

Description

ISO containers are standardized with respect to their dimensions and are provided with corner fittings at all of their corners. Corresponding locking members such as pins or twist-locks are disposed at pre-determined spacings on platforms of container transport vehicles. The largest ISO containers have a length of 40 ft. (12192 mm).

For the transport of low-density materials such as gases including pressure-liquified gases, more recent draft standards (such as the draft CEN Swap Tank Euro Standard) provide for - normally symmetrical - extensions of the tank beyond the standard length of the base frame structure, which is standardized at 20 ft. (6058 mm), 30 ft. (9125 mm) or 40 ft. (12192 mm) for ISO containers. In order to secure such extended tanks on the available vehicle platforms, the transverse bars provided with corner fittings are maintained at their standard spacing and the tank symmetrically projects beyond these transverse bars. In many cases, a manhole concentric with respect to the tank axis is disposed in the tank bottom on one of the projecting end regions.

For protecting the tank end regions including any manhole armatures that may be provided there, it has been known to dispose attachments outside the transverse bars which slightly project beyond the tank in the longitudinal direction thereof and are formed of bent tubes like railings or include straight bars and struts that may be interconnected by means of additional outer ISO corner fittings. Such attachments may further be reinforced by disposing two such structures above each other.

It is an object of the present invention to provide a swap tank which has end regions projecting beyond the bottom transverse bars and is provided with a structure which not only protects the projecting end regions but also assists in introducing any longitudinal and transverse forces exerted on the tank into the ends of the transverse bars which form the regular support and engagement points of the overall tank structure.

This object is met by the invention as recited in claim 1. The first part of that claim is based on DE-A-3 330 561 wherein the end regions are provided with structures that transmit the forces exerted on the tank to support and engagement points (corner fittings) of transverse bars provided at the tank ends. This document, however, describes a tank which is sized to fall completely within the standard dimensions, each the end frame being each provided with four corner fittings defining the outer dimensions of a tank container.

The invention characterized in claim 1 provides not only a lower anti-buffing structure supported by the tank, but achieves the additional advantage that not only transverse forces are transmitted from the

main tank portion via usual direct supports to the transverse bar but also longitudinal acceleration forces occurring during braking and starting operations are introduced from the lower part of the tank bottom via a support member and two diagonal struts into the ends of the transverse bar.

Since the support member is formed of two triangular wall elements extending at an angle with respect to each other, varying this angle will permit an adjustment of the inclination of the edges facing the tank bottom relative to the area where the support member is attached to the tank bottom. As a result, the support member can be fitted between a prefabricated base frame structure and a corresponding tank bottom irrespective of manufacturing tolerances and may be connected to the tank bottom in a low-stress manner. As a result, the invention provides a structure with excellent supporting and force-transmitting characteristics, yet constituting a light-weight part that is easy to install.

DE-A-3 714 396 discloses a connection between the tank and framework of a tank container which includes two parallel and somewhat triangular sheet metal pieces. Otherwise however the known design is quite dissimilar from the present invention as regards both the underlying object and the structure meeting that object.

The developments of the invention according to claims 2 and 3 result in a particularly uncomplicated structural part which allows adjusting the angle between the two triangular surface portions by a simple bending operation.

The configurations of claims 4 and 5 result in an even better distribution of the forces to be transmitted between the tank bottom and the support member. The closed circular weld will avoid peak stresses and provide a plane connecting surface that enables a flaw-less weld connection with even the straight edges of the triangular surface elements.

Further advantageous supporting and force-transmitting measures are achieved by claims 6 to 8, and additional protective features for the projecting tank portions are achieved by claims 9 to 11. The outer corner fittings provided in accordance with claim 11 render the overall tank more flexible with respect to securing it to pins or twistlocks provided on a vehicle platform.

Preferred embodiments of the invention will now be described with reference to the drawings, in which Figure 1 is a schematic plan view showing an end portion of a swap tank,

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

Figure 3 is an end view as seen from the right in Figure 2, and

Figures 4 and 5 are views similar to Figure 1 showing modifications of a swap tank.

As shown in Figures 1 to 3, the swap tank in-

cludes a cylindrical main portion 10 having curved tank bottoms 11 (only one of which is seen).

Each tank bottom has an associated base frame structure comprising a transverse bar 12 provided with ISO corner fittings 13 and its ends, a pair of diagonal struts 14 extending from the corner fittings 13 towards each other in the direction of the tank end, and a pair of diagonal bars 15 extending from the corner fittings 13 in the opposite direction and towards each other. The outermost ends of the diagonal struts 14 are interconnected by welding and together with the transverse bar 12 form a triangular partial frame.

The transverse bar 12 is connected to the lower side of the tank main portion 10 by vertical supports 16, preferably of the structure known from DE-A-3 624 430. In the area where the supports 16 are connected to the tank envelope the latter is reinforced by a reinforcing plate 17.

The inner ends of the diagonal bars 15 facing away from the tank end are also connected to the lower side of the tank main portion 10 by further supports 18, the tank main portion 10 being again provided with a reinforcing plate 19 in the area where it is connected to the supports 18. For further reinforcement of the base frame structure, the inner ends of the two diagonal bars 15 are interconnected by a transverse member 20.

The tank bottom 11 shown in Figures 2 and 3 is provided with a manhole 22 disposed symmetrically and thus coaxially to the tank axis 21. (The manhole 22 is not shown in Figure 1 for simplification of the drawing.)

An angular or L-section ring 23 is provided below the manhole 22 and thus eccentrically below the tank axis 21. The peripheral edge of the ring 23 is welded to the tank bottom 11, so that the flange remote from the tank forms a plane annular surface. The open ring 23 shown may be replaced by a flat cylindrical element having a closed end and being provided with a venting and dewatering opening.

A support member 24 is inserted between the ring 23, which serves as a bearing member, and the interconnected ends of the diagonal struts 14. The support member 24 is formed as an integral bent sheet metal part having a central, narrow, rectangular wall element 25 and two lateral triangular wall elements 26.

As shown in Figure 2, the central wall element 25 extends almost vertically and is inclined at a small angle with respect to a plane perpendicular to the tank axis 21. The two lateral triangular wall elements 26 are bent with respect to the central wall element 25 towards the tank in such a manner that their free edges 27 are flush with the plane constituted by the ring 23.

Such a flush abutment can always be achieved by varying the bending angle between the triangular wall elements 26 and the central wall elements 25,

thereby compensating for tolerances in the shape of the tank bottom 11, the mounting position of the ring 23 and the shape of the support member 24 itself. Given roughly accurate shapes, the said angle will be always in such a range that the lower edges of the support member 24 along their entire lengths will lie within the width of the diagonal struts 14.

During assembly, one ring 23 will first be welded to each tank bottom 11 with the closed annular weld being advantageous to avoid peak stresses. The two base frame structures are then prepared and disposed relatively to each other with the prescribed longitudinal spacing between the corner fittings provided at the two transverse bars 12. Subsequently, the tank is placed on the supports 16 and 18 of the base frame structures and welded thereto. In a final mounting step, support members 24 are inserted and shaped by adapting the above-mentioned angle so as to permit welding of the edges 27 to the rings 23 and of the lower edges to the diagonal struts 14.

Alternatively, the lower ends of the two triangular wall elements 26 may be overlap-welded to the vertical flanges of the diagonal struts 14, which in this case must have a corresponding cross-sectional shape. In this case, the angular adaptation may require a certain spacial distortion of the wall elements 26.

The embodiments of the swap tank according to Figures 4 and 5 differ from that of Figures 1 to 3 by being provided with an additional frame portion which is attached to the corner fittings 13, slightly extends in the longitudinal direction beyond the tank end to form an anti-buffing protection, and is connected to the outer ends of the diagonal struts 14. In Figure 4, this frame portion is shaped as a one-piece curved bracked 28.

Figure 4 further shows a connection between the diagonal bars and the lower portion of the tank modified over that of Figure 1. In Figure 4, the inner ends of the diagonal bars 15 are welded to both sides of the vertical web 33 of a short T-bar 34 which has its horizontal flange 35 supporting the tank main portion 10. The horizontal flange 35 is welded to the tank along its entire outer edge which is rounded at its ends to avoid peak stresses.

In the modification of Figure 5, the frame portion extending beyond the tank bottom 11 consists of two longitudinal bars 29 connected to the corner fittings 13 and an outer transverse strut 30 welded to the ends of the diagonal struts 14. The transverse strut 30 and the longitudinal bars 29 are interconnected by respective further corner fittings 31, which in this embodiment offer a further possibility of securing the swap tank to locking members on the respective transport platform.



Claims

1. A swap tank comprising
 - a cylindrical main portion (10) having curved tank bottoms (11),
 - base frame structures associated to the tank ends and each including a transverse bar (12) and a pair of diagonal struts (14) extending from the ends of the transverse bar (12) towards each other, and
 - two saddle arrangements each including a support member (24) disposed between the tank bottom (11) and the associated base frame structure,
 characterized in
 - that the two diagonal struts (14) of each base frame structure extend from the transverse bar (12) towards the tank end and are there interconnected, and
 - that the support member (24) includes a pair of triangular wall elements (26) extending at an angle with respect to each other, each having a first edge connected to the first edge of the respective other wall element (26), a second edge connected to a corresponding diagonal strut (14), and a third edge (27) connected to the tank bottom (11).
2. The swap tank of claim 1 wherein the support member (24) is formed by an integral bent sheet metal part.
3. The swap tank of claim 1 or 2, wherein the two triangular wall elements (26) are interconnected by a rectangular wall element (25) extending essentially transverse of the tank axis (21).
4. The swap tank of any one of claims 1 to 3, wherein a bearing member (23) is disposed between the tank bottom (11) and the support member (24), the bearing member (23) having an annular edge welded to the tank bottom (11) eccentrically below the tank axis (21) and an outer end face for connection with the support member (24).
5. The swap tank of claim 4, wherein the bearing member is formed as an open ring (23) or as a cylinder having one closed end.
6. The swap tank of any one of claims 1 to 5, wherein the ends of the transverse bar (12) are connected to the tank main portion (10) by means of two diagonal bars (15) extending towards each other in the direction of the opposite tank end.
7. The swap tank of claim 6, wherein the inner ends of the diagonal bars (15) are welded to both sides of the vertical web (33) of a T-bar (34), the hori-

zontal flange (35) of the T-bar (34) supporting the tank main portion (10).

8. The swap tank of any one of claims 1 to 7, wherein the transverse bar (12) is connected to the tank main portion (10) via a support arrangement (16) extending transverse of the tank axis (21).
9. The swap tank of any one of claims 1 to 8, wherein the ends of the transverse bar (12) are interconnected by a frame portion (28; 29, 30) which, in the direction of the tank axis (21), extends beyond the tank end and is connected to the outer ends of the diagonal struts (14).
10. The swap tank of claim 9, wherein the frame portion is formed as a one-piece curved bracket (28).
11. The swap tank of claim 9, wherein the frame portion includes an outer transverse strut (30) provided with corner fittings (31) and connected to the transverse bar (12) by longitudinal bars (29).

Patentansprüche

1. Wechseltank, umfassend
 - einen zylindrischen Hauptteil (10) mit gewölbten Tankböden (11),
 - den Tankenden zugeordneten Bodengruppe, deren jede einen Querholm (12) und ein Paar von Diagonalstreben (14) aufweist, die von den Enden des Querholms (12) aufeinander zu verlaufen, und
 - zwei Sattelanordnungen, deren jede ein zwischen den Tankböden (11) und die zugeordnete Bodengruppe eingefügtes Stützteil (24) aufweist,
 - dadurch gekennzeichnet,
 - daß die beiden Diagonalstreben (14) jeder Bodengruppe von dem Querholm (12) zum Tankende verlaufen und miteinander verbunden sind, und
 - daß das Stützteil (24) ein Paar von unter einem Winkel zueinander stehenden dreieckigen Flächenelementen (26) enthält, deren jedes eine mit einer ersten Kante des betreffenden anderen Flächenelements (26) verbundene erste Kante, eine mit der betreffenden Diagonalstrebe (14) verbundene zweite Kante und eine mit dem Tankboden (11) verbundene dritte Kante (27) aufweist.
2. Wechseltank nach Anspruch 1, wobei das Stützteil (24) von einem einstückigen gekanteten Blechteil gebildet ist.
3. Wechseltank nach Anspruch 1 oder 2, wobei die



Claims

1. A swap tank comprising

a cylindrical main portion (10) having curved tank bottoms (11),

base frame structures associated to the tank ends and each including a transverse bar (12) and a pair of diagonal struts (14) extending from the ends of the transverse bar (12) towards each other, and

two saddle arrangements each including a support member (24) disposed between the tank bottom (11) and the associated base frame structure,

characterized in

that the two diagonal struts (14) of each base frame structure extend from the transverse bar (12) towards the tank end and are there interconnected, and

that the support member (24) includes a pair of triangular wall elements (26) extending at an angle with respect to each other, each having a first edge connected to the first edge of the respective other wall element (26), a second edge connected to a corresponding diagonal strut (14), and a third edge (27) connected to the tank bottom (11).

2. The swap tank of claim 1 wherein the support member (24) is formed by an integral bent sheet metal part.

3. The swap tank of claim 1 or 2, wherein the two triangular wall elements (26) are interconnected by a rectangular wall element (25) extending essentially transverse of the tank axis (21).

4. The swap tank of any one of claims 1 to 3, wherein a bearing member (23) is disposed between the tank bottom (11) and the support member (24), the bearing member (23) having an annular edge welded to the tank bottom (11) eccentrically below the tank axis (21) and an outer end face for connection with the support member (24).

5. The swap tank of claim 4, wherein the bearing member is formed as an open ring (23) or as a cylinder having one closed end.

6. The swap tank of any one of claims 1 to 5, wherein the ends of the transverse bar (12) are connected to the tank main portion (10) by means of two diagonal bars (15) extending towards each other in the direction of the opposite tank end.

7. The swap tank of claim 6, wherein the inner ends of the diagonal bars (15) are welded to both sides of the vertical web (33) of a T-bar (34), the hori-

zontal flange (35) of the T-bar (34) supporting the tank main portion (10).

8. The swap tank of any one of claims 1 to 7, wherein the transverse bar (12) is connected to the tank main portion (10) via a support arrangement (16) extending transverse of the tank axis (21).

9. The swap tank of any one of claims 1 to 8, wherein the ends of the transverse bar (12) are interconnected by a frame portion (28; 29, 30) which, in the direction of the tank axis (21), extends beyond the tank end and is connected to the outer ends of the diagonal struts (14).

10. The swap tank of claim 9, wherein the frame portion is formed as a one-piece curved bracket (28).

11. The swap tank of claim 9, wherein the frame portion includes an outer transverse strut (30) provided with corner fittings (31) and connected to the transverse bar (12) by longitudinal bars (29).

Patentansprüche

1. Wechseltank, umfassend

einen zylindrischen Hauptteil (10) mit gewölbten Tankböden (11),

den Tankenden zugeordneten Bodengruppe, deren jede einen Querholm (12) und ein Paar von Diagonalstreben (14) aufweist, die von den Enden des Querholm (12) aufeinander zu verlaufen, und

zwei Sattelanordnungen, deren jede ein zwischen den Tankboden (11) und die zugeordnete Bodengruppe eingefügtes Stützteil (24) aufweist,

dadurch gekennzeichnet,

daß die beiden Diagonalstreben (14) jeder Bodengruppe von dem Querholm (12) zum Tankende verlaufen und miteinander verbunden sind, und

daß das Stützteil (24) ein Paar von unter einem Winkel zueinander stehenden dreieckigen Flächenelementen (26) enthält, deren jedes eine mit einer ersten Kante des betreffenden anderen Flächenelements (26) verbundene erste Kante, eine mit der betreffenden Diagonalstrebe (14) verbundene zweite Kante und eine mit dem Tankboden (11) verbundene dritte Kante (27) aufweist.

2. Wechseltank nach Anspruch 1, wobei das Stützteil (24) von einem einstückigen gekanteten Blechteil gebildet ist.

3. Wechseltank nach Anspruch 1 oder 2, wobei die

- beiden dreieckigen Flächenelemente (26) über ein im wesentlichen quer zur Tankachse (21) stehendes rechteckiges Flächenelement (25) miteinander verbunden sind. 5
4. Wechseltank nach einem der Ansprüche 1 bis 3, wobei zwischen den Tankboden (11) und das Stützteil (24) ein Auflagerelement (23) eingefügt ist, das am Tankboden (11) mit einer ringförmigen Kante exzentrisch unterhalb der Tankachse (21) angeschweißt ist und eine äußere Stirnfläche zur Verbindung mit dem Stützteil (24) aufweist. 10
5. Wechseltank nach Anspruch 4, wobei das Auflagerelement als offener Ring (23) oder als einseitig geschlossener Zylinder ausgebildet ist. 15
6. Wechseltank nach einem der Ansprüche 1 bis 5, wobei die Enden des Querholms (12) über zwei in Richtung des entgegengesetzten Tankendes aufeinander zu verlaufende Diagonalholme (15) mit dem Tank-Hauptteil (10) verbunden sind. 20
7. Wechseltank nach Anspruch 6, wobei die inneren Enden der Diagonalholme (15) an beide Seiten des vertikalen Steges (33) einer T-Schiene (34) angeschweißt sind, deren horizontaler Flansch (35) den Tank-Hauptteil (10) abstützt. 25
8. Wechseltank nach einem der Ansprüche 1 bis 7, wobei der Querholm (12) über eine quer zur Tankachse (21) stehende Stützordnung (16) mit dem Tank-Hauptteil (10) verbunden ist. 30
9. Wechseltank nach einem der Ansprüche 1 bis 8, wobei die Enden des Querholms (12) über ein Rahmenteil (28; 29, 30) miteinander verbunden sind, das in Richtung der Tankachse (21) das Tankende überragt und mit den äußeren Enden der Diagonalstreben (14) verbunden ist. 40
10. Wechseltank nach Anspruch 9, wobei das Rahmenteil als einstückiger gerundeter Bügel (28) ausgebildet ist. 45
11. Wechseltank nach Anspruch 9, wobei das Rahmenteil eine mit Eckbeschlägen (31) versehene äußere Querstrebe (30) enthält, die über Längsholme (29) mit dem Querholm (12) verbunden ist. 50

Revendications

1. Citerne amovible comprenant 55
une partie principale cylindrique (10) munie de fonds de citerne bombés (11),
des structures de cadres de base associés aux extrémités de la citerne, dont chacune

comprend une barre transversale (12) et deux contreventements obliques (14) qui partent des extrémités de la barre transversale (12) en se dirigeant l'un vers l'autre, et

deux dispositifs formant berceau dont chacun comprend un élément support (24) disposé entre le fond (11) de la citerne et la structure de cadre de base correspondante,

caractérisée

en ce que les deux contreventements obliques (14) de chaque structure de cadre de base partent de la barre transversale (12) vers l'extrémité de la citerne et sont assemblés l'un à l'autre à cet endroit, et

en ce que l'élément support (24) comprend deux éléments de paroi triangulaires (26) qui forment un angle entre eux, chacun ayant un premier bord fixé au premier bord de l'autre élément de paroi (26) respectif, un deuxième bord fixé à un contreventement oblique (14), et un troisième bord (27) fixé au fond (11) de la citerne.

2. Citerne amovible selon la revendication 1, dans laquelle l'élément support (24) est formé d'une pièce de tôle pliée d'un seul tenant.
3. Citerne amovible selon la revendication 1 ou 2, dans laquelle les deux éléments de paroi triangulaires (26) sont assemblés par un élément de paroi rectangulaire (25) qui s'étend sensiblement transversalement à l'axe (21) de la citerne.
4. Citerne amovible selon une quelconque des revendications 1 à 3, dans laquelle l'élément de portée (23) est disposé entre le fond (11) de la citerne et l'élément support (24), l'élément de portée (23) ayant un bord annulaire soudé au fond (11) de la citerne, excentriquement au-dessous de l'axe (21) de la citerne, et une face d'extrémité extérieure destinée à s'assembler à l'élément support (24).
5. Citerne amovible selon la revendication 4, dans laquelle l'élément de portée présente la forme d'un anneau ouvert (23) ou d'un cylindre ayant une extrémité fermée.
6. Citerne amovible selon une quelconque des revendications 1 à 5, dans laquelle les extrémités de la barre transversale (12) sont fixées à la partie principale (10) de la citerne à l'aide de deux barres obliques (15) qui s'étendent l'une vers l'autre dans la direction qui est à l'opposé de l'extrémité de la citerne.
7. Citerne amovible selon la revendication 6, dans laquelle les extrémités intérieures des barres obliques (15) sont soudées aux deux côtés de

l'âme verticale (33) d'une barre en T (34), la semelle horizontale (35) de la barre en T (34) supportant la partie principale (10) de la citerne.

8. Citerne amovible selon une quelconque des revendications 1 à 5, dans laquelle la barre transversale (12) est reliée à la partie principale (10) de la citerne par l'intermédiaire d'un dispositif support (16) qui s'étend transversalement à l'axe (21) de la citerne.

9. Citerne amovible selon une quelconque des revendications 1 à 8, dans laquelle les extrémités de la barre transversale (12) sont assemblées par une partie de cadre (28 ; 29, 30) qui, dans la direction de l'axe (21) de la citerne, s'étend au-delà de l'extrémité de la citerne et est reliée aux extrémités extérieures des contreventements obliques (14).

10. Citerne amovible selon la revendication 8, dans laquelle la partie de cadre est constituée par une ferrure cintrée (28) en une seule pièce.

11. Citerne amovible selon la revendication 9, dans laquelle la partie de cadre comprend une entretoise transversale extérieure (30) équipée de ferrures d'angle (31) et reliée à la barre transversale (12) par des barres longitudinales (29).

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