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(54) **TANK CONTAINER**

(57) A tank container, comprising a tank body (1) and a frame (2) supporting the tank body; the frame comprises two end frames (21) respectively supporting two ends of the tank body, a plurality of saddle seats (22) provided at intervals along the longitudinal direction of the tank body and supporting the bottom of the tank body, and bottom support assemblies (23) connecting the end frames to the adjacent saddle seats; each of the saddle seats has a recessed bearing surface, the bearing surface being adapted to the shape of the bottom circumferential contour of the tank body so as to bear the tank body; each of the bottom support assemblies comprises a connecting beam (231) and a support member (232); one end of the connecting beam is connected to the bottom corner of the end frame, and the other end is connected to the saddle seat with a height spacing between the connection position and the bottom of the saddle seat; and the support member is connected to one end of the connecting beam close to the saddle seat, a support plate (2321) being integrally formed on the support member and extending along the longitudinal direction of the tank

body, the support plate being fixedly connected to the tank body.

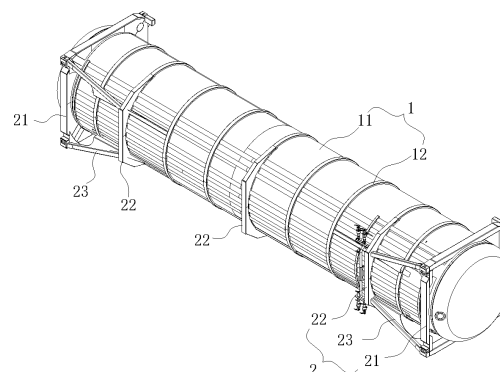


FIG.1

Description

TECHNICAL FIELD

[0001] The present invention relates to the field of storage and transportation equipment, and specifically, relates to a tank container.

BACKGROUND

[0002] A tank container ("tankcontainer" for short) is mainly composed of a tank body and a frame supporting the tank body. The frame bears the load of the tank body and transmits the load to the transportation means (such as a transport vehicle, a transport boat, etc.). In a tradition, for a tank container with a relatively large volume such as a volume ranging from 27 m³ to 37 m³ and a maximum design gross weight of 36 T to 39 T, the frame often includes end frames supporting both ends of the tank body and a saddle supporting the bottom of the tank body. The angle of the wrap angle of the saddle to the tank body is generally in the range of 80 ° ~ 100 °, and the load carried by the saddle is small. According to the current development trend of tank containers, the development of larger volume tank containers is the general trend, and the current saddle structure is difficult to meet the requirements.

[0003] In some existing preferred structures, the end frame and the saddle will be connected together by connecting beams to increase the bearing capacity. However, in the existing structure, the two ends of the connecting beam are respectively connected to the bottom of the end frame and the bottom of the saddle, the effect of load transmission is poor, and the effect of increasing the overall bearing capacity of the frame is limited. In order to meet the needs of larger volume tank containers, the frame structure of tank containers still needs to be further optimized.

SUMMARY

[0004] The object of the present invention is to provide a tank container which can have a large volume and a large load.

[0005] The present invention provides the following solution: a tank container comprises a tank and a frame supporting the tank body. The frame includes two end frames for respectively supporting two ends of the tank body, a plurality of saddles disposed at intervals along the longitudinal direction of the tank body and supporting the bottom of the tank body and a bottom supporting component for connecting the end frame and the adjacent saddle. The saddle is provided with a concave bearing surface which is matched with the circumferential contour shape of the bottom of the tank body to bear the tank body. The bottom supporting component includes a connecting beam and a supporting member connected to one end of the connecting beam that closes to the

saddle. One end of the connecting beam is connected to a bottom corner of the end frame, the other end of the connecting beam is connected to the saddle. An interval height is formed between the connecting position of the connecting beam and the saddle and the bottom of the saddle. The supporting member is provided integrally with a supporting plate extending longitudinally along the tank body and the supporting plate fixedly connected to the tank body.

[0006] Preferably, the saddle comprises at least two bearing plates disposed at intervals along the longitudinal direction of the tank body, a bottom plate connected to the bottoms of the bearing plates, sealing plates connected to the sides of the bearing plates and rib plates connected to two adjacent bearing plates, wherein the upper edge of each bearing plate forms the bearing surface; wherein the connecting beam and the supporting member are both connected to the bearing plate, and the interval height is formed between the connecting beam and the bottom plate.

[0007] Preferably, the end of the supporting plate is connected to the saddle; wherein the saddle further comprises a reinforcing tube which is of an integrally formed structure with a closed cross section shape, and two ends of which are connected to the bearing plate respectively, wherein the reinforcing tube is disposed in the longitudinal direction of tank body and is opposite to the supporting plate.

[0008] Preferably, the reinforcing tube is a circular tube or a square tube.

[0009] Preferably, the tank body comprises a body and a reinforcing ring circumferentially surrounding the outer side of the body, wherein the saddle is welded and fixed on the reinforcing ring.

[0010] Preferably, the supporting plate and the central axis of the tank body are located in the same plane.

[0011] Preferably, the supporting member is integrally formed by bending, and further comprises a transition plate connected to the supporting plate by bending and a connecting plate connected to the transition plate by bending; wherein the connecting plate is connected to the connecting beam and parallel with the axis of the connecting beam.

[0012] Preferably, the transition plate is vertically disposed, and an angle is formed between the transition plate and the supporting plate.

[0013] Preferably, the connecting beam is a tube.

[0014] Preferably, the bottom supporting component further includes a reinforcing plate connected between the connecting beam and the end frame, wherein the outer edge of the reinforcing plate is in an inward concave arc shape.

[0015] Preferably, on the cross section of the tank body, an angle between connecting lines of the end points of two ends of the bearing surface and the center of the tank body is not less than 150°.

[0016] According to the above-mentioned solution, the present invention has at least the following advantages

and positive effects: in the present invention, the bottom of the frame supports the tank body by a structure of a saddle and bottom supporting component, and the saddle is a large-wrap-angle structure, so that the bearing strength of the saddle is effectively improved, and the load distribution condition is improved. The connecting beam is used for connecting the saddle and the end frame into a whole, so that the bearing capacity is improved. Particularly, there is an interval height between the connecting point of the connecting beam and the saddle, and the bottom of the saddle. The connecting beam is of a downward inclined structure in the direction from the saddle to the end frame, so that the load of the saddle can be more favorably transmitted to the end frame. The supporting member is connected to the tank body by the supporting plate which is integrally formed and extends longitudinally, which can directly bear part of the load of the tank body and then transfer the load to the end frame, so that a load transfer path is increased, and the integral bearing capacity and load transfer capacity of the frame are improved. In the tank container of the present invention, the frame structure and the connection mode of the frame structure and the tank body can bear larger tank load, so that the tank container can have larger volume and design load.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a schematic structural diagram of an embodiment of the tank container of the present invention. FIG. 2 is a schematic view of the overall structure of a frame in the embodiment of the tank container of the present invention.

FIG. 3 is a schematic structural view of a saddle in the embodiment of the tank container of the present invention.

FIG. 4 is a simplified diagram of the cooperation between the saddle and a tank body in the embodiment of the tank container of the present invention.

FIG. 5 is a schematic diagram of the connection of an end frame, a bottom supporting component and the saddle in the embodiment of the tank container of the present invention.

FIG. 6 is a connection schematic diagram of the bottom supporting component, the saddle and the tank body in the embodiment of the tank container of the present invention.

[0018] The reference numbers are described as follows: 1, tank body; 11, body; 12, reinforcing ring; 2, frame; 21, end frame; 211, bottom corner casting; 212, lower beam; 22, saddle; 220, bearing surface; 221, bearing plate; 222, bottom plate; 223, sealing plate; 224, rib plate; 225, reinforcing tube; 23, bottom supporting component; 231, connecting beam; 232, supporting member; 2321, supporting plate; 2322, connecting plate; 2323, transition

plate; 233, reinforcing plate.

DETAILED DESCRIPTION

[0019] Typical embodiments embodying the features and advantages of the present invention will be described in detail in the following description. It should be understood that the present invention can have various modifications in different embodiments, which do not depart from the scope of the present invention, and the descriptions and illustrations therein are essentially to be regarded as illustrative, and not as restrictive.

[0020] Referring to Fig. 1 and Fig. 2, an embodiment of the present invention provides a large volume tank container. The tank container includes a tank body 1 and a frame 2 supporting the tank body 1, both ends of the tank body 1 exceed both ends of the frame 2. The tank body 1 includes a body 11 and a reinforcing ring 12 circumferentially surrounding the outer side of the body 11, and a plurality of reinforcing rings 12 are spaced along the longitudinal direction of the body 11.

[0021] The frame 2 includes two end frames 21 that respectively support the two ends of the tank body 1, three saddles 22 that support the bottom of the tank body 1, and a bottom supporting component 23 that connects the end frame 21 and the adjacent saddle 22. Along the longitudinal direction of the tank body 1, three saddles 22 are distributed between the two end frames 21 at intervals, and the two saddles 22 at the two ends are correspondingly connected to one end frame 21 respectively.

[0022] Referring to Figs. 3 and 4, the saddle 22 includes two bearing plates 221 spaced along the longitudinal direction of the tank body 1, a bottom plate 222 connecting the bottoms of the two bearing plates 221, and a sealing plate 223 connecting the sides of the two bearing plates 221, and a rib plate 224 and a reinforcing tube 225 connected between the two bearing plates 221.

[0023] The bearing plate 221, the bottom plate 222 and the sealing plate 223 are enclosed to form a hollow structure with an open on an upper end. There are a plurality of rib plates 224, which are disposed at intervals in the hollow structure to reinforce the structure of the saddle 22. The number of reinforcing tubes 225 is two, which are symmetrically disposed in the hollow structure. The reinforcing tubes 225 are an integrally formed structure with a closed cross-section, which could be circular tubes, square tubes, or other polygonal cross-section tubes. The reinforcing tubes 225 connect to the two bearing plates 221 vertically, the axis of which coincides with the longitudinal direction of the tank body 1.

[0024] The upper edge of the bearing plate 221 is substantially in the shape of a concave arc, and is adapted to the circumferential contour shape of the bottom of the tank body 1. The upper edges of the two bearing plates 221 are flush, and together constitute the bearing surface 220 for supporting the tank body 1. The upper edge of the bearing plate 221 is welded and fixed to the reinforcing

ing ring 12 of the tank body 1.

[0025] As shown in FIG. 4, viewed in the cross-section of the tank body 1, the connecting lines between the two ends of the bearing surface 220 and the center of the tank body 1 are the connecting line L1 and the connecting line L2 respectively, and an angle α between the connecting line L1 and the connecting line L2 is not less than 150 ° and not more than 180 °. The wrap angle range of the bearing surface 220 to the tank body 1 is large, which can effectively increase the bearing strength of the saddle 22 and improve the load distribution.

[0026] Referring to Figs.5 and 6, a bearing plate 221 of the saddle 22 faces the end frame 21, and the bottom of the end frame 21 has two bottom corner castings 211 located at two bottom corners and a lower beam 212 connected between the two bottom corner castings 211. The saddle 22 and the end frame 21 are connected by two sets of bottom support components 23, and each bottom supporting component 23 connects a bottom corner of the end frame 21 with one side of the saddle 22.

[0027] Specifically, the bottom supporting component 23 includes a connecting beam 231, a supporting member 232 and a reinforcing plate 233.

[0028] In this embodiment, the connecting beam 231 is a square tube, one end of which is connected to the bottom corner casting 211 of the end frame 21, and the other end of which is connected to the bearing plate 221 of the saddle 22. In the direction from the saddle 22 to the end frame 21, the connecting beam 231 is a structure with an inclined down ward direction. There is a certain interval height h from the connection position of the connecting beam 231 and the bearing plate 221 to the bottom plate 222 of the saddle 22. This inclined arrangement of the connecting beam 231 is more conducive to transmit loads from the saddle 22 to the end frame 21. In other embodiments, the connecting beam 231 may also be a rectangular tube, a square tube, or other irregular cross-section tubes. The connecting beam 231 may be a constant cross-sectional structure or a variable cross-sectional structure in the length of the connecting beam 231.

[0029] The reinforcing plate 233 is disposed between the connecting beam 231 and the end frame 21, and is generally triangular. One side edge of the reinforcing plate 233 is connected to the connecting beam 231, one side edge is connected to the lower beam 212 of the end frame 21, and the other side edge is an outer edge which is not connected to other structures. The outer edge of the structure is in an inward concave arc shape. The reinforcing plate 233 connects the connecting beam 231 and the end frame 21 to form a whole.

[0030] The supporting member 232 is disposed between the connecting beam 231 and the saddle 22, and is integrally formed by bending from a plate-like structure. The supporting member 232 includes a connecting plate 2322, a transition plate 2323 connected to the connecting plate 2322 by bending, and a supporting plate 2321 connected to the transition plate 2323 by bending.

[0031] The connecting plate 2322 is connected to the

connecting beam 231, and the axis of the connecting beam 231 and the connecting plate 2322 are parallel. The connecting plate 2322 is generally triangular and has two longer sides and a shorter side. One longer side of the connecting plate 2322 is connected to the connecting beam 231, the other longer side is connected to the transition plate 2323, the shorter side is in an inward concave arc shape and is opposite to the curved side of the reinforcing plate 233. From the overall view of the frame 2, the connecting plate 2322 is located inside the connecting beam 231, that is, at the side close to the other bottom supporting component 23, and the connecting plates 2322 of the two sets of bottom supporting components 23 are located in the same plane.

[0032] The transition plate 2323 and the supporting plate 2321 both extend longitudinally along the tank body 1. One end of the transition plate 2323 and one end of the supporting plate 2321 are connected to the bearing plate 221 of the saddle 22, and the supporting plate 2321 is located opposite the reinforcing tube 225 within the saddle 22, the upper edge of the supporting plate 2321 is fixedly connected to the tank body 1. The transition plate 2323 is vertically disposed. There is an angle between the supporting plate 2321 and the transition plate 2323, The supporting plate 2321 and the central axis of the tank body 1 are in the same plane.

[0033] The whole of the supporting member 232 is an integrally formed structure, and connects the connecting beam 231 and the tank body 1 into a whole. The supporting member 232 can bear part of the load of the tank body 1, and transfer the load to the end frame 21 through the connecting beam 231, which increases the load transmission path and is beneficial to improve overall load capacity and load transfer capacity of the frame 2. The arrangement of the supporting plate 2321, the transition plate 2323 and the tank body 1 conforms to the load direction of the tank body 1, and at the same time, the angle between the supporting plate 2321 and the transition plate 2323 increases the rigidity of the supporting plate 2321. In addition, the position of the supporting plate 2321 is opposite to the position of the reinforcing tube 225 in the saddle 22. The closed cross-sectional structure of the reinforcing tube 225 forms reinforcement for the supporting plate 2321, meanwhile the load of the supporting plate 2321 can also be transmitted through the reinforcing tube 225, which further improves load bearing capacity.

[0034] In the tank container of the present invention, the structure of the saddle 22 and the bottom supporting component 23 greatly enhances the bearing capacity of the frame 2 and effectively increases the volume and design load of the tank body 1. It has been verified that the tank structure of the present invention can be applied to swap body tanks with a load of 78T and a volume of 80 m³.

[0035] Although the present invention has been described with reference to several exemplary embodiments, it should be understood that the terminology used

is illustrative and exemplary rather than limiting. Since the present invention can be embodied in various forms without departing from the spirit or essence of the invention, it should be understood that the above-described embodiments are not limited to any of the foregoing details, but should be widely interpreted within the spirit and scope defined by the appended claims. Therefore, all changes and modifications falling within the scope of the claims or equivalents thereof should be covered by the appended claims.

Claims

1. A tank container, **characterized in that** comprising:
 - a tank body ; and
 - a frame supporting the tank body, including :
 - two end frames for respectively supporting two ends of the tank body;
 - a plurality of saddles disposed at intervals along the longitudinal direction of the tank body and supporting the bottom of the tank body, wherein the saddle is provided with a concave bearing surface which is matched with the circumferential contour shape of the bottom of the tank body to bear the tank body; and
 - a bottom supporting component for connecting the end frame and the adjacent saddle, including:
 - a connecting beam, one end of which is connected to a bottom corner of the end frame, the other end of which is connected to the saddle, wherein an interval height is formed between the connecting position of the connecting beam and the saddle and the bottom of the saddle, and
 - a supporting member connected to one end of the connecting beam that closes to the saddle, and provided integrally with a supporting plate extending longitudinally along the tank body and the supporting plate fixedly connected to the tank body.
2. The tank container according to claim 1, **characterized in that**, the saddle comprises at least two bearing plates disposed at intervals along the longitudinal direction of the tank body, a bottom plate connected to the bottoms of the bearing plates, sealing plates connected to the sides of the bearing plates and rib plates connected to two adjacent bearing plates, wherein the upper edge of each bearing plate forms the bearing surface;
3. The tank container according to claim 2, **characterized in that**, the end of the supporting plate is connected to the saddle; wherein the saddle further comprises a reinforcing tube which is of an integrally formed structure with a closed cross section shape, and two ends of which are connected to the bearing plate respectively, wherein the reinforcing tube is disposed in the longitudinal direction of tank body and opposite to the supporting plate.
4. The tank container according to claim 3, **characterized in that**, the reinforcing tube is a circular tube or a square tube.
5. The tank container according to claim 2, **characterized in that**, the tank body comprises a body and a reinforcing ring circumferentially surrounding the outer side of the body, wherein the saddle is welded and fixed on the reinforcing ring.
6. The tank container according to any one of claim 1 to claim 5, **characterized in that**, the supporting plate and the central axis of the tank body are located in the same plane.
7. The tank container according to claim 6, **characterized in that**, the supporting member is integrally formed by bending, and further comprises a transition plate connected to the supporting plate by bending and a connecting plate connected to the transition plate by bending; wherein the connecting plate is connected to the connecting beam and parallel with the axis of the connecting beam.
8. The tank container according to claim 7, **characterized in that**, the transition plate is vertically disposed, and an angle is formed between the transition plate and the supporting plate.
9. The tank container according to claim 7, **characterized in that**, the connecting beam is a tube.
10. The tank container according to claim 9, **characterized in that**, the bottom supporting component further includes a reinforcing plate connected between the connecting beam and the end frame, wherein the outer edge of the reinforcing plate is in an inward concave arc shape.
11. The tank container according to claim 1, **characterized in that**, on the cross section of the tank body,

Wherein the connecting beam and the supporting member are both connected to the bearing plate, and the interval height is formed between the connecting beam and the bottom plate.

an angle between connecting lines of the end points of two ends of the bearing surface and the center of the tank body is not less than 150° .

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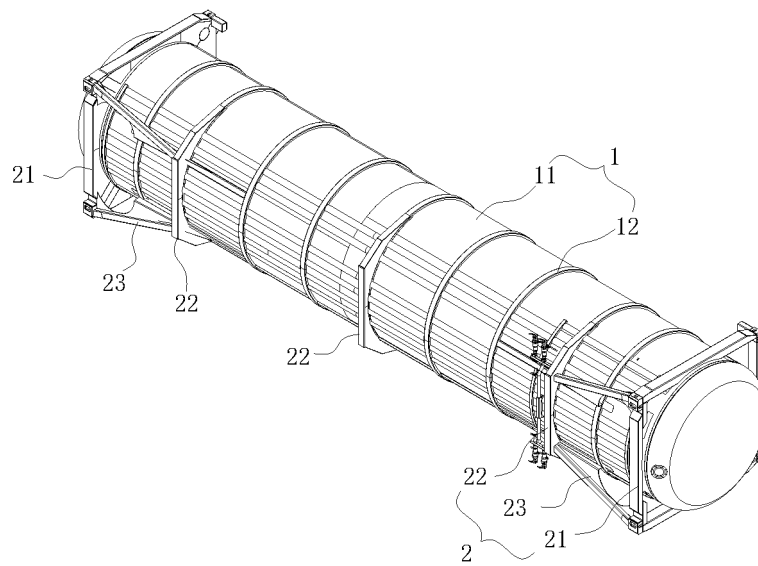


FIG.1

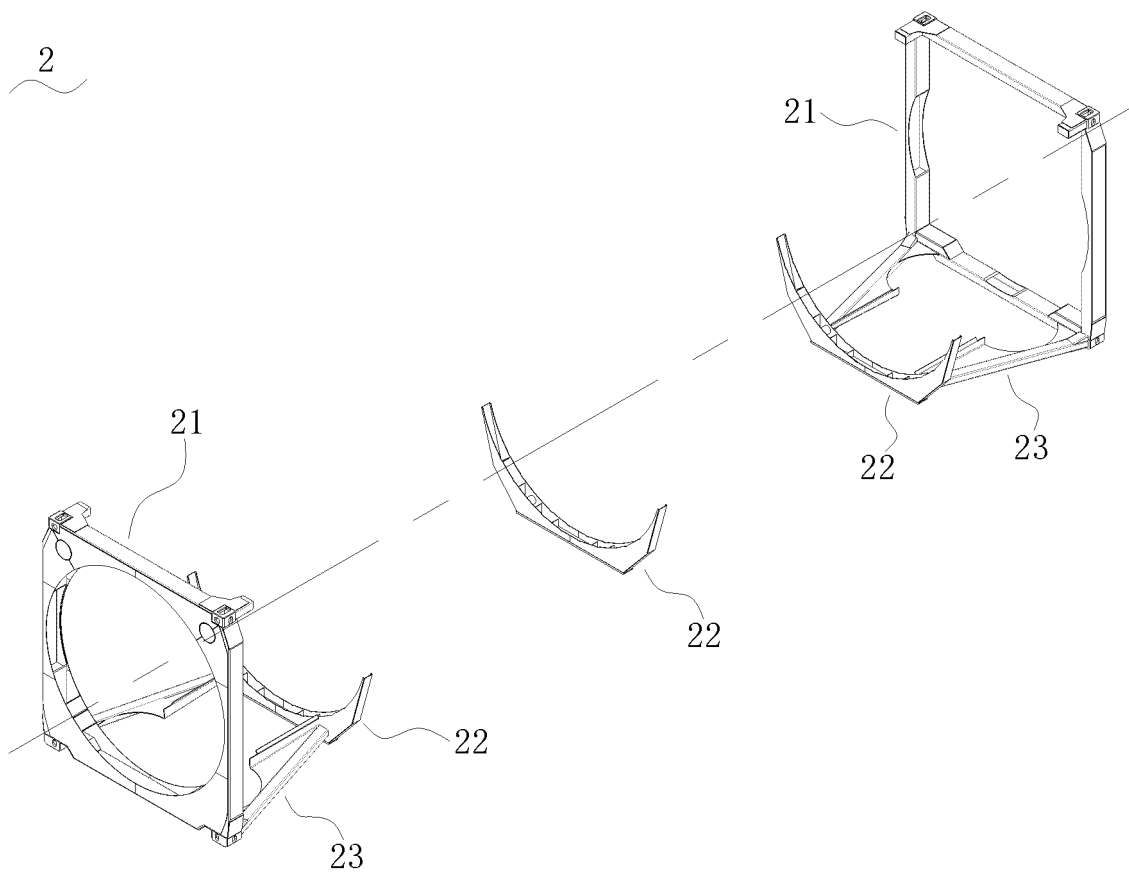


FIG.2

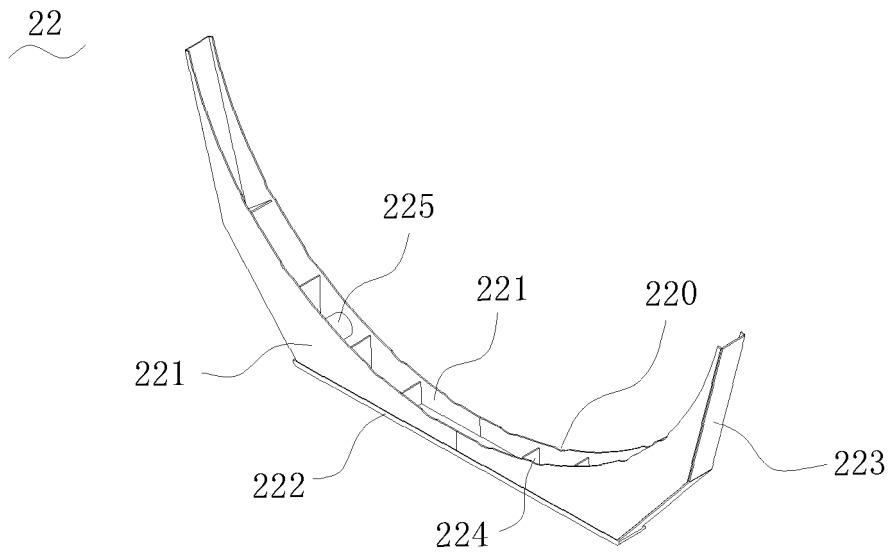


FIG.3

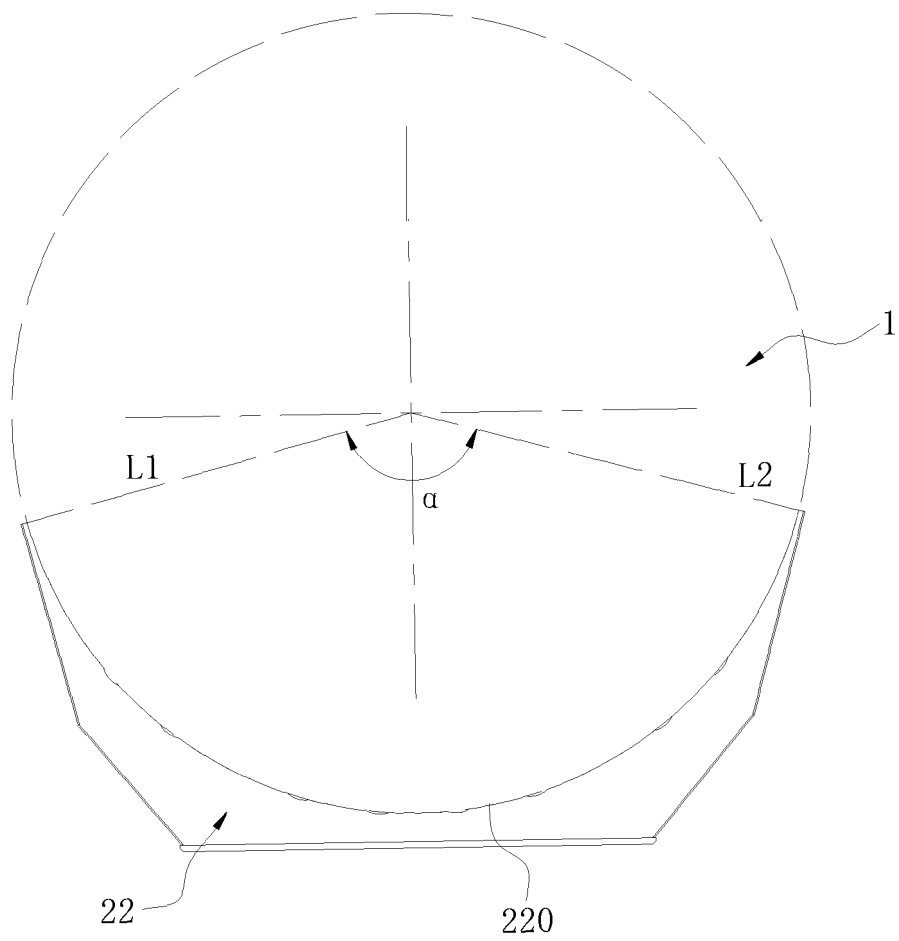


FIG.4

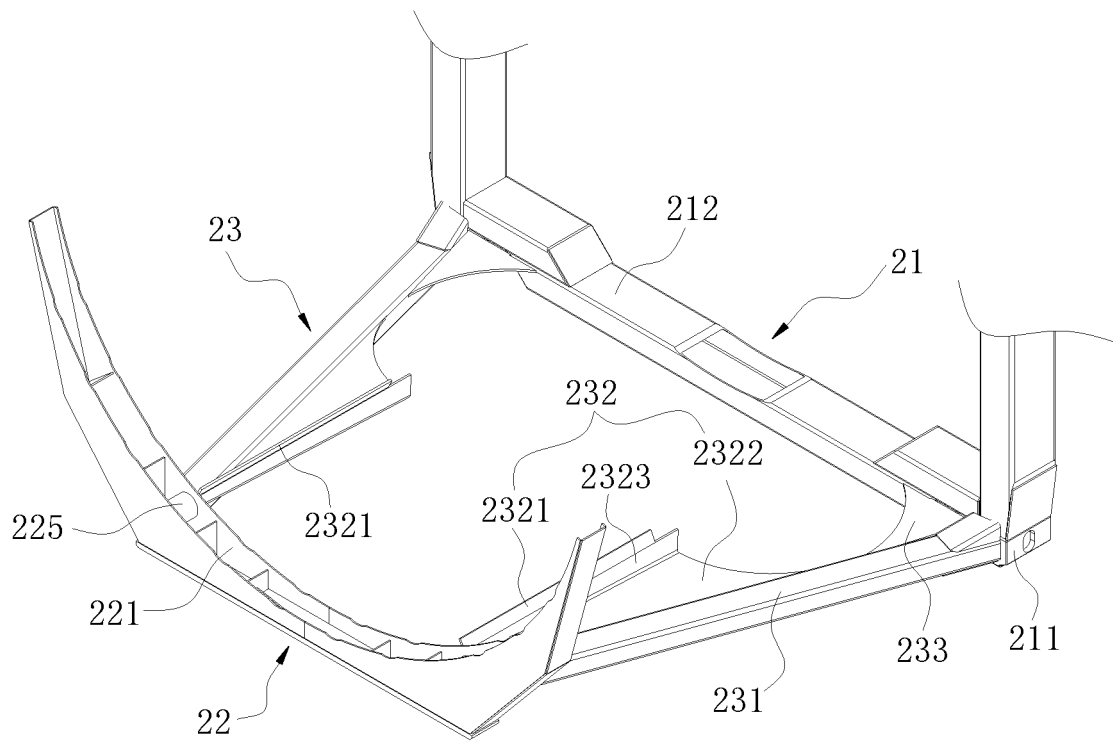


FIG.5

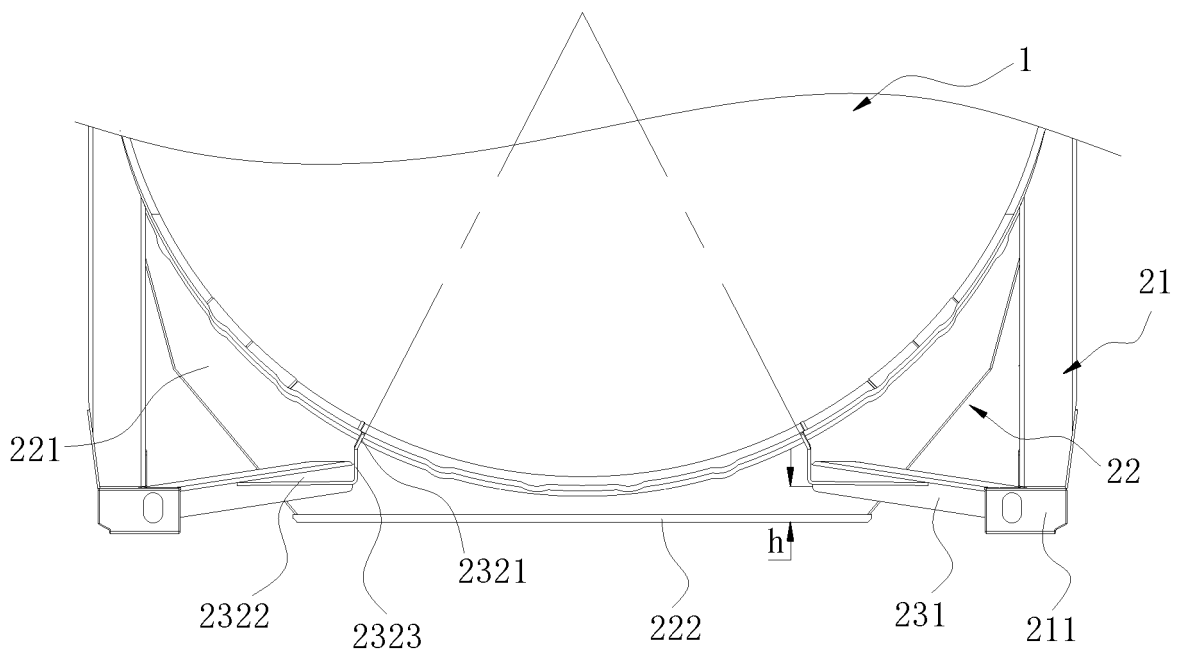


FIG.6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/086415

A. CLASSIFICATION OF SUBJECT MATTER

B65D 90/20(2006.01)i; B65D 90/12(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CPEA; CNMED; PLABS; KRABS; AUABS; DWPI; TWABS; JPABS; FRABS; TWMED; HKABS; SGABS; CNABS; DEABS; RUABS; LEXIS; MOABS; ILABS; SIPOABS; 罐式集装箱, 端框, 鞍座, 梁, tank, container, end frame, saddle, beam

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 106892217 A (NANTONG CIMC TANK EQUIPMENT CO., LTD. ET AL.) 27 June 2017 (2017-06-27) description, paragraphs 17-26, and figures 1-2	1-11
A	CN 106892224 A (NANTONG CIMC TANK EQUIPMENT CO., LTD. ET AL.) 27 June 2017 (2017-06-27) entire document	1-11
A	CN 102837909 A (NANTONG CIMC TANK EQUIPMENT CO., LTD. ET AL.) 26 December 2012 (2012-12-26) entire document	1-11
A	CN 203714509 U (NANTONG CIMC TANK EQUIPMENT CO., LTD. ET AL.) 16 July 2014 (2014-07-16) entire document	1-11
A	EP 0261858 A2 (CONSANI ENGINEERING (PROPRIETARY) LIMITED) 30 March 1988 (1988-03-30) entire document	1-11

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 29 July 2019	Date of mailing of the international search report 15 August 2019
Name and mailing address of the ISA/CN China National Intellectual Property Administration No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088 China	Authorized officer
Facsimile No. (86-10)62019451	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2019/086415

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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CN	106892224	A	27 June 2017	None			
CN	102837909	A	26 December 2012	CN	102837909	B	23 March 2016
CN	203714509	U	16 July 2014	None			
EP	0261858	A2	30 March 1988	EP	0261858	A3	10 August 1988
				IE	872500	L	15 March 1988
				US	4813567	A	21 March 1989

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