

PATENT SPECIFICATION (11)

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(54) TOWABLE FLOATING STORAGE CONTAINER

(71) We, THE GOODYEAR TIRE & RUBBER COMPANY, a corporation organised under the laws of the State of Ohio, United States of America, of 1144 East Market Street, Akron, Ohio, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a floating, towable container for transporting oil or other liquid having a specific gravity lower than water on waterways.

The problem of uncontrolled oil spills from damaged tankers has, in recent years, caused a large-scale pollution problem in the ocean and shoreline areas. In order to alleviate such problems, it is necessary to provide some type of container which can be quickly and easily deployed at the scene of a distressed tanker and can serve as a container for oil which has either spilled on the water or must be removed from the damaged tanker. There are various types of flexible walled, towable containers known in the prior art. A typical example of such container is shown in United States Patent No. 3,067,712 issued to E. H. Doerpinghaus. One of the problems encountered with many towable containers of the flexible walled type is the problem of stability during towing of the container, particularly when subjected to high waves. Many shapes of containers tend to yaw and otherwise move about when they are towed through the water and such movement creates undesirable stresses in both the towlines and in the container itself.

It is a primary object of this invention to provide a towable container which is stable when being towed through the water. This and other objects of the invention will be more fully apparent as the description proceeds in the following specification and the accompanying drawings.

Figure 1 is a perspective view showing

the overall configuration of the towable container of the invention;

Figure 2 is a cross-sectional view taken on line 2—2 of Figure 1;

Figure 3 is a top plan view showing the rear end closure fitting of the container;

Figure 4 is an enlarged fragmentary cross-sectional view showing a typical reinforced bead portion onto which the end closure fittings are attached; and

Figure 5 is a fragmentary view showing a portion of the front end closure fitting with a towline attached thereto.

Referring now to Figure 1, the towable container is indicated generally by the numeral 1. The container 1 has an elongated body portion 2 shaped like a truncated cone and tapering from a smaller diameter at the front end to a larger diameter at the rear end. The front end has a hemispherical, flexible end portion 3 and the rear end has a similar hemispherical end portion 4 which is substantially the same as the end portion 3 except that it is larger in diameter to accommodate the larger end of the body portion.

In normal manufacture, the body portion 2 and the end portions 3 and 4 are made as an integral unit with no circumferential seams between the body and end portions. For the sake of simplicity in the drawings, no seams have been shown; however, it should be mentioned that the body portion and the end portions are made up of a series of longitudinal strips of material, preferably square-woven nylon cloth coated with material such as polyurethane or the like, and are assembled in a manner similar to that used in the production of pillow tanks as described in our British Patent No. 1,064,632. To provide additional strength, the seams are fastened both by sewing and by adhesive.

Each end of the container has a centrally located opening surrounded by a reinforcing bead portion 5 as shown in Figures 3 and 4 to which rigid end fittings are attached. A front end fitting 6 is attached at the front

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[Price 25p]

of the container and a rear end fitting 7 is attached at the rear of the container. The front end fitting 6 has a circular plate 8, the periphery of which engages the inner side of the bead portion 5 as shown in Figure 4. A series of reinforcing ribs 9 are welded perpendicular to the plate 8 to provide additional strength. A clamping ring 10 having an L-shaped cross-section is clamped around the bead portion 5 on the outside and is fastened to the plate 8 by bolts 11 which have their heads welded to the plate 8 and receive nuts 12 on the opposite end for retaining the clamping ring 10 in position against the bead 5. The bead 5 is constructed by first passing a series of reinforcing cords 13 around a wire bead ring 14 and then by wrapping a portion of the reinforcing fabric 15 of the container around the bead ring 14 and the reinforcing cords 13. An additional outer fabric reinforcement strip 16 may be placed on the outer surface of the bead portion 5 to provide a transition between the thick portion of the bead and the thinner wall of the container. The entire bead is covered both inside and out with a layer 17 of polyurethane or other suitable elastomeric material. The bead ring with the reinforcing cords 13 wrapped therearound may be made and molded as an integral unit before attaching the layers 15 of reinforcing fabric. While Figure 4 shows a bead at the front of the container, the construction of the bead at the rear of the container is identical and will not be described separately.

A series of buoyant pads 18 are positioned along the top of the container 1 on the inner surface of the container wall. The pads 18 are preferably made of a closed cell, vinyl foam but may also be made of any suitable buoyant material. The pads 18 may be adhered to the wall by an adhesive and if desirable, may be covered by a suitable covering. A set of tapered buoyant pads 19, similar to the pads 18, are located at each end of the container. The pads 18 and 19 provide a neutral buoyancy that causes the container 1 to float on the water when empty while it is being deployed. For example, the container is normally packaged in such manner that it can be dropped by parachute over the area that it is to be used. The package is provided with a means for automatically releasing the container from its packaged condition and the container will then float on the surface of the water in readiness for connection to a tanker or otherwise filling, with liquid having a specific gravity lower than water. After the container is filled, the pads 18 and 19 serve to hold the container in an upright position.

The container 1 has a series of circumferential bands 20 spaced apart at various locations along the length of the body por-

tion 2. Attached to the bands 20 on each side are loops 21 which carry "D" rings 22 to which mooring and lifting lines 23 may be attached. Each of the lines 23 carries a buoy 24 to aid in retrieving the lines in the water. The mooring and lifting lines 23 are used primarily for handling or mooring the container. A vent 25 is located at the top of the container near the rear end for permitting the escape of air and vapors from the interior of the container. Also located on the top of the container 1 is a beacon light 26 which aids in locating the container when it is towed at night. The beacon light 26 is preferably a battery-operated light which is activated upon impact with the water. The front end fitting 6 as previously described, has a centrally located bracket 27 welded to the plate 8 for receiving a towline 28. The towline has a failsafe link 29 which is designed to break before any damage can be done to the fitting 6 or to the flexible portion of the container 1 which would result in spillage of oil or other liquid from the container. An anchor 30 is connected to the end of the towline 28 prior to the deployment of the container and is used to retain the container in the proximity of the tanker until it is towed to the tanker for filling and/or until it is ready to be towed away. At this time the anchor is removed and the end of the line 28 is attached to a towing vessel. A buoy 31 is attached by a line 32 to the anchor 30 to aid in locating it.

Referring now to Figures 2 and 3 which show the details of the rear end fitting, it may be seen that the rear fitting 7 differs primarily from the front fitting 6 in that it has a filling and discharge opening 33 located in a plate 34 which is similar to the plate 8 on the front fitting 6. The fitting 7 is attached to the bead 5 by a clamping ring 35 which is bolted to the plate 34 in the same manner as the clamping ring 10 on the fitting 6. The fitting 7 has a centrally located reinforcing rib 36 with an opening 37 adjacent the filler opening 33 to permit the flow of liquid coming through the opening 33 to be easily distributed into the interior of the container. A pair of reinforcing ribs 38 are positioned perpendicular to the rib 36. The ribs 36 and 38 are all welded to the plate 34 and to each other to provide a rigid assembly. The ribs 36 and 38 are of sufficient height to hold the wall of the container a spaced distance from the inlet opening to prevent blockage of the opening by the container wall. Other reinforcing rib patterns may be used and a different number of ribs may be used depending upon the size of the plate 34 and the structural requirements of the fitting. Additional openings serving the same function as the opening 37 may be located in the other ribs of the assembly. A valve assembly 39 is 130

fastened to the plate 34 by a plurality of bolts 40. The valve assembly 39 has a conventional butterfly-type valve 41 and a conventional cam-lock device 42 which secures an end plug 43 in the central opening 44 of the fitting which communicates with the opening 33 in the plate 34. When it is desired to fill or empty the container, the plug 43 is removed and is replaced by a hose fitting which is locked in position by the cam lock in the same manner as the plug 43. A pair of brackets 45 provides a means for attaching a line 46 which forms a loop for receiving a rear mooring and manoeuvring line 47. A locating buoy 24 similar to those used on the lines 23 is attached to the line 47. In the event that the container cannot be towed from the front towline 28, it can also be towed by attaching a line to the line 46 on the rear fitting 7. However, because of the taper of the container, there is much greater stability obtained when the container is towed from the front fitting 6 since the taper affects the manner in which the container performs in the water. The larger diameter at the rear of the container causes a certain amount of drag which tends to stabilize the container when it is being towed. In some instances, it may be desired to attach a drag skirt or flow separator around the stern or rear end of the container. Although this has not been shown in the drawings, such a skirt would be in the form of an annular ring surrounding the container.

It will be understood that various materials could be used in the manufacture of the flexible container described herein and square-woven, nylon cloth coated with polyurethane has been given as one of the preferred embodiments. The end fittings for the sake of lightness in weight, are made preferably of aluminum; however, other suitable materials could also be used.

WHAT WE CLAIM IS:—

1. A floating container for transporting liquid having a specific gravity lower than water on waterways comprising:

(A) an elongated flexible walled body portion having substantially the shape of a truncated cone which has the smallest diameter at the front end thereof and which gradually increases in diameter toward the rear end;

(B) a substantially hemispherical flexible

walled end portion on each end of the body portion and integral therewith, each end portion having a centrally located opening therein;

(C) a rigid closure fitting mounted in each of said openings, each fitting having a means for attaching a towline thereto;

(D) at least one of the fittings having a filling and discharge opening therein; and

(E) buoyant material located along the top of the body portion on the interior wall surface thereof to cause the container to float at least when empty of liquid.

2. A floating container as claimed in Claim 1 including mooring line attachment means fastened in spaced apart relationship along each side of the body portion.

3. A floating container as claimed in Claim 2 wherein the mooring line attachment means is secured to the body portion by circumferential bands encircling the body portion.

4. A floating container as claimed in Claim 1 including at least one vent valve to permit escape of air and vapor from the interior of the container.

5. A floating container as claimed in Claim 1 including a beacon light thereon to aid in towing the container at night.

6. A floating container as claimed in Claim 1 wherein the end closure fittings have reinforcing ribs on the inner side thereof and wherein at least part of the ribs have openings therethrough to facilitate liquid flow from the inlet opening into the container.

7. A floating container as claimed in Claim 6 wherein the ribs are of sufficient height to hold the wall of the container a spaced distance from the inlet opening to prevent blockage of the opening by the container wall.

8. A floating container as claimed in Claim 1 wherein the buoyant material is a closed cell foam.

9. A floating container as claimed in Claim 1 including a drag skirt around the rear end of the container.

10. A floating container as claimed in Claim 9 wherein the drag skirt is an annular ring surrounding the container.

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fastened to the plate 34 by a plurality of bolts 40. The valve assembly 39 has a conventional butterfly-type valve 41 and a conventional cam-lock device 42 which secures an end plug 43 in the central opening 44 of the fitting which communicates with the opening 33 in the plate 34. When it is desired to fill or empty the container, the plug 43 is removed and is replaced by a hose fitting which is locked in position by the cam lock in the same manner as the plug 43. A pair of brackets 45 provides a means for attaching a line 46 which forms a loop for receiving a rear mooring and manoeuvring line 47. A locating buoy 24 similar to those used on the lines 23 is attached to the line 47. In the event that the container cannot be towed from the front towline 28, it can also be towed by attaching a line to the line 46 on the rear fitting 7. However, because of the taper of the container, there is much greater stability obtained when the container is towed from the front fitting 6 since the taper affects the manner in which the container performs in the water. The larger diameter at the rear of the container causes a certain amount of drag which tends to stabilize the container when it is being towed. In some instances, it may be desired to attach a drag skirt or flow separator around the stern or rear end of the container. Although this has not been shown in the drawings, such a skirt would be in the form of an annular ring surrounding the container.

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walled end portion on each end of the body portion and integral therewith, each end portion having a centrally located opening therein;

(C) a rigid closure fitting mounted in each of said openings, each fitting having a means for attaching a towline thereto;

(D) at least one of the fittings having a filling and discharge opening therein; and

(E) buoyant material located along the top of the body portion on the interior wall surface thereof to cause the container to float at least when empty of liquid.

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