterteilen, dass der Tank (1) als septischer Tank verwendbar ist.
9. Tank nach Anspruch 8, **dadurch gekennzeichnet, dass** mindestens drei Trennwände (7) derart vorgesehen sind, dass der Tank in mindestens drei Kammern unterteilt ist.
10. Tank nach Anspruch 9, **dadurch gekennzeichnet, dass** die Trennwände (7) derart angeordnet sind, dass das Volumen der ersten Kammer im wesent-

lichen die Hälfte des Gesamtvolumens des Tanks (1) beträgt.

11. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der obere Teil des Tanks (1) mit Anker-Befestigungsteilen (5) versehen ist. 5
12. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** die Torus-Form einer Form entspricht, die durch ein Rechteck definiert ist, das um die Achse auf der gleichen Ebene gedreht worden ist. 10
13. Tank nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** die Torus-Form einer Form entspricht, die durch ein Oval definiert ist, das um die Achse auf der gleichen Ebene gedreht worden ist. 15
14. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der Flächenbereich der horizontalen Oberfläche des Torus größer ist als der Flächenbereich der vertikalen Oberfläche. 20
15. Tank nach einem der Ansprüche 1 bis 13, **dadurch gekennzeichnet, dass** der Flächenbereich der vertikalen Oberfläche des Torus größer ist als der Flächenbereich der horizontalen Oberfläche. 25
16. Tank nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** die Torus-Form einer Form entspricht, die durch einen Kreis definiert ist, der um die Achse auf der gleichen Ebene gedreht worden ist. 30
17. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der Tank (1) ein Steigrohr (12) aufweist, das im wesentlichen in der Mitte des Tanks (1) angeordnet ist. 35
18. Tank nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** die Wand des Tanks (1) mindestens zwei Lagen (15a-15c) aufweist. 40
19. Tank nach Anspruch 18, **dadurch gekennzeichnet, dass** die innerste Lage (15a) des Tanks (1) leichter ist als die anderen Lagen (15b, 15c). 45
20. Tank nach Anspruch 18 oder 19, **dadurch gekennzeichnet, dass** mindestens eine Lage (15a-15c) Polyolefin mit geschlossenen Zellen aufweist. 50

Revendications 55

1. Réservoir permettant de conserver de l'eau ou des déchets liquides ou pouvant être utilisé comme fos-

se septique, le réservoir (1) étant sans pression, conçu pour être utilisé enterré et constitué d'un plastique, le réservoir (1) comprenant au moins une ouverture pour entraîner le liquide dans le réservoir (1) et le réservoir (1) ayant un volume, **caractérisé en ce que** la surface interne du réservoir (1) est essentiellement en forme de tore de sorte que la hauteur du réservoir (1), lorsque le réservoir (1) est en position normale en cours d'utilisation, est inférieure à la hauteur d'un réservoir sphérique pour le même volume.

2. Réservoir selon la revendication 1, **caractérisé en ce que** la surface externe du réservoir est essentiellement en forme de tore.
3. Réservoir selon la revendication 1 ou 2, **caractérisé en ce que**, en cours d'utilisation, le réservoir est un réservoir de stockage des eaux usées.
4. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la surface du réservoir (1) est équipée de nervures (3).
5. Réservoir selon la revendication 4, **caractérisé en ce que** les nervures (3) sont formées de sorte que la surface externe du réservoir (1) est équipée de gorges.
6. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le réservoir (1) comprend au moins une ouverture préformée (4) pour installer une fixation séparée (8) raccordée au réservoir (1).
7. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le réservoir comprend au moins une fixation d'entrée (10) et au moins une fixation de sortie (11) et au moins une cloison (7), et en cours d'utilisation, le liquide s'écoule depuis la fixation d'entrée vers la fixation de sortie de sorte que le réservoir (1) est installé pour fonctionner comme un réservoir de décantation.
8. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le réservoir (1) est équipé d'au moins deux cloisons (7) afin de séparer le réservoir (1) en chambres telles que le réservoir (1) peut être utilisé comme fosse septique.
9. Réservoir selon la revendication 8, **caractérisé en ce qu'il** comporte au moins trois cloisons (7), de sorte que le réservoir est séparé en au moins trois chambres.
10. Réservoir selon la revendication 9, **caractérisé en**

ce que les cloisons (7) sont installées de sorte que le volume de la première chambre représente environ la moitié du volume total du réservoir (1).

11. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la partie supérieure du réservoir (1) est équipée d'attaches d'ancrage (5). 5
12. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la forme en tore correspond à une forme définie par un rectangle qui a tourné autour d'un axe au même niveau. 10
13. Réservoir selon l'une quelconque des revendications 1 à 11, **caractérisé en ce que** la forme de tore correspond à une forme définie par une ovale qui a tourné autour d'un axe au même niveau. 15
14. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la surface horizontale du tore est plus grande que la surface verticale. 20
15. Réservoir selon l'une quelconque des revendications 1 à 13, **caractérisé en ce que** la surface verticale du tore est plus grande que la surface horizontale. 25
16. Réservoir selon l'une quelconque des revendications 1 à 11, **caractérisé en ce que** la forme en tore correspond à une forme définie par un cercle qui a tourné autour d'un axe au même niveau. 30
17. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le réservoir (1) comprend un tuyau de refoulement (12) installé essentiellement au milieu du réservoir (1). 35
18. Réservoir selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la paroi du réservoir (1) est constituée d'au moins deux couches (15a - 15c). 40
19. Réservoir selon la revendication 18, **caractérisé en ce que** la couche la plus centrale (15a) de la paroi du réservoir (1) est plus légère que les autres couches (15b, 15c). 45
20. Réservoir selon la revendication 18 ou 19, **caractérisé en ce qu'**au moins une couche (15a - 15c) est constituée de polyoléfine à alvéole fermé. 50

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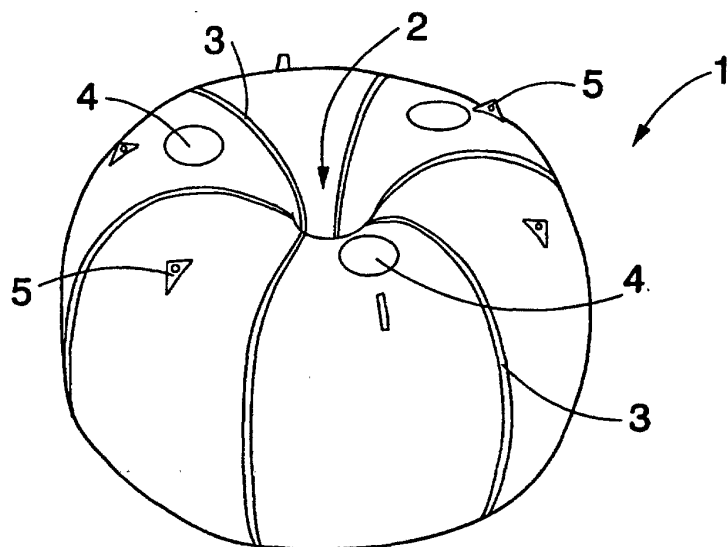


FIG. 1

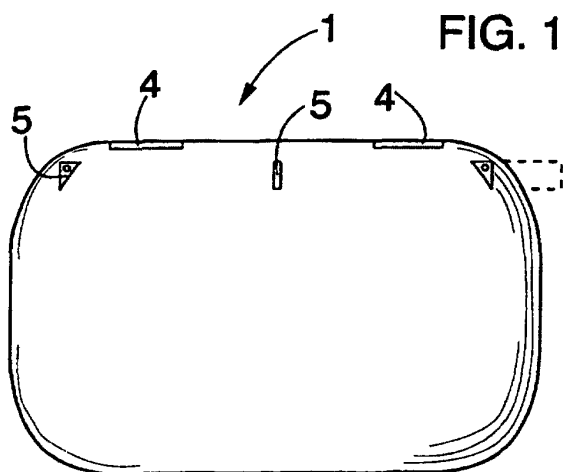


FIG. 2

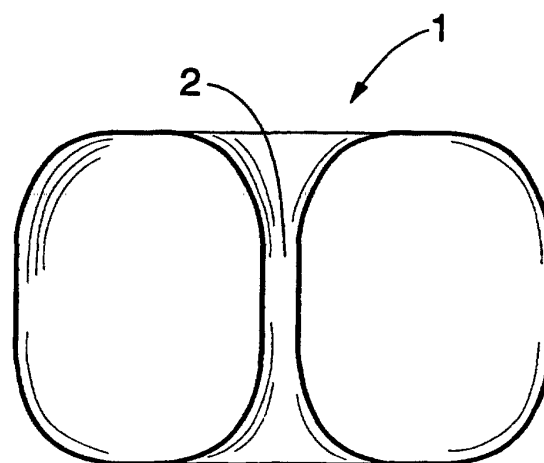


FIG. 3

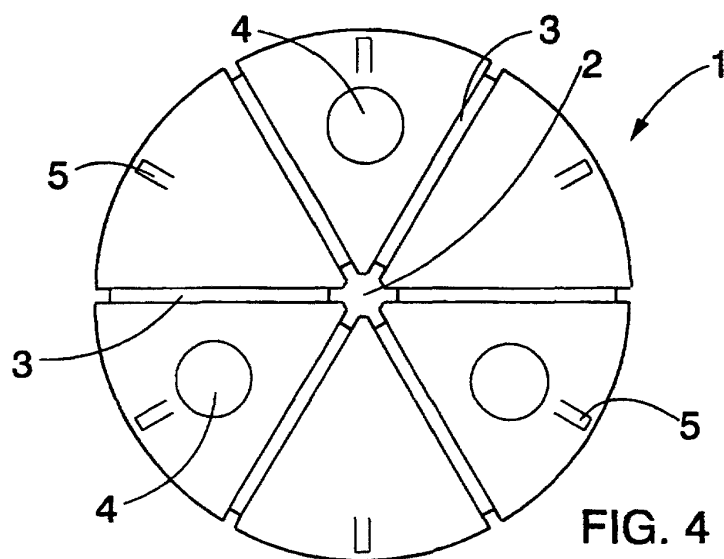
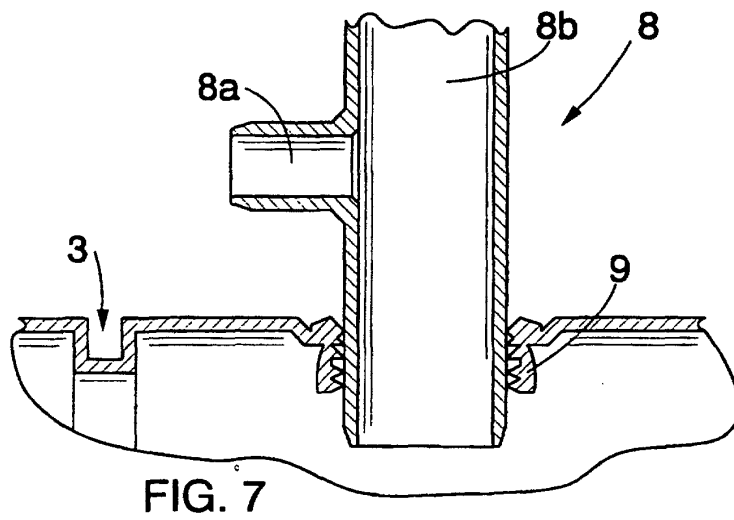
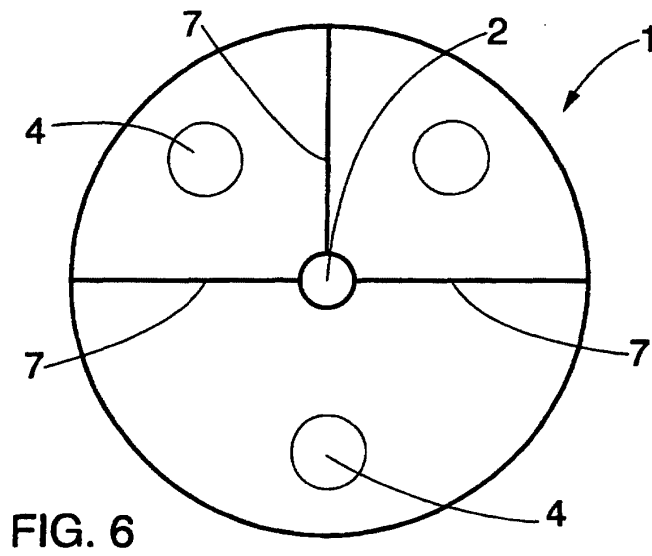
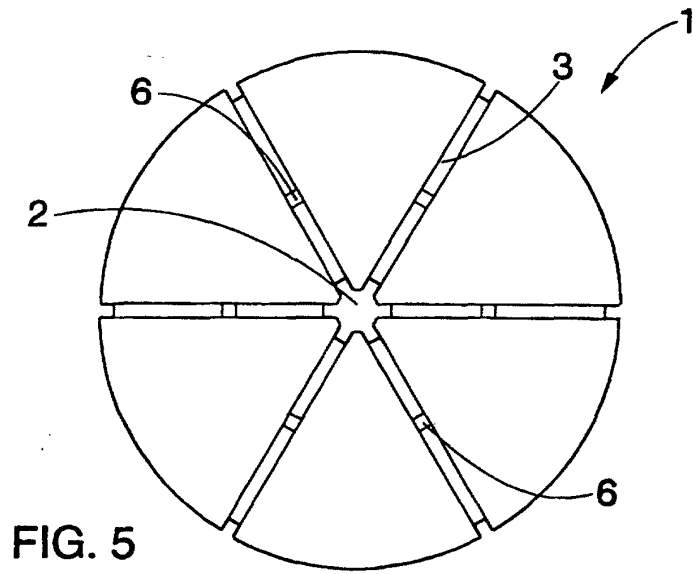
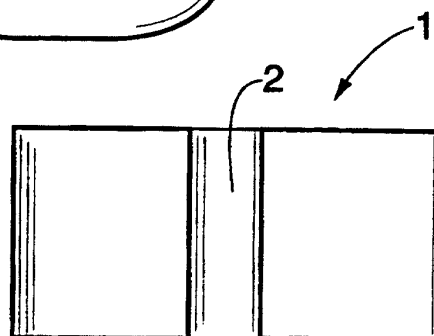
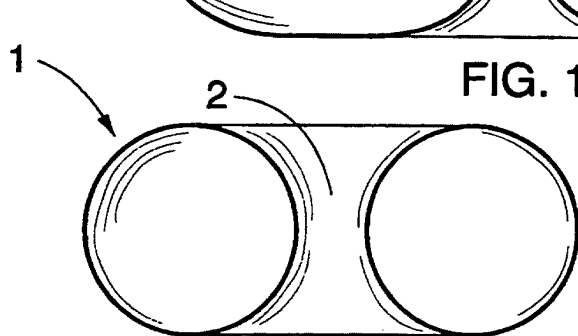
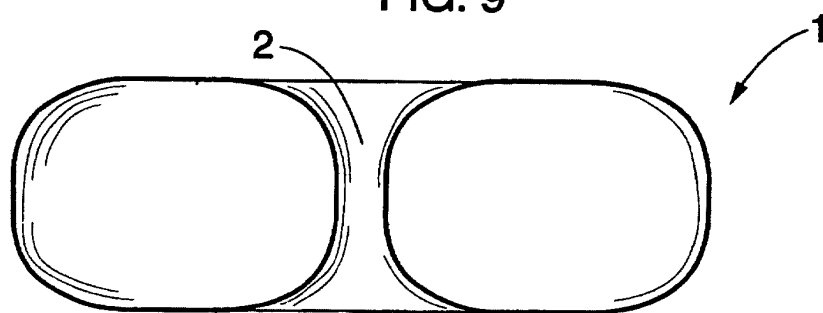
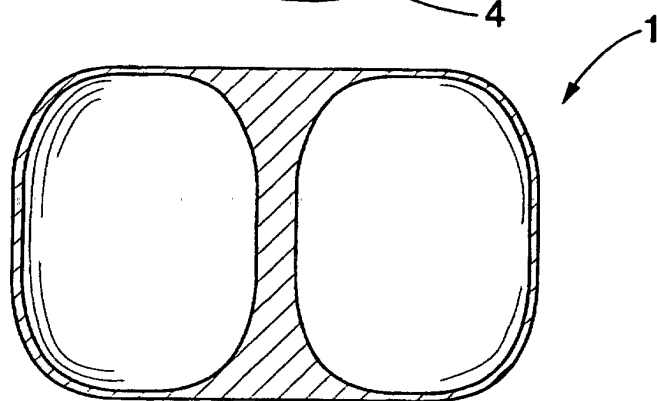
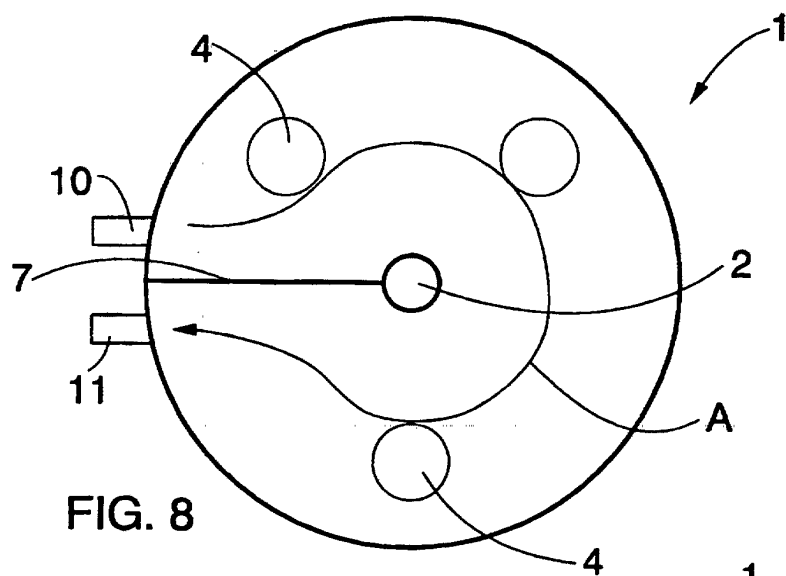


FIG. 4





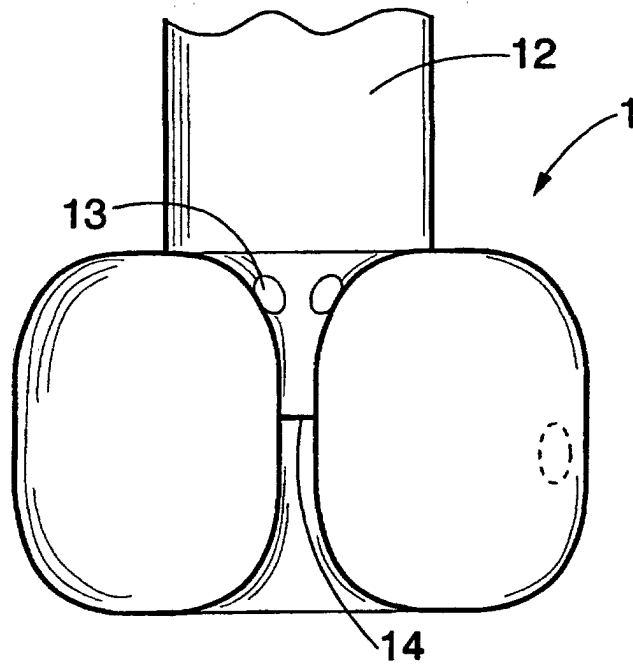


FIG. 13

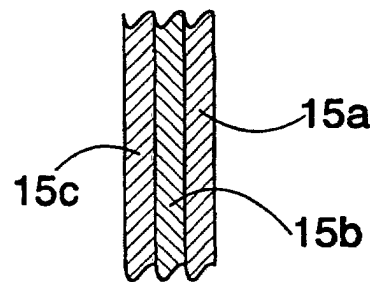


FIG. 14