May 31, 1966 J. M. DEMPSTER, JR 3,253,732

EVAPORATION INHIBITING DEVICE

Filed Nov. 30, 1962

FIG. 1

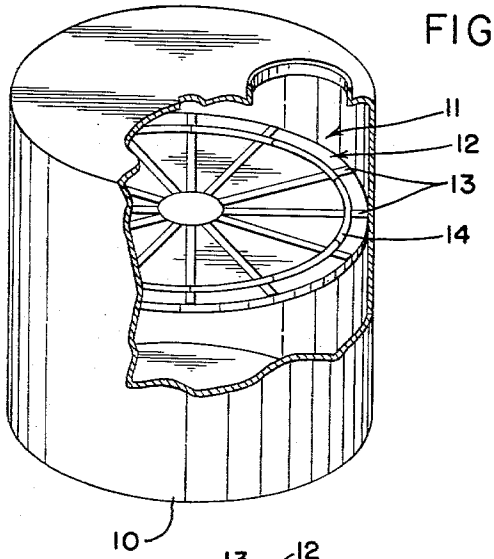
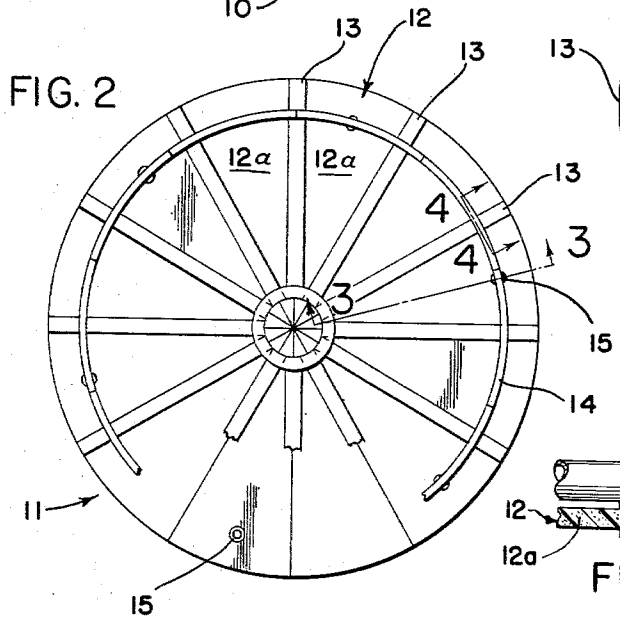


FIG. 2



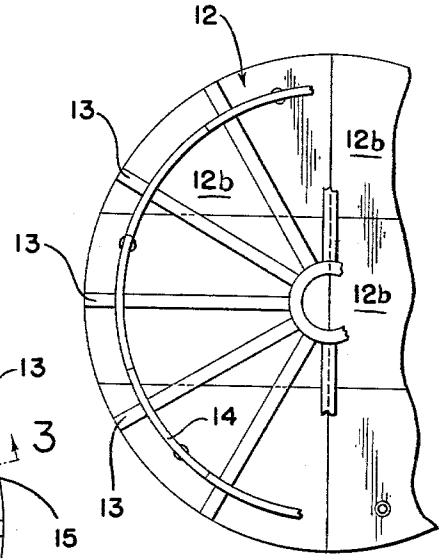


FIG. 5

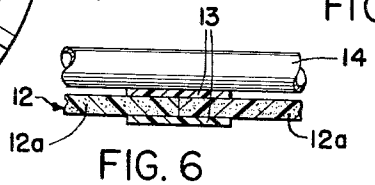


FIG. 6

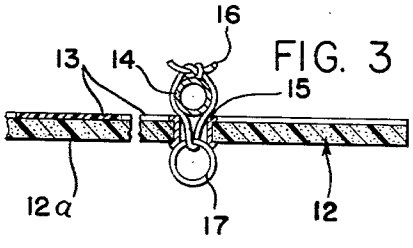


FIG. 3

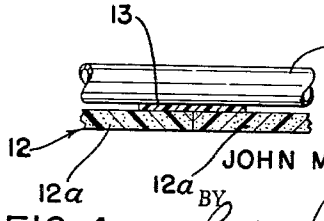


FIG. 4

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EVAPORATION INHIBITING DEVICE

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3 Claims. (Cl. 220—26)

This invention relates to the art of inhibiting the evaporation of a volatile liquid in storage. More particularly, the invention relates to an evaporation-inhibiting device adapted to float on a volatile liquid, such as gasoline.

Recent trends in this art have been toward the development of evaporation-inhibiting devices comprising a thin, flexible blanket formed of materials such as plastics, which are insoluble in the volatile liquid to be protected. The advantages of such devices are manifold; they are light-weight, can be rolled up to facilitate shipping and installation, are low cost and yet are capable of reducing by 80–90% the evaporation losses incurred where such devices are not used. One such prior art device is described in U.S. Patent 3,049,261.

While the design of the floating blanket disclosed in the aforementioned patent is admirably suited to its purpose, some difficulty has been encountered in finding thin, flexible plastic materials which are completely resistant to gasoline and other volatile liquids. While a number of plastic materials are sufficiently insoluble in gasoline to be useful, no plastic has yet been found which is swell-resistant in the presence of gasoline.

Since the initial size and shape of these floating blankets are designed to substantially conform with the cross-sectional dimensions of a storage tank, when the blanket swells in use, its dimensions will exceed those of the tank and the blanket will not fit properly. The increased dimensions of the swollen blanket cause it to lap up on the walls of the tank, and prevent free movement of the blanket as the liquid level in the tank rises and falls.

Attempts to compensate for this swelling by using an undersized blanket which would hopefully swell to proper size, have proved unsuccessful. Failure of this scheme has been attributed to the fact that the extent of swelling is not uniform throughout the blanket, thus a proper fit could not be achieved.

According to the present invention, the swelling problem is overcome by providing a cut-to-fit blanket with a plurality of non-swellable elements, substantially uniformly distributed across, and secured to at least one face but preferably both faces of a floating blanket. In this manner, it has been found possible to control both the extent and direction of blanket swelling.

It is therefore an object of this invention to provide an evaporation-inhibiting device comprising a thin, flexible, swellable blanket having improved dimensional stability.

Other objects and advantages of the invention will become apparent from the following detailed description, with reference being made to the accompanying drawings, in which:

FIG. 1 in schematic perspective with parts cut away, illustrates an evaporation-inhibiting device mounted in a storage tank;

FIG. 2 is a plan view with parts cut away showing an embodiment of an evaporation inhibiting device;

FIG. 3 is a sectional view taken on line **3**—**3** of FIG. 2;

FIG. 4 is a sectional view taken on line **4**—**4** of FIG. 2;

FIG. 5 is a fragmentary plan view with parts cut away showing a modified embodiment of an evaporation-inhibiting device.

FIG. 6 is a sectional view of a modified embodiment of an evaporation-inhibiting device.

Referring now to the drawings, FIG. 1 shows a generally cylindrical storage tank **10** housing an evaporation-

inhibiting device **11** which generally conforms in size and shape to the cross-section of the tank. The shape of the tank is of no particular consequence, though they are almost universally cylindrical. It is important only that the evaporation-inhibiting device substantially conform to the cross section of the tank, whatever it may be.

The evaporation-inhibiting device **11** comprises a thin, flexible, swellable blanket **12**, a plurality of non-swellable elements **13**, uniformly distributed across a face of the blanket, and optionally, a substantially inflexible stiffening member **14**.

The blanket **12** may be formed from a single piece of material, as shown in FIG. 1 or it may be fabricated by joining together a plurality of pieces of material as shown in FIGS. 2 and 5. The blanket depicted in FIG. 2 is composed of a series of pie-shaped elements **12***a* while the blanket shown in FIG. 5 is formed from six elements **12***b*, of differing shapes. Where jointing is required, butt joints are preferred to minimize bulk and retain maximum flexibility in the blanket.

Where the blanket is circular in shape, non-swellable elements **13**, will preferably be arranged along equally spaced radii, extending from a point at or near the center of one face of the blanket out to the circumference of the blanket and thence to a point at or near the center of the opposite face of the blanket. In the particularly favored embodiments shown in the drawings, the radial elements **13** terminate at a disc element (FIG. 1) or at an annular ring element (FIGS. 2 and 5) disposed near the center of the blanket. This avoids the added bulk which would result if the elements **13** criss-crossed at the exact center of the blanket. Where the tapes extend across both faces of the blanket (FIG. 6) a disc or annular ring is provided on each face.

By way of example only, the blanket **12** may be formed of a foam prepared from a mixture of a vinyl chloride polymer, a butadiene-acrylonitrile rubber and a plasticizer. If desired, the foam may be coated on one or both sides with a vulcanizable, synthetic rubber lacquer to reduce the diffusion of vapors into the blanket. The invention is not limited to the use of the described blanket material but is intended to cover any and all flexible materials which are insoluble in but swellable by a volatile liquid to be stored under such materials.

The non-swellable elements **13** preferably take the form of tapes, and may be made of nylon or glass fiber, or any other material which is non-swellable with respect to volatile liquid to be stored. The aforementioned disc and annular ring may be formed of the same materials. These tapes are secured to the blanket by use of a cement, such as a nitrile-butadiene rubber. This same, or a different, cement may be used to join sections of the blanket to each other.

Where the blanket **12** is formed from more than one piece of flexible materials, the non-swellable tapes may or may not cover the joints in the blankets. This is not critical. In the embodiment shown in FIG. 2, the tapes **13** do cover the butt joints between the pie-shaped pieces **12***a*, forming the blanket, see also FIGS. 4 and 6. In the embodiment shown in FIG. 5, the tapes **13** do not coincide with the butt joints between pieces **12***b*. If desired, only one side of the blanket may be taped, although generally it is preferred that the tapes extend across both faces as shown in FIG. 6.

The purpose of inflexible stiffening member **14** is twofold. First, it helps to control the extent and direction of swelling of the blanket **12**; second, it introduces a degree of firmness to the peripheral portions of the blanket, and thus prevents the blanket from folding back on itself during periods of tubulence when volatile liquid is pumped into or out of the tank.

The stiffening member **14** is preferably a hollow, tubu-

lar affair, and may be formed of a substantially inflexible plastic, or aluminum, or the like. In order to secure the stiffening member **14** in place, blanket **12** is fitted with a plurality of grommets **15** circumferentially arranged at a radial distance equal to the radius of the stiffening member **14**. As best seen in FIG. 3, tie-down of the stiffening member is accomplished by looping a tie cord **16** around tie ring **17** located at the underside of the blanket, threading the tie cord **16** up through grommet **15** and tying member **14** securely in place over the grommet. Other equivalent tie-down means will occur to those skilled in the art.

The efficacy of the present invention was established in a field test in which two blankets made of the same plastic, one radially taped as described above, and the other untaped, were placed in service in gasoline storage tanks. After a 14-day equilibrium period, the untaped blanket showed a net swelling of 3.1% while the taped blanket showed a net swelling of only 0.26%.

Having thus described my invention, I claim:

1. In combination with a storage tank having an upright wall an evaporation-inhibiting device comprising:

(a) a thin, flexible, substantially circular blanket formed of a plastic which is swellable by said volatile liquid, and

(b) a plurality of tapes of at least about radial length, non-swellable by said liquid, uniformly distributed across at least one face of said circular blanket, and adhesively secured thereto.

2. In combination with a storage tank having an upright wall, an evaporation-inhibiting device comprising:

(a) a thin, flexible, substantially circular blanket of a plastic foam which is swellable by said volatile liquid,

(b) a network of tapes, non-swellable by said liquid, adhesively secured to at least one surface of said circular blanket, said network comprising a plurality of tapes, non-swellable by said liquid, uniformly disposed along radii of at least one face of said circular blanket, and adhesively secured thereto, and

(c) a substantially inflexible stiffening member in the form of an annular ring positioned near the periphery of said blanket, and means securing such stiffening member to said blanket.

3. In combination with a storage tank having an upright wall an evaporation-inhibiting device comprising:

(a) a thin, flexible, substantially circular blanket of a plastic foam which is swellable by said volatile liquid and

(b) a network of elements, non-swellable by said liquid, adhesively secured to both surfaces of said circular blanket, said network comprising,

(i) a disc on each surface of said blanket mounted concentrically therewith, said disc having a diameter considerably smaller than that of the blanket,

(ii) a plurality of radial tapes extending from the periphery of the disc on the first face of said blanket out to the periphery of the blanket and thence along the second face of the blanket terminating at the periphery of the disc on the second face of said blanket.

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