

Tank Container

A tank container with the features indicated in the preamble of claim 1 is known from U.S. patent 4,593,832. There a large tank container is indicated on which front flanges attached to the arched end bottoms are connected with a radial flange on saddle segments, each of which is placed in the four front frame corners of the frame structure. Here the saddle elements simultaneously form diagonal reinforcements between the transverse spars and the corner supports.

From DE-A-0 654 421 a saddle structure is known in which the tank is connected via a front flange with saddle ring elements placed exclusively at the corner supports. For tank containers that cannot be stacked, which require no corner supports, these solutions are disadvantageous, because the corner supports always have additional weight.

However, tank container arrangements exist that should be designed so as not to be stacked, but rather are capable of being coupled only via their bottom structure, if necessary a frame in ISO dimensions, with the loading surface of a railway-, highway- or ocean-going vehicle, and which if necessary are transferred only by means of a forklift stacker and not by so-called spreaders.

DE 22 01 354 A shows a tank saddle, in which the tank is connected via reinforcement rings running in the cylindrical area and a flat steel structure with saddles and above this with a carrying device (floor frame). It is here that the forces are applied to the cylindrical part of the tank.

The task that is the basis of the invention is to provide a tank container in which the saddle between the tank and bottom frame has sufficient rigidity for small and medium-size containers with the least possible material and weight, as well as a favorable loading sequence and which can be manufactured in tolerance-friendly fashion at as low a fabrication cost as possible.

The solution to this problem is indicated in claim 1. According to it, the saddle segment is provided with a circumferential contour following the front flange in sections, along which it is connected with the front flange. At the same time, the saddle segment has an attachment area which is connected with the bottom frame. Thus, a simple, self-stabilizing attachment structure is present - the circumferential contour is stabilized by the connection with the front flange and the attachment area through connection with the bottom frame which permits a weight-saving, stable connection of a tank with a bottom frame. Additional stabilizing corner supports, requiring a lot of material, are not necessary. The circumferential contour following the course of the front flange, which admits the front flange in cradle fashion, permits a simple tolerance compensation in the axial direction (in the direction of the longitudinal tank axis) during assembly.

The development according to claim 2 is advantageous in that it also permits the saddle element to be attached in tolerance-friendly fashion to a transverse spar of the bottom frame, and includes it as a structurally stabilizing element.

The overlapping coupling of the axially running front flange with the axial flange of a profile ring, which in turn is coupled via a radial flange overlapping with the saddle segment, permits three degrees of freedom in aligning the tank to the saddle structure, namely horizontally and laterally transverse to the tank axis between the radial flange and saddle segment and horizontally along the tank axis between the front flange and axial flange of the profile ring as per claim 3.

According to claim 4, by having the profile ring connected via the circumferential contour of the saddle element with the front flange, it stabilizes it and prevents peak stresses at the ends of the saddle segment, in that the relatively unstable front flange is there reinforced by the profile ring.

The rib elements according to claim 5 permit an additional stabilizing coupling of the saddle element with the transverse spar and make possible relatively thin-walled and thus weight-saving saddle segments.

According to claim 6, longitudinal spars are provided, which admit transverse elements configured in channel-like fashion, via which a simple transfer of at least the empty tank container is possible.

The design according to claim 7 gives this structure additional stability; for one, in that the stacking channels or transverse elements are connected to each other via a coupling pan, and secondly, that this coupling pan and thus the stacking channels are coupled with the tank via a support element placed in the coupling pan. This, a part of the transfer loads is brought into the tank so as to be easy on the tank. At the same time, resonant vibrations that appear under certain transport conditions which could lead to an overload, especially of the longitudinal spars, are avoided.

According to claim 8, the support element can be taken off by a removable holding and covering element that is placed on the coupling pan, and is replaced if worn.

According to claim 9, the support element is manufactured to have elastic or elastoplastic properties, preferably from a plastic foam material.

An embodiment example of the present invention is now explained in greater detail using the drawings. Shown are:

- Figure 1 a perspective depiction of an invention-specific tank container
- Figure 2 a side view of the tank container depicted in figure 1
- Figure 3 a longitudinal section (section I-I) of the tank container depicted in figures 1 and 2
- Figure 4 detail A from figure 3
- Figure 5 a cross section (section II-II in figure 2) of the tank container depicted in figures 1 to 3
- Figure 6 detail B from figure 5
- Figure 7 a perspective view of a tank container arrangement with an invention-specific tank container.

From figures 1 to 4 it is evident that in the flange area of the arched end bottoms 11 of tank container 1, front flanges 12 are welded on to follow the course of the flange. The End bottoms 11, along with the jacket aprons 4 and 5, form tank 2, which is coupled via saddle segments 14 with transverse spars 16 and 18 of bottom frame 3.

Here the tank cross section depicted is configured to be oval or trunk-shaped. The designs which follow are also precisely valid for circular, cloverleaf, or other cross sections of the tank.

Each of the saddle segments 14 is connected (welded as a rule) by its surface facing outward to overlap with the corresponding surfaces of transverse spars 16, 18 that point inward, in overlapped fashion. On the upper, tank-side end of saddle segment 14, a circumferential contour 20 is provided, which follows the course of front flange 12 in sections. On each of the surfaces of saddle segments 14 pointing inward, an angle ring 22 is placed that follows the circumferential contour 20 and thus also the course of the front flanges 12, which [angle ring] with its radial flange 26 pointing away from the tank axis 24 is connected in overlapping fashion with the saddle segment, for which see especially figure 4. The flange 28 running in the axial directions is connected with front flange 12, likewise in overlapping fashion. Through the arrangement of the front flanges 12 in the longitudinal direction on axial flange 28, length tolerances, that are caused for example by differing archings of the floor, can be compensated for. Heights and lateral tolerances can be compensated for by appropriate positioning of the saddle segments 14 transverse to the tank axis on transverse spars 16 and 18. For reinforcement of the saddle segments 14, gusset plates 30 are provided, which are connected with the upper side of transverse spars 16, 18 and with the surfaces of saddle segments 14 pointing outward, and which stabilize and reinforce them.

On one end, transverse spar 16 connects the end fittings 32, which in turn are connected with end fittings 32 at the other end via longitudinal spars 34 with each other. In the embodiment example depicted, tank 2 is made to be shorter than bottom frame 3, so that one saddle segment 14 is placed with the transverse spar 18 in the longitudinal directing between the end fittings 32. In other versions, the tank takes up the entire length of the bottom frame 3 and then is connected with the transverse spars on the front ends of tank container 1. In the embodiment example

shown, between transverse spar 18 and the free end with transverse spar 36, diagonal spars 38 are provided for better load transmission, which [diagonal spars] connect transverse spar 18 with the corresponding end fittings 32. The forward front flange 12 is provided with a securing eye 40 in an upper "corner area" and reinforced there with a gusset plate 42 for better load application. The securing eye 40 lying opposite diagonally is depicted in figure 7.

In the center area of the bottom frame, under the longitudinal spars 34, stacking channels 44 are attached. Additionally, for better load transmission, gusset plates 46 are provided there. In figures 2, 3, 5 and 6 can be seen that between the stacking channels 44, a multiple-edged coupling pan 48 running in the longitudinal direction is provided, which on each of its ends is connected (welded, for example) with each of the lateral flanks of the stacking channels pointing toward each other. Into the coupling pan, a support element 50 is inserted, so that a connection is made with the sole area of tank 2 of coupling pan 48 and thus the stacking channels 44. In this way, a part of the transfer loads brought into the staking channels is applied to tank 2. So that no damage is done to tank jacket aprons 4,5, coupling pan 48 ends at a certain distance beneath jacket aprons 4, 5 and in addition has an edge 52, so that if support element 50 is missing or defective, only a surface contact can appear in the area of edge 52 between coupling pan 48 and the tank and jacket aprons 4, 5. Coupling pan 48 is closed at one end with a detachable holder and covering element 54, which securely fixes support element 50 in its position. Support element 50 has elastic or elastoplastic properties and is made, for example, of a suitable plastic foam such as PUR or PIR. Along with assuming transfer loads, support element 50 provides through coupling via the coupling pan to the stacking channels 44 and thus to the longitudinal spars 34 that especially the longitudinal spars – for example when transported by road or train – cannot oscillate too severely. Especially, the resonant vibrations that are particularly dangerous are thus prevented. Additionally, the container is acoustically deadened.

In other embodiments not depicted, the coupling pan 48 is placed with support element 50 between the transverse spars 16, 18. Embodiments also exist in which another tank receptacle or saddle is provided, for example a front flange saddle with corner supports, but at the same time also the coupling pan 48 depicted above is implemented with support element 50. Support

element 50 and coupling pan 48 are thus independent of the saddle structure and able to be implemented without stacking channels.

Figure 7 shows a complete tank container arrangement 100 with an invention-specific tank container and additional attaching parts like a running board 6, folding railing 8, cowl box 9 and an aggregate area 7 with access flaps 71 and 72.

Further embodiments and versions of the present invention can be gleaned by one skilled in the art from the following claims.

CLAIMS

1. Tank container (1) with an essentially cylindrical tank (2), the end bottoms (11) of which are each connected via a saddle structure (12, 14, 22) with a bottom frame (3), which comprises a front flange (12) attached on an end of the tank, wherein a saddle segment (14) running transverse to the tank axis (24) is provided with a circumferential contour (20) running at least in sections and connected with it, which is connected with the bottom frame (3).
2. Tank container (1) according to claim 1, in which the saddle segment (14) is connected via a coupling surface with a surface running parallel thereto of a transverse spar (16, 18; 36) of the bottom frame (3).
3. Tank container (1) according to claim 1 or 2, in which a profile ring (22) is provided, which overlaps the front flange (12) with an axial flange (28) running parallel to the tank axis (24), and is connected with it, and a radial flange (26) running transverse to the tank axis (24) and directed away from it, which overlaps a coupling surface of the saddle segment (14) and is connected with it.
4. Tank container (1) according to claim 3, in which the profile ring (22) is connected laterally via the circumferential contour (20) of the saddle segment (14) projecting out with the front flange (12).
5. Tank container (1) according to one of the foregoing claims, in which the saddle segment (14) via rib elements (30) running in the direction of the tank axis, is connected with the bottom frame (3).

6. Tank container (1) according to one of the foregoing claims, in which the bottom frame (3) has longitudinal spars (34) running in the direction of the tank axis, and transverse elements, especially stacking channels (44) configured in channel fashion, placed transverse to them.
7. Tank container (1) according to claim 6, in which the transverse elements or the stacking channels (44) are coupled to each other in the sole area of the tank via a coupling pan (48) and via a support element (50) placed in the coupling pan (48) with the tank.
8. Tank container (1) according to claim 7, in which the support element (50) via a detachable holding and covering element (54) placed on the coupling pan is situated in the coupling pan (48) so as to be removable.
9. Tank container (1) according to claim 7 or 8, in which the support element (50) is formed from an elastic or elastoplastic material, especially a plastic foam material.