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(54) **Pallet for supporting a tank**

(57) A pallet (2) for supporting a tank (12) comprises: a platform (4) on which the bottom of the tank rests; and below this a support structure (6) extending peripherally around the edges of the platform (4). The platform (4) and the support structure (6) are connected by a plurality of distance blocks (5). Advantageously a stiffening cross member (22) that connects two opposite

sides of the support structure (6) runs under the central area of the platform (4) and includes a strut (23) to support the platform (4) in said central area, in order to prevent the platform (4) from deforming under the weight of the tank and developing a concavity.

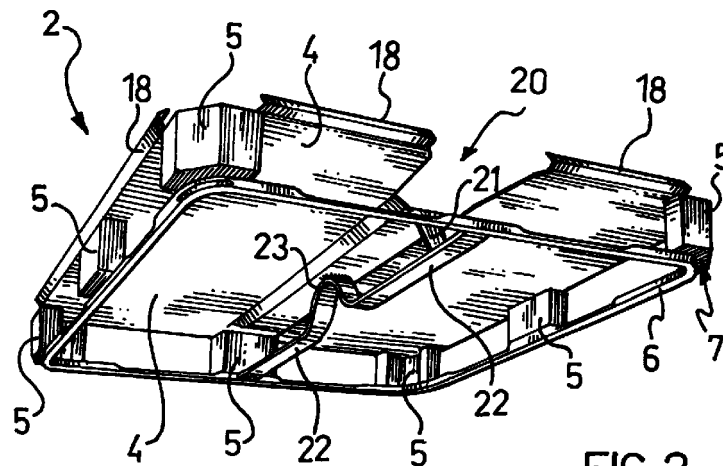


FIG.3

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Description

[0001] The present invention relates to a pallet for supporting a tank.

[0002] It relates in particular to a pallet intended to be combined with a lateral containment cage in such a way as to form a container used for transporting and containing tanks.

[0003] This kind of pallet is designed to be lifted by the forks of a forklift truck, and these containers can therefore easily be moved and transported together with the tank and its contents by conventional lifting equipment.

[0004] In this context, it should be pointed out that the abovementioned containers, and hence also the pallets, have not only to withstand the static loads of their own weight and that of the liquid contained in the tanks, but also of course to be able to withstand the dynamic loads associated with their lifting and transportation, as well as any impacts to which the containers may be subject. Nor is that all, for in order to be approved to transport goods or liquids classified as hazardous, these containers must be able to pass certain tests such as, for example, the drop test. During this test, the container is first lifted diagonally and then dropped into its front wall, in which the tank's drain valve is usually positioned.

[0005] It is clear from the above that there is a great awareness of the need for an extremely stout container, capable, that is to say, of absorbing the energy of the impact without compromising the integrity of the tank which it contains.

[0006] Clearly, in order for this to happen, the structure of the supporting pallet must be sufficiently rigid not to be deformed by an impact. In particular the pallet must not be deformed on the abovementioned front wall.

[0007] Another requirement that must be satisfied is that the deformation of the platform of the pallet on which the bottom of the tank rests must be limited, as the load exerted by the tank tends to cause the platform to deform in a direction resulting in an undesirable concave configuration which causes the phenomenon of liquid being left stagnant in the tank when the tank is emptied.

[0008] Tanks are shaped so that the outflow aperture is positioned at their lowest point in order to enable all the liquid contained inside them to be drained out, but, clearly, if no liquid is to be left stagnant at the bottom, the bottom of the tank must be properly supported by the pallet platform, especially in the centre.

[0009] The platform must remain nondeformable even following the repeated impacts and falls to which the container and pallet are subject during handling and shipping.

[0010] Lastly, consideration must also be given to the structure of the pallet, which must allow access to the forks of forklift trucks from all four sides.

[0011] The containers and associated pallets currently used are unable to satisfy these requirements in a satis-

factory manner.

[0012] The problem addressed by the present invention is how to produce a pallet whose structural characteristics are such as to satisfy the abovementioned requirements and which is at the same time simple to construct.

[0013] This problem is solved with a pallet according to Claim one.

[0014] One advantage of the pallet according to the invention is that it is structurally rigid and therefore withstands impacts and deformation of the platform of the pallet.

[0015] According to another aspect the abovementioned requirements are satisfied by a container in accordance with Claim 10.

[0016] Further characteristics and advantages of the pallet according to the invention will become clear in the following description of a preferred example of an embodiment thereof. This is given by way of non-limiting indication with reference to the accompanying drawings, in which:

- Figure 1 shows a perspective view of a container comprising a pallet according to the invention;
- Figure 2 shows a perspective view of a pallet according to the invention;
- Figure 3 shows a perspective view of the pallet of Figure 2 from a different viewpoint;
- Figure 4 shows a plan view of the pallet of Figure 2;
- Figure 5 shows a cross-section taken on V-V as marked in Figure 4;
- Figure 6 shows a cross-section of a detail of the container of Figure 1; and
- Figures 7 and 8 show two views of the detail shown in Figure 6 at two different stages in the assembly of the container 1.

[0017] Referring to the accompanying Figures, 1 is a general reference for a container for containing and transporting a tank 12. The container 1 comprises a pallet 2 according to the invention to which is fixed a lateral containment cage 3.

[0018] The pallet 2 is a four-way pallet made of galvanised steel and comprises a roughly square platform 4 and, underneath it, a support structure 6.

[0019] The support structure 6 takes the form of a peripheral tube, preferably square-sectioned, which runs around the edges of the platform 4 to form a closed loop. The support structure 6 is preferably circumscribed within the perimeter of the platform 4.

[0020] The platform 4 and the support structure 6 are connected by a plurality of distance blocks, of which there are seven in this example, marked 5 in the figures. The blocks 5 are positioned at each corner of the platform 4 and, except for the front wall of the pallet, are also positioned in the centre of the edge of the three remaining walls of the platform 4. As a consequence of this the pallet 2 is accessible to the forks of a forklift

truck from all sides.

[0021] At each point where the forks of a forklift truck are inserted, the square-sectioned tube of the support structure 6 has preferably been suitably deformed to make it flat and permit easier insertion of the forks.

[0022] The blocks 5 have opposing flat end surfaces, one welded to the platform 4 and the other to the support structure 6.

[0023] With respect to the support structure 6, i.e. with respect to the peripheral square-sectioned tube, the blocks 5 protrude in the outward direction to define a centring ledge 7 (Fig. 5) that will allow the container 1 to be stacked in a restrained manner with identical containers, as will be evident in the course of the description.

[0024] Opposite sides of the support structure 6 are connected by a stiffening cross member 22 which runs underneath the central area of the platform 4.

[0025] Advantageously, the stiffening cross member 22 includes a strut 23 that supports the platform 4 in said central area, in order to prevent the platform 4 from deforming under the weight of the tank 12 and developing a concavity.

[0026] Preferably, the strut 23 is formed in one piece with said stiffening cross member 22 and is produced by bending a central portion thereof.

[0027] In the example, the strut is shaped like an inverted V having an ascending arm and a descending arm joined by an apex in contact with the lower surface of the platform 4.

[0028] Advantageously, the stiffening cross member 22 extends in a transverse direction Y-Y to the front wall of the pallet 2 and along the centre line of said wall. The stiffening cross member 22 is therefore in line with the drain aperture and the valve means 14 of the tank 12.

[0029] The lateral containment cage 3 comprises a plurality of horizontal 8 and vertical 9 tubular metal components arranged at suitable distances from each other to form a grid. At each point of intersection between a horizontal tubular component 8 and a vertical tubular component 9, the tubular components are welded together.

[0030] The horizontal components 8 form closed loops along a perimeter roughly corresponding to that of the platform 4 of the pallet 2.

[0031] Among the horizontal tubular components 8 of the cage 3, one is a top tubular component 10 and one a base tubular component which forms a flange 11 running around the edges of the platform 4. The flange 11 rests on the platform 4 of the pallet 2.

[0032] The dimensions of the top tubular component 10 are such that two containers 1 can be stacked by inserting the support structure 6 of the upper container inside the top tubular component 10 of the lower container, until the centring ledge 7 of the upper container meets the top tubular component 10 of the lower container. Substantially, the container 1 is nestable with identical containers.

[0033] The tank 12 is made of plastic, is roughly cubical in form and is housed in the container 1 so as to be entirely contained inside it. The tank 12 rests on the platform 4 of the pallet 2, and is laterally contained by the grid structure of the cage 3.

[0034] At the top of the tank 12 is a filling aperture with a cap 13, while at the bottom a drain aperture is positioned in the middle of one of the side walls. Fitted to the drain aperture are valve means 14 for stopping the outflow, e.g. a valve or tap, in the continuation of which is an outflow sleeve closed by a cap 15.

[0035] The tank 12 is inserted in the container 1 in such a way that its valve means 14 are towards the front wall of the pallet 2. The reason for this is that, precisely in order to prevent interference with the valve means 14, the platform 4 contains a notch 20 extending widthways over a defined central section M of the front wall of the pallet 2 and in depth over a defined section P extending from the edge of the platform 2 towards the central area of the platform 2. The notch 20 prevents interference between the platform 4 and the outflow valve means 14 of the tank 12.

[0036] In the same way the base flange 11 of the cage 3 is also interrupted at the abovementioned central section M of the front wall of the pallet 2 so as not to create interference with the valve means 14 of the tank 12.

[0037] The stiffening cross member 22 and the innermost portion 17 of the notch 20 lying above this member are joined by an inclined strap 21 which acts as a support. The strap 21 is preferably formed from a bent portion of the platform 4. During the operation of cutting the notch of the platform 4, this portion of the platform is expressly left so that it can then be bent to form the strap 21.

[0038] The platform 4 of the pallet 2 is shaped in such a way as to form a trough 24 extending in direction Y-Y away from the notch 20 and over the stiffening cross member 22. This trough is designed to receive a corresponding shaped portion of the bottom of the tank 12.

[0039] In order to secure the tank 12 inside the cage 3, the container 1 includes a plurality of upper cross members 16 extending between opposite sides of the top tubular component 10 to which they are fixed by bolt fixings.

[0040] When the tank 12 is filled with liquid the pressure exerted by the liquid deforms the side walls of the tank 12, which then press against the containment cage 3.

[0041] The cage 3 of the container 1 is advantageously fixed to the pallet 2 by means of clamps 18, of which there are five in the example, connected to the pallet 2 and able to grasp the flange 11 in order to fasten the cage 3 firmly to the pallet 2.

[0042] In the example shown in the figures, the abovementioned clamps 18 are L-shaped, are formed integrally with the platform 4 of the pallet 2 and are bent by deformation around the flange 11 of the cage 3.

[0043] In substance, the flange 11 of the cage 3 is

gripped between the clamps 18 and the platform 4 of the pallet 2 as if between two jaws of a vice.

[0044] It is only necessary to point out that in order for it to be possible for the clamps 18 to be bent around the flange 11 without interfering with the vertical tubular components 9 of the cage 3, the vertical tubular components 9 are located on the inside of the closed loop formed by the base tubular component forming the flange 11, as clearly shown in Figure 7.

[0045] The clamps 18 advantageously extend all the way along the sides of the pallet 2, except, obviously, for the abovementioned central section M of the front wall of the pallet, where the valve means 14 of the tank 12 are located.

[0046] The platform 4 of the pallet 2 is produced with the clamps 18 extended like wings along the sides of the platform 4 in an open position (Fig. 7), that is to say in a position in which they do not overlie the platform 4.

[0047] Once the lateral containment cage 3 is correctly positioned on the platform 4 of the pallet 2 (Fig. 8), the clamps 18 are deformed to bend them over the flange 11 of the cage 3 (Fig. 6), as indicated earlier.

[0048] Next, to ensure that the clamping force of the clamps 18 on the flange 11 does not weaken, fixing means 19, which in this example are screws, are fitted to connect the clamps 18, the flange 11 and, optionally, the platform 4 and the distance blocks 5.

[0049] It should be emphasised that, in contrast to the practice with containers of the prior art, in which the fixing of the lateral containment cage to the pallet is localised in a few points, the clamps 18 exert an efficient and continuous securing action extending around all sides of the flange 11.

[0050] Consequently, between the pallet 2 and the lateral containment cage 3 a strong structural connection is formed, so that the container 1 behaves, especially if bumped or dropped, as an integral whole. In particular, because the cage 3 is efficiently connected to the pallet 2, the structure of the cage 3 actively collaborates with the pallet 2 in absorbing the energy of an impact or fall of the container 1.

[0051] The stiffening cross member 22 increases the structural rigidity of the pallet 2 so as to make it less deformable even when bumped or dropped. This is particularly the case with the front wall of the pallet 2, in which the valve means 14 of the tank 12 are located.

[0052] Furthermore the strut 23 formed by the cross member 22 prevents the platform from deforming under the action of the load bearing down upon it, thus preventing it from deforming and developing an undesirable concave configuration.

[0053] It should also be emphasised that the inverted V configuration of the central section of the stiffening cross member 22 helps to increase the torsional rigidity of the latter.

[0054] As will be appreciated from the above account, the pallet according to the invention satisfies the abovementioned requirements. Thus, the presence of the

stiffening cross member and of the associated strut increases the structural rigidity of the pallet and hence that of the container, so that in the event of stresses caused by being bumped or dropped, the integrity of the tank and of its valve means is nonetheless preserved and there are no hazardous escapes of liquid.

[0055] A further advantage of the pallet according to the invention is that it is structurally simple, meaning that its manufacture can easily be automated.

[0056] Clearly, a person skilled in the art will be able, in order to satisfy particular and specific requirements, to make numerous modifications and alterations to the container according to the invention described above, all however coming within the scope of protection of the invention as defined in the following claims.

Claims

1. Pallet (2) for supporting a tank (12), of the type that comprises: a platform (4) on which the bottom of the tank (12) rests; a underneath support structure (6) extending peripherally around the edges of the platform (4), the platform (4) and the support structure (6) being connected by a plurality of distance blocks (5); and a stiffening cross member (22) that connects two opposite sides of the support structure (6); characterised in that said stiffening cross member (22) runs underneath the central area of the platform (4) and includes a strut (23) to support the platform (4) in said central area, in order to prevent the platform (4) from deforming under the weight of the tank (12) and developing a concavity.
2. Pallet (2) according to Claim 1, in which said strut (23) is formed in one piece with said stiffening cross member (22).
3. Pallet (2) according to Claim 2, in which said strut (23) is produced by bending a portion of said stiffening cross member (22), said strut (23) being shaped like an inverted V having an ascending arm and a descending arm joined by an apex in contact with the platform (4).
4. Pallet (2) according to any one of the previous claims, in which said stiffening cross member (22) extends transversely to a front wall of the pallet (2), along the centre line of said wall.
5. Pallet (2) according to Claim 4, in which the platform (4) contains a notch (20) extending widthways over a defined central section (M) of the front wall of the pallet (2) and in depth from the edge of the platform (4) towards the central area of the platform (4), which notch (20) prevents interference between the platform (4) and outflow valve means (14) of the tank (12).

6. Pallet (2) according to Claim 5, in which the stiffening cross member (22) and the innermost portion (17) of the notch (20) lying above this member are joined by an inclined strap (21). 5
7. Pallet (2) according to Claim 6, in which said strap consists of a bent portion of the platform (4), said portion of the platform (4) being expressly left during the operation of cutting the notch (20) of the platform (4) and then bent to form the strap (21). 10
8. Pallet (2) according to Claim 6, in which said platform (4) comprises a trough (24) extending transversely to said front wall of the pallet (2), from said notch (20), along the centre line of said front wall. 15
9. Pallet (2) according to Claim 1, in which said pallet (2) is made of steel.
10. Container for transporting and containing tanks and the like, comprising a supporting pallet (2), a cage (3) for lateral containment of the tank (12) and means for securing the cage (3) to the pallet (2), characterised in that said pallet (2) is in accordance with any one of the previous claims. 20
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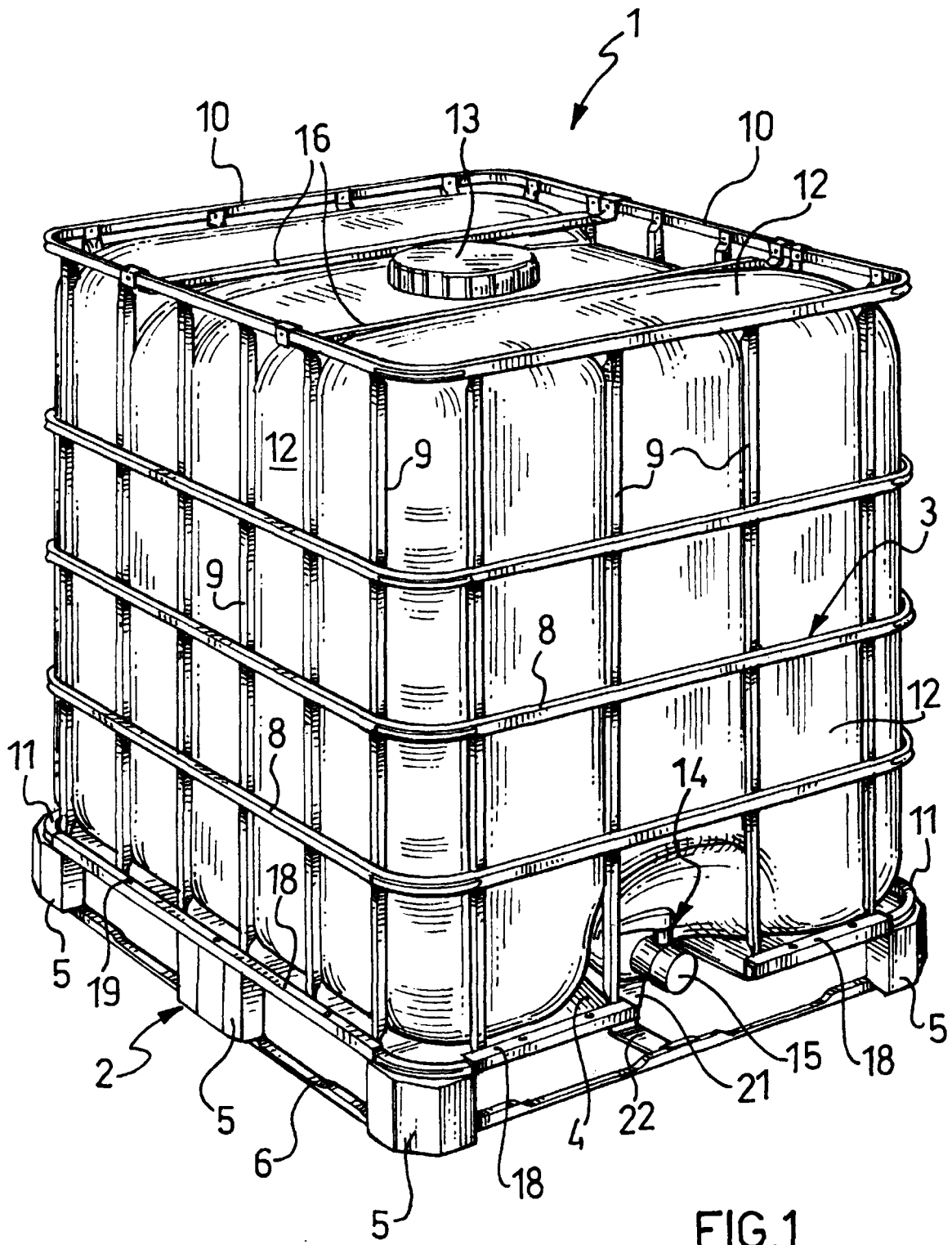
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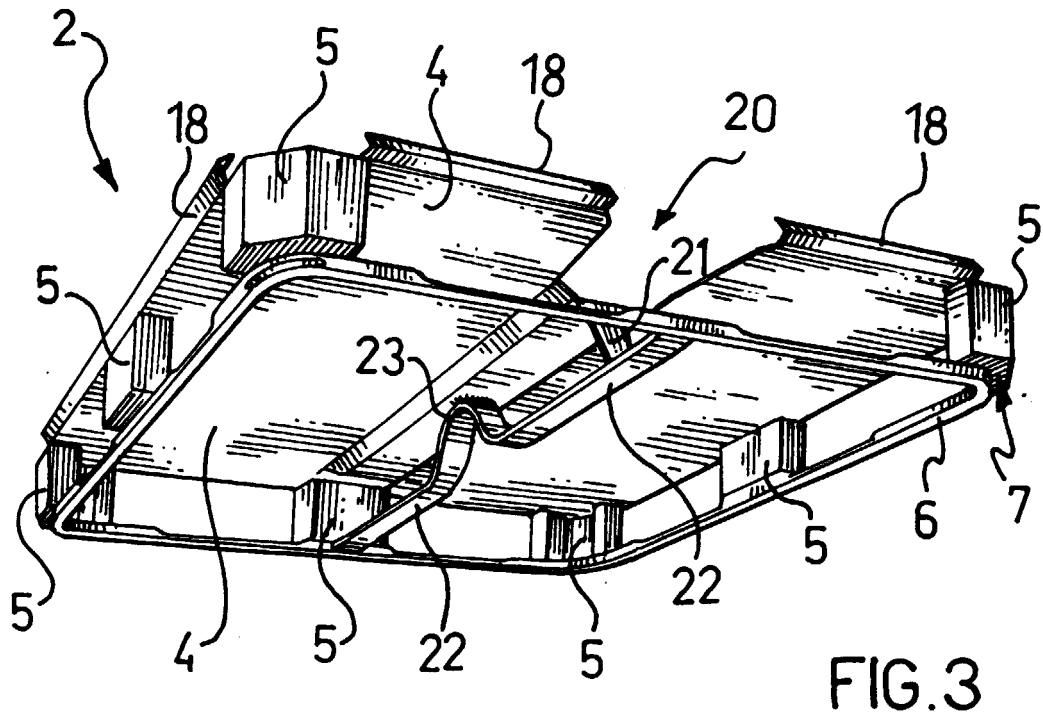
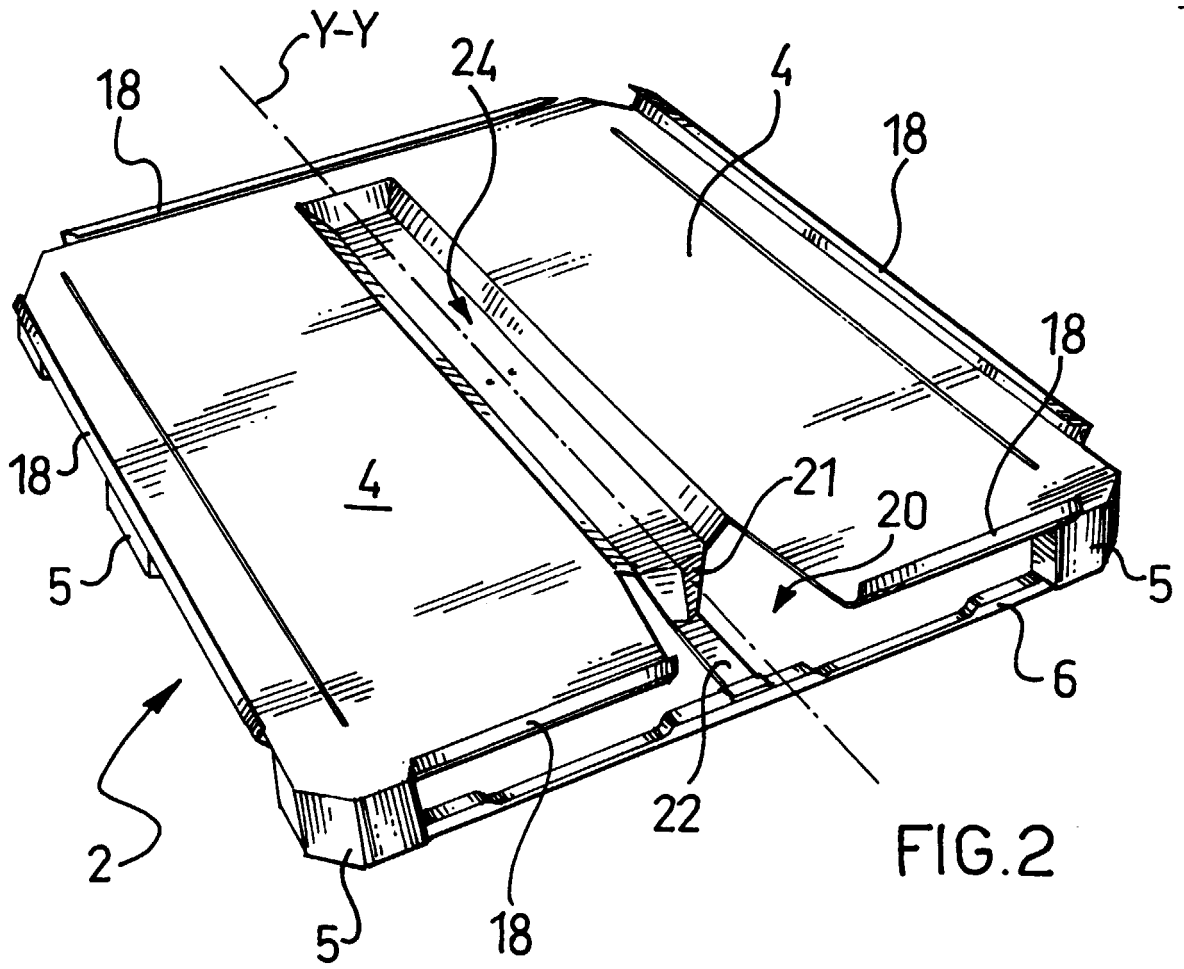
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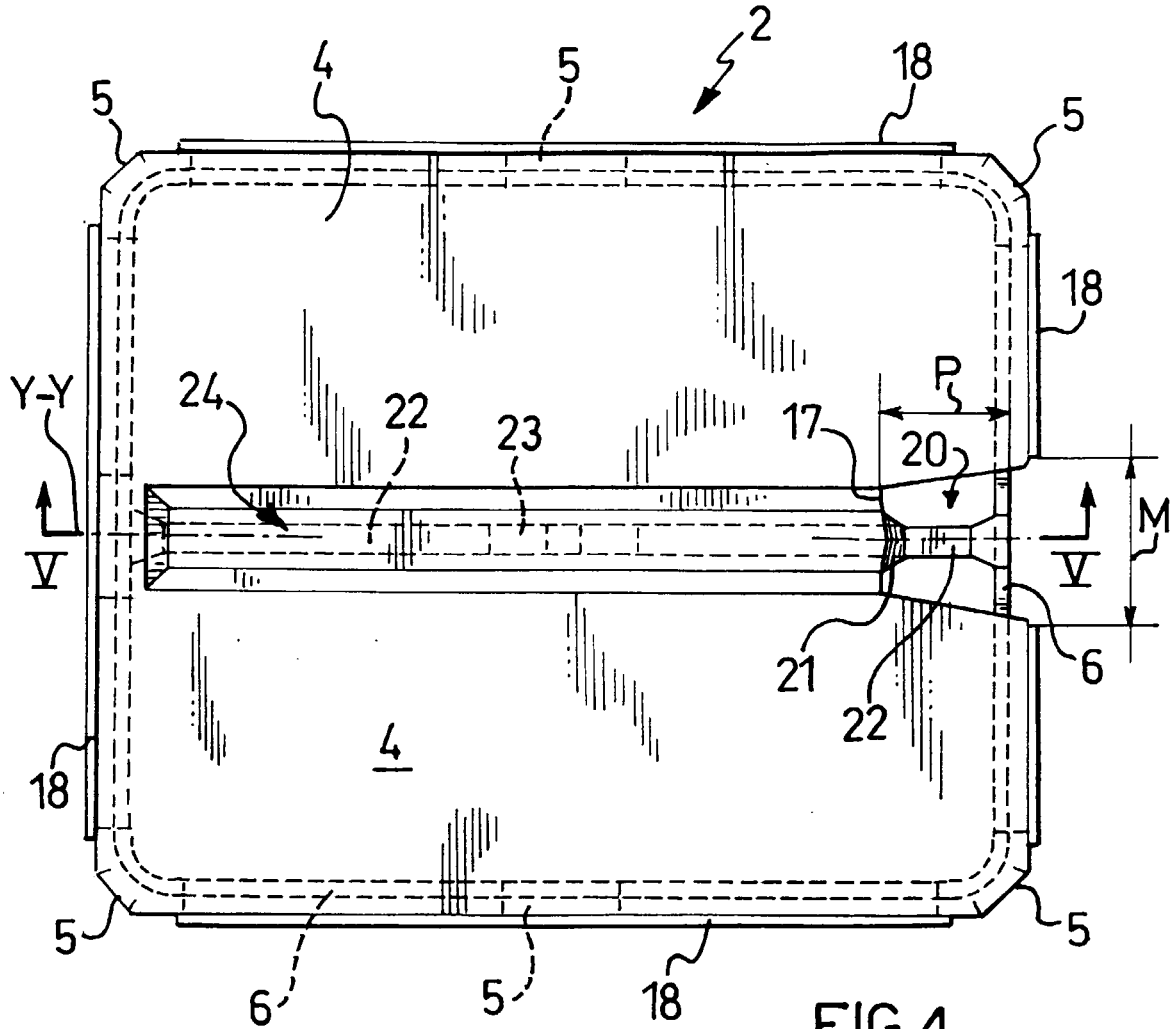


FIG. 4

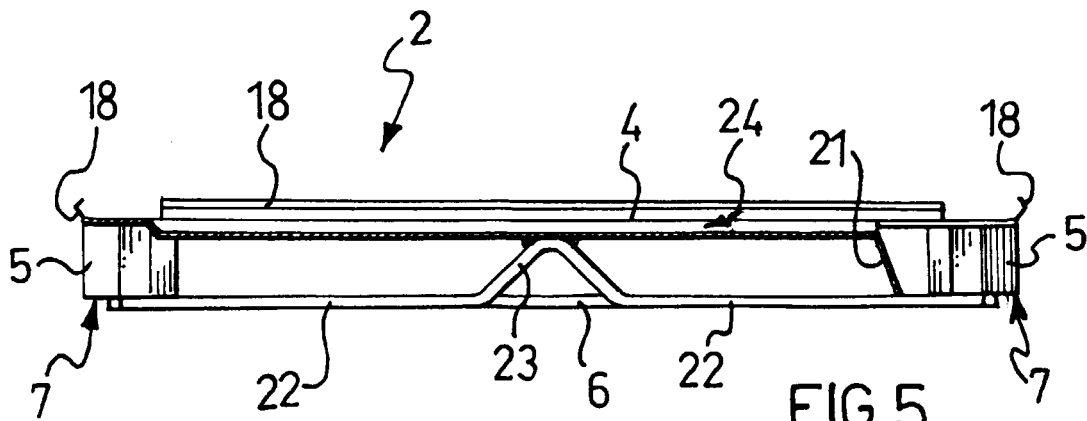


FIG. 5

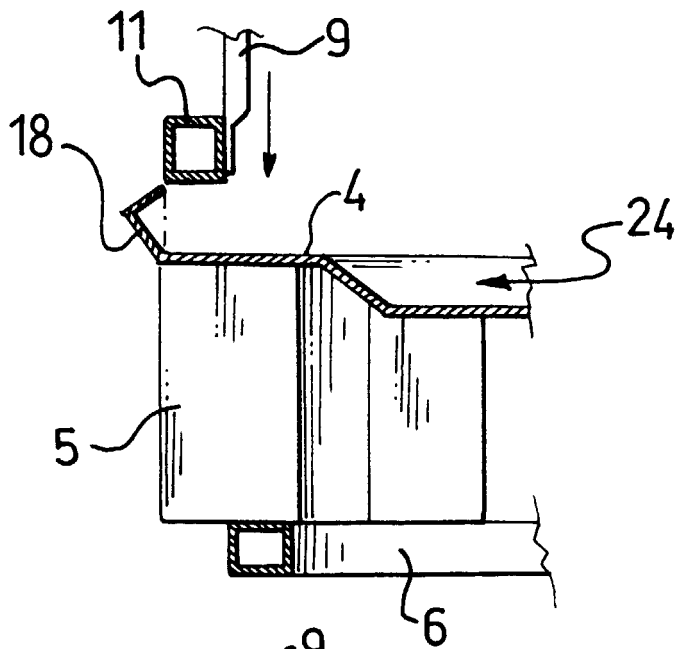


FIG. 7

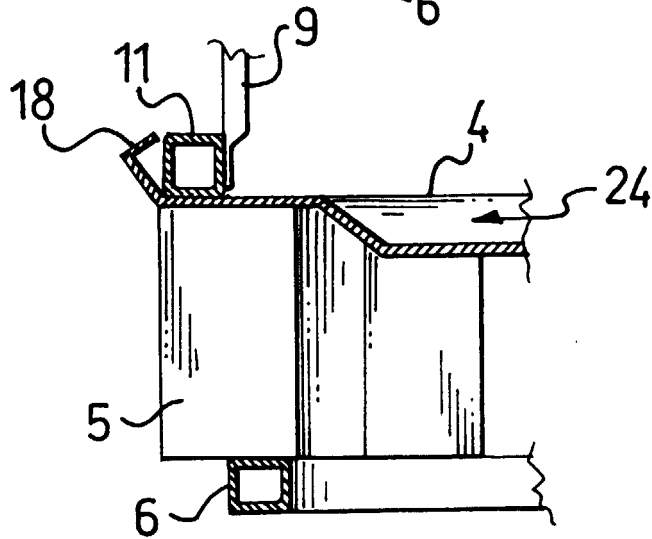


FIG. 8

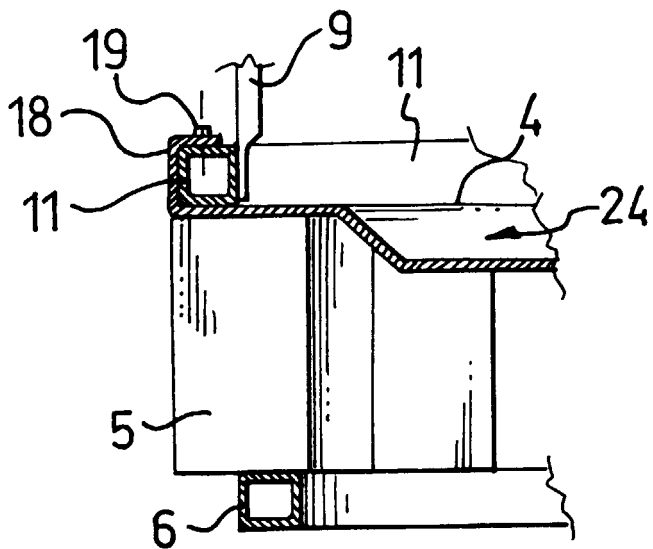


FIG. 6



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Application Number
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Place of search		Date of completion of the search	Examiner
BERLIN		17 February 1999	Spettel, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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