

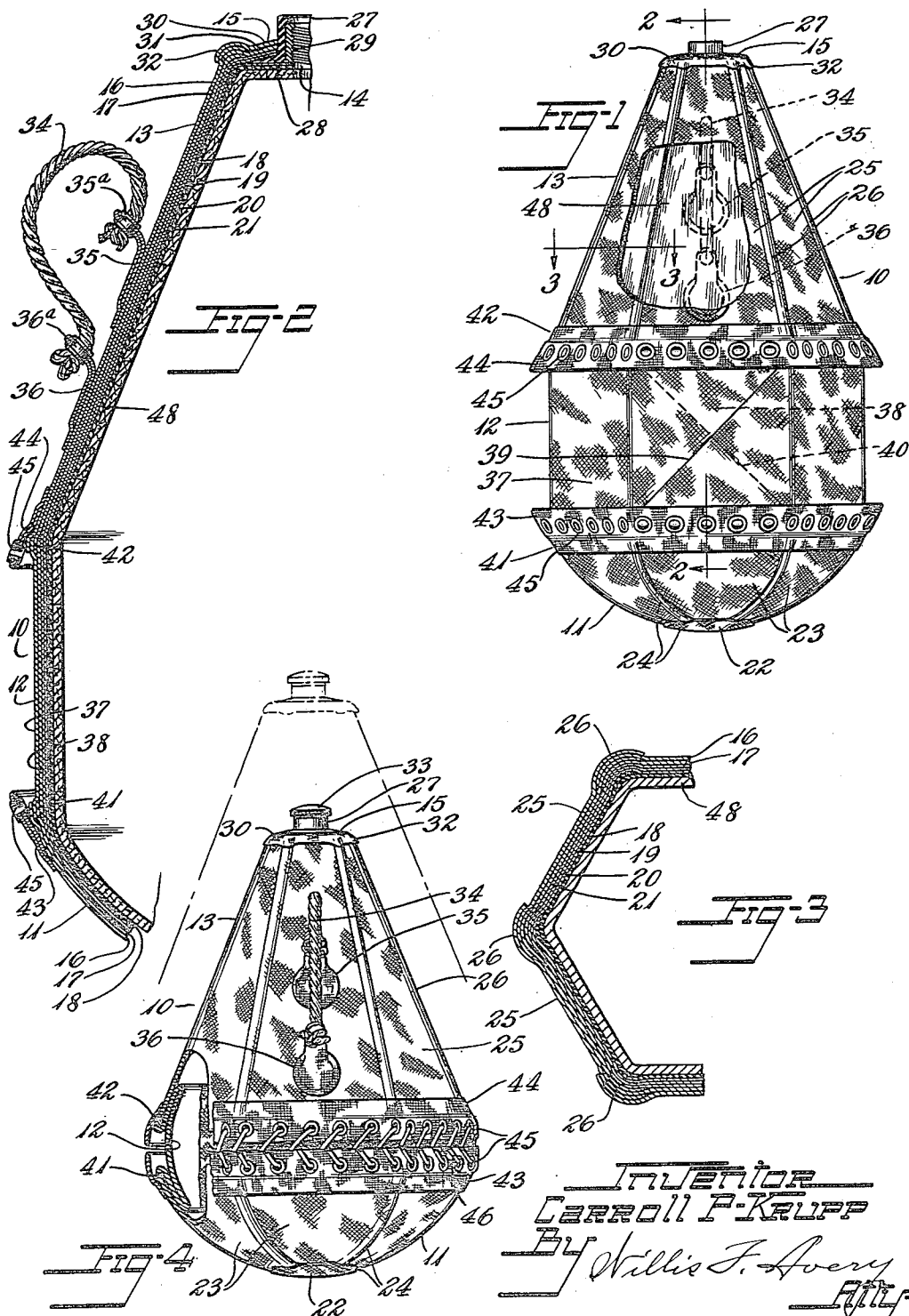
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EXPANSIBLE IMPACT CONTAINER PROVIDED WITH YIELDABLE RETAINING MEANS

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EXPANSIBLE IMPACT CONTAINER PROVIDED WITH YIELDABLE RETAINING MEANS

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This invention relates to containers and especially to impact containers for flowable material such, for example, as liquid fuel or other liquids or flour or other foodstuffs or supplies.

My invention is especially useful for facilitating the delivery of liquid fuel, foodstuffs and other supplies to persons under emergency conditions such, for example, as isolated groups of people in flooded areas or troops occupying a position otherwise not conveniently accessible. Delivering such supplies under these conditions by parachuting the packages of supplies from flying aircraft to the earth, has the objection that the packages may land beyond the desired area due, for example, to the wind currents causing the parachute to deviate from the desired path of descent; hence the supplies may be lost. Even though the packages do descend within the desired area, there exists the danger that the contents may be wholly or partially destroyed by the bursting of the container upon impact with the ground or other body.

It is desirable that the container have the ability to withstand impact forces tending to rupture it even when under some conditions it is dropped from a considerable height without the aid of a parachute.

Principal objects of the invention are to provide a container capable of resisting effectively failure under impact, to provide for minimizing and dissipating impact forces on the container, to provide for protecting material in the container when the container is dropped, for example, from a moving vehicle, and to provide simplicity of construction, convenience of manufacture and handling, and reliability of operation.

These and other objects and advantages of the invention will be apparent from the following description.

In the accompanying drawing, which forms a part of this specification, and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a view in elevation of an impact container in assembled relation upon a building form, and constructed in accordance with and embodying the invention, parts being broken away,

Fig. 2 is a sectional view taken along line 2-2 of Fig. 1,

Fig. 3 is a sectional view taken along line 3-3 of Fig. 1, and

Fig. 4 is a view in elevation of the container arranged for use, parts being broken away and in

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section, the dot and dash lines indicating enlargement of the container upon impact.

In the illustrative embodiment of the invention as shown in Figs. 1 to 4, the impact container 10, which may be of generally pear-shape, includes a rounded and enlarged end portion 11, a wall portion 12 adjacent the end portion 11 and adapted to be folded, and a tapered portion 13 terminating in an aperture 14 at the end 15 opposite the end portion 11, the aperture 14 providing for filling the container 10 with flowable material such, for example, as gasoline, fuel oil, flour, foodstuffs and other supplies. While other shapes such, for example, as spherical, cubical, and cylindrical may be used, the pear-shape container has the advantage of anti-tipping characteristics during storage, and such pear-shape facilitates maintenance of the container in an upright position or substantially so in the trajectory due to forward motion of the carrying vehicle or the straight line path due to gravity alone, when the container is dropped from an appreciable altitude, whereby the enlarged end portion 11 takes a forward position for impact with the earth or other body. This result is desirable for obtaining effective enlargement of the container space in the manner to be described more fully hereinafter.

To provide strength for resisting bursting under impact, the container 10, as shown especially in Figs. 2 and 3, has desirably an outer covering or layer of two superimposed plies 16 and 17 of bias-laid square-woven textile fabric substantially throughout the extent thereof, the fabric having a suitable coating on both its sides of resilient rubber or other rubber-like material, and corresponding elements of the fabric plies being arranged crosswise of one another in the bias disposition. The exterior surface of the outer ply 16 may have a wear-resistant coating of rubber or other rubber-like material for resisting abrasion.

The inner layer of the container 10 is made of a suitable flexible, substantially impervious material for preventing harmful contamination and objectionable leakage of the contents of the container. This inner layer includes preferably a first ply 18 of oil-resistant resilient rubber or other rubber-like material, a second ply 19 of suitable adhesive material such as a cement of rubber-like material, a third ply 20 of flexible oil-resistant material for which I have found a superpolyamide such as liquid nylon to give good results, and a fourth ply 21 of suitable adhesive material adjacent the fabric ply 17.

The impact container may be made hexagonal in cross-section, which facilitates manufacture, although other suitable shapes in section such, for example, as circular and octagonal may be used. The fabric plies 16 and 17 at the generally rounded end portion 11 consist of a substantially circular reinforcing patch 22 and a plurality of suitably shaped strips 23 in assembled relationship with each other and with overlapping joints 24 at adjacent margins of the strips 23, also at the margins of the strips and the patch 22, and each strip comprises a side of the hexagon.

At the tapered portion 13 the fabric plies 16 and 17 comprise a plurality of suitably shaped strips 25 extending preferably from a margin of the wall portion 12 to the end 15 and having overlapping joints 26 at adjacent margins of the strips, each strip being a side of the hexagon as shown especially in Figs. 1 and 3.

The end 15 of the tapered portion 13 is sealed by a closure arrangement capable of withstanding the impact stresses. To this end, the closure construction shown especially in Figs. 1, 2 and 4 may be used. A molded and apertured fitting 27 including a mounting flange 28 of resilient rubber or other rubber-like material and including an internally threaded metal insert 29 is disposed in registry with the aperture 14, the flange 28 being sandwiched between the plies 19 and 20 of the inner layer of the container. End patches 30 and 31 of suitable fabric having apertures for receiving the body of the fitting 27 are disposed in superimposed relation on the ply 21 of the inner layer and the margins of these patches are in overlapping relation with the end margins of the strips 25 as indicated at the region 32. A suitable closure and sealing cap member 33 engageable with the metal insert 29 is provided for detachably closing the aperture 14.

To facilitate handling the container 10 a suitable handle structure may be provided, which structure may comprise rope handles 34 oppositely disposed on the tapered portion 13 and attached to the wall thereof by suitable fabric elements 35 and 36 adhered in position. The respective ends of the rope handle 34 extend through metal grommets 35a and 36a which are secured to the margins of apertures in the elements 35 and 36, the ends of the rope being enlarged by knotting to prevent slippage through the grommets during handling of the container.

The construction of the container at the wall portion 12 provides for enlargement of the container space and provides for minimizing and dissipating the impact forces on the container. The plies 16 and 17 at the portion 12 comprise superimposed bands 37 and 38 of suitable textile fabric extending transversely around the container preferably in bias-laid fashion, the ends of the bands being spliced diagonally together at 39 and 40 as shown especially in Fig. 1. The bands have corresponding elements of the fabric arranged crosswise of one another for effectively resisting bursting stresses while providing the desired flexibility and foldability.

The bands 37 and 38 are joined adhesively at their margins 41 and 42 in an overlapping relationship with the adjacent end margins of the strips 23 and 25 of the rounded end and the tapered portions respectively, as shown especially in Fig. 2. Strip elements 43 and 44 of suitable fabric material, desirably of double thickness, having a plurality of spaced-apart apertures reinforced by metal grommets 45 are attached adhesively to the ply 16 of the outer covering at the

region of the margins 41 and 42 of the bands 37 and 38. A cord or cords 46 passing through the grommets 45 laces the opposing margins of the strip elements 43 and 44 in adjacency when the wall portion 12 is in the folded condition as shown in Fig. 4, which cord or cords are subject to extension or rupture or both so as to be yieldable, thereby retaining the fold while permitting separating movement of the margins 41 and 42 adjacent the fold under pressure exerted upon impact by the contents of the container 10. The cord or cords 46 may be strong and elastic and may comprise rubber for the purpose with or without fibers, or they may be cords of fibers or other suitable material and of low elasticity, but subject to rupture upon attainment of a substantial force upon them, or they may be selected to stretch a considerable extent and then break.

While the rubber and fabric parts of the container and adhesive materials thereof are in assembled relationship with one another, as shown in Figs. 1 and 2, and on a collapsible mold 48 desirably of destructible material such, for example, as cardboard, papier-mâché, or plaster of Paris, these parts are all united integrally preferably by vulcanization in a chamber under heat and pressure, the heat having access to the interior of the form or mold 48 through the fitting 27 and a registering aperture in the mold per se, as well as access to the exterior of the container for obtaining the desired cure. Upon conclusion of the cure, the mold 48 may be broken and its parts removed through the aperture 14, and the container 10 is arranged then with the wall portion 12 in a folded condition as shown in Fig. 4.

When the container is filled wholly or partially with flowable material such, for example, as gasoline, the strips 23 and 25 may assume an outwardly bulged condition under the hydrostatic pressure of the gasoline, thus changing in shape from hexagon in section to a shape approaching a generally circular section, while the joints 24 and 26 between adjacent strips serve as stiffening members for maintaining the generally pear-shape of the container. The rounded end portion 11 may be flattened to a limited extent when the loaded container is resting on a supporting surface in a moving vehicle such, for example, as an aircraft, and this flattened condition together with the low center of mass of the contents by virtue of the pear-shape of the container prevents effectively tipping over despite the movement of the supporting surface.

For dropping the filled container, as from aircraft, the container may be supported by the rope handles 34 and released through a suitable opening in the aircraft during flight. By virtue of its shape the container maintains an upright position or substantially so in its trajectory so that the enlarged end portion 11 takes a forward position for impact.

Upon impact the increased pressure exerted by the contents on the walls of the container causes extension of the cord 46 if elastic or breaking of the cord or both, thereby permitting separating movement of the margins 41 and 42 of the folded wall portion 12 with consequent opening of the fold which action facilitates enlargement of the container space inasmuch as the tapered portion 13 is capable of assuming a position indicated by dot and dash lines in Fig. 4. In this manner the impact stresses in the wall of the container are lessened and dissipated rapidly thus materially reducing the likelihood of failure of the container

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while all the time the contents are protected against contamination.

Variations may be made without departing from the scope of the invention as it is defined in the following claims.

I claim:

1. An impact container for flowable material, said container comprising a hollow body including a wall portion of flexible non-metallic material having a foldable portion therein and margins adjacent said foldable portion, and means including a breakable element attached to both said margins for retaining said foldable portion collapsed, said means being effective upon impact of the container with contained flowable material to release said foldable portion by breakage of said element under the force of the impact, for enlargement of the container space.

2. An impact container for flowable material, said container comprising a hollow body of textile material substantially throughout the extent thereof and having an inner layer of resilient rubber-like material, said body comprising a rounded end portion, a wall portion adjacent said end portion, and a tapered portion opposite said rounded end portion, said wall portion having a foldable portion therein and margins adjacent said foldable portion, and means comprising strip elements attached at said margins and an elastic cord element interconnecting said strip elements at spaced-apart positions along said strip elements for retaining said foldable portion collapsed, while permitting separating movement of said margins under pressure exerted by said flowable material upon impact of the container.

3. An impact container for flowable material, said container comprising an elongated hollow body of textile material substantially throughout the extent thereof and having an inner layer of resilient rubber-like material substantially resistant to deterioration by said flowable material, said body comprising a rounded end portion, a folded portion adjacent said end portion and having margins adjacent the fold, and a tapered portion terminating in an aperture at the end opposite said end portion, means for detachably sealing said aperture, means attached at said tapered portion for handling said container, strip elements attached at said margins and having a plurality of spaced-apart reinforced apertures, and a continuous elastic cord laced through said apertures and interconnecting said strip elements for retaining said folded portion collapsed, while permitting separating movement of said margins under pressure exerted by said flowable material upon impact of said end portion with another body.

4. An impact container for flowable material adapted to be dropped from a height, said container comprising an elongated hollow body having an enlarged portion at one end and having the center of gravity of the body located predominately toward said end to compel landing on said end, said body comprising a wall of flexible non-metallic material intermediate the ends of the body, said wall having a foldable portion therein extending transversely around the body, and yieldable retaining means for normally holding said foldable portion collapsed, while permitting elongation of the container by yielding of said means and extension of said foldable portion under the force of impact of landing of the container with contained flowable material.

5. An impact container for flowable material adapted to be dropped from a height, said con-

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tainer comprising a hollow body having an enlarged rounded portion at one end and having the center of gravity of the body located predominately toward said end to compel landing on said end, said body comprising a wall of flexible non-metallic material adjacent said rounded portion, said wall having a foldable portion therein and margins adjacent said foldable portion, and retaining means including a yieldable element attached at said margins for normally holding said foldable portion collapsed, while permitting expansion of the container by yielding of said element and extension of said foldable portion under the force of impact of landing of the container with contained flowable material.

6. An impact container for flowable material adapted to be dropped from a height, said container comprising a hollow body of generally pear-shape having an enlarged rounded portion at one end and having the center of gravity of the body located predominately toward said end to compel landing on said end, said body comprising a wall of flexible non-metallic material adjacent said rounded portion, said wall having a foldable portion therein extending transversely around said body and having margins adjacent said foldable portion, and retaining means including an elastic element attached at said margins for normally holding said foldable portion collapsed, while permitting elongation of the container by yielding of said element and extension of said foldable portion under the force of impact of landing of the container with contained flowable material.

7. An impact container for flowable material adapted to resist impact forces when dropped from a height, said container comprising a hollow body having a wall of non-metallic flexible material substantially throughout the extent and thickness of the wall and including a foldable portion and margins of said flexible material adjacent said foldable portion, and elastic means mounted on said margins for holding said foldable portion collapsed while permitting separating movement of said margins by elongation of said elastic means and extension of said foldable portion under the force of impact of landing when the container is dropped with contained flowable material.

8. An impact container for flowable material adapted to resist impact forces when dropped from a height, said container comprising a hollow body including a wall portion of material flexible throughout the thickness of the wall portion and having a foldable portion therein, and yieldable retaining means mounted on said body for normally holding said foldable portion collapsed while permitting enlargement of the container space by yielding of said means and extension of said foldable portion under the force of impact of landing when the container is dropped with contained flowable material.

9. An impact container for flowable material adapted to resist impact forces when dropped from a height, said container comprising a hollow body including a wall portion of material flexible throughout the thickness of the wall portion and having a foldable portion therein and margins of the flexible material adjacent said foldable portion, and yieldable retaining means mounted on said margins for normally holding said foldable portion collapsed while permitting enlargement of the container space by yielding of said means and extension of said foldable portion under the

force of impact of landing when the container is dropped with contained flowable material.

10. An impact container for flowable material adapted to resist impact forces when dropped from a height, said container comprising a hollow body including a wall portion of material flexible throughout the thickness of the wall portion and having a foldable portion therein and margins of the flexible material adjacent said foldable portion, and yieldable retaining means mounted on said margins for normally holding said foldable portion collapsed while permitting enlargement of the container space by yielding of said means and extension of said foldable portion under the force of impact of landing when the container is dropped with contained flowable material, said yieldable retaining means including an elastic cord element extending back and forth across said foldable portion and interconnecting said margins about the periphery of the body.

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