

June 12, 1945.

E. J. BRAUN

2,377,989

CAR LINING

Filed July 1, 1943

3 Sheets-Sheet 1

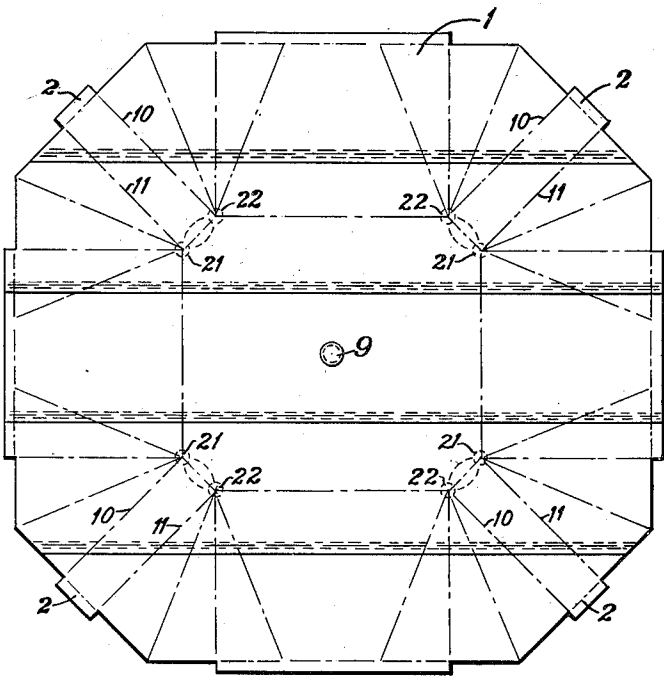


Fig. 1

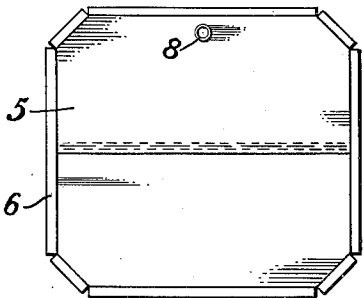


Fig. 2

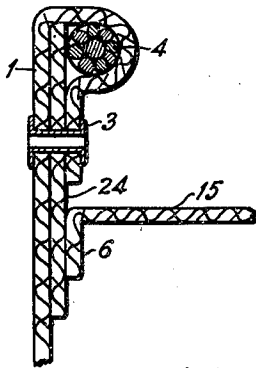


Fig. 3

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3 Sheets-Sheet 2

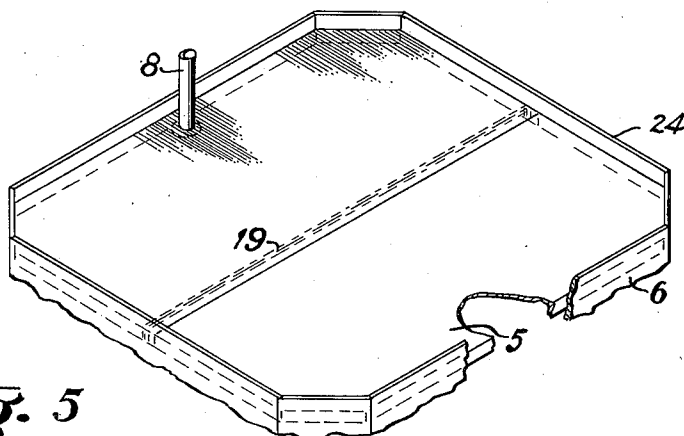


Fig. 5

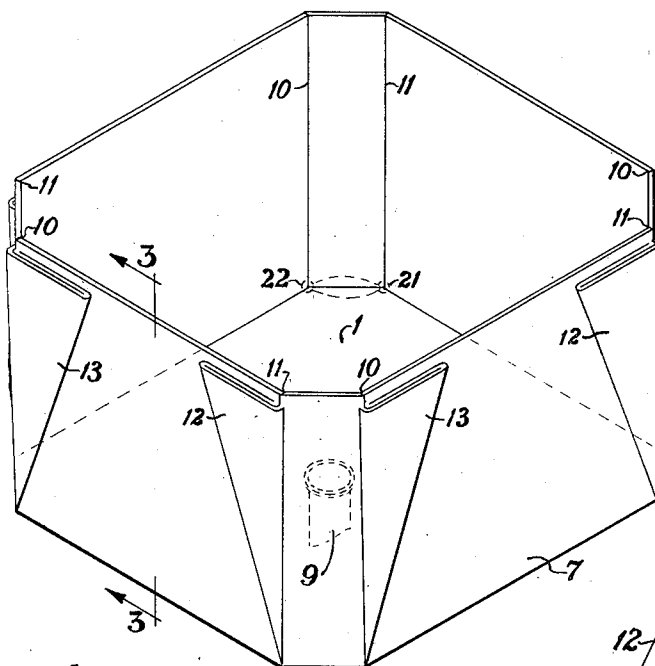
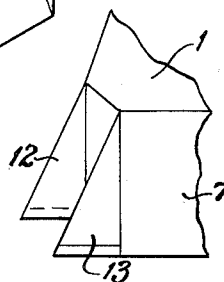


Fig. 4

Fig. 6



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3 Sheets-Sheet 3

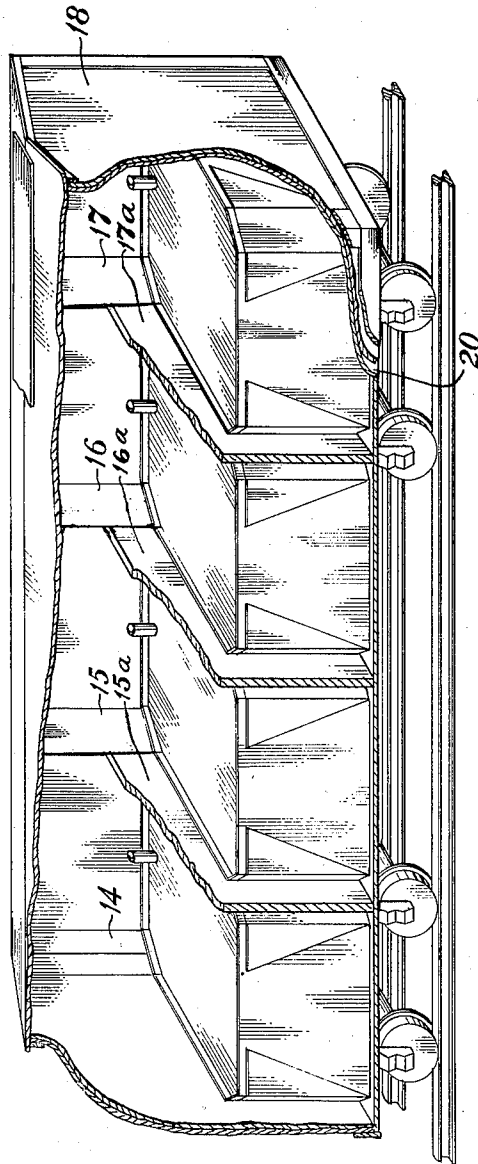


Fig. 7

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UNITED STATES PATENT OFFICE

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Application July 1, 1943, Serial No. 493,026

2 Claims. (Cl. 150—0.5)

This invention relates to a tank for use in a supporting enclosure and more particularly to a flexible tank suitable for holding hydrocarbon liquids, such as oils, petroleum, gasoline, and the like for storage or shipment.

Heretofore petroleum was shipped from the oil producing sections of the country to the non-oil producing sections by railroad tank cars and by seagoing tankers. At the present time the tankers are used for military purposes and the number of tank cars as well as storage tanks is inadequate to handle all of the requirements of the sections of the country which do not produce petroleum, particularly the Eastern States.

It is an object of this invention to provide flexible tanks for use in boxcars, barges and the like which are suitable for carrying large volumes of petroleum. It is also an object of this invention to provide a durable, flexible tank for storing liquids underground or with suitable supporting walls. Other objects will appear as the description of the invention proceeds.

These and similar objects are accomplished by the provision of a flexible tank prepared from a continuous sheet of a suitable fabric coated with a resistant coating, such as neoprene and Thiokol. The coated fabric sheet is folded in such a way that there are substantially no sharp corners as will be more apparent from the drawings and following description.

In the drawings Figure 1 represents a layout of a coated fabric before it is folded into the shape of a tank. Figure 2 represents a plan view of the cover of the tank. Figure 3 is a section of Figure 4 along the line III—III' with the modification that the cover is in place. Figure 4 is a perspective view of the tank showing the folding detail. Figure 5 is a perspective view of the cover. Figure 6 is a perspective view showing the tank draped over a form and manner of folding during its manufacture. Figure 7 is a side elevation, partly cut away, of a boxcar showing four tanks fitted therein.

In all of the figures, 1 represents a coated fabric from which the tank is prepared. The tank is raised into position by suitable means of which 2 designates tabs which are provided with grommets shown as 3. The tab is also folded over a rope 4. The sides of the tank may be held in position in the car or other enclosure by means of suitable hooks or similar supports attached to the supporting walls and inserted in the grommets 3. In Figure 1, the portions intended to be floor corners are reinforced by patches 21 and 22. The covering 5 is provided with peripheral flange 6

which is fastened to apron 24. This apron is subsequently attached to the tank and grommets are placed through the tank and the apron. The cover is also provided with an inlet or vent 8 which may be controlled by a suitable valve not shown. The floor of the tank is provided with an outlet 9 having suitable flanges and valves which are likewise not shown. The tank is prepared from a continuous sheet of coated fabric without stitching or cutting. In Figure 4 the surplus material is folded along the lines 10 and 11 and the folded material is shown as 12 and 13. In Figure 7 four tanks are shown in a standard boxcar. The car is shown as 18 and it is provided with a suitable smooth lining 20 which may be pressed wood fibres, "Celotex," heavy paper, or the like. The corners of the car are provided with a filler or other suitable means 14 which fills the corner and has a triangular cross-section. Similar strips 15, 16, and 17 are provided between the adjacent tanks. Partitions between the tanks are shown as 15a, 16a and 17a. These form a strong bulkhead for each tank.

In preparing the tank a suitable fabric such as a No. 6 duck weighing approximately 21 to 22 ounces per square yard is dried for about an hour at 220° F. The fabric is then impregnated with two coats of a cement having the following composition:

30

Composition A

Neoprene.....	60 lbs.
Cumar.....	3 lbs.
Pine tar.....	2 lbs.
35 Magnesia.....	2 lbs. 8 ozs.
Anti-oxidant ¹	1 lb.
Super fine whiting.....	10 lbs.
Soft carbon black.....	5 lbs.
Zinc oxide.....	3 lbs.
40 Accelerator (benzothiazyl disulfide).....	3 ozs.

¹The anti-oxidant used in this composition is that known as Neozone A although other anti-oxidants well known in the art may be used.

45 100 lbs of the above composition was churned with 25 gallons of a suitable solvent. A satisfactory solvent for this preparation is Solvesso No. 1 sold by the Standard Oil Company. About 10 ounces of solids of this composition were applied to the fabric in two coats after which the fabric was dried at about 160° F. for four hours. It was then returned to a spreader and six coats of the following composition was applied to one side of 55 the fabric.

Composition B

Neoprene	41 lbs.
Magnesia	1 lb. 12 ozs.
Soft carbon black	25 lbs.
Fine particle whiting	21 lbs.
Oil ¹	3 lbs.
Anti-oxidant ²	12 ozs.
Stearic acid	8 ozs.
Factice ³	5 lbs.
Zinc oxide	2 lbs.

¹ A suitable oil for this purpose is sold as "Circo" by the Sun Oil Company and is a high naphthenic content mineral oil.

² The anti-oxidant used in this composition is the same as used in Composition A.

³ The factice used in this composition was Neophax A.

100 lbs. of the above composition was churned with 20 gallons of industrial xylol until a smooth homogeneous cement was obtained. This cement filled all of the interstices and increased the weight of the fabric about 8 ounces per square yard. The fabric was then dusted with talc on the coated side and dried for about 1½ hours at 160° F. The opposite side of the fabric was then coated with 1½ ounces per square yard of Composition A applied in three coats. The material was then dried after which a calender coat approximately .020 inch thick was applied to the base coated side. The composition used for the calender coat is Composition B from which has been omitted the solvent. The coated fabric is then cured in an oven for 3 hours at 260° F.

The material is now ready for use in preparing the tank. In tanks of relatively large dimension, such as would be used in boxcars, it is necessary to cement several lengths of fabric together longitudinally although such seams are avoided as far as possible. A satisfactory cement for use in joining the seams is given below:

Composition C

Neoprene	75 lbs.
Resin ¹	25 lbs.
Magnesia	3 lbs. 8 ozs.
Anti-oxidant ²	1 lb. 8 ozs.
Zinc oxide	6 lbs.

¹ The resin used in this composition is that sold for such purposes by the Resinous Products Company as R.6.3 resin and is described as a modifier and extender.

² The anti-oxidant used in this composition is sold under the trade name Neozone D.

The edges of the seams are taped with a cured sheet which may be prepared from the following composition:

Composition D

Neoprene ¹	36 lbs.
Neoprene ²	5 lbs.
Magnesia	1 lb. 12 ozs.
Soft carbon black	25 lbs.
Fine particle whiting	21 lbs.
Circo oil	3 lbs.
Anti-oxidant ³	12 ozs.
Stearic acid	8 ozs.
Neophax A	5 lbs.
Zinc oxide	2 lbs.

¹ The type of neoprene used is that sold under the name of Neoprene GN.

² The type of neoprene used is that sold under the name of Neoprene ILS.

³ The anti-oxidant used in this composition is that known as Neozone A.

The composition described above is made into a sheet and cured and is subsequently used for taping the edges of the seams.

After the fabric is coated and cemented into sheets of the proper size, it is cut out as shown in

Figure 1. Tape is applied where necessary for reinforcement by rolling it to prevent air gaps between the tape and fabric base. Gaskets of the base material or other similar coated fabric are provided around the outlet hole 9 after which the suitable flanges and outlet pipe are provided. Before cementing or reinforcing any particular area, it should be sanded and a cement which is resistant to the liquid used in the tank should be applied. Reinforcements 21 and 22 are applied to the corners on the inside of the tank. It is then draped over a form of proper dimensions. The form should be substantially a quadrilateral having its corners cut off or truncated. The excess material is then arranged as shown in Figure 6 leaving triangular flaps 12 and 13 extended beyond the truncated corners. These flaps are then folded against their respective sides of the adjacent quadrilateral side of the form and fastened. The same procedure is applied to each of the corners and after the tank is withdrawn from the form, these flaps will be folded and fastened as shown in Figure 4. The fabric sheet is then removed from the form.

The top of the tank is then prepared by forming an apron 24. The cover itself is cut out as shown in Figure 2. After proper sanding and cementing it is attached to the tank as shown in Figure 3. The protruding portion of the tank is then folded over a rope 4 and cemented to the inside of apron 24. The protruding portion of the combined tank and apron is provided with grommets 3 also shown in Figure 3. The tank except the top and bottom is placed in a suitable oven and cured. The top and bottom are similarly cured and are then firmly joined to the sides by cold cementing. It is to be understood that all edges are treated with cement to prevent wicking and leaking. Likewise the corners, particularly at the base of the tank, are provided with reinforcing patches cemented in place shown as 21 and 22. The cover is also provided with a vent 8 similar to the outlet 9 which is securely fastened by suitable means, such as a flange, to the cover 5. This vent may be used in some circumstances as an inlet although it is preferred to fill and empty the tank through the outlet 9 in the base.

While the invention has been illustrated by the use of neoprene as the liquid-proofing agent, it is to be understood that other synthetic rubbers or similar material may be used provided they are resistant to hydrocarbon liquids to which the tank is adapted. Examples of such material are known in the art as Thiokol, Perbunan or Hycar.

The present invention offers many advantages over similar tanks heretofore used. One of the principal advantages is that it is prepared from essentially one piece of tarpaulin having no seams as a result of tailoring or fitting the tank into a confined space. All fitting is done by suitable folding. Another advantage of the present invention resides in the manner in which the surplus material shown as 12 and 13 is folded away from the truncated corners and along the longer sides of the tank. This construction prevents wear and abrasion between the tank and the supporting wall, particularly when the tank is used in a boxcar in which there is constant vibration and surges while in motion. The tank has no sharp corners and this permits free flow of liquids and a substantial elimination of strain and wear due to abrasion between the tank and its supporting bulkhead. Another advantage is that the flexible top rests on the liquid and func-

tions as an effective damper or baffle when the tank is subjected to change in speeds as when the train stops or starts. These results are also obtained by the truncated piece of the corner in which surges of liquid are deflected gently rather than by the four sides of a corner of a tank having right angle corners. The apron around the top of the tank to which the cover is attached prevents a shearing action between the top of the tank when the liquids surge and also provides a simple and efficient manner of attaching the cover to the tank with the seams. It will also be obvious that most of the materials used in the tank are available at the present time and save metal.

It is apparent that many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, and therefore, it is not intended to be limited except as indicated in the appended claims.

I claim:

1. A flexible tank adapted for transporting in boxcars hydrocarbon liquids comprising a substantially integral sheet of fabric coated with a synthetic rubber-like material which is highly resistant to the hydrocarbon liquids to be stored in the tank, the said fabric being folded in a manner such that a substantially four-sided figure is obtained having truncated corners, the excess fabric at the said truncated corners being folded away from the truncated section and along the side of the said four-cornered figure, a cover cemented to an apron, the said apron being disposed peripherally about and cemented to the interior of the said tank near and below its upper edges, grommets through the upper edge of the apron for supporting the said tank, an inlet in the floor of the tank and a vent in the cover.

2. The tank described in claim 1 in which the fabric is impregnated with neoprene.

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