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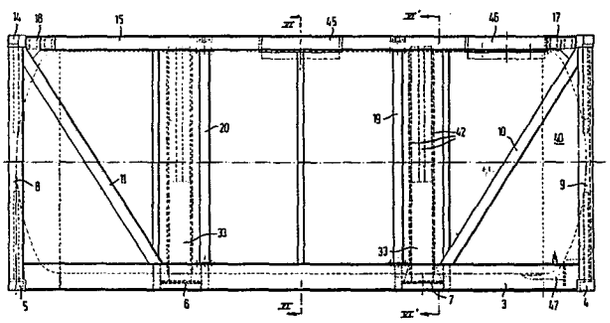
(71) Applicant: **Holvrieka Nirota B.V., Lorentzstraat 7, NL-8606 JP Sneek (NL)**

(72) Inventor: **Ferwerda, Jan, Worpstraat 7, NL-8633 KM Ijsbrechtum (NL)**

(74) Representative: **Urbanus, Henricus Maria, Ir. et al, c/o Vereenigde Octrooibureaux Nieuwe Parklaan 107, NL-2587 BP 's-Gravenhage (NL)**

(54) A tank container.

(57) A tank container (40) comprising a frame (1–20) and a tank (40), while all attachment points (6, 7) for attachment of the tank (40) on the frame are disposed on the lower bed (3) of the frame.



EP 0 090 468 A1

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Title: A tank container

The invention relates to a tank container comprising a frame and a tank.

Tank containers are already known and mostly consist of a rectangular open frame of the same standardized outside dimensions as the conventional closed containers. A cylindrical tank is mounted in horizontal position in the frame, so that a tank container is suitable for transport of e.g., liquids, and can still be treated during transport in the same manner as the conventional closed cargo containers.

Some drawbacks going with certain known tank containers are that the tank capacity is not optimal and the tank is not optimally protected against damage. There is further a need for a tank container that is provided with a heating device, in order that liquid product may be transported at low ambient temperatures which otherwise would solidify or become so viscous that the tank cannot be emptied properly at the ultimate destination.

Existing tanks, mounted in a standardized 20-feet frame have a capacity of 10-20 m^3. A larger volume would enable a better use of the transport capacity.

Besides, containers in general, and hence also tank containers, when transported by sea, road or rail, are often subject to rough handling during loading and unloading. There is also the risk of collision in case of road transport. Under such circumstances, the tank should remain closed.

Heating of the tank may in practice be desirable already at normal ambient temperatures when e.g. bituminous substances are transported. Even under winter conditions, in which in some regions temperatures in the order of -40° may occur, liquids have to be transported, and accordingly, if no or inadequate heating possibilities are present, the contents of the tank could solidify.

It is accordingly an object of the present invention to provide a tank container having an optimally large tank capacity, with the tank being optimally protected against damage, and which may be provided with means for heating the tank.

To this effect according to the invention, a tank container is characterized in that all attachment points for attachment of the tank to the frame are disposed on the lower bed of the frame.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a side view of an embodiment of a frame for a tank container according to the invention;

Fig. 2 is a rear elevation, partly in section on the line II-II of Fig. 1, of the frame shown in Fig. 1;

Fig. 3 shows a part of the lower bed of the frame, comprising attachment points for the tank;

Fig. 4 is a cross-section on the line IV-IV of Fig. 3;

Fig. 5 is a side view of a tank container according to the invention comprising a tank and insulation; and

Fig. 6 is a cross-section on the lines VI-VI and VI'-VI', respectively, of Fig. 5.

Figs. 1 and 2 show an embodiment of a frame for a tank container.

The frame substantially comprises a lower bed 1 and an upper bed 2 connected by uprights. The lower bed comprises a rectangular framework consisting of two longitudinal girders formed e.g. of steel I-beams, one of which is shown at 3. The longitudinal girders are connected at the ends by cross girders 4, 5, consisting in the embodiment shown of steel box girders welded to the longitudinal girders. The longitudinal girders are further connected by two intermediate cross girders 6, 7, which will be further described, and which serve for attaching the tank thereto. Furthermore, reinforcing struts may be provided in the lower bed, which, however, are not shown.

Welded to the corners of the lower bed are uprights, two of which are shown at 8 and 9. These uprights are each in turn connected with a strut 10, 11 to the longitudinal girders of the lower bed and further connected to the cross girders of the lower bed with struts 12 (see Fig. 2).

The top ends of the uprights are interconnected by end cross girders 13, 14. These, together with top girders 15, form the upper bed, which may also be provided with a plurality of intermediate

cross girders, not shown. The end cross girders are again connected by struts 16 (Fig. 2) to the vertical girders.

Although in a container frame, preferably only welded connections are used, for obtaining an optimal strength, the longitudinal girders of the upper bed according to the invention are secured by means of bolt connections indicated at 17 and 18. As a result, the upper bed has become effectively detachable, resulting in an easier positioning of the tank in the frame, and moreover in the possibility for it to be made larger than would be permitted by a frame having the same dimensions and whose upper bed is not detachable.

For instance, it is possible in a standard 20-foot frame with a detachable upper bed to position a tank having a 22,000 liter capacity, whereas a maximal tank capacity of 20,000 liters is feasible with the conventional, entirely welded construction.

According to Fig. 1, intermediate uprights 19 and 20 are employed in the embodiment shown, which are bolted to the upper longitudinal girders. Intermediate cross girders of the upper bed, e.g. 21 (Fig. 2) can be attached with bolts or by welds.

Fig. 3 shows a top view of a part of the lower bed 1, i.e. the part comprising the intermediate cross girders 6 and 7. The longitudinal girders are indicated by 3 and 3'.
Each cross girder 6, 7 comprises in the present embodiment two parallel box girders 24, 24' and 25, 25', respectively, interconnecting the longitudinal girders.

Between the box girders 24, 24' and 25, 25', respectively, plates and/or T-sections are welded adjacent the ends thereof, indicated by 27 and 28. The plates 27 comprise bolt holes, in the present embodiment six, with which the tank can be attached to the frame via saddles mounted on the tank. The plates 28 are also provided with bolt holes. In this case, however, slotted holes are employed. The purpose thereof will be further described in the following, with reference to Fig. 4.

Fig. 4 shows a cross-section on the line IV-IV of Fig. 3. The plate 28 welded between the longitudinal girders 24, 24' comprises three sets of three slotted holes, one set of which is shown in Fig. 4.

The slotted holes 29 serve for receiving a securing bolt, as indicated at 31, while the central slotted hole 30 serves for receiving a catch pin 32. By 33 is indicated a saddle mounted on the tank and fitted with a baseplate 34 containing normal bolt holes in places that correspond with the slotted holes 29 and to which furthermore a pin 32 is welded, which in mounted condition extends through the central slotted hole 30.

By virtue of the use of the slotted holes, a "sliding" connection is obtained at plates 28, whereas there is a rigid connection at plates 27.

The "sliding" connection is designed in such a way that if, owing to the nature of the material to be transported, and/or to climatic conditions, the tank is to be heated, this can expand without impediment relative to the frame, thus avoiding undesirable stresses in the tank body. The required length of the slotted holes depends on the expansion coefficient of the material from which the tank is made, on the distance between the rigid attachment and the sliding attachment and on the temperature difference between tank and frame. In practice, it may be desirable to heat the tank to 250°C, so that the expansion of the tank can be substantial. For that reason the supporting points of the tank on the frame are positioned as closely together as possible. With a total length of the tank of about 6 m, the distance between the girders 6 and 7 may e.g. be 2½ m. The rigid attachment has been designed so as to the capable of absorbing fully the forces occurring in longitudinal direction in the horizontal plane, i.e. the acceleration and deceleration forces occurring during the transport of the container.

Disposed between the baseplate 34 of the saddle and the plate 28 of the girder 6 is a slide plate 35, which is made preferably of polytetrafluoroethylene (PTFE). The slide plate reduces friction between the baseplate 35 and the plate 28. A second important function of the slide plate is the provision of heat insulation, so that loss of heat from the tank to the frame is minimal.

With a view to this function, a similar plate is disposed adjacent the rigid attachment of the tank to the frame.

Furthermore, the bolts 31 extend also through a carrier

strip 36, which to this effect if fitted with normal bolt holes. The catch pin 32 likewise extends through the carrier strip 36. This construction prevents a possible tilting tendency of the bolts 31, if the baseplate 34 moves relative to the plate 28.

The sliding attachment is preferably located farthest from the tank end fitted with an orifice, thus preventing the orifice, which as a matter of fact is rather vulnerable, from getting outside the frame due to expansion.

In a tank container according to the invention, the attachment points described are the only places of connection between the tank and the container frame, so that the frame offers optimal protection for the tank in case of collisions and the like.

This construction also optimally reduces loss of heat from the tank to the frame.

Besides, the construction described offers the possibility to insulate the tank highly effectively, as will be further explained in the following.

Fig. 5 is a side elevational view of an embodiment of a complete tank container according to the invention, while Fig. 6 is a cross-section on the line VI-VI and VI -VI', respectively, of Fig. 5. Parts corresponding with parts of Figs. 1-4 are indicated by the same reference numerals.

Figs. 5 and 6 illustrate the manner in which a tank 40 is positioned in the frame. The tank comprises known per se, exteriorly placed heating elements, which are not shown. The tank is further surrounded by a suitable insulating material 41, which may e.g. be glass wool, and which surrounds the tank supporting and attachment construction. As appears from cross-section VI-VI' of Fig. 6, the tank comprises rings 42 formed e.g. of a U-shaped section, which rings are welded on the one end to the tank and on the other end to the tank saddles 33, one of which is visible.

Preferably, the insulating material is applied after the tank has been positioned in the frame. Besides the detachable upper bed, this enables an optimally large tank to be positioned in the frame. The insulating material is covered by a loose jacket 43, which has a hooded shape and is made in one piece or of a plurality of moisture-proof, interconnected sections. The jacket may be made e.g.

of polyester, aluminium or stainless steel sheet. The jacket is supported on the longitudinal girders 3, as indicated at 44 and is closed at the end faces with vertical plates of the same material.

Owing to the hooded shape and the described manner of attachment of the jacket, the tank can move independently of the jacket and the insulating material is optimally protected against penetration of moisture. As a result, the insulating effect remains optimal and likewise the (electric) heating elements of the tank are well protected.

Also, such a jacket, after a possible damage, can be readily removed and repaired or replaced.

The jacket is fitted with openings to accommodate fittings troughs present at the top of the tank, such as 45, 46, which may also be internally insulated.

Fig. 5 shows at 47 the orifice of the tank, which is conventionally disposed at the back, and, as stated before, preferably situated as far as possible from the sliding attachment of the tank.

It is observed that various modifications of the embodiment described will readily occur to those skilled in the art. Such modifications are deemed to fall within the scope of the invention.

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* C L A I M S *

1. A tank container comprising a frame and a tank, characterized in that all attachment points for attachment of the tank to the frame are disposed on the lower bed of the frame.

2. A tank container according to claim 1,characterized in that the attachment points are disposed on two parallel, spaced apart cross girders of the lower bed.

3. A tank container according to claim 1 or 2, characterized in that the attachment points comprise two horizontally spaced apart groups, at least one of said groups of attachment points being designed in such a way that a displacement is possible in situ between the tank and the frame.

4. A tank container according to claim 3, characterized in that the said displacement is made possible by application of slotted holes, through which extend attachment bolts, which likewise extend through normal bolt holes in a member attached to the tank.

5. A tank container according to claim 4, characterized in that the lower bed of the frame carries a plurality of horizontal plates wherein the slotted holes are provided in sets of two holes longitudinally spaced one behind the other, and that the tank comprises saddles which carry horizontal baseplates corresponding with the horizontal plates, said baseplates comprising normal bolt holes corresponding with the slotted holes.

6. A tank container according to claim 5, characterized in that between the baseplates and the horizontal plates, there are arranged friction-reducing means.

7. A tank container according to claim 6, characterized in that the friction-reducing means also have a heat-insulating effect.

8. A tank container according to claim 6 or 7, characterized in that the friction-reducing means comprise plates of polytetrafluoroethylene (PTFE) having slotted holes corresponding with the slotted holes in the horizontal plates.

9. A tank container according to any one of claims 4-8, characterized in that in mounted condition, the attachment bolts likewise extend through a carrier strip disposed at the side of the horizontal plate facing away from the baseplate.

10. A tank container according to claim 9, characterized in that the baseplate comprises at least one catch pin interposed between each pair of bolt holes and extending through a slotted hole in the horizontal plate, said pin extending also through a round hole in the carrier strip.

11. A tank container according to any one of claims 3-10, characterized in that at the other group(s) of attachment points, heat-insulating means are interposed between attachment means mounted on the tank and the attachment points of the frame.

12. A tank container according to claim 11, characterized in that the heat-insulating means comprise plates of polytetrafluoroethylene (PTFE).

13. A tank container according to any one of claims 3-10, characterized in that the group of attachment points enabling a displacement between the tank and the frame lie farthest removed from the orifice of the tank.

14. A tank container according to any one of the preceding claims, comprising heating means for the tank and tank-surrounding insulating material, characterized in that the insulating material is covered by a loose jacket supported on parts of the lower bed of the frame and attached thereto.

15. A tank container according to claim 14, characterized in that the jacket is hood-shaped in cross-section.

16. A tank container according to claim 14 or 15, characterized by vertical protection plates for the insulating material disposed at the ends, which plates link up with the jacket.

17. A tank container according to any one of the preceding claims, characterized in that the upper bed of the frame is substantially detachable.

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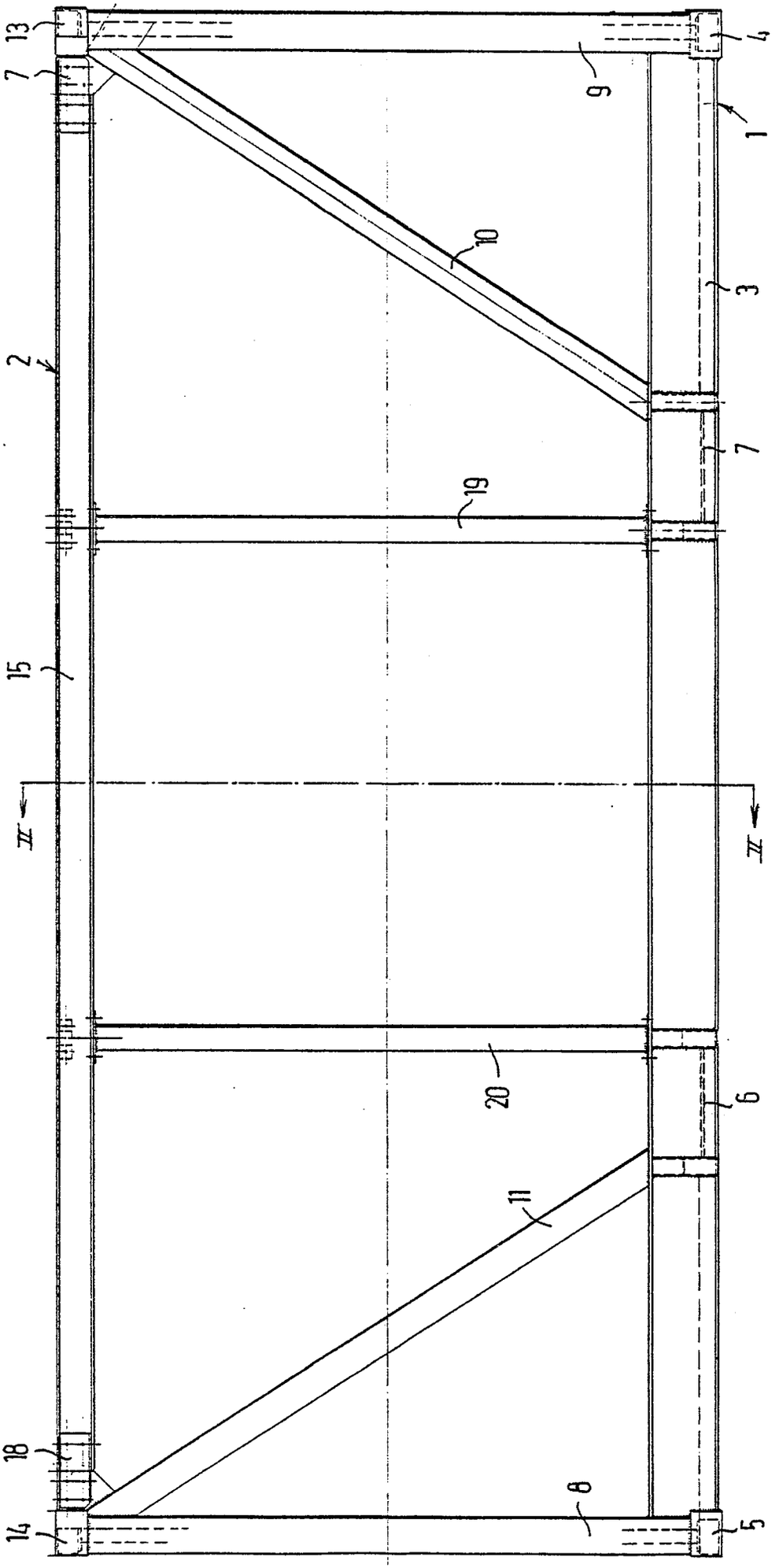

FIG.1

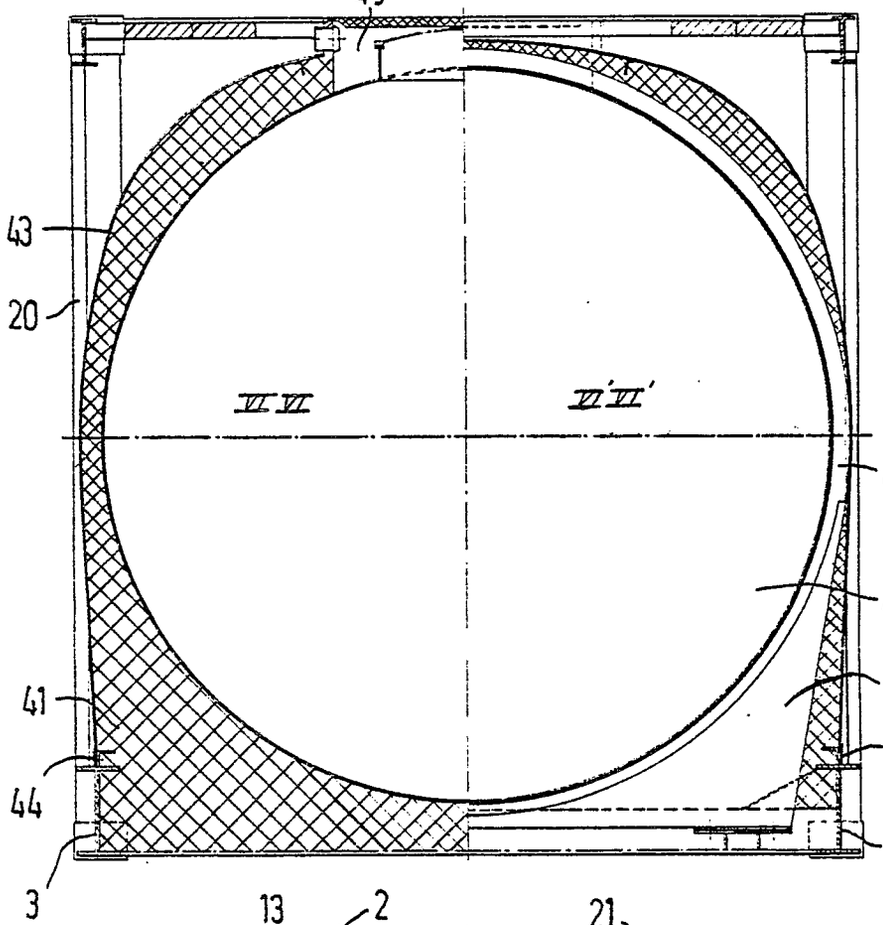

FIG.6

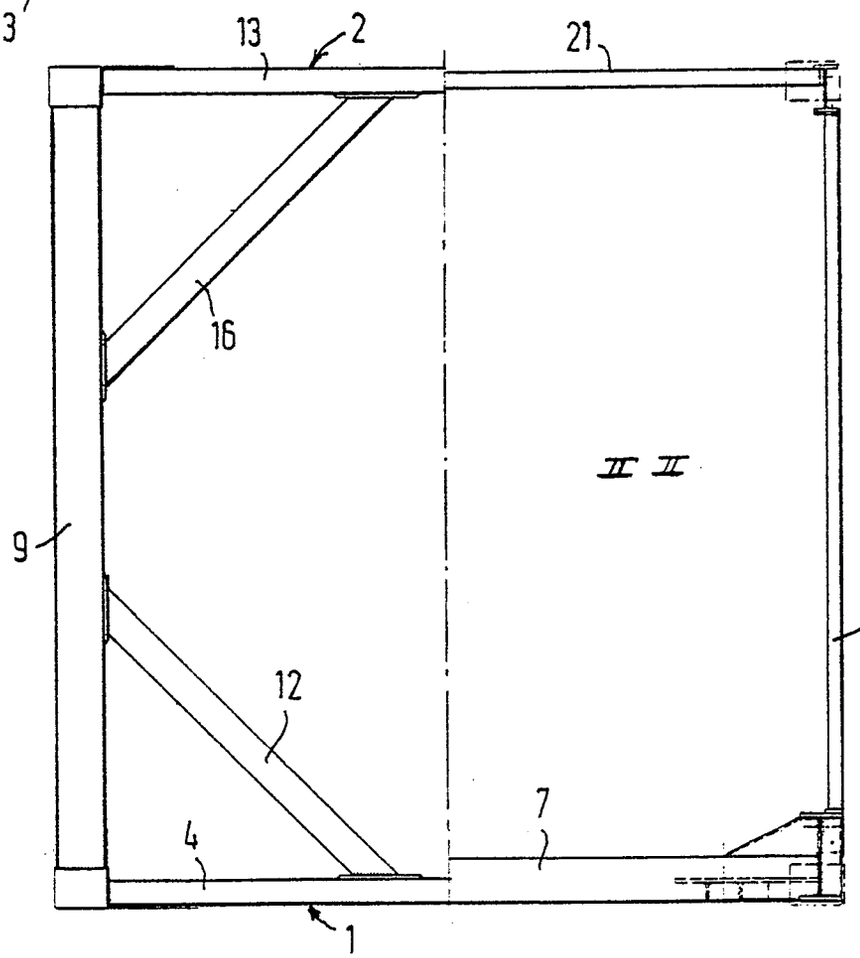

FIG.2

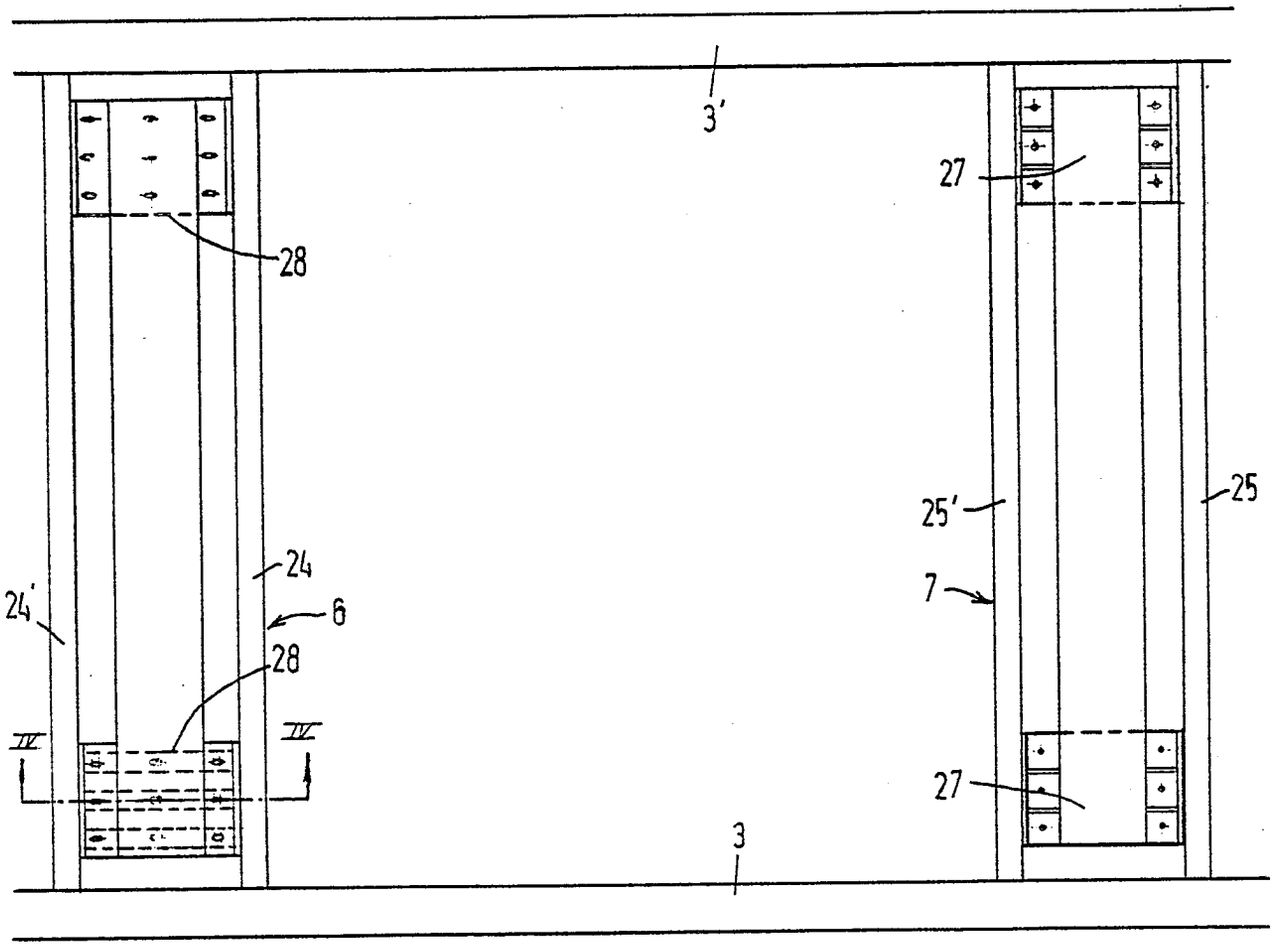

FIG.3

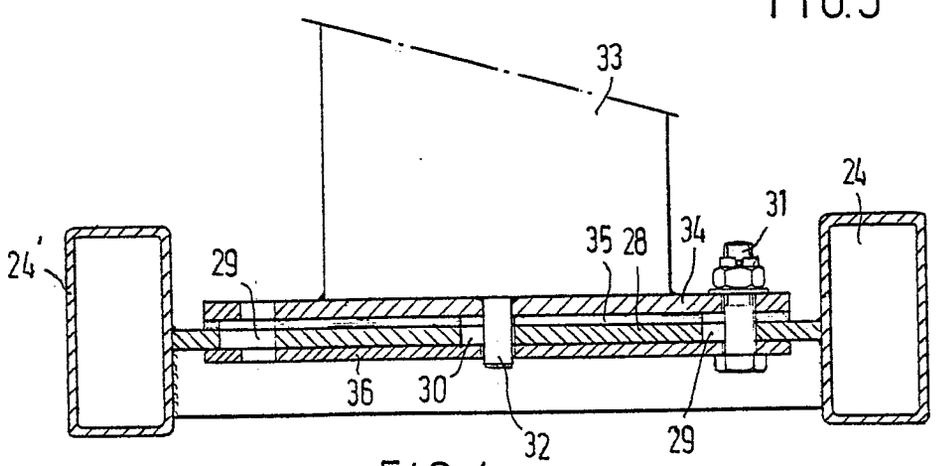

FIG.4

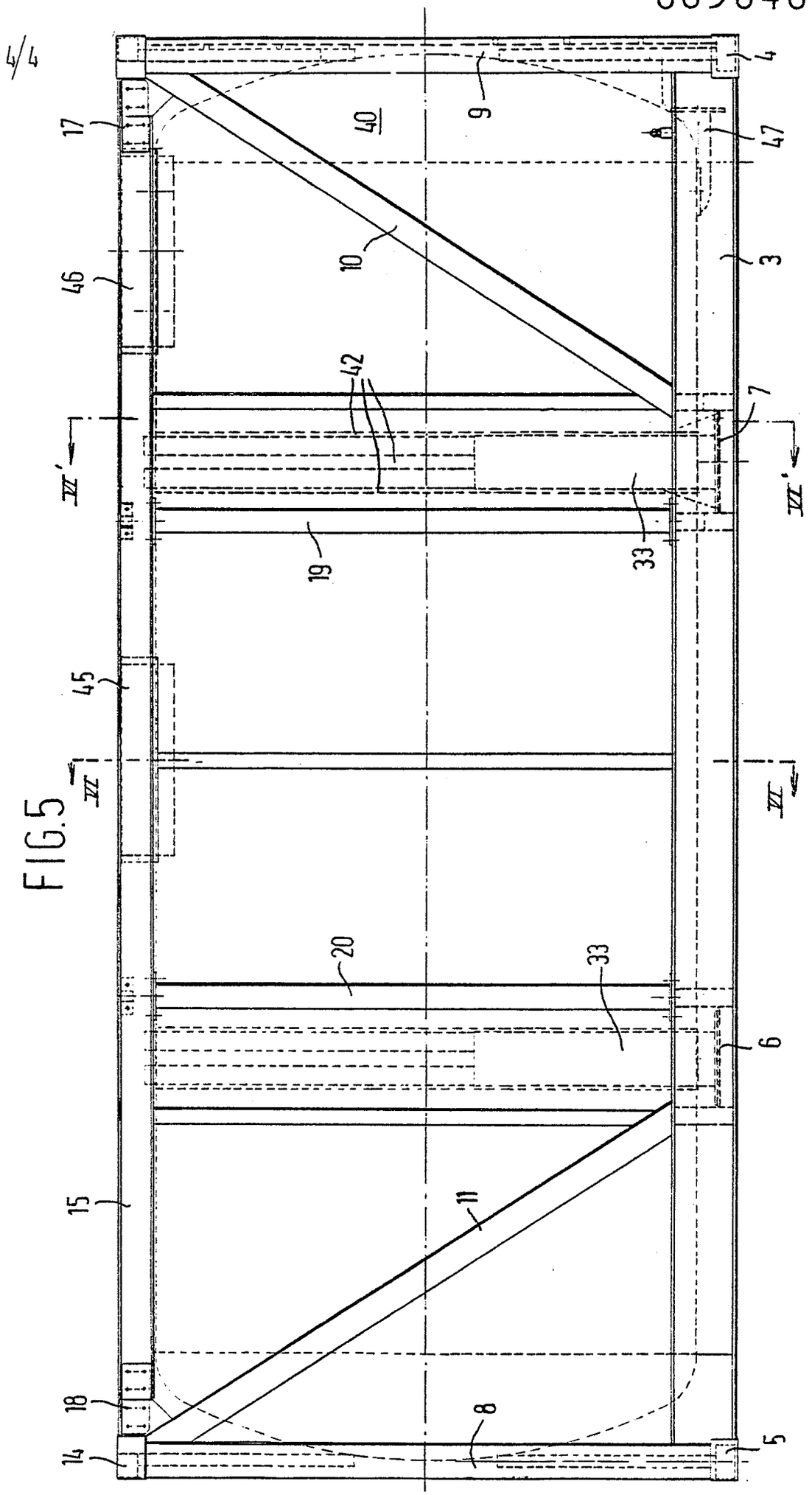

FIG.5

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Application number

EP 83 20 0421

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EUROPEAN SEARCH REPORT

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. ³)
X	DE-A-1 937 192 (RAMME) * Claims 1,6; page 5, lines 9-16; figures *	1	B 65 D 88/12
X	FR-A-2 292 644 (HELMUT GERHARD) * Claims 1,2; figures *	1	
A	GB-A-1 225 325 (VAILLANT) * Claims 1,2,4,5,6; page 2, lines 45-50 *	3,6,14	
A	FR-A-2 342 913 (CAINAUD) * Page 4, lines 24-29; figures *	17	
A	US-A-2 375 442 (SANDBERG) * Claim 1; figures *	3	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

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	05-07-1983	VAN ROLLEGHEM F.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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