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TANK CONTAINER

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5 The invention is directed to a tank container whose frame structure comprises end frames and a respective side protection assembly on either of the longitudinal sides, including a bottom longitudinal beam and a fender beam disposed thereabove.

10 With a conventional tank container frame structure of this type, which is known from the British Patent Specification 1,225,325, the lateral longitudinal beams are permanently joined by welding to the end frames. However, longitudinal beams of containers are frequently damaged by rough transshipment handling, e.g. with gantry-cranes and fork-
15 lift trucks. In that case, bent longitudinal beams can be either hot-dressed, wherein considerable damage to the tank or to the insulating sheath of the container itself must be tolerated, or they have to be cut out with flame cutters, exchanged or dressed and again welded in position.

20 The removal of re-usable sectional elements by flame cutting, however, considerably deteriorates the mechanical properties of the material on re-use. Moreover, the respective repair welds normally have to be performed in
25 fixed position and do not satisfy the strength characteristics of production welds which are performed in gravity position during regular production on welding jigs.

30 When the longitudinal beam after repair is painted in disassembled state, the welds produced during reassembly in the container frame require fresh descaling, cleaning, derusting and painting, whereby normally the quality of the coating is deteriorated. In permanently welded structures such defects in the coat of paint frequently occur on the
35 side of the frame sections facing the tank.

In the hitherto known bolted container frames, which are sometimes used, both the bottom longitudinal beams and the screw joints are of extremely heavy structure, because they have to absorb the considerable horizontal forces produced in operation and to transfer the same from the lower corner fittings of one container end face to those of the other end face. This constitutes a drawback in respect of both weight and costs.

10 It is therefore advantageous to design the tank and the frame structure such that the horizontal acceleration forces occurring in the bottom assembly are directly introduced via diagonal braces into the tank and may be absorbed thereby. A container structure in accordance with this
15 "beam concept", as it is called, without a continuous bottom assembly is described, for instance, in the DE-PS 2,828,349.

However, due to the complete elimination of bottom longitudinal beams the protection of the lower container half against mechanical damage during transport is reduced. The same applies to the belt region of the tank, which is especially susceptible to damage in case of lateral collisions. Practical experience accumulated over many
20 years has shown that repairs of any damage to the thermal insulation of the tank and to the sheath thereof occurring at the side of the tank are extremely expensive.

The object of the instant invention therefore resides in
30 the elimination of the drawbacks existing in the prior art and in protecting a tank container on either of its longitudinal sides from lateral damage which may occur either during transport or in transshipment. Such a side protection assembly is adapted, after having suffered deformation, to
35 be dressed and again made corrosion-resistant in an inex-

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pensive and yet technically correct way without any flame, cutting and welding operations and without any damage to the tank or the insulating sheath thereof.

Moreover, said side protection assembly
5 should have a low dead weight, so that especially in combination with a beam tank a tank container of low overall weight is provided.

At the same time it should be possible to integrate in such a side protection structure the
10 standard recesses for handling of the container with stock-yard cranes in inland terminals (ISO 1496/III, appendix D and UIC Regulations).

The solution of the above-specified objects in accordance with the invention is achieved in that
15 each side protection assembly is detachably secured to the vertical corner supports of the two end frames which are joined to the tank in self-supporting fashion.

In a preferred embodiment to each corner
20 support there is mounted a fixing element for fixing an end of the respective side protection assembly, said fixing element comprising a support arm fixedly joined to the vertical corner support and projecting in longitudinal direction of the container, and a
25 brace which extends obliquely upwardly from the end of the support arm and is fixedly joined to the corner support. Preferably in each side protection assembly the lower longitudinal beam is adapted to be joined to the support arm, and the fender beam is
30 adapted to be joined to the inclined brace.

The dead weight of such a side protection assembly may be kept low, because there are practically no horizontally acting compressive and buckling forces to be accommodated. Furthermore it
35 is possible to dismount the side protection assembly with few manipulations, and any damage may be

dressed, freshly sand-blasted and painted on all sides like a new-value part without deterioration of the surface quality of the tank or its insulation.

When the fixing elements and the bottom longitudinal beam are configured in accordance with the characterising portion of Claim 4 and the bottom longitudinal beams are provided with guide plates in predetermined areas, handling zones as prescribed by the Standard are formed together with the side protection assembly. From the viewpoint of production engineering the folding in the lower region of the guide plates is especially advantageous, because welding of special square sections is then unnecessary. The two guide plates in each side protection assembly provide for the guide strips in the region of the handling zones as required by the Standard and also for the necessary sliding surfaces which prevent improper hooking of the grapplers in the container frame during transshipment. In the embodiment of the invention according to Claim 9 the guide plates furthermore serve the purpose of locking the side protection assembly in transverse direction during mounting thereof by engagement with the fixing elements.

Preferably, the bottom longitudinal beam and the fender beam of the tank are interconnected by struts and thus form a unitary side group.

The further development of the invention according to the Claims 7 to 9 substantially facilitates mounting of the side protection structures, i.e. securing thereof to the fixing elements which are connected to the end frames, because the entire side protection assembly is fixed relative to the tank container both in vertical and longitudinal direction and in transverse direction.

The embodiment of the invention according

to Claim 10 is inexpensive and exhibits high mechanical stability under load.

Below a preferred embodiment of the invention will be explained in detail with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a side view of a region of a tank container having recesses for handling; and

Figure 2 is a somewhat enlarged cross-section along the line "A-A" in Figure 1.

Fig. 1 illustrates a container end frame including a vertical corner support 11 and a lower corner fitting 12, a fixing member 30 and a side protection assembly 20 which is detachably joined to the fixing member 30.

The side protection assembly 20 comprises a lower longitudinal beam 21 and an additional fender beam 22 below the belt line of the cylindrical tank. One or several connecting struts 24 extending along the length of the container are provided between these longitudinal elements 21, 22 to reinforce the detachable side protection assembly 20. The connecting struts 24 may be vertical sectional struts as illustrated in Fig. 1, or they may be diagonal struts intersecting (meeting) at the fender beam 22 approximately in the centre of the container.

Externally extending guide plates 23 for grapples having minimum external dimensions of 600 x 300 mm² are provided on the lower longitudinal beam 21 in the regions of the handling zones, which are fixed by ISO-Standard 1496/I, Appendix D. These guide plates 23 are inwardly folded along their lower side by 12 mm, and the folded portions 231 engage the respective lower longitudinal beams 21 and are sufficiently welded thereto. They serve both as sliding surface and also as lateral stop means and guide strip for the grapples.

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The fixing elements 30 formed of a support arm 31 and a brace 32 are employed to join the side assemblies 20 to the container end frame 10. The support arm 31 is a sectional arm which projects in longitudinal direction of the container and is welded to the corner support 11, at right angles. For reinforcing purposes this projecting arm 31 is diagonally supported by means of the brace 32 relative to the vertical corner support 11. The diagonal brace 32 extends preferably at an angle of 45° to the corner support 11 and is configured as a sectional element. It may also be configured together with the support arm 31 as an integral gusset plate.

As illustrated in Fig. 2, the support arm 31 and the lower longitudinal beam 21 are configured as similar C-sections (NPU 100 x 100 x 50 x 6) in this embodiment. In the region of the handling zones, the profile of the lower longitudinal beam 21 may be reinforced by means of some vertical webs to withstand the loads applied thereto. In the described embodiment the fender beam 22 consists of an open-bottomed C-section beam of the same or smaller dimensions as the lower longitudinal beam 21.

Bolts of required cross-section join the top flange of the lower longitudinal beam 21 to the bottom flange of the support arm 31 welded to the corner support 11, and join the fender beam 22 to the inclined diagonal corner brace 32 by means of a flange 221 extending in parallel thereto. The support arm 31 is welded to the corner support 11 in such a way that the lower longitudinal beam 21, which is secured thereto, extends with its bottom edge at the level of the top edge of the lower corner fittings 12, i.e. at the level of the handling

zones.

As will be apparent from Fig. 2, the C-sections of the support arm 31 and of the lower longitudinal beam 21 are packed in superimposed relationship in such a way that the support arm 31 opens outwardly and the bottom longitudinal beam 21 opens inwardly. By this arrangement the mechanical strength of the packed sectional arms is increased, and passage of the required connecting bolts is facilitated. Moreover, a large bearing surface results for the guide plate 23 to be mounted to the lower longitudinal beam 21, when the latter is closed to the outside.

The side protection assembly 20 may be mounted as described with little expenditure, as the assembly 20 is fixed relative to the container frame and the fixing elements 30, respectively, in vertical direction by means of the longitudinal beam 21 which extends beneath the support arms 31 and engages the same, and in transverse direction by means of the guide plates 23 welded to the lower longitudinal beam 21, and in longitudinal direction by means of the flanges 221 engaging the inclined corner supports 32. The fixing elements 30 and the lower longitudinal beam 21 should be designed so that the operational load acting on each of the four handling zones may be accommodated and converted. According to ISO the operational load acting on each handling zone is calculated as follows:

$$1.25 \times R : 4 \quad (R = \text{overall weight}).$$

When the frame structure is used in conjunction with a beam tank, the longitudinal forces created during operation are directly introduced into the tank so that they need not be transferred from the bottom longitudinal beams 21. However, for

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safety reasons the longitudinal beams 21 are designed such that they may also accommodate horizontal longitudinal forces of residual magnitude.

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CLAIMS

1. A tank container whose frame structure comprises end frames and a respective side protection assembly on either of the longitudinal sides, each assembly including a lower longitudinal beam and a fender beam disposed thereabove, wherein each side protection assembly is detachably secured to vertical corner supports of the two end frames which are joined to the tank in self-supporting fashion.
2. A tank container as claimed in Claim 1, wherein to each corner support there is mounted a fixing element for fixing an end of the respective side protection assembly, said fixing element comprising a support arm fixedly joined to the vertical corner support and projecting in longitudinal direction of the container, and a brace which extends obliquely upwardly from the end of the support arm and is fixedly joined to the corner support.
3. A tank container as claimed in Claim 2, wherein in each side protection assembly the lower longitudinal beam is adapted to be joined to the support arm, and the fender beam is adapted to be joined to the inclined brace.
4. A tank container as claimed in Claim 3, wherein the fixing elements are configured such that the bottom edge of the lower longitudinal beam secured to the support arm extends approximately at the level of the upper edge of lower corner fittings of the container end frames.
5. A tank container as claimed in any of the Claims 1 to 4, wherein each side protection assembly includes a predetermined region near each end a guide plate mounted to the lower longitudinal beam, said guide plate having a lower, inwardly folded portion



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engaging the underside of the longitudinal beam to form a zone for engagement by container handling elements.

5 6. A tank container as claimed in any one of Claims 1 to 5, wherein in each side protection assembly the lower longitudinal beam and the fender beam are joined to each other by means of further struts.

7. A tank container as claimed in Claim 2 and any Claim appended thereto wherein in each side protection assembly either end of the fender beam is provided with a flange extending in parallel to the
10 inclined brace.

8. A tank container as claimed in Claim 7, wherein the flanges provided on the fender beams due to their engagement with the inclined braces fix the side protection assembly in vertical and longitudinal
15 direction relative to the tank container.

9. A tank container as claimed in any of the Claims 5 to 8, wherein in each side protection assembly the two guide plates due to their engagement with the fixing elements fix the side protection
20 assembly in transverse direction relative to the tank container.

10. A tank container as claimed in Claim 5 and any Claims appended thereto wherein in each side protection assembly the lower longitudinal beam and
25 the support arm are C-section members, and the two C-sections are disposed on top of each other with their respective open sides facing in opposite directions.

11. A tank container according to Claim 1, constructed, arranged and adapted to operate
30 substantially as herein described with reference to, and as shown in, the accompanying drawings.