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## (54) A tank.

(57) A road tank (1) comprises a tank (5) divided into two internal compartments (11) and (12) by a flexible skin (9). A mounting member (14) welded to the tank (5) and clamping bars (17) and (18) secure the periphery of the skin (9) to the tank (5). Inlets (28) and (29) and outlets (30) and (31) are provided to the tank (5). The skin (9) is movable from the side (23) to the side (24) of the tank so the volume of the compartments (11) and (12) may be varied from being similar to the total volume of the tank (5) to zero volume. Accordingly, the tank (5) may be used for the transportation of one material in the compartment (11) on one leg of a journey and a different material in the compartment (12) on the return leg without the need for washing the tank.

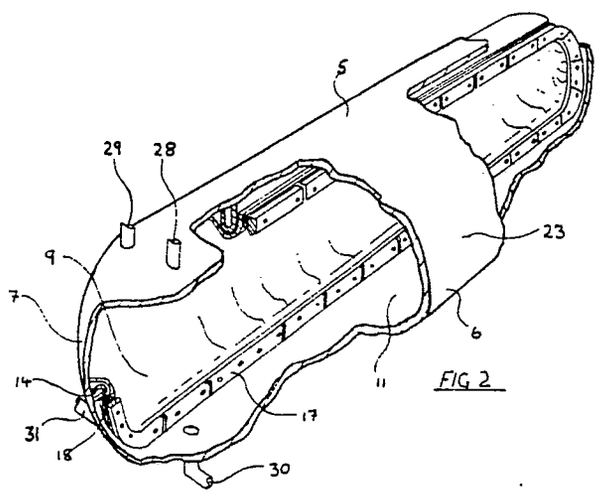


FIG 2

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# A TANK

The present invention relates to a tank of the type comprising a shell defining an interior region, and in particular though not limited to such a tank for use on a road vehicle, such as a road tanker or a swap body vehicle. The invention also relates to a partition wall for use in the tank.

In the transportation of fluids such as liquids and gases, and granular or powder material with fluid like characteristics, considerable inefficiencies occur. In general, tankers delivering a consignment of fluid material from one location to another travel the return journey empty. This is undesirable. In many cases, materials are available which a road tanker on its return journey could transport. However, usually the two materials, namely the material on the outward journey and that on the return journey are incompatible. Thus, the only way a tank can deal with two such incompatible materials is to thoroughly wash out the tank on discharging one material prior to filling with the other material. This is time consuming and in many cases not practical. For example, it is generally accepted that it is not feasible to use a tanker which has delivered, for example, fuel oil, on its outward journey to transport an edible material on its return journey. Even where a tank is thoroughly washed out after discharging the fuel oil, the standards of hygiene required for the transportation of an edible material cannot be achieved without a level of washing which would be prohibitively expensive. Further similar type problems arise with two materials which, if mixed together, would be explosive. Thus, because of these factors, it is generally not possible to have a road tanker transport two materials which are incompatible, one on an outward journey and the other on a return journey. Accordingly, this leads to considerable inefficiencies in the transportation of materials.

There is therefore a need for a tank which overcomes these problems.

The present invention overcomes the problem of known prior art tanks by virtue of the fact that according to the invention a flexible partition means is mounted within the interior region of the tank to form two compartments, and mounting means for mounting the peripheral edge of the flexible partition means to the shell is provided, the partition means being deformable to vary the volume of the compartments.

The advantages of the invention are many, however, a particularly important advantage of the invention is the fact that the tank is divided into two compartments, two different materials can be transported in the tank, either simultaneously or sequentially. For example, a tank could carry one material on one leg of a journey in one compartment, and on the material being discharged from that compartment, the other compartment could be filled with a different type of material for transportation on another leg of a journey and so on. In fact, where the flexible partition means is adapted to be movable from one side of the tank to the other and when adjacent one side forms one compartment of substantially the volume of the interior of the container, while the other compartment is of substantially zero volume, the advantage of this aspect of the invention is that the tank can carry a full consignment of a material in one leg of a journey in one compartment, and a full consignment of a different material in the other compartment on another leg of the journey. A further advantage of the invention is that it provides for separation of materials, and accordingly, where materials which are mixed together would form a combustive mixture, these can be shipped either simultaneously or sequentially without any danger or risk of combustion, and furthermore, without the need of washing out the tank between different legs of a journey.

Furthermore, if the partition wall is formed of a laminate of two materials, one laminate can be adapted to be non-reactive with a material to be carried in one compartment, while the material of the other laminate could be arranged to be non-reactive with the material to be carried in the other compartment.

In one embodiment of the invention, the flexible partition means is movable between two opposing portions of the shell, the volume of respective compartments alternately being substantially similar to the volume of the interior region and having substantially zero volume.

The advantage of this feature of the invention is that it permits each compartment to alternately essentially define the full volume of the interior region of the tank.

In another embodiment of the invention, the mounting means extends around the interior of the tank and defines a plane of symmetry of the tank along the vertical longitudinal axis of the tank.

The advantage of this feature of the invention is that the skin can readily easily be moved from side to side of the tank without undue danger of wear.

In another embodiment of the invention, the partition means is of double skinned construction being formed by two sheets of flexible material.

The advantage of this feature of the invention is that the skins may be selected to be non-reactive with certain materials so that one compartment can be used for transporting one material,

while the other compartment can be used for transporting a different type of material. A further advantage and indeed a very important advantage of this construction is that where a leak develops in one of the skins or where any seepage takes place through one of the skins, it will not mix with the material in the other compartment, since, in general, it would be trapped between the two skins. In fact, in certain cases, it is envisaged that drain openings may be provided from the compartment formed between the two skins to drain any leaked material to indicate the presence of a leak.

In a further embodiment of the invention, the two sheets of material are spaced apart.

The advantage of this feature of the invention is that it further facilitates protection of a leak, and also facilitates in avoiding mixing of the liquids in the different compartments.

In another embodiment of the invention, the two sheets of material are movable apart relative to each other to form a third compartment.

The advantage of this feature of the invention is that it provides a third compartment in the tank to facilitate the transportation of a third material, either simultaneously with the materials in the first two compartments or sequentially.

In another aspect of the invention, the mounting means comprises an elongated mounting member secured to the shell on the interior side thereof, and an elongated clamping means being provided to clamp each skin onto the mounting member.

The advantage of this feature of the invention is that it provides a relatively quick and easy mounting arrangement for the partition wall and further it provides a relatively inexpensive mounting arrangement.

In another embodiment of the invention, a peripheral bead extends around the partition means to engage a groove of the mounting member.

The advantage of this feature of the invention is that it provides a particularly secure mounting arrangement for mounting the partition wall to the tank. Further, this feature of the invention also provides a relatively inexpensive mounting arrangement.

In another aspect of the invention, inlets are provided in the shell, one inlet being provided for each compartment and outlets are provided in the shell, one outlet being provided for each compartment.

The advantage of this feature of the invention is that it provides a relatively inexpensive mounting arrangement and also a relatively secure mounting arrangement for the partition wall.

Additionally, the invention provides a partition wall of flexible material for use in the tank according to the invention.

The advantage of this feature of the invention is that a relatively inexpensive partition is provided for use in the tank.

Further the invention provides a road tanker comprising a tank according to the invention.

The advantage of this feature of the invention is that a road tanker which has the facility for transporting different materials, either simultaneously or sequentially without the need for washing the tank between changing from one material to the other.

The invention will be more clearly understood from the following description of some preferred embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a road tanker according to the invention,

Fig. 2 is a cut-away perspective view of a tank for use with the road tanker of Fig. 1,

Fig. 3 is a sectional end view of the tank of Fig. 2 in one position,

Fig. 4 is a sectional end view of the tank of Fig. 2 in a different position,

Fig. 5 is a sectional end view of the tank of Fig. 2 showing the tank in a still further different position,

Fig. 6 is a perspective view of a detail of the tank of Fig. 2,

Fig. 7 is a cut away perspective view of a tank according to another embodiment of the invention,

Fig. 8 is a perspective view of a detail of the tank of Fig. 7,

Fig. 9 is a perspective view of a detail of the tank according to a further embodiment of the invention,

Fig. 10 is a perspective view of a detail of a tank according to a further embodiment of the invention,

Fig. 11 is a cut away perspective view of a tank according to a still further embodiment of the invention,

Fig. 12 is a sectional view of the tank of Fig. 11,

Fig. 13 is a perspective view of a detail of a tank according to a still further embodiment of the invention,

Fig. 14 is a cross sectional view of a detail of a tank according to another embodiment of the invention, and

Fig. 15 is a cross sectional view of a detail of a tank according to a still further embodiment of the invention.

Referring to the drawings, and initially to Figs. 1 to 6 there is illustrated a road tanker according to the invention indicated generally by the reference numeral 1 for the transportation of fluid like material, such as a liquid, gas or granular or powder

material with fluid like characteristics. The road tanker 1 comprises a chassis 2 with ground engaging wheels 3 and a cab 4. A tank 5 of stainless steel also according to the invention is mounted on the chassis 2.

The tank 5 comprises a shell formed by a cylindrical member 6 closed by end caps 7. A partition means in this case provided by a partition wall of a single skin 9 of flexible material divides the tank 5 into two compartments 11 and 12. The skin 9 is of a polymer material laminated onto a reinforcing woven fabric, in this case the polymer is Neoprene. The skin 9 is of a shape which substantially defines one half of the tank 5. Mounting means for mounting the skin 9 to the tank 5 is provided by an elongated mounting member 14 of hollow section stainless steel extending around the interior of the tank 5. The mounting member 14 is seam welded at 15 and 16 to the cylinder 6 and the end caps 7 along its entire length. As can be seen, the member is welded to the tank to define a vertical plane of symmetry, thereby dividing the tank 5 into two halves. Clamping means in this case first and second clamping members 17 and 18, respectively, are provided to sealably clamp the skin 9 to the mounting member 14. Fastening means, namely screws 19 secure the first and second clamping members 17 and 18 and the skin 9 and the mounting member 14 together. Threaded holes 20 are provided in the mounting member 14 to receive the screws 19. Counter sunk holes 21 in the first clamping member 17 and holes 22 in the second clamping members 18 accommodate the screws 19. Holes 25 are also provided in the skin 9 for the screw 19. The second clamping members 18 are of relatively thin section stainless steel, in this case 3mm thick and are relatively long. The first clamping members 17 are relatively short, but are of relatively thick stainless steel material, in this case 20 mm and retain the second clamping members 18 smoothly and tightly against the skin 9, thereby effecting an efficient seal. The first clamping member is 250 mm long by 40 mm high and the second clamping member are 1000 mm long by 30 mm high. This thus ensures that the joints where the ends of the first clamping members abut each other are staggered from the joints where the ends of the second clamping members abut each other. Accordingly, provided the ends of the second clamping members tightly abut each other to form a smooth joint, there will be no danger of the skin creeping between the abutting ends of the second clamping members. This thus ensures a good seal. The screw centres are 100 mm. The profiles 26, 27 and 32 of the members 14, 17 and 18 respectively are rounded. This avoids any danger of the skin 9 rupturing or chafing as it is moving from side to side in the tank as will be described below. The fact that the first and second clamping members 17 and 18 are provided in easily handleable lengths provides for relatively easy fitting of the skin 9 to the mounting member 14.

The skin 9 is movable within the tank 5 from the position illustrated in Fig. 3 where the skin 9 abuts the side 23 of the tank to the position illustrated in Fig. 4 where the skin 9 abuts the side 24 of the tank. When the skin 9 is in the state illustrated in Fig. 3 whereby it is abutting the side 23 of the tank 5, the volume of the compartment 12 is substantially similar to the interior volume of the tank 5, and the compartment 11 is zero volume. However, when the skin 9 is in the state illustrated in Fig. 4, the compartment 11 is of volume substantially similar to the interior volume of the tank 5, while the compartment 12 is substantially zero volume. An inlet 28 is provided in the compartment 11 and an inlet 29 is provided in the compartment 12. Outlets 30 and 31 are provided from the compartments 11 and 12 respectively. It is envisaged that the skin will be moved from side to side, namely, the side 23 to the side 24 by filling the compartment 11 through the inlet 28. It is envisaged while the compartment 11 is filling, the outlet 31 from the compartment 12 will be open to facilitate evacuation of the compartment 12. Indeed, where the compartment 12 only contains air, it is envisaged that both the outlet 31 and inlet 29 may be open for evacuating purposes. Similarly, to move the compartments from the side 24 to the side 23, the compartment 12 is filled through the inlet 29.

In certain cases, it may be desirable for the tank to be used for the transportation of different liquids in respective compartments 11 and 12 simultaneously. In which case, the skin 9 will take up an appropriate position, for example, the position illustrated in Fig. 5 whereby the compartments 11 and 12 will be sized to accommodate their contents of liquid or other fluid like material.

In use, it is normally expected that the tank will be used to transport one material only at one time, in other words, one material on one leg of a journey and a different material on the return leg. However, if desired, in certain cases it will be readily appreciated that the tank could be used to transport two materials simultaneously. One material would be placed in the compartment 11, while the other would be placed in the compartment 12. The skin 9 would take up the appropriate position to divide the container in such a way that the tank would be full or substantially full when charged with the two materials. However, in practice where the tank is be used for the transportation of a single material only in one direction and a different material in a return leg of a journey, one

compartment, for example, the compartment 11, is filled through the inlet 28 with the material and the skin 9 takes up the position illustrated in Fig. 4. When the material has been discharged from the compartment 11 through the outlet 30 the other compartment 12 may then be filled with a different material through the inlet 29. When the compartment 12 is full, the skin 9 takes up the position illustrated in Fig. 3. Discharge of the material from the compartment 12 is through the outlet 31. Indeed, in many cases, it is envisaged that the compartment 12 may be filling, while the compartment 11 is discharging and vice versa.

While the inlets and outlets have been illustrated without valves, it will be readily be appreciated by those skilled in the art that appropriate valves and closure caps will be provided. Similarly, it will be appreciated that in certain cases as well as an inlet and outlet to each compartment, a manhole may also be provided to each compartment. The manholes would normally be provided on top of the tank on each side of the skin 9.

Typical examples of the use of the tank 5 according to the invention would be, for example, the transportation of fuel oil in the compartment 11 and the transportation of edible oil in the compartment 12. Thus, on one leg of each journey, the compartment 11 would be exclusively used for the transportation of fuel oil, while on the return leg of each journey, the compartment 12 would be exclusively used for the transportation of edible oil.

Accordingly, it will be readily appreciated that the tank according to the invention has many advantages, and in particular one of the most important advantages is the fact that there is no need to wash out the tank between the legs of a journey, since the compartments 11 and 12 are separated by the skin 9.

Referring now to Figs. 7 and 8 there is illustrated a tank 40 according to another embodiment of the invention also for use on a road tanker. In this case, the tank 40 is substantially similar to the tank 5 and similar components are identified by the same reference numeral. The main difference between this tank 40 and the tank 5 is that the flexible partition means in this case is provided by a partition wall 41 of double skin construction, which is formed by a pair of spaced apart skins 42 similar to the skin 9. The skins 42 are secured on each side of the mounting member 14 and two sets of first and second clamping bars 17 and 18 are provided on each side of the mounting block 14 for securing the skins 42 to the mounting member 14.

Holes 43 are provided in the portion of the mounting member 14 which extends along the bottom 44 of the cylindrical portion 6 of the tank 40. Holes 45 are provided in the cylinder 6 at the bottom 44 beneath the member 14. The holes 43 and 45 allow any fluid between the skins 42 to be drained off. Thus, in the event that one of the skins 42 develops a leak, this will be readily apparent by a discharge from the holes 45. In practice, it is envisaged that a collecting device will be provided beneath the tank 5 to collect any discharge to the holes 45 for inspection. Accordingly, the tank 40 according to this embodiment of the invention provides an additional safety feature which ensures quick and early detection of a leak developing in one of the skins 42 before there is any danger of seepage of a liquid from one compartment 11 to the other compartment 12, or vice versa.

The use of this tank 40 is similar to the road tanker 1.

In certain cases, it is envisaged that the skins 42 may be provided with ribs projecting towards each other to retain the two skins 42 spaced apart to further facilitate the run off of any liquid which may seep through the skins 42.

It is also envisaged that one skin 42 may be of a different material to the other. This would be of considerable advantage where the fluids to be carried in the compartments 11 and 12 reacted with certain skin materials. In which case, the material forming the skin of the compartment 11 could be chosen to be non-reactive with the fluid to be carried in that compartment, and the material of the skin of the compartment 12 would similarly be chosen.

Referring now to Fig. 9 there is illustrated portion of a partition wall 50 which may be used as an alternative partition wall in the tanks 5 and 40. In this case, the partition wall 50 is of single skin construction and of plastics material. The partition wall 50 also substantially defines the shape of half the tank 5. However, in this case, a peripheral portion 51 which extends completely around the periphery of the skin 50 is of greater thickness than the remainder of the skin 52, namely the portion of the skin 52 in from the peripheral portion 51. In this case, the area of the thickened portion accounts for approximately 25% of the total area of the skin and the thickened portion 51 is approximately twice as thick as the portion 52. To avoid sudden changes in thickness in the skin 50 a portion 53 extends between the peripheral portion 51 and the inner portion 52 which is tapered. Securing of the skin 50 to the mounting member 14 is similar to that already described with reference to the tanks 5 of Figs. 1 to 6.

The advantage of the skin 50 is that by virtue of the fact that the peripheral portion 51 is of thicker material, there is less danger of the skin rupturing adjacent the mounting means as a result of being moved from side to side of the tank.

Referring now to Fig. 10 there is illustrated a flexible partition wall 60 for use in a tank according

to another embodiment of the invention similar to the tanks 5 and 40. The mounting means for mounting this partition wall 60 to a cylindrical portion 6 of a tank is similar to the mounting means described in the tank 5 with reference to Figs. 1 to 6 and similar components are identified by the same reference numeral. In this case, the partition wall 60 is of double skin construction having skins 61 and 62, laminated together. The skins 61 and 62 are of different materials, both are of a polymer material laminated onto a reinforcing woven fabric web. The polymer of the skin 61 is nitrile while the polymer of the skin 62 is butyle. The advantage of providing a partition wall of this construction is that one of the material may be of a material non-reactive with one of the materials to be transported, and the other skin would be of material non-reactive with the other material to be transported.

Referring now to Figs. 11 and 12, there is illustrated a tank 70 according to another embodiment of the invention. This tank 70 is substantially similar to the tank 5 and similar components are identified by the same reference numeral. The tank 70 is provided with flexible partition means which in this case is provided by a pair of spaced apart skins 71 which are movable away from each other to form a third compartment 72, as well as the compartments 11 and 12. The skins 71 are mounted to the tank by mounting means comprising mounting members 14 and clamping members 17 and 18 similar to those used in the tank 5. However, as can be seen, the mounting members 14 are spaced apart a sufficient distance to accommodate an inlet 73 and an outlet 74 to the compartment 72.

Operation of this tank 70 is substantially similar to the other tanks already described. However, in this case the tank having three compartments, namely the compartments 11, 12 and 72 is capable of transporting three different liquids simultaneously, or alternatively three different liquids at different times. For example, one liquid could be transported in the compartment 11 with the two skins 71 substantially adjacent the side wall 24 of the tank 70. A different liquid at another time could be transported in the compartment 12 with the two skins 71 adjacent the sides 23 of the tank 70. A third liquid could be transported in the compartment 72 with one skin 71 adjacent the side 23 of the tank 70 and the other skin 71 adjacent the side 24 of the tank 70. In all three cases, the compartment in use would be of volume substantially similar to the volume of the interior of the tank 70.

Referring now to Fig. 13 there is illustrated a mounting means 80 for mounting a pair of skins 81 to a tank, for example, similar to the tank 5. The mounting means 80 comprises an elongated mounting member 82 which extends longitudinally round the interior of the tank 5 in similar fashion to the mounting member 14. The mounting member 82 is seam welded to the tank 5 at 83 and 84 similar to the seam welds 15 and 16. Longitudinal grooves 85 extending longitudinally of the mounting member 82 receive a peripheral bead 86 of each skin 81. Clamping members 87 retain the peripheral bead 86 of each skin 81 in the grooves 85. Screws 88 at 75mm centres secure the clamping members 87 to the mounting member 82. A portion 89 of the mounting member 82 is removed to reduce the weight of the member 82. The member 82, clamping members 87 and screws 88 are all of stainless steel material. It is envisaged that the mounting member 82 and clamping members 87 will be formed by extrusion. It is envisaged that the clamping members 87 will be of approximately 1.99 kgs per metre length, and the mounting member 82 will be of 10.45 kgs per metre length.

A wire rope 90 of 6mm diameter is moulded in the bead 86. It is envisaged that the bead 86 will be formed simultaneously with the formation of the skin 81. As can be seen, the skin tapers slightly at 91 towards the bead 86.

Profiles 92 and 93 of the mounting member 82 and clamping members 87 are rounded to prevent rupturing or chafing of the skins 81 as they move from side to side of the tank.

Although not illustrated in Fig. 13, it is envisaged that drain holes be provided in the mounting member 82 between the skins 81 and in the bottom 44 of the tank to drain off any fluid or liquid which may leak or seep through the skins 81.

Referring now to Fig. 14 there is illustrated portion of a mounting means 100 for use with a tank also according to the invention. In this case, only half the mounting means 100 is illustrated, however, the second half is a mirror image of the first half, and as can be seen, it is substantially similar to the mounting means 80. The mounting means 100 comprises a pair of grooves 102 for engaging and retaining a pair of partition skins 103. Only one groove and one skin are illustrated. A clamping member 104 secured to the mounting member 101 by screws 105 retains each skin 103 in each groove 102. Each clamping member 104 is shaped to define with the groove 102 a substantially circular bore 106 for receiving the skin 103. The skin 103 adjacent its periphery is wrapped round an elongated rod 107 to form a bead which substantially defines the cross section of the bore 106. Thus, on securing of the clamping member 104, the skin 103 and rod 107 are secured in the bore 106. A second layer 108 of material is laminated to the skin 103 over the area which forms the bead to reinforce this area of the skins 103. The layer of material 108 may be a reinforcing material or may be of material similar to the skin 103.

Referring now to Fig. 15, there is illustrated a mounting means 110 for use in a tank also according to the invention. In this case, the mounting means 110 is substantially similar to the mounting means 100 and similar components are identified by the same reference numeral. The main difference between this mounting means and that just described is the fact that a second bead 111 is provided around the periphery of the skin 103. The bead 111 is formed by folding portion of the skin 103 around an elongated member 112 of nylon material. The free edge of the skin 103 is stitched at 114 to retain the member 112 in position. The advantage of providing the second bead 111 is that it prevents the skin 103 pulling out of the groove 102 by unwinding around the rod 107. Indeed, in certain cases it is envisaged that this problem could be overcome by stitching the skin at 115.

Needless to say, in both embodiments of the invention illustrated in Figs. 14 and 15, it is not necessary for a second layer 108 of material to be laminated to the skin 103. It will also of course be appreciated that drain holes may be provided in the mounting member between the two grooves 102 for draining off any leaks through the skins 103. In which case, corresponding drain holes will be provided in the shell 6 of the tank to enable drain off of any leaked fluid.

While the members 107 and 112 have been described as being of nylon material, they could be of any other suitable material.

It is envisaged that, if desired, the skins 9, 42, 50 and 61, 62, 71 and 81 may be provided with or without reinforcing material. Such reinforcing may be provided by a woven textile or a woven wire mesh material or any other suitable reinforcing material. The reinforcing, in general, it is envisaged, would be provided within the skins and in general it is envisaged that the skins would be formed around the reinforcing material. Indeed, it is envisaged in the case of the partition wall 60 that should the skins 61 and 62 not be reinforced a reinforcing material may be laminated between the skins 61 and 62. Further, it is envisaged that in many cases where reinforcing material is provided in the skins, more reinforcing material will be provided around the peripheral mounting portion than inwardly of the mounting portion. Further, it is envisaged in certain cases that reinforcing material may only be provided in the mounting portion, for example, in the case of the skin 50 with the thickened portion 51 reinforcing material could be provided in this portion. Needless to say, it will be appreciated that it is not necessary to provide a thickened portion where reinforcing material is only provided in the peripheral mounting portion of the skin.

It will be appreciated that while the partition wall and mounting member have been described as being provided in a vertical plane of symmetry of the tank along its longitudinal axis, in certain cases it is envisaged that the skin and mounting means may be mounted in the tank to divide it about a transverse plane of symmetry, in other words, the skin 9 would be essentially parallel to the end caps of the tank and the mounting means would form a hoop around the cylindrical portion of the tank. It will, of course, be appreciated that it is not necessary that the plane of symmetry should be vertical, it could be horizontal or indeed any other angle. Further, it will be appreciated that in certain cases it is envisaged that the partition and mounting means may not be provided in a plane of symmetry, they could be provided more to one side or one end of the tank than the other side or end respectively.

It will also be appreciated that while the partition wall has been described as defining substantially the shape of half the tank, this is not necessary, indeed, it is envisaged that in certain cases the partition wall may be of substantially flat construction. In which case, it is envisaged that sufficient material would be provided in the partition wall to enable it to extend from one side of the tank or one end of the tank to the other as the case may be. Although in certain cases it is envisaged that the partition means may not be movable from one side to the other or from one end to the other, it may only be movable partly towards the ends or side walls. Indeed, it is envisaged in certain cases that the partition means may be of an elastic material which would expand and contract to take up differing and varying positions within the tank.

While particular shapes and constructions of mounting means for mounting the partition wall to the tank have been described, other suitable mounting means could be provided without departing from the scope of the invention. Indeed, if desired, the mounting member may be of solid section and/or the clamping members may be of hollow section.

It will also, of course be appreciated that while the tanks described with reference to the drawings have been described for use for mounting on road tankers, they could be used for any other purpose, for example, for mounting on a swop body trailer or road vehicle, for use on board a ship, rail/road vehicle, aircraft, or indeed for use with any other means or mode of transport.

Further, it will be appreciated that while particular materials have been described in the construction of the tank, partition means and mounting means, other materials could be used without departing from the scope of the invention. For example, in certain cases, it is envisaged that the tank may be of steel, in which case it is envisaged that

the mounting means would generally also be of steel. Needless to say, any other materials could be used for the tank and mounting means, and while in general it is envisaged that the mounting means and tank would be of similar materials, the tank and mounting means could be of different materials in certain cases. Further, it is envisaged that the inner surface of the walls of the tank and indeed, in certain cases the walls of the outer surface, as well as the surfaces of the mounting means, if desired, could be coated with any desired material, for example to avoid corrosion or chemical reactions with certain chemical fluids. For example, it is envisaged that the tank walls and mounting means, if desired, could be coated with teflon or other suitable plastics material, polymer materials, elastomer materials and the like. Indeed, in certain cases, the coating could be a rubber type coating.

Furthermore, while the partition wall has been described as being provided by a skin or skins of certain materials and construction, any other suitable material or construction could be used. For example, other suitable polymer, elastomer materials or any other suitable plastics material could be used. Indeed, in certain cases, natural material such as natural rubber may be used. Further, it is envisaged in certain cases that the skins of the partition wall could, if desired, be coated with non-corrosive or non-reactive material, such as, for example, teflon or any other desired material. Needless to say, while the partition wall has been described as comprising two and three skins, it could comprise any desired number of skins, where these are laminated, they may be laminated by bonding, heat sealing or any other suitable laminating means.

It will of course be appreciated that any number of inlets and outlets may be provided in the tank, and similarly any other desired arrangement of handholes, manholes and the like could also be provided.

Furthermore, any number of skins could be provided and these skins may or may not be movable relative to each other. Where more than two skins movable relative to each other are provided, more than three compartments could be provided in the tank. Furthermore, in certain cases, it is envisaged that where two or more skins are provided, while the skins would be spaced apart, they may be secured together by, for example, ribs, projections extending from one skin to the other or the like, so that the skins would move together from one side or end of the tank to the other.

It is also envisaged that instead of moving the skins from one side of the tank to the other, air pressure may be provided for this purpose. In which case, the compartment to be formed would be pressurized using, for example, compressed air or other fluid. Alternatively, a vacuum pump may be provided to evacuate one compartment, thereby drawing the skin into that compartment to form the other compartment.

Additionally, while a tank of a particular shape and construction has been described, the tank may of any other shape or construction without departing from the scope of the invention. For example, in certain cases, the tank may be of square shape, for example, cubic or square section, or rectangular section, spherical or any other desired shape or construction.

While the partition wall has been described in the embodiment of the invention with reference to Fig.9 as having a thickened area around the periphery and the thickened area is described as being 25% of the area of the skin, it will be appreciated that the thickened area could constitute other suitable proportions of the area. Indeed, it is envisaged that the thickened area could range from 4% to 40% of the area of the skin. Further, it is envisaged that the thickness of the thickened portion could be any desired amount thicker than the rest of the skin. For example, it is envisaged that the thickness of the thickened portion could range from 1.2 times the thickness of the inner portion of the skin to 5 times the thickness of the inner portion of the skin.

While the tank has been described as being substantially cylindrical, it could be of any other desired shape, such as, for example, elliptical or of max section.

## Claims

1. A tank of the type comprising a shell (6) defining an interior region, characterized in that a flexible partition means (9) is mounted within the interior region to form two compartments (11,12), and mounting means (14,17,18) for mounting the peripheral edge of the flexible partition means (9) to the shell (6) is provided, the partition means (9) being deformable to vary the volume of the compartments (11,12).

2. A tank as claimed in Claim 1 characterized in that the flexible partition means (9) is movable between two opposing portions (23,24) of the shell (6), the volume of respective compartments (11,12) alternately being substantially similar to the volume of the interior region and having substantially zero volume.

3. A tank as claimed in Claim 1 or 2 characterized in that the mounting means (14,17,18) extends around the interior of the tank (5) and defines a plane of symmetry of the tank (5) along the vertical longitudinal axis of the tank (5).

4. A tank as claimed in any preceding claim characterized in that the means (9) is of double skinned (42,42,61,62) construction being formed by two sheets (42,42,61,62) of flexible material.

5. A tank as claimed in Claim 4 characterized in that the two sheets (42,42) of material are spaced apart.

6. A tank as claimed in Claim 4 or 5 characterized in that the two sheets (71,71) of material are movable apart relative to each other to form a third compartment (72).

7. A tank as claimed in any preceding claim characterized in that the mounting means (14,17,18) comprises an elongated mounting member (14) secured to the shell (6) on the interior side thereof, and an elongated clamping means (17,18) being provided to clamp each skin (9) onto the mounting member (14).

8. A tank as claimed in Claim 7 characterized in that a peripheral bead (86) extends around the partition means (9) to engage a groove (85) of the mounting member (82).

9. A tank as claimed in any preceding claim characterized in that inlets (28,29,73) are provided in the shell (6), one inlet (28,29,73) being provided for each compartment (11,12,72) and outlets (30,31,74) are provided in the shell (6), one outlet (30,31,74) being provided for each compartment (11,12,72).

10. A partition wall of flexible material (9) for use in a tank (5) in any of Claims 1 to 9.

11. A road tanker comprising a tank (5) according to any of Claims 1 to 9.

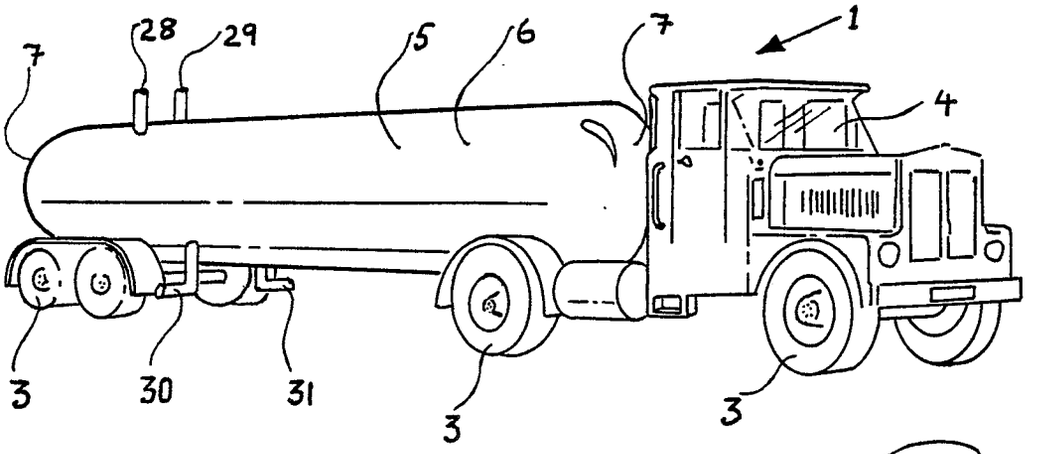



FIG 1

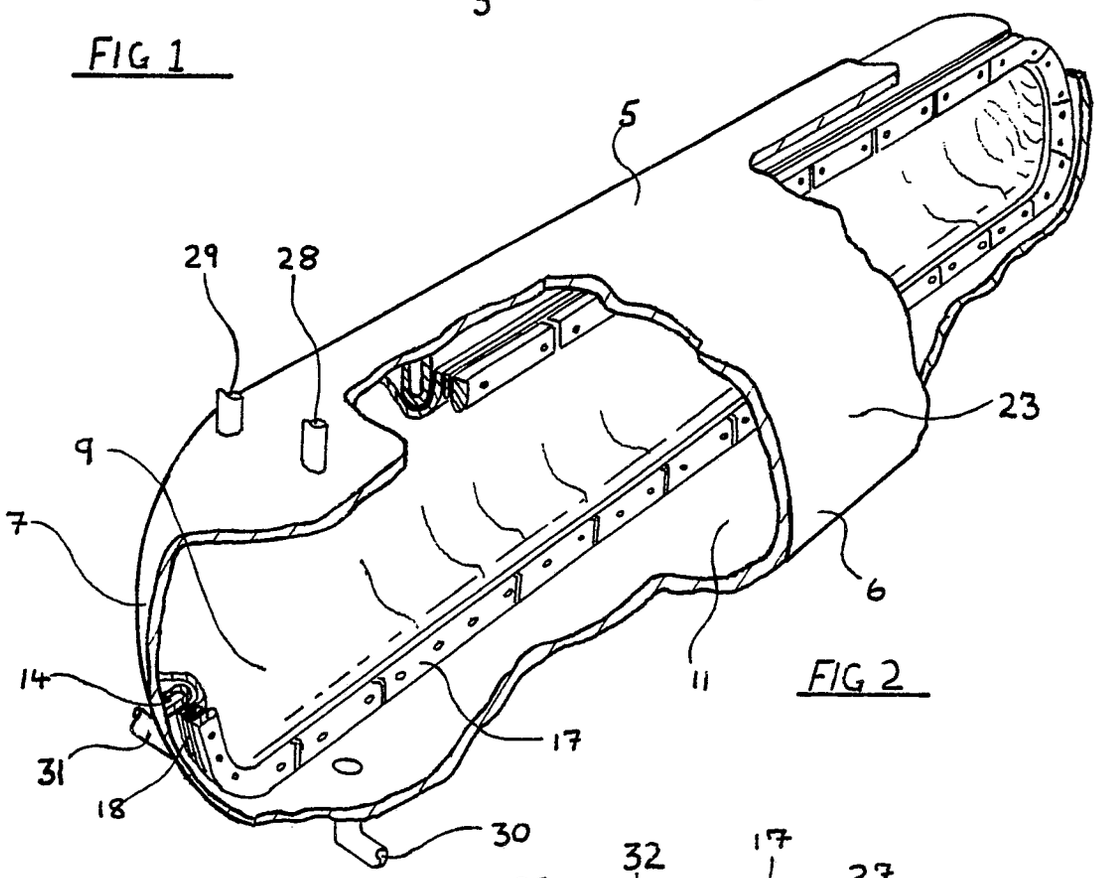



FIG 2

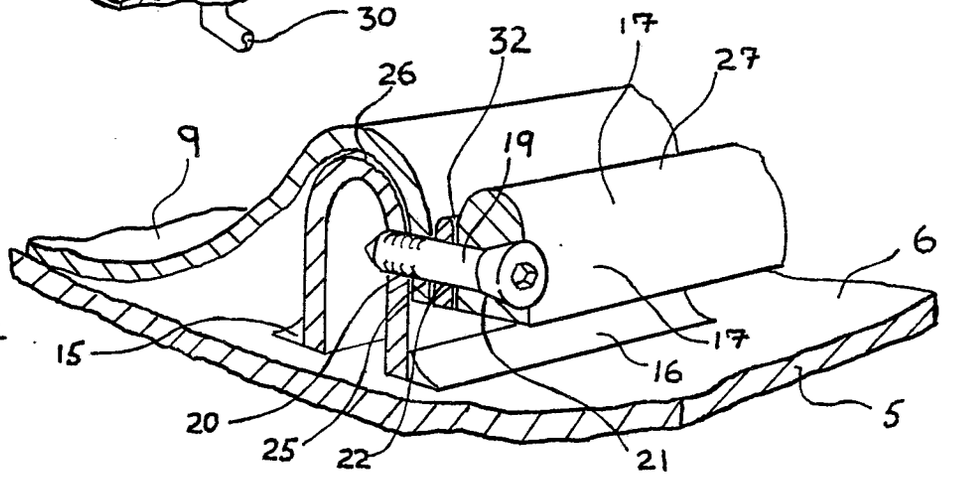



FIG 6

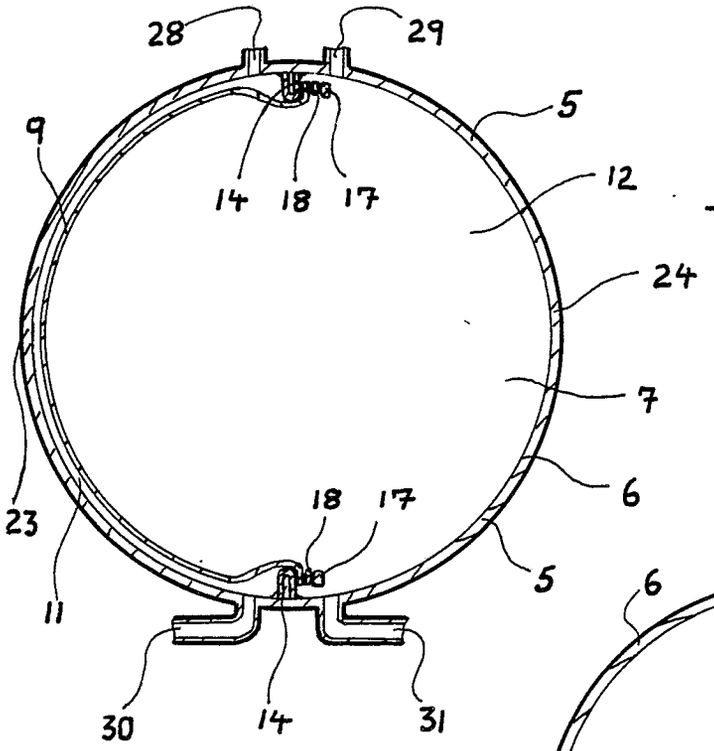



FIG 3

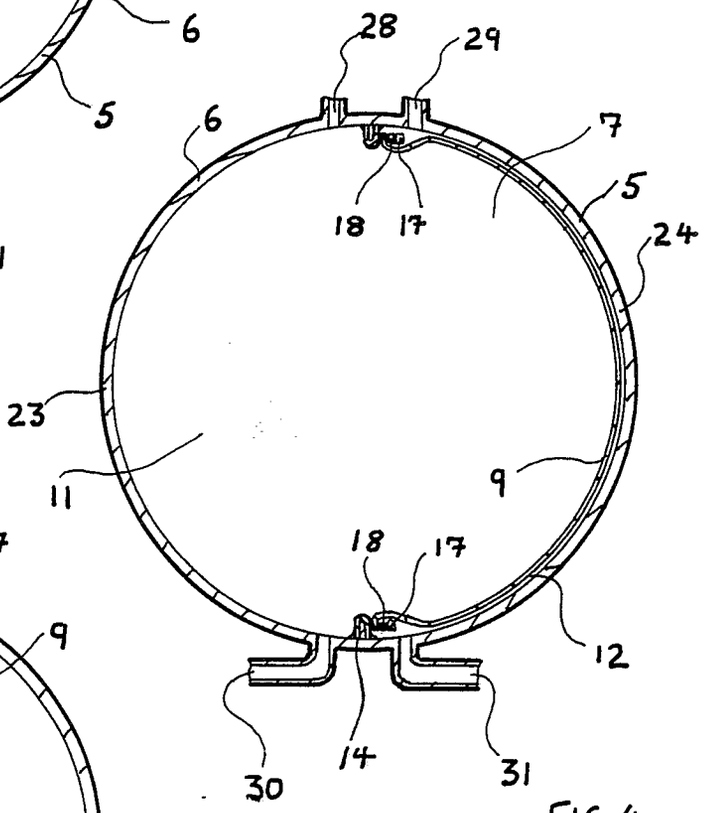



FIG 4

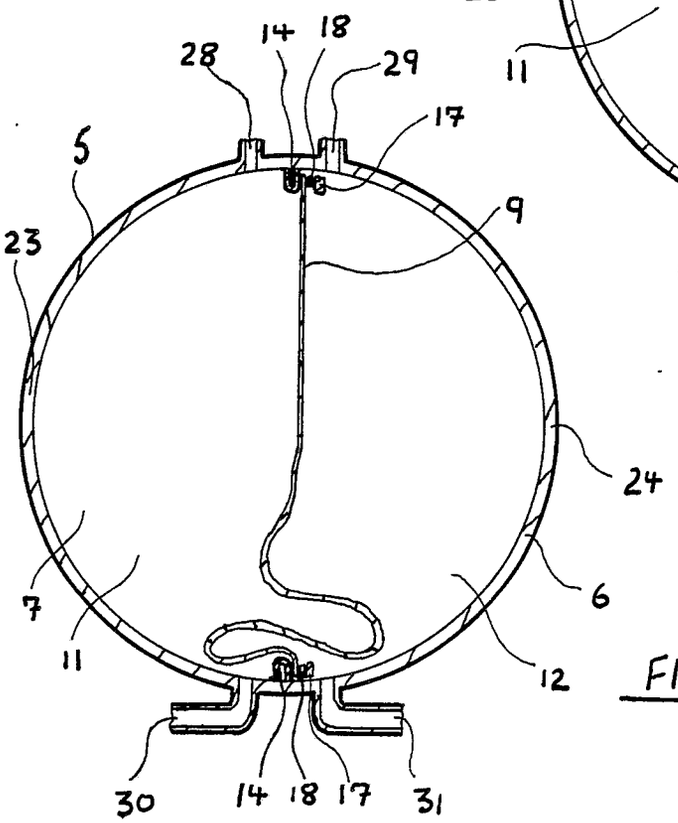



FIG 5

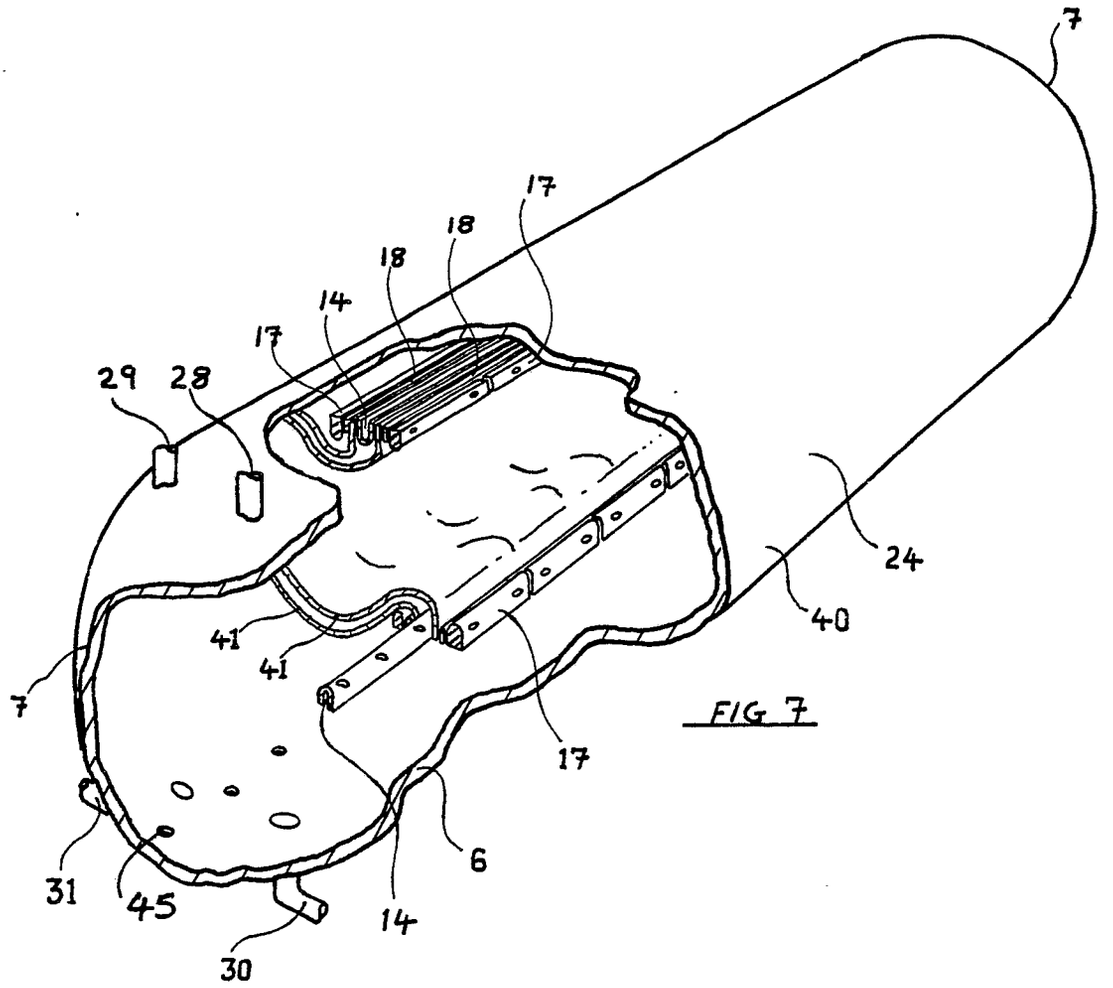
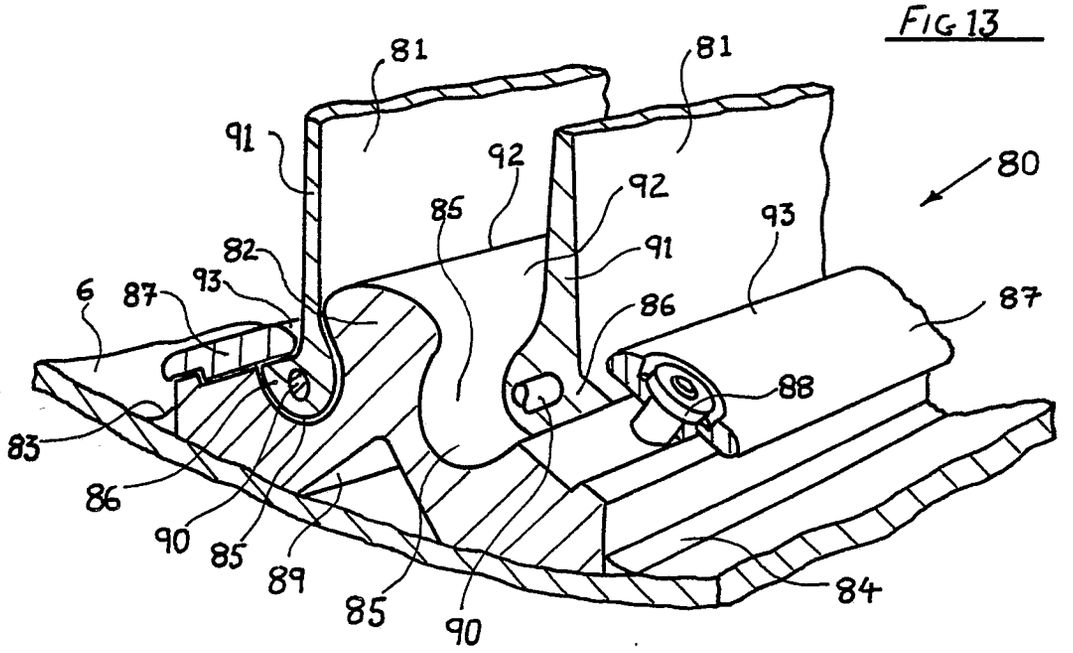



FIG 7

FIG 13



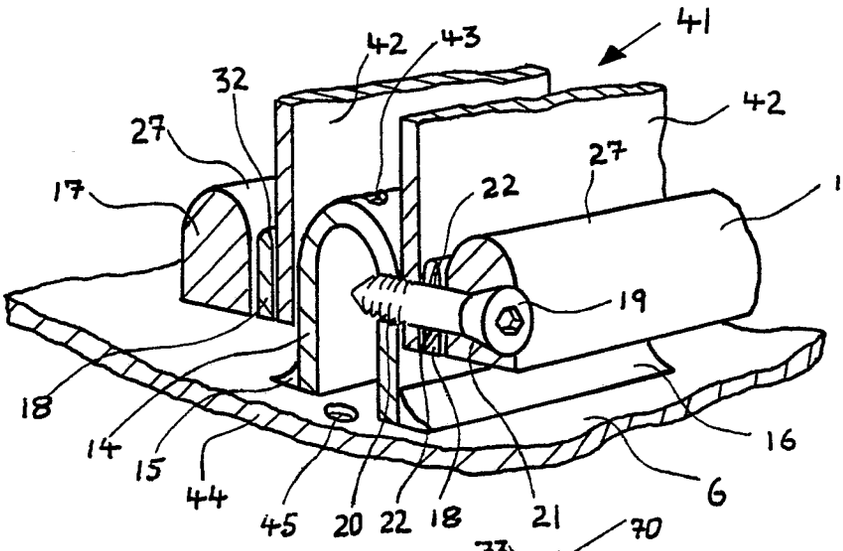



FIG 8

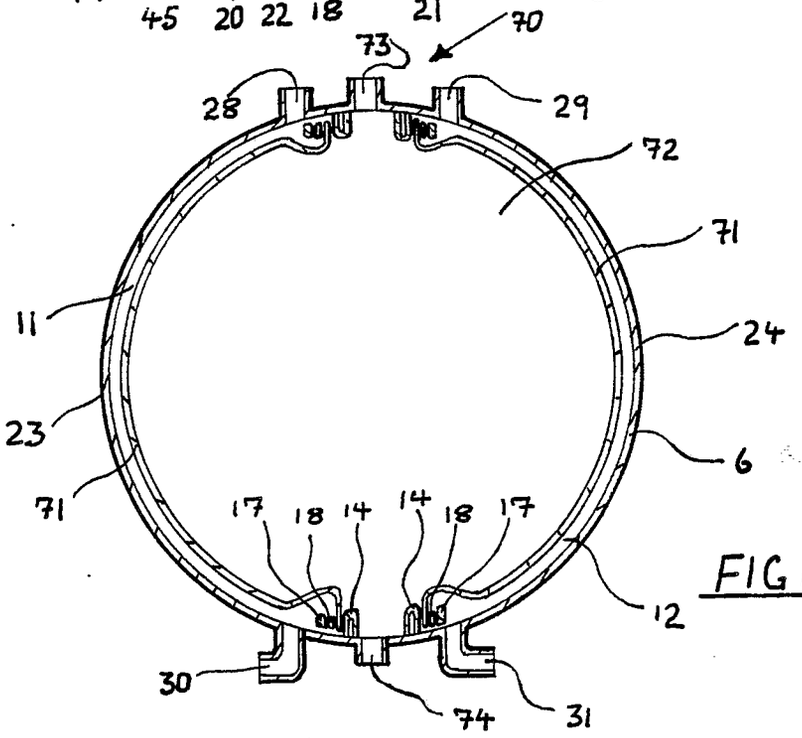



FIG 12

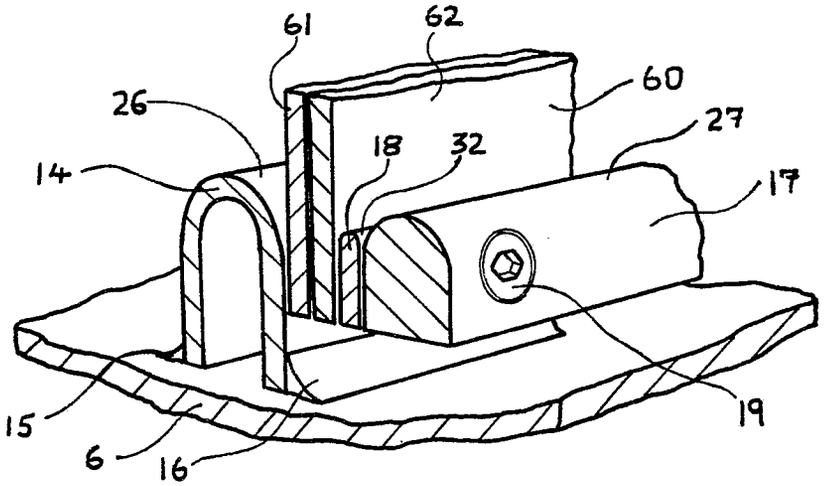



FIG 10

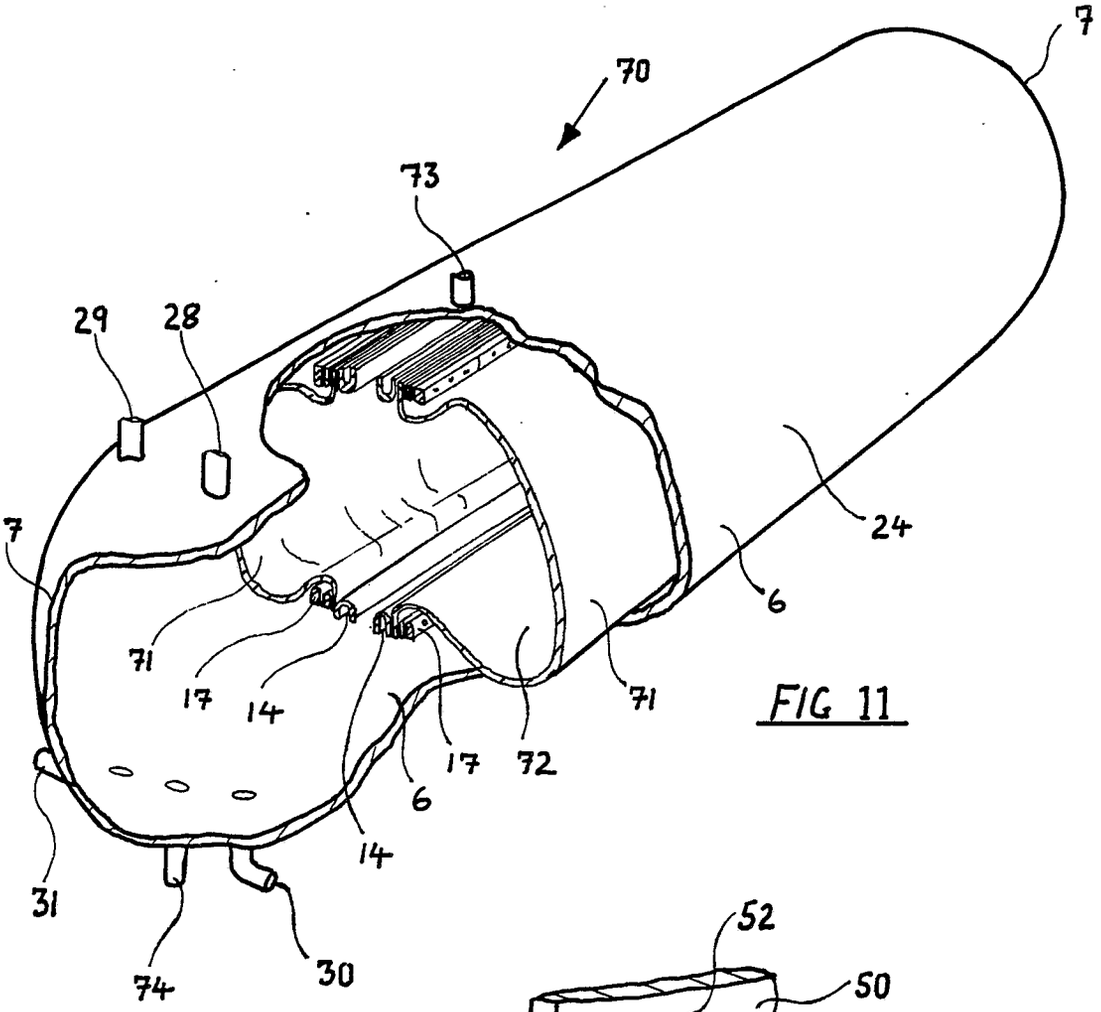



FIG 11

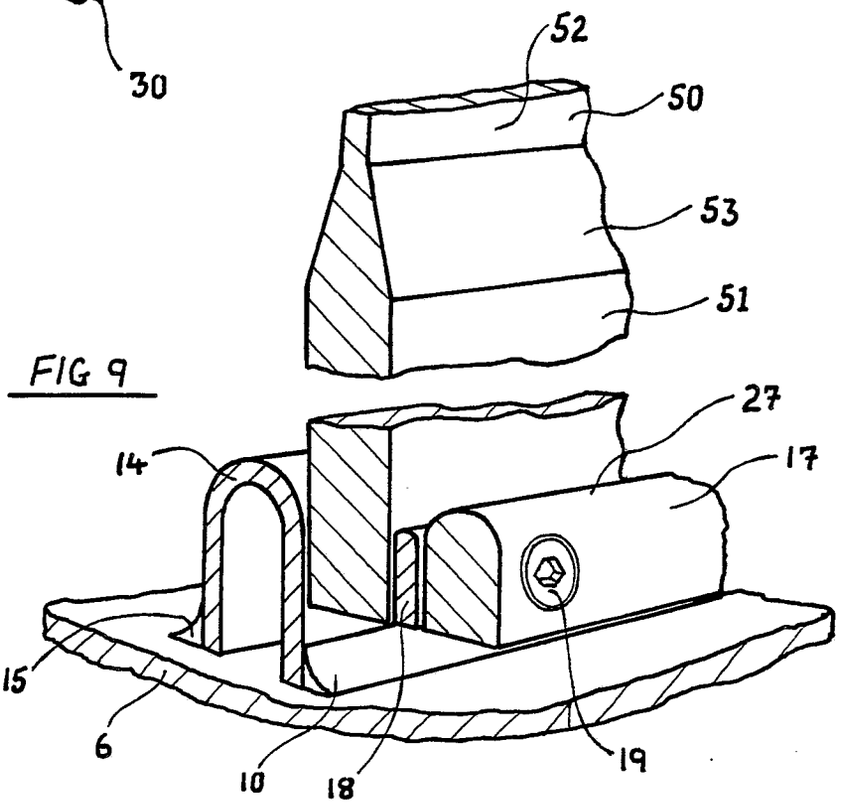



FIG 9

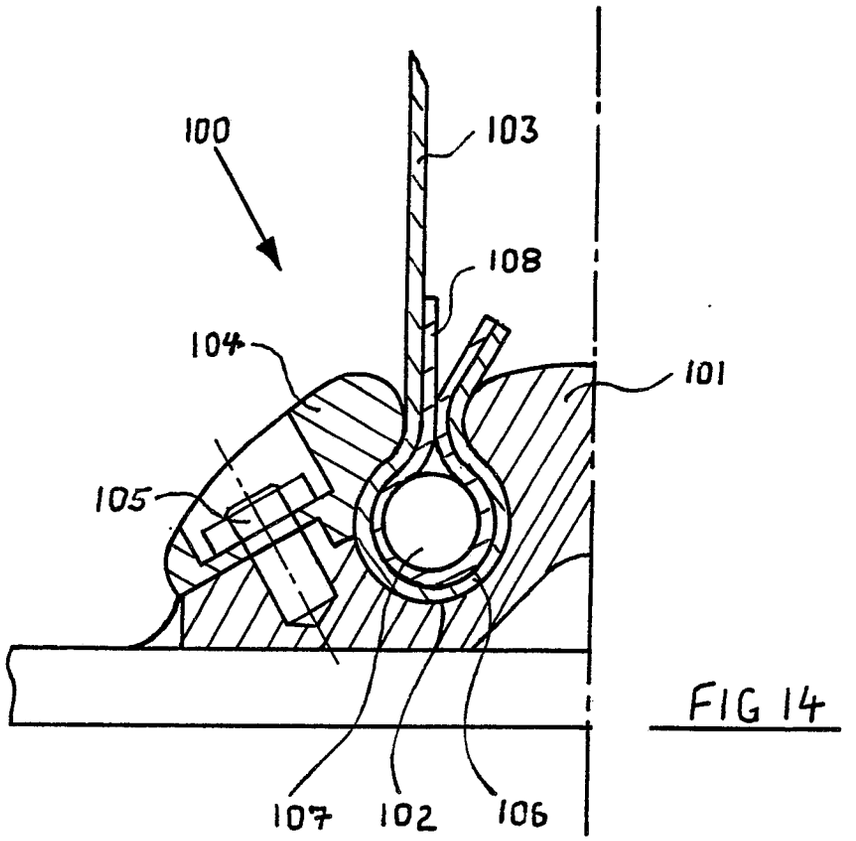



FIG 14

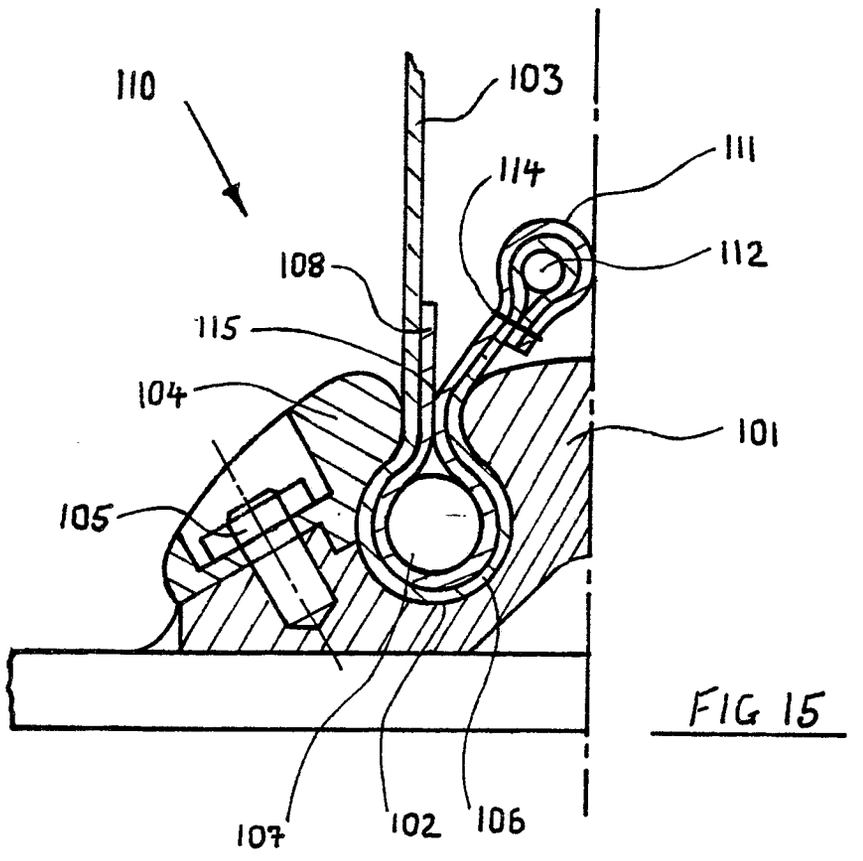



FIG 15

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number

EP 88 30 7279

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.4) |
|---|---|---|---|
| X | DE-A-2 252 698 (WILLYUCK)<br>* The whole document * | 1-3,7-11 | B 65 D 88/62 |
| X | DE-A-3 305 903 (AQUANORT)<br>* The whole document * | 1,2,4-6,10,11 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 09-11-1988 | WERNER D.M. |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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