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MULTIPLE COMPARTMENT TANK

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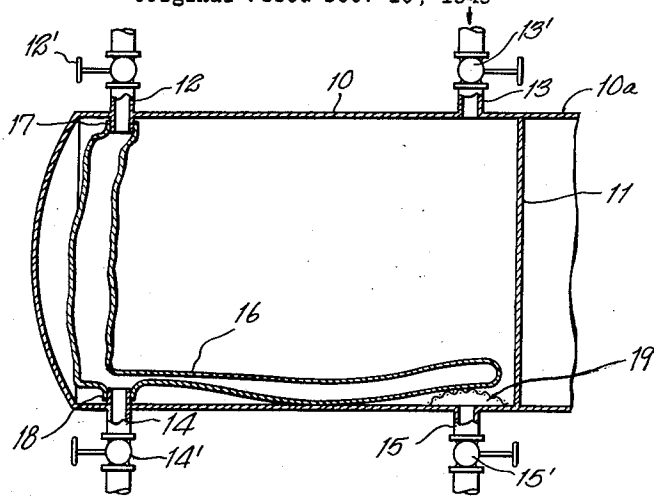


Fig. 1.

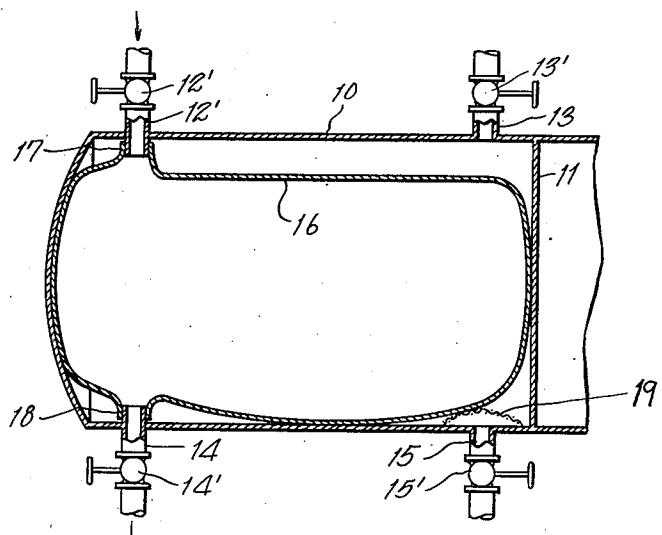


Fig. 2.

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MULTIPLE COMPARTMENT TANK

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Original application December 10, 1949, Serial No. 132,291. Divided and this application April 22, 1953, Serial No. 350,300

1 Claim. (Cl. 220—63)

This invention relates to a commodity carrier. More particularly it relates to a tank-type carrier adapted to accommodate at different times and without an intervening tank cleaning operation any number of full loadings of two different liquids without subjecting either liquid to contamination by residue of the other.

This application is a division of the copending application Serial No. 132,291, filed December 10, 1949.

The use of a tank wagon to transport a capacity load of an unrefined stock, such as crude oil, from a storage point to a refinery and then to carry a capacity load of a refined stock, such as gasoline, on the return or other ensuing trip has heretofore required thorough cleaning of the tank after unloading the crude stock to remove all remnants thereof in order to prevent contamination of the refined product. Where effective purging operations cannot be readily or economically performed, it has been necessary to allocate one tank wagon for each product transported, resulting in non-productive return trips with an empty tank.

Two different species of an invention for overcoming the economic disadvantages of conventional tank wagons are disclosed in the said copending application. In one species a flexible single-sheet diaphragm is attached girthwise to the walls of a horizontally disposed cylindrical tank approximately midway between the ends. Sufficient slack is provided to enable the diaphragm to be forced to one end of the tank or the other. With separate sets of inlet and outlet openings provided in the tank on both sides of the diaphragm, the tank may be filled to capacity and emptied at different times with incompatible liquids without cross contamination.

By the use of this arrangement, however, regardless of which way the tank is filled, a portion of the bare walls of the tank as well as one surface of the flexible diaphragm are necessarily engaged by the liquid, making it necessary to limit the use of the tank to fluids which will not harm the walls of the tank, or alternatively to coat the inside walls of the tank with a protective barrier.

Another disadvantage of the aforescribed arrangement is that the attachment of a diaphragm girthwise within a cylindrical tank necessitates the use of an elaborate joint construction to effect a liquid-tight, mechanically strong seal. Most existing tanks are not readily adapted to such diaphragm installation in the absence of structural modifications. For example, one means for attaching the diaphragm requires the use of a two-part tank construction, the diaphragm being clamped therebetween. A still further disadvantage resides in the fact that the inherent partitioning nature of the diaphragm requires a more or less symmetrical tank as well as a mounting for the diaphragm which bisects the tank. Moreover there are further limitations imposed on the location of the bisecting diaphragm so as to avoid the creation of undrainable pockets for liquid within the tank.

It is therefore one object of the species of the invention of this application to provide an improved tank construction whereby the same tank may be filled to capacity at

different times through different inlets with no possibility of cross contamination and whereby for at least one mode of filling the inside walls of the tank are completely shielded from the liquid, in the absence of additional protective means.

Another object of the invention is to provide an improved tank construction which may be incorporated in tanks of a wide variety of shapes and which may use inlet and outlet connectors disposed at a wide variety of positions on the tank.

Still another object of the invention is to provide an improved design for affording separate filling areas within a single tank which may be carried out with minimum structural modifications and which may be readily applied to existing tanks of many designs.

These and other objects and features are attained in accordance with the present invention by fitting a liquid-tight tank, which may be of any particular shape, with two sets of inlet and outlet connectors, preferably at the top and bottom, respectively, of the tank. To one set of connectors is attached a bag-type member having flexible, liquid-tight walls capable of assuming substantially the same shape as the inside of the tank. These connectors communicate with the inside of the bag-type member. In this fashion the tank may be filled to capacity and then drained by means of the first set of connectors, and then filled to capacity and drained by means of the second set of connectors. In the former case the bag-type member will completely line the inside walls of the tank so that liquids may be accommodated which are harmful to those walls. In the latter case the inside walls of the tank will be engaged directly by the liquid. However, if both liquids to be accommodated are harmful to the walls of the tank, additional bag-type members, each with its own inlet and outlet, may be provided within the tank. In any case, there will be no surfaces common to both inlets so that residual liquid accommodated by the first set of connectors will never contaminate liquid accommodated by the second set. When the second set of connectors is used, the bag-type members will collapse.

In order to prevent the bag-type member from blocking the outlet connector of the second set of connectors, a raised, perforate shield may be disposed thereover.

The invention may be better understood by reference to the accompanying drawing in which:

Figure 1 is a side view in cross-section of a portion of a tank assembly formed in accordance with present invention; and

Figure 2 is a view corresponding to Figure 1 showing the arrangement of tank parts when the tank is filled to slightly less than capacity through one of the inlet connectors.

In the illustrated embodiment of the invention there is shown a liquid-tight tank 10 which may, if desired, be formed within a shell common to other and like tanks such as the tank 10a, the two tanks otherwise being entirely separated by virtue of a liquid-tight barrier 11. A pair of inlet connectors 12 and 13, which may include suitable valves 12' and 13', respectively, are fitted in the tank in the vicinity of its upper end. A pair of outlet connectors 14 and 15, which may include valves 14' and 15', respectively, are fitted in the tank in the vicinity of its lower end.

Contained within the tank 10 is an imperforate flexible, bag-like member 16 formed of rubber, plastic, treated fabric, or other suitable material and secured to the inlet connector 12 and the outlet connector 14 in liquid-tight joints 17 and 18 so that liquid may be passed in and out of the flexible member 16. When filled to capacity through the inlet connector 12 the flexible member overlies the inner surfaces of the tank and assumes the con-

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tours thereof. This liquid can be withdrawn only through the outlet connector 14 and none will ever engage the unprotected walls of the tank. For this reason a liquid may be accommodated to the full capacity of the tank which is harmful to the material of which the rigid walls are formed. Thus, for example, the tank may be formed of metal and, nevertheless, be utilized to accommodate harmful acids by utilizing a flexible member formed of a material suitably impervious to the action of the acids.

The tank may also be filled to capacity through the inlet 13, in which case the flexible member 16 will be caused to collapse thereby occupying very little total volume within the tank. The outlet connector 15 is provided for emptying the products taken on through the inlet connector 13 and so that it will not become clogged by the flexible bag member, a suitable barrier in the form of a screen or perforate shield 19 offset from the inner surface of the tank is provided.

Because the flexible member 16 prevents any exposure of the inside walls of the tank to the liquids introduced through the inlet connector 12, there is no possibility of contamination of a liquid product taken in through that inlet by remnants of a liquid taken in through inlet 13. It follows that a liquid introduced through the inlet 13 is not subject to contamination by residual liquid previously introduced through this inlet 12.

The tank 10 may, if desired, be filled partially through each of the inlets, with the flexible bag member preventing intermixing. It should be noted that the overall tank assembly may be divided into a multiplicity of tanks within the purview of the invention as by the rigid inner wall or barrier 11 so that a plurality of separate tanks are provided, each of which may be fitted with a flexible member as described above. Also, within the purview of the invention, at least two flexible bag-type members may be used within each tank, one being collapsed within the tank at such times as the other is filled, or the two being utilized concurrently to accommodate partial loadings of different liquids simultaneously and independently. Each flexible member will of course have its own inlet connector and in no case will the bare inside walls of the tank be engaged by the liquids.

It will be understood that the flexible inner bag member by its collapsing action tends to prevent exposure of liquids stored therein to excessive amounts of air, and consequently prevents vapor losses from volatile liquids.

From the foregoing detailed description of preferred embodiments of the invention it will be apparent that

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modifications may be made, within the spirit of the invention, to provide tanks formed into compartments by internal bag-type members and accordingly the invention should not be limited to the specific embodiments described above but should be determined in scope by the following claim.

I claim:

A tank assembly adapted to accommodate loadings of non-compatible liquids at separate times, comprising, a liquid-tight tank having at least first and second spaced apart inlet connectors disposed in the vicinity of the top of the tank, at least first and second spaced apart outlet connectors disposed substantially in vertical alignment with said first and second inlet connectors respectively and located in the vicinity of the bottom of the tank, a bag-type container having flexible liquid-tight walls and mounted within the tank to define a closed space therein, said flexible bag-type container having a size and shape, when filled, corresponding substantially to the size and shape of the interior of the tank, and means forming an inlet and an outlet respectively in the top and bottom of the bag-type container and joined respectively to the first inlet and first outlet connectors of the tank in fluid-tight unions, said connections forming the sole securing means of said bag-type container within said tank whereby the tank may be filled through said first inlet connector and drained through the corresponding outlet connector, during which the interior walls of the tank will be shielded throughout from the liquid by means of the bag-type container, and during which residual liquid in the tank from a preceding loading accommodated by the second inlet and outlet connectors will be unable to contaminate the liquid, and whereby the tank may be filled through the second inlet connector and drained through the corresponding outlet connector, during which the flexible bag-type container will be collapsed on itself to bring its opposite internal surfaces into engagement.

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