Oct. 17, 1944. J. A. SPERRY 2,360,525

SELF-SEALING TANK

Filed June 15, 1943

Fig. 1.

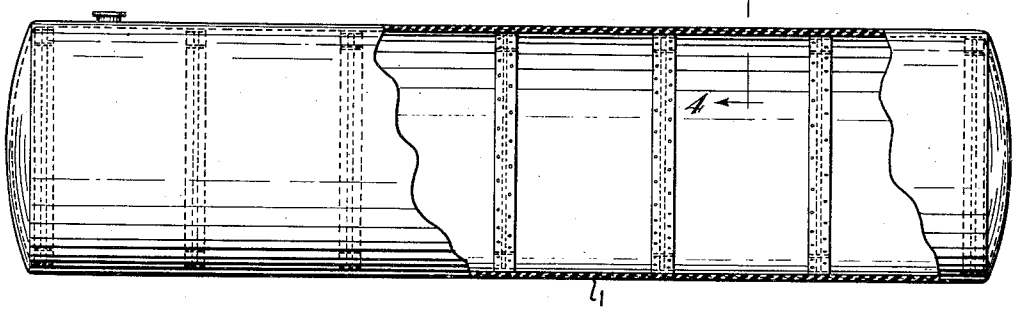


Fig. 2.

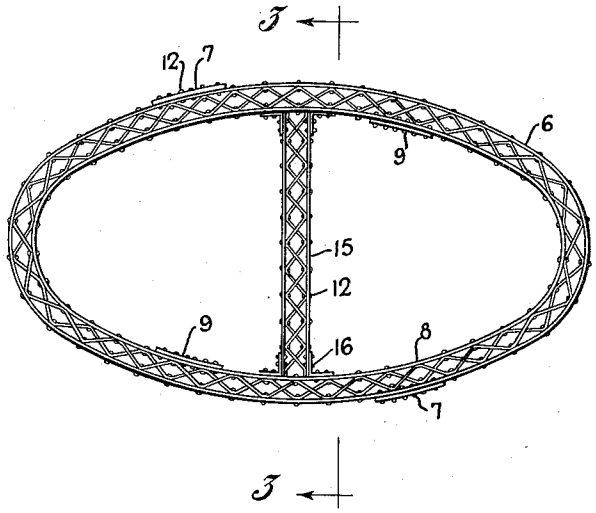


Fig. 3.

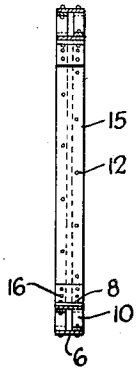
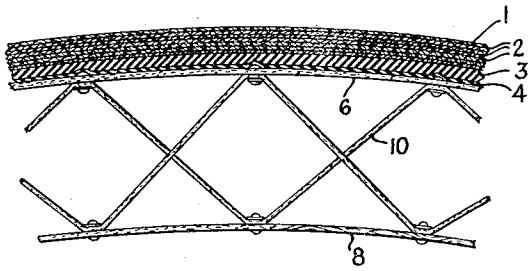


Fig. 4.



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SELF-SEALING TANK

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2 Claims. (Cl. 220—71)

The present invention relates particularly to the construction of self-sealing gasoline tanks such as used for storage of gasoline, especially for airplanes. It is designed to overcome certain serious defects in prior tank constructions for this general purpose.

When such a tank is pierced by a high speed bullet, a powerful surge is set up in the body of the liquid which, in former tank constructions, has proved to be highly destructive. It is necessary to reinforce tanks of this type, the walls of which are composed of fabric and rubber including a self-sealing layer or stratum, by ribs and struts located interiorly of the tank. It has been found, however, that the powerful surge generated by the entrance of the bullet has often stripped out the usual reinforcing ribs and struts. By the design and construction shown herein, the destructive effect of the surge has been eliminated and the tank is able to withstand the powerful forces generated by a bullet.

In the drawing is shown the best known and preferred tank construction as it has been developed and perfected, but it will be understood that changes and modifications may be made therein without departing from the essential features of the invention as set forth in the appended claims.

In the drawing is shown a typical bullet-proof or self-sealing tank, in which

Fig. 1 is a side elevation of a tank made in accordance with the invention, part of the tank wall being broken away to disclose the interior construction;

Fig. 2 is a side elevation of a reinforcing element or brace which has been found to withstand the destructive forces set up by the surging of the contents of the tank when a bullet enters the gasoline;

Fig. 3 is a cross-section on the line 3—3 of Fig. 2; and

Fig. 4 is an enlarged detail of a fragment of the tank wall showing the details of construction.

The numeral 1 indicates the wall of the tank which is usually composed of a multiplicity of layers of heavy rubberized fabric 2 and an inner layer 3 of a mastic composition which acts as the self-sealing medium. 4 indicates an inner covering layer of rubber or rubber-like material which is gasoline resistant. The general design of tank wall is well known and the construction illustrated and described is typical of any self-sealing wall construction.

In making the large tanks which are used in bombers and other large planes, it is necessary to provide reinforcing braces and ribs on the interior of the tank. Prior to the development of the form of tank shown herein, it has been customary to provide a series of solid flanges or webs and struts which offer substantial resistance to the wave or surge created by the bullet, with the result that the reinforcing members are bodily stripped from the walls. In the improved design shown herein, the struts or reinforcing members are so constructed that while they give an equal or superior reinforcement to the walls of the tank, they will offer relatively little resistance to the surge and will, therefore, remain in place. This result is accomplished by forming the reinforcing ribs or struts in the manner shown. These reinforcing elements are preferably made of vulcanized fiber sheeting of any well known type, for requisite lightness and strength. Tanks for the purpose are usually oval-shaped in cross-section and several braces or reinforcing ribs are distributed along the tank. In the preferred form shown herein, each reinforcing rib is composed of a continuous beam made of an outer vulcanized fiber layer 6 usually formed in two sections joined by the plates 7. An inner layer spaced from the layer 6 is indicated at 8 having tie plates 9, these plates being located at some distance from the plates 7. Joining the two layers 6 and 8 are two narrower strips of vulcanized fiber sheeting 10 which cross back and forth between the inner and outer layers 6 and 8, forming crossing diagonal ribs which are connected to the layers by rivets at the points where the strips contact the inner and outer layers.

Due to the material from which the reinforcing elements are made and the design of these members, they have a degree of flexibility which enables them to yield with the walls of the tank. This permits the entire structure to have the requisite flexibility so that the composite fabric and mastic tank walls will not separate or tear loose from the reinforcing elements under heavy stresses created when the liquid surges within the tank under the impact of a bullet. If the reinforcing elements were without the ability to come and go with the flexible outer wall the wall would be torn away. At the same time the reinforcing elements have sufficient rigidity to maintain the tank in its proper shape under normal conditions.

Extending across the short axis of the brace is the vertical strut 15 made of the same latticed construction and connected to the beams by angular tie plates 16. The entire structure which braces the walls of the tank is riveted together as shown, the rivets being made of aluminum or an aluminum alloy for lightness.

It will be seen that the open lattice work braces and struts are reticulated beams in which the component elements are all presented edgewise to the axis of the tank so as to offer little resistance to the flow of the liquid within the tank, whereby any surge or wave will pass through the reinforcing members and will not destroy or displace them.

Each reinforcing member is assembled in the form shown in Figs. 2 and 3 and is coated with a thermosetting cement or varnish and baked. When finished, the entire reinforcing member is sufficiently rigid to withstand successfully any crushing force which it will normally encounter. Each brace is cemented firmly to the interior of the tank wall. In smaller tank constructions or where it may be advisable to provide for a certain degree of flexibility of the tank the transverse strut may be omitted, the continuous beam giving sufficient bracing effect to the tank.

What is claimed is:

1. In a self sealing tank, the combination of a flexible outer wall of fabric and a self-sealing material, and a bracing member arranged transversely of the tank and attached to the inside surface of the outer wall and following the contour of the outer wall of the tank, said bracing member being in the form of a beam of open construction made from flat strips of vulcanized fibre connected together to form a lattice construction in which all of the strips are located with their major surfaces parallel to the longitudinal axis of the tank so that their edges are transverse to the direction of flow of the contents of the tank along the wall, whereby the contents of the tank may pass through the beam and the beam may flex with the wall of the tank when a surge is created therein.

2. In a self-sealing tank, the combination of a flexible self sealing outer wall of laminated fabric, and a bracing member arranged transversely of the tank and attached to the inner surface of the outer wall and following the contour of the outer wall of the tank, said bracing member being composed of a plurality of flat strips arranged in an open truss formation with all of their major surfaces parallel to the longitudinal axis of the tank and with their edges presented to the direction of flow of the contents along the tank wall, said bracing member thereby offering a minimum resistance to the flow of the contents and being sufficiently flexible to yield with the wall of the tank when a surge is created in the contents of the tank by the entrance of a projectile therein.

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