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3,327,883

STORAGE TANK FOR FLUIDS

Filed June 11, 1965

2 Sheets-Sheet 1

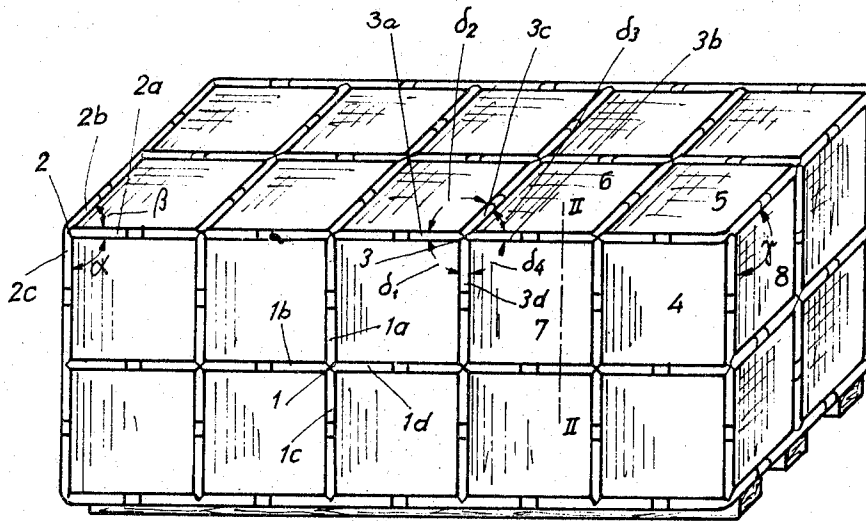


Fig. 1

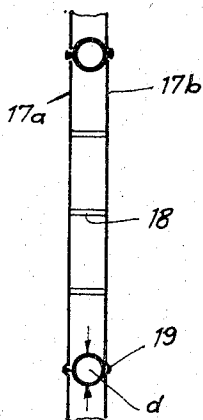


Fig. 2

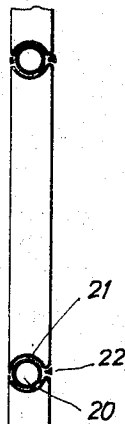


Fig. 3

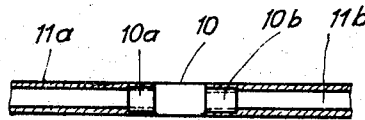


Fig. 4

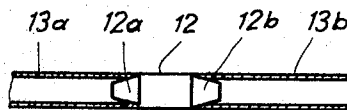


Fig. 5

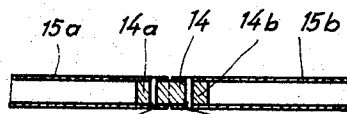


Fig. 6

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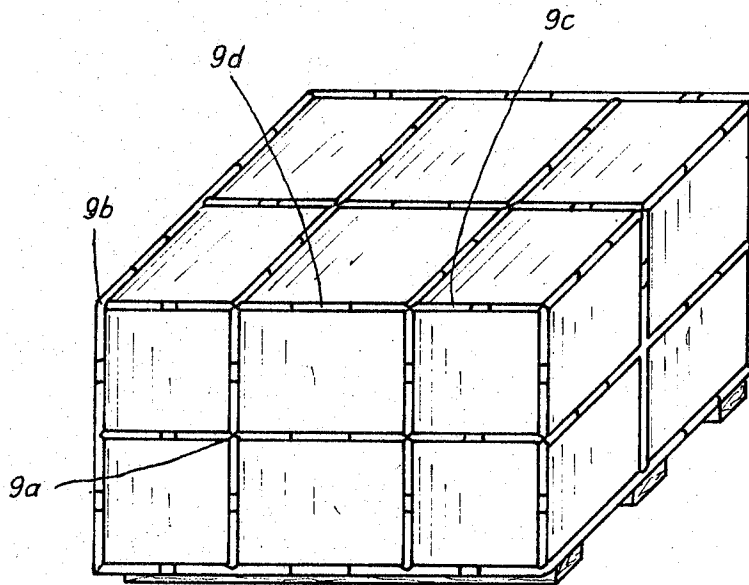


Fig. 7

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STORAGE TANK FOR FLUIDS

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19 Claims. (Cl. 220—5)

This invention relates to a storage tank for fluids and more particularly to a storage tank which serves as an oil storage tank or as a water tank to be used, for example, as a swimming pool.

The main object of the invention consists in to provide a tank of the aforesaid kind which can be constructed practically in any dimension with only a small number of types and sizes of tubular elements and plates.

Another object of the invention consists in to provide a tank of the general character described with which a wide range of possible variations is obtained not only in length but also in height and breadth.

Yet another object of the invention consists in to provide a tank of the aforementioned character with which assembling can be performed in a short time with a few simple manipulations so that also the costs are greatly reduced.

Still another object of the invention consists in to provide a tank of the kind in question with which the constructional elements can be prefabricated with the required degree of accuracy in series production.

A further object of the invention consists in to provide a tank of the character described having a small weight and a high rigidity.

Another object of the invention consists in to provide a storage tank of the character aforesaid which comprises in combination: a skeleton-like framework serving to give the said tank the necessary coherence, said framework being constituted by tubular elements releasably connected with each other, said tubular elements having arms extending from a center point radially in outward direction in the manner of the arms of a cross or a star; individual plates being each composed of at least one wall element, said plates being fixedly held by, and between, the arms of the said tubular elements, whereby said plates constitute each a portion of a tank wall.

These and other objects, features and advantages of the present invention will become further apparent from the following detailed description thereof.

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

FIG. 1 is a diagrammatical perspective view of a storage tank or container in accordance with the invention as viewed from one side,

FIG. 2 is a sectional view along the line II—II of FIG. 1 of the arrangement according to FIG. 1,

FIG. 3 is a view similar to that of FIG. 2 of a modified embodiment of the invention,

FIG. 4 is a vertical sectional side view of a detail of the arrangement according to FIG. 1 from which the connection between two arms of adjacent tube-elements can be taken,

FIG. 5 is the detail according to FIG. 4 in a modified embodiment of the invention,

FIG. 6 is the detail according to FIG. 4 and 5 in another modified embodiment of the invention, and

FIG. 7 is a schematical perspective view of a further modified embodiment of the invention.

The storage tank or container shown in the drawings can be used, for example, as oil tank or as swimming pool. It has a skeleton-like framework constituted of tube-elements which can releasably be connected and, further,

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individual plates which are held between the arms of the tube-elements forming the skeleton-like framework of the container. These sheets may be single or double-walled, each forming a portion of the container wall or side. As may be realized especially from FIG. 1, the framework of the container has the shape of a prism with rectangular section.

The skeleton-like framework of the embodiment represented in FIG. 1 consists of three types of tube-elements, namely of cross pieces 1, of corner pieces 2, and of edge pieces. The cross pieces have four arms 1a, 1b, 1c, 1d going out cross-like from a common center, their longitudinal middle axes extending and being contained in one and the same plane. The corner pieces 2 have three arms 2a, 2b, 2c, going out star-like from a center and forming two by two angles α , β , γ of 90 deg., their middle axes extending and being contained in three different planes 4, 5, 8 which in their turn form two by two angles of 90 deg. between them. The edge pieces 3 have four arms 3a, 3b, 3c, 3d which go out cross-like from one center with their longitudinal axes being contained three by three in two planes 6, 7 forming a right angle between them, each of which forming a right angle δ_1 , δ_2 , δ_3 , δ_4 with the neighbouring arm. The longitudinal axes of the arms of the corner pieces 2 are contained in planes 4, 5, 8 extending rectangularly to each other and intersecting along three edges which are rectangular to one another and which correspond to the longitudinal axes of the arms of the corner pieces. The longitudinal axes of the arms of the edge pieces are contained in two planes 6, 7 which extend rectangularly to each other and intersect along an edge that corresponds to the longitudinal axes of two opposite arms of edge pieces. Each corner piece forms one of the eight corners of the skeleton-like framework, and the edge pieces—taken individually or in rows—form the longitudinal or cross edges of the skeleton-like framework, whereas the cross pieces serve to stiffen and to reinforce the walls of the container, joining and connecting to that purpose the edge pieces with one another.

In an embodiment of the invention only schematically indicated in FIG. 7, there are incorporated in the skeleton-like framework, in addition to the cross pieces 9a, the corner pieces 9b and the edge pieces 9c, also additional tube-like supplementing elements 9d which can be added to or inserted between the above described normal tubes elements if the wall of the container has to be enlarged in a certain manner. As it is to be seen from the drawings, the arms of the cross pieces and those of the edge or corner pieces are equal in length, whereas the arms of the supplementing elements have lengths corresponding approximately to half the length of the arm of a tube element. In this way to each wall of the container a length can be given which at least corresponds to the sum of the length or breadth of a cross piece and the doubled length of an arm of an edge piece or a corner piece, whereas its breadth at least corresponds to the sum of the breadth or length of a cross piece and the doubled length of an arm of an edge piece or a corner piece. By means of the tube-elements and of the eventually provided additional supplementing elements containers of any dimensions can be built with only a small number of sizes of elements. Thereby it is possible to have the breadth and/or the length of an individual plate representing a portion of the container wall to correspond to or to slightly exceed the double length of an arm of a tube-element.

As it can be seen from the drawings, the arms or tube-elements are hollow and conveniently circular in cross section, but there is no objection to let them have, for example, a square section.

The tube-elements are connected with each other by means of connecting pieces to which the arms of the tube-

elements are releasably connected, for instance, by means of a plug-in connection. With the embodiment according to FIG. 4, the connecting pieces are constructed as threaded nipples, which are provided outside with right-handed threads on the one ends 10a and with left-handed threads at the other ends 10b, the arms 11a resp. 11b of the tube-elements equipped with the corresponding inside thread being screwed on these ends. The assembly is most simple because on account of the arrangement according to the invention only the arms have to be joined to the ends of the connecting pieces whereby by simply rotating or turning the connecting pieces the two arms of the tube-elements can be simultaneously screwed onto the connecting pieces. With another embodiment of the invention the connecting pieces 12 are constructed as a double cone with ends 12a, 12b diminishing or tapering in opposite directions, whereby onto each of these ends an arm 13a, 13b of a tube-element is slipped which is joined and connected with the connecting piece by glueing, for example, by means of a so-called metallic adhesive. With the embodiment represented in FIG. 6, the connecting pieces have the shape of a cylinder 14, onto the ends 14a, 14b of which the arms 15a, 15b of tube-elements are slipped which are releasably connected with the connecting pieces, for example, by means of locking pins 16a, 16b. The assembly of these variations is likewise most simple.

The individual plates representing wall portions of the container consist of two sheets 17a, 17b with rectangular or square cross section which are approximately equal in size and run parallelly with each other. These sheets are kept at a distance from one another corresponding to the thickness *d* of the arms of the tube-elements by approximately uniformly distributed intermediate bars 18. With the embodiment according to FIG. 2, the individual sheets embrace the arms of the tube-elements from above and from below, overlapping them approximately to the middle, whereby the sheets of the plates can be connected at the butt joints by means of a metallic adhesive, as indicated at 19. With the embodiment shown in FIG. 3, the sheets have covering parts 21 on the side facing the arms of the tube-elements and shaped according to the periphery of these arms 20, whereby the sheets are put onto the arms and held on these arms by their shape. In addition, these sheets can be glued together as indicated at 22 in FIG. 3. In that case, too, it is recommendable to use a metallic adhesive, for instance, the adhesive known in the trade under the trademark "Araldit."

The skeleton-like framework of the storage tank or container and/or the sheets covering the interspaces can be made of metal, for example, of steel tubes or iron plates, however, the one or the other or both may be made of synthetic or artificial material. Finally, the necessary connecting pieces as well as the supplementing elements can consist also of metal or synthetics.

Although my invention has been illustrated and described with reference to the preferred embodiments thereof, I wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed my invention, what I claim is:

1. A storage tank for fluids comprising in combination: a skeleton-like framework serving to give the said tank the necessary coherence, said framework being constituted by tubular elements releasably connected with each other, said tubular elements having arms extending from a center point radially in outward direction in the manner of the arms of a cross or a star; individual plates being each composed of at least one wall element, said plates being fixedly held by, and between, the arms of the said tubular elements, whereby said plates constitute each a portion of a tank wall.

2. The storage tank set forth in claim 1, wherein the

said framework has the shape of a prism with rectangular cross section.

3. The storage tank set forth in claim 1, wherein the said framework is constituted of three types of tubular elements, namely of cross pieces having four arms going out cross-like from a center point and being, two by two, rectangular to one another and having longitudinal middle axes contained in a sole common plane, further, of corner pieces having three arms going out star-like from a center point and being, two by two, rectangular to one another and having longitudinal middle axes contained in planes perpendicular to one another, and, finally, of edge pieces having four arms going out cross-like from a center point, the longitudinal middle axes thereof being contained, three by three, in planes rectangular to one another, each arm forming with the adjacent arm an angle of 90 deg.

4. The storage tank set forth in claim 3, wherein the longitudinal middle axes of the arms of the corner pieces are contained in three planes rectangular to one another which intersect along three edges perpendicular to one another and corresponding to the longitudinal axes of the arms of the corner pieces.

5. The storage tank set forth in claim 3, wherein the longitudinal middle axes of the arms of the edge pieces are contained in two planes rectangular to one another which intersect along an edge corresponding to the longitudinal axes of two arms of edge pieces opposite to one another.

6. The storage tank set forth in claim 5, wherein the corner pieces constitute the corners of the framework and the edge pieces partake in constituting the longitudinal edges or cross edges of the framework, whereas the cross pieces contained within an area enclosed by corner pieces and edge pieces serve for stiffening the tank walls and connect to this end the edge pieces with one another.

7. The storage tank set forth in claim 1, wherein the arms of the tubular elements are hollow and have circular cross section.

8. The storage tank set forth in claim 1, wherein the tubular elements are interconnected by means of intermediate pieces to which the arms of the tubular elements are releasably secured.

9. The storage tank set forth in claim 8, wherein the said intermediate pieces consists each of a threaded nipple having on one end a right-handed thread and on the other end a left-handed thread, arms of tubular elements being screwed onto the said ends of said nipple, said arms being provided to this end with corresponding internal threads.

10. The storage tank set forth in claim 8, wherein the said intermediate pieces are constructed as a double cone with ends tapering in opposite directions, whereby over these ends an arm of a tubular element is slipped which is connected with the said intermediate piece by glueing.

11. The storage tank set forth in claim 8, wherein the said intermediate pieces have the shape of a cylinder over the ends of which an arm of a tubular element is slipped which is releasably connected with the said intermediate piece.

12. The storage tank set forth in claim 1, wherein the said individual plates constituting each a portion of the tank wall consist of two sheets of approximately equal size with square or rectangular cross section and running parallelly to one another which are held spaced from one another at a distance corresponding to the thickness of the arms of the said tubular elements by means of uniformly distributed intermediate bars.

13. The storage tank set forth in claim 12, wherein the said individual plates constituting a portion of the tank wall embrace the arms of the tubular elements from above and from below thereby overlapping them approximately to the middle, the sheets of the said plates being connected at their butt joints by glueing.

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14. The storage tank set forth in claim 12, wherein the said individual plates have on their sides facing the arms of the said tubular elements a covering part shaped according to the periphery of these arms, whereby the said sheets are put onto the arms and held on these arms due to their shape, and by engagement between them and the said arms, they being also interconnected by glueing.

15. The storage tank set forth in claim 1, wherein at least one of the elements of the group consisting of the framework of the tank and the individual plates covering the interspaces and the intermediate pieces consists of a substance of the group constituted by metal and artificial material.

16. The storage tank set forth in claim 3, wherein the said arms of the said cross pieces and those of the said edge pieces and of the said corner pieces of the said tubular elements are equal in length.

17. The storage tank set forth in claim 16, wherein the

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said frame work incorporates tubular supplementing elements the length of which corresponds approximately to the half length of an arm of a tubular element.

18. The storage tank set forth in claim 1, wherein the breadth and the length of an individual plate constituting a portion of a tank wall corresponds at least to an arm of a tubular element.

19. The storage tank set forth in claim 3, wherein each wall of the said tank has a length which corresponds at least to the sum of the length or breadth of a cross piece and of the double length of an arm of an edge piece or corner piece, whereas its breadth corresponds at least to the sum of the breadth or length of a cross piece and the double length of an arm of an edge piece or corner piece.

No references cited.

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