

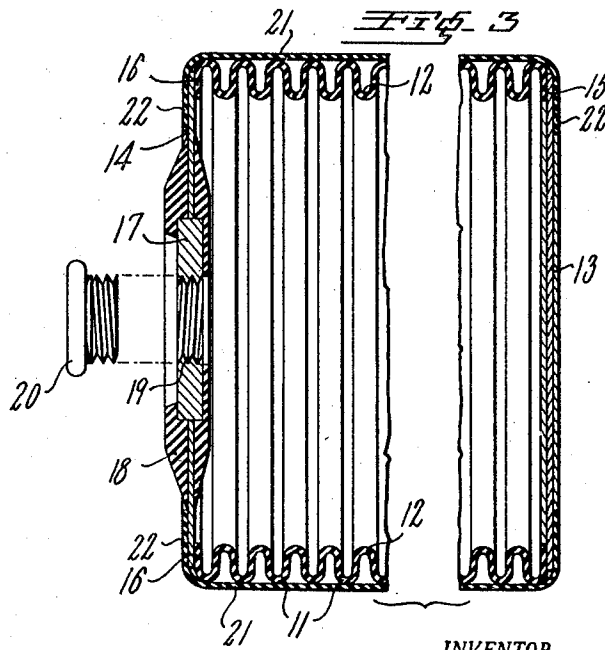
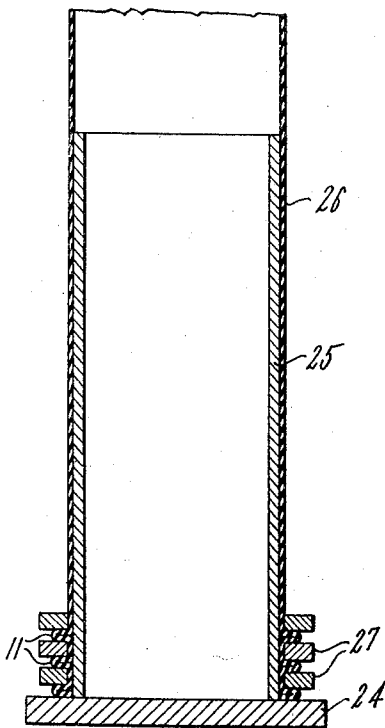
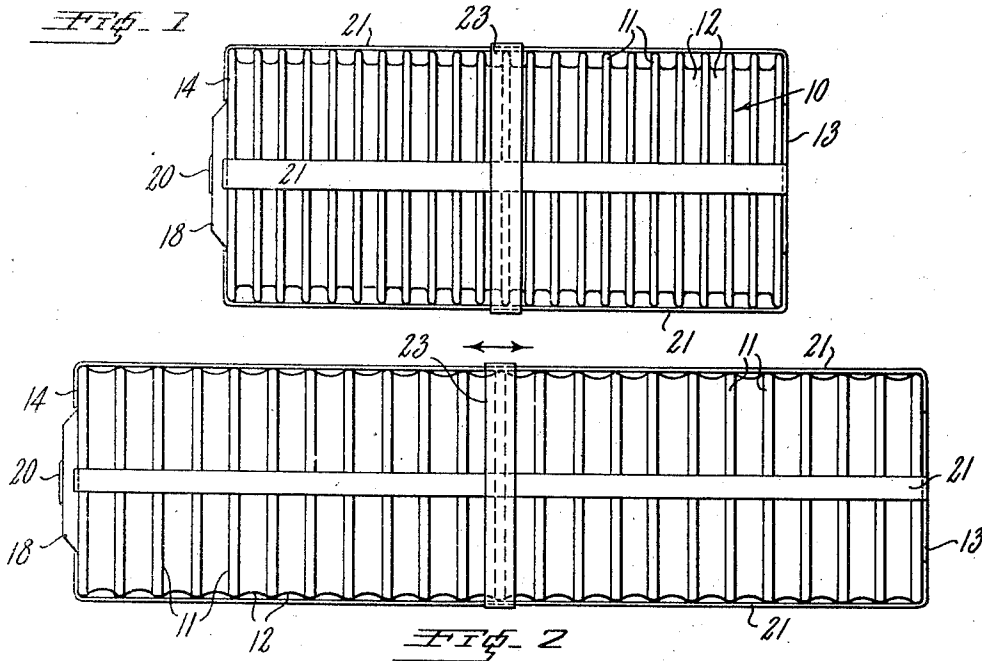
Nov. 18, 1947.

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2,430,905

CRASH-PROOF LIQUID CONFINING RECEPTACLE

Filed March 25, 1944



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2,430,905

CRASHPROOF LIQUID CONFINING
RECEPTACLE

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Application March 25, 1944, Serial No. 528,142

2 Claims. (Cl. 150—1)

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This invention relates to liquid confining tanks, bags, or receptacles adapted to be dropped from a low-flying airplane to the ground and which are so constructed that they will not spring a leak when they crash against the ground.

In warfare and also in peacetimes it may be desirable to employ airplanes to supply liquid such as gasoline, oil, or water to persons on the ground from an airplane flying above such persons without requiring the airplane to land.

The present invention therefore contemplates liquid confining receptacles such as tanks or bags capable of holding a number of gallons of liquid, and which are so constructed that when such a receptacle containing liquid is dropped from a height up to approximately 150 feet and crashes upon the ground it will greatly increase its capacity at the instant of crash, so as to reduce the rupturing force exerted at this instant inside the receptacle by the spreading pressure exerted by the confined liquid. This increase in the capacity of the receptacle when the crash occurs is secured by forming the receptacle with corrugated walls and by constructing such walls of rubber or tough plastic material that is sufficiently elastic to permit the corrugations to straighten out to their nearly fully extended condition under the high internal pressure exerted by the confined liquid at the moment of crash.

The crash-proof liquid confining receptacle of the present invention may be given various shapes, having corrugated walls and relatively flat closed ends, but the preferred receptacle is cylindrical in shape with flattened ends and has the cylindrical walls deeply corrugated so that the receptacle may extend lengthwise preferably as much as twice its normal length at the instant of crash to thereby lessen the internal pressure of the confined liquid.

The various features of the present invention will be further understood from the following description when read in connection with the accompanying drawing illustrating one good practical form of the invention.

In the drawing:

Fig. 1 is a side elevation of a crash-proof liquid confining receptacle constructed in accordance with the present invention, showing the receptacle as it normally appears when filled with liquid;

Fig. 2 is a similar view showing the receptacle of Fig. 1 when fully extended;

Fig. 3 on a larger scale is a longitudinal sectional view through the end portions of the receptacle of Fig. 1; and

Fig. 4 is a vertical sectional view illustrating

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a method for imparting the corrugations to the cylindrical material used in forming the wall portion of the receptacle of Fig. 1.

The receptacle shown in the drawing has the form of a corrugated tube 10 in which the corrugations are formed of the annular ribs 11 and valleys 12. One end of the receptacle 13 which may be regarded as the bottom is shown as formed of a plurality of reinforced discs. The opposite end 14 of the receptacle which may be regarded as the top has a central opening through which liquid may be introduced into the receptacle and removed therefrom.

The corrugated tubular portion 10 of the receptacle is preferably so formed that it has the annular flange 15 at one end thereof to which the bottom disc 13 is firmly adhered or vulcanized, and has a similar flange 16 at the other end of the receptacle to which the top disc 14 is firmly secured. The top 14 in the construction shown is provided with the internally threaded ring 17 disposed at the center of the disc 14. It is firmly secured in place at the center of the disc by embedding the ring 17 in a mass of rubber or other plastic material 18. This mass is preferably formed so as to provide an annular recess at the outer face of the ring around the threaded opening 19 so that the head of the threaded cap 20 may lie in this protecting recess when the cap 30 is screwed tightly in place to confine the liquid within the receptacle. The end discs 13 and 14 are conveniently formed of two or more piles of fabric impregnated with rubber or other plastic material.

It is important that the corrugated walls 10 of the crash-proof receptacle be made of plastic material which when vulcanized, cured or set in the corrugated condition will have sufficient elasticity to permit the corrugations to straighten out from the normal liquid confining condition of Fig. 1 to the greatly extended condition of Fig. 2. This expansion under the crash condition should preferably be 100% or more.

The material used in forming the corrugated tubular portion 10 of the receptacle need not be highly elastic but should be capable of stretching sufficiently to accommodate the outward expansion of the valley portions 12 of the corrugations nearly to the diameter of the annular ribs 11 as shown in Fig. 2, to thereby accommodate the straightening out of the corrugations under the spreading action which the confined liquid exerts within the receptacle when the crash occurs. The material used in making the corrugated portions 10 of the receptacle should obviously be strong

and tough so that it will not rupture when the receptacle crashes and possibly slides some distance along the ground as the result of the momentum imparted to the receptacle by the speed of the airplane that drops the same.

The material used in forming the portion 10 of the receptacle may be natural rubber, synthetic rubber or thermoplastic or thermosetting materials, provided they have the required strength and toughness, and elastic character to the extent above indicated, in the finished corrugated receptacle, but the choice of such material will depend to some extent upon whether the receptacle is to contain water or a solvent liquid such as gasoline.

As an example of one good practical construction, a crash-proof fuel tank having a normal capacity of 7.5 gallons was formed throughout the corrugated area 10 thereof of a mixture of synthetic rubber comprising 80% Hycar and 20% Thiokol. This tank had a wall thickness ranging from .10 to .15 inch and was capable of being dropped from a slowly moving airplane flying not more than 150 feet from the ground, without springing a leak when it crashed against the ground.

If the receptacle shown in Fig. 1 of the drawing, when filled with liquid, is lifted by gripping the same around its upper end and exerting an upward pull it may elongate appreciably under this stretching force. To prevent this, in the construction shown, the receptacle is provided with the longitudinally extending elastic straps 21 and the ends 22 of which are firmly secured to the end discs 13 and 14. These straps 21 will prevent the receptacle from extending appreciably under normal handling conditions but will stretch as shown in Fig. 2 to permit the receptacle to stretch approximately its full length under the crash condition. The straps 21 are entirely free from the receptacle except at the ends 22 thereof, and since they may tend to sag away from the receptacle near the central portion thereof, the encircling band 23 secured to the straps 21 is provided to hold these straps close to the corrugated walls of the receptacle.

One convenient method for corrugating the tubular material to form the body portion 10 of the receptacle is illustrated in Fig. 4 wherein there is provided a supporting means such as a table or floor 24, upon which is placed upright a relatively heavy cardboard tube 25 having the internal diameter that is to be imparted to the receptacle of Fig. 1 and approximately the same length as that of the receptacle shown in Fig. 1. Over this tube 25 is placed a much longer tube 26 formed of unvulcanized rubber or rubber-like or plastic material such as above described as being suitable for use to form the portion 10 of the receptacle. This tube 26 is corrugated step by step as will be apparent from Fig. 4 by forcing the tube downwardly a predetermined distance to thereby form the successive corrugations 11, 12. Split annular rings 27 of any desired thickness are provided about the tube 26 to determine the distance between the successive corrugations, and since these rings 27 are split they may be removed from the tube 26 when the corrugations are formed. After the tube 26 has been completely corrugated the end discs 13 and 14 may be adhe-

sively secured to the end flanges 15 and 16 respectively as above described. Then the receptacle thus formed may be vulcanized, cured or otherwise treated to set the tube 26 in this corrugated condition. After the receptacle is completely formed it may be filled with water which will serve to soften the cardboard tube 25 to a fluid mass which may then be removed by pouring this mass out through the threaded opening 19.

It will be seen from the foregoing that the crash-proof liquid confining receptacle of the present invention is relatively inexpensive to construct and is well adapted to be used to supply gasoline or other essential materials to troops or other persons on the ground from an airplane flying overhead at a low altitude.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. An expansible container adapted to hold liquid and withstand the increased pressure of said liquid on the walls thereof when the liquid loaded container is subjected to a rapid change of motion, said container comprising flexible walls having a plurality of extensible corrugations extending completely around said container, said container being bendable in all directions about an axis encompassed by said corrugations, elastic and universally flexible means cooperating with said walls and bendable with said walls for retaining said corrugations in a retracted position when said liquid is in a static condition, and adapted to permit said corrugations to be extended by said increased pressure of said liquid.
2. An expansible container adapted to hold liquid and withstand the increased pressure of several gallons of said liquid on the wall thereof when the liquid loaded container is subjected to a rapid change of motion, said container comprising elastic walls having a plurality of extensible corrugations extending completely around said container and expansible in all directions, said container being bendable in all directions about an axis encompassed by said corrugations, and elastic and universally flexible means cooperating with said walls for resiliently retaining said corrugations in a retracted position when said liquid is in a static condition, and said means being bendable with said container in all directions and adapted to permit said corrugations to be extended by said increased pressure of said liquid.

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REFERENCES CITED

- The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,607,626	Hopkinson	Nov. 23, 1926
2,295,590	Manson et al.	Sept. 15, 1942
2,225,764	Beal	Dec. 24, 1940
1,452,039	Gravell	Apr. 17, 1923
2,186,183	Trumbull	Jan. 9, 1940
1,852,897	Price	Apr. 5, 1932

FOREIGN PATENTS

Number	Country	Date
116,935	Australia	Mar. 25, 1930