Aug. 27, 1957 T. A. HARTLEY 2,804,228

FLOATING ROOF FOR STORAGE TANKS

Filed Aug. 31, 1955

Fig. 5

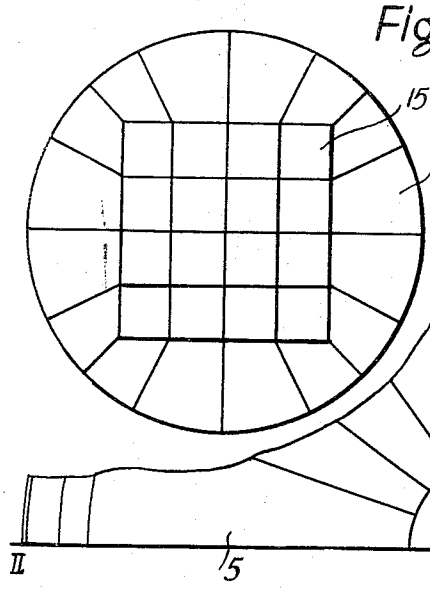

Fig. 1

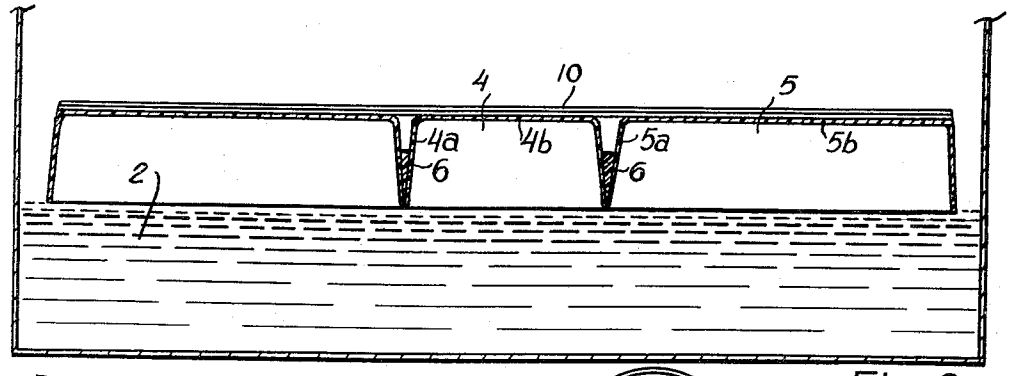

Fig. 2

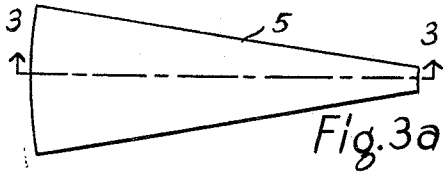

Fig. 3a

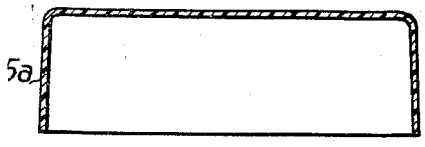

Fig. 3b

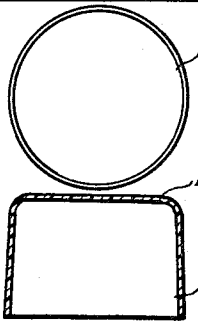

Fig. 4a

Fig. 4b

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FLOATING ROOF FOR STORAGE TANKS

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5 Claims. (Cl. 220—26)

The present invention relates to improvements in floating roofs for use in storage tanks, and more particularly to such roofs which may be installed in existing as well as in new tanks.

Floating roof tanks are used for storing volatile liquids such as oil, gasoline and certain chemicals. In such tanks, the roof floats on top of the liquid and rises and falls with the liquid level. Various types of floating roofs have been proposed in the past for use in tanks of this type, practically all of them making use of pontoons to maintain the buoyancy of the roof. Some of these roofs have been designed specifically to eliminate any vapor space between the liquid level and the roof to lessen or prevent corrosive effects of volatile liquid vapors. In addition to evaporation losses, corrosion has been one of the problems encountered in this field.

It is one object of the present invention to provide an economical, corrosion-resistant floating roof which may easily be installed piece-meal in any vertically cylindrical storage tank containing a fluid which is to be protected from air contact and evaporation.

It is another object of this invention to provide individual sections for a plastic floating roof, such sections being characterized by their ease of handling and small volume while in the unassembled condition.

It is a further object of this invention to prevent loss of valuable vapors and to provide a space permitting the convenient collection of such valuable vapors which are given off by the liquid in the storage tank.

I have accomplished the above and other objects and overcome various disadvantages of prior floating roofs by constructing a floating roof of a plurality of sections each having the form of an inverted pan and being made of a light corrosion-resistant material which is chemically inert to the fluid stored in the tank. Suitable materials include synthetic resins, metals or alloys; a preferred material is fiberglass. The necessary buoyancy of the roofs of my invention will be assured by the vapor-filled pockets formed between the liquid level and the bottoms of the inverted pan sections of the roof. Furthermore, liquid vapors collecting in these vapor pockets will add to the buoyancy of the floating roof. The vapors, when condensed in the pockets of the floating roof, will be returned to the liquid by gravity, thus preventing loss of valuable substances. In addition to being corrosion-resistant to the stored liquid and its vapors, the plastic materials contemplated by this invention for the roof sections also possess valuable insulating qualities.

By using the inverted pan principle for keeping the roof afloat, I have, among other advantages characteristic of my invention, eliminated the need for air-tight compartments or pontoons which considerably add to the cost of construction and which may, from time to time, develop leaks.

The various features and advantages of my invention will be more fully explained in connection with an illustrative embodiment thereof shown in the accompanying drawing, wherein:

Fig. 1 is a partial plan view of my floating roof as mounted in a storage tank;

Fig. 2 is a vertical cross-section taken through line II—II of Fig. 1;

Fig. 3*a* is a plan view of one of the inverted pan sections;

Fig. 3*b* is a sectional view of an inverted pan roof section along line 3—3 of Fig. 3*a*;

Fig. 4*a* is a plan view of the central inverted pan roof element;

Fig. 4*b* is a vertical section of the element shown in Fig. 4*a*; and

Fig. 5 shows a modification of the invention for use in large-capacity tanks.

Referring to the drawing wherein the same reference numerals designate like parts, a floating roof storage tank as shown comprises a vertically cylindrical shell **1** and a floating roof **10** therein adapted to float on the top of the fluid **2** stored in the tank. The floating roof is positioned within the cylindrical shell leaving a narrow space **3** between the edge of the roof **10** and shell **1**. Any suitable type of sealing means (not shown), for instance a wiper seal, may be used to cover space **3**, such sealing means being well known in the art and forming no part of the present invention.

According to this invention, the floating roof consists of a central inverted pan or cup-shaped member **4** and a plurality of radially extending inverted pan roof sections **5**. The side walls **4***a* and **5***a*, respectively, of the inverted pan roof elements are slightly inclined, having a pitch of 1½°, for instance, to assist in the assembly of the various elements. The elements may be connected to each other by placing any suitable adhesive in the spaces formed between the inclined side walls of the elements, such as shown at **6**. If fiberglass sections are used, epoxy resin adhesives may be used, for instance.

The deck of the floating roof is formed by portions **4***b* and **5***b*, respectively, of the inverted pan elements. If a smooth finish of the deck is desired, filler pieces, not shown, may be inserted in the empty spaces left by the adhesive in the interspaces formed between the side wall of the roof elements.

Fig. 5 shows how a larger roof may be made of a series of rectangular inverted pan sections **15** in the center, and the usual pie-shaped sections **16**.

If desired, for cleaning or inspection, the plastic roof may be further supported by the provision of support legs in the tank, such legs being vertically adjustable or of fixed height.

Also if desired, the roof elements may be provided with any type of conventional vapor vent. As is also known in the art, the portions **5***b* of the roof sections may slope inwardly toward the center member **4** to cause rain water or water of condensation to flow toward a central drain provided in the member **4**. This particular method of construction may be used in open top storage tanks and since these features are well known, they are not further described.

The plastic roof sections may easily be molded either at the factory and shipped to the place of installation, or at the site of the tank where the floating roof is to be mounted. Owing to their small volume, they may in certain cases be installed in covered storage tanks simply by introducing them through a manhole or similar opening. It is also possible, by my invention, to provide standardized plastic sections adapted for producing "knock-down" circular decks or covers of predetermined diameters for convenience of handling, storage, transportation and installation by non-skilled labor. The sections may be assembled by means of bolts or they may be permanently connected by means of fusing or suitable plastic cements, as hereinabove described.

While the floating roof of my invention has been described specifically in connection with one illustrative embodiment thereof, it should be clearly understood that many modifications and changes may occur to the skilled in the art after benefiting from my teachings without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A floating roof for a fluid storage tank, comprising a plurality of inverted pan elements of a light corrosion-resistant plastic material which is chemically inert to the fluid stored in the tank, the elements having outwardly tapering side walls and being adjacent to one another, and adhesive sealing material disposed between adjacent ones of said side walls for connecting said elements to each other to form the roof.

2. A floating roof as claimed in claim 1, in which said elements are molded elements.

3. The floating roof of claim 1, wherein said elements are of glass fiber sheeting.

4. A floating roof for a fluid storage tank, comprising a centrally positioned inverted pan roof element with a circular top portion and an outwardly tapering side wall, a plurality of adjacent inverted pan roof elements radially extending from said circular roof element and each element having outwardly tapering side walls, all roof elements being of a light corrosion-resistant plastic material which is chemically inert to the fluid stored in the tank, and adhesive material disposed between adjacent ones of said side walls for connecting said elements to each other to form the roof.

5. The floating roof of claim 4, wherein said elements are of glass fiber sheeting.

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