May 14, 1968 A. KRINGS 3,383,017

AERIAL DROP CONTAINERS

Filed Dec. 10, 1965

FIG. 1

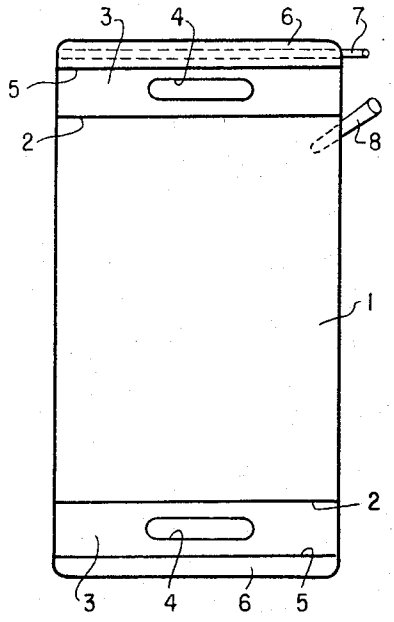


FIG. 2

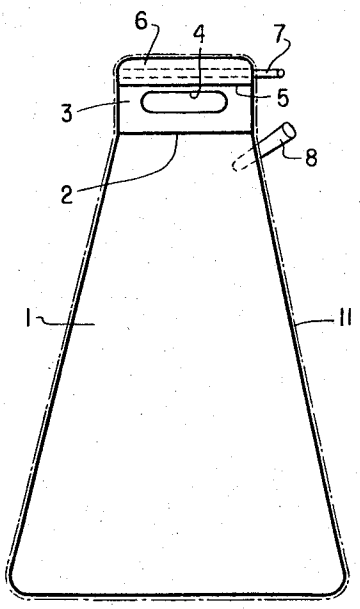
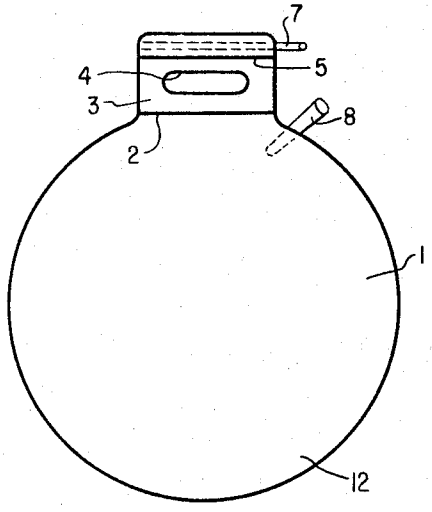


FIG. 3



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AERIAL DROP CONTAINERS

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2 Claims. (Cl. 222—93)

The present invention relates to containers for fuels and more particularly to aerial drop containers for fuel adapted to be dropped from airplanes or the like.

In the course of military operation, it may become necessary to supply troop units by aerial chutes or drops. Various systems of aerial supply are in common usage which rest on dropping off at the destination, arms, apparatus, equipment, and the like by means of parachutes. In principle, fuel can also be dropped off in this manner. However, this is less meaningful and desirable for military reasons as these fuels, because of the relatively low falling velocity of parachutes, would be exposed to an increased extent to enemy fire which, however, might lead to nonpermissively high loss quotas, especially also by reason of their ready flammability. Accordingly, provision is made for fuels to drop the same from airplanes in handy, small containers of about 10 to 50 liters capacity without use of parachutes.

Containers which can be used for such a drop have to exhibit, in addition to a sufficient resistance against the filling media, a high mechanical strength and resistance with respect to the high stresses during impact, especially on hard and sometimes rough terrain. There beyond, these containers must be relatively lightweight in order that at least reasonably favorable ratio can be achieved between packing weight and payload, i e. in order that as large as possible an amount of fuel can be supplied.

Known in the prior art are fuel-drop containers of synthetic rubber reinforced with polyamide or polyester fabrics. The fabric reinforcement imparts thereby to the fuel-resistance material a high mechanical strength, especially with respect to tensile stresses; nevertheless it happens frequently in case of strong stresses, as may result from drops at high altitude and correspondingly large final velocities or from drops at low altitudes and large horizontal dropping velocities that the containers burst open upon impact on the ground. According to the results obtained heretofore in practice, one has to count on an average loss quota of about 30% of the dropped fuel as a result of damage to the container upon impact on the ground so that these containers satisfy the demands made thereof only in a limited way which had to be accepted, however, in the absence of a better solution.

Whereas with the aforementioned known drop containers for fuels one utilized fabric reinforced materials, i.e., one started with materials which possess, wi h a very high strength against tensional stresses, an extraordinarily low elasticity, it is proposed according to the present invention in contrast thereto to manufacture the containers of a material having high tensile strength and high elasticity, preferably, of thermoplastic material, especially of a synthetic polymer plastic, for example polyurethane such as those based on isocyanate-linked polyesters or polyethers. As has been demonstrated by dropping experiments, such containers are capable by reason of the high elasticity of the material, to elastically deform themselves so strongly on all sides thereof upon impact that they absorb the impact energy nearly in all cases without damage whereby container and fuel losses are avoided in a most far-reaching manner.

It is proposed in appropriate construction of the present invention to make the container, preferably with a wall thickness of 0.5–2 mm. of two foil blanks of identical dimensions or of a foil bank folded to provide dimensional coincidence or of a full hose section of corresponding dimensions and to tightly close the same by means of high-frequency or heat-welding except for a filling and discharge aperture adapted to be closed. Possibly, the container according to the present invention may also be made from a foil hose piece produced by means of a worm or extrusion press in such a manner that this piece is placed directly after leaving the extruder orifice into a corresponding blow mold and is blown therein into the desired container shape whereby the filling and discharge aperture has to be provided subsequent to the blowing operation.

According to a further proposal of the present invention, provision is made to weld tightly into the filling and discharge aperture along the rim thereof a spout or nozzle preferably of funnel shape and consisting of thin foil, preferably on the base of the material used for the container manufacture, which spout projects with one end into the inside of the container and with the other end outwardly beyond the container. The foil spout may again be made of two foil blanks of identical dimensions connected with each other along the lateral edges thereof by means of welding or also of a single foil blank folded for dimensional coincidence and welded together correspondingly along the one lateral edge brought into coincidence as a result of the folding. Of course, a foil hose section may also be used as spout.

For purposes of simple and convenient handling of the filled container, it is appropriate in accordance with the present invention to weld off the container body at least at one place into a carrying handle and thereby to provide one or several correspondingly dimensioned apertures for the insertion of the hand. In view of the high elasticity of the container material, it is additionally recommended in accordance with the present invention to reinforce the carrier handle by appropriate measures so that an elastic stretching is avoided within the area of the handle carrier upon seizing of the filled container and thereby a uniform distribution of the weight load is achieved over the entire length of the handle. For example, provision may be made in that connection to weld-in an insert consisting of cardboard, wood, or a relatively form-rigid plastic material or any other suitable material between the two superposed container walls within the area of the carrier handle. Additionally, or also in lieu thereof, provision may be made to arrange between the handle aperture and the outer rim of the carrier handle, intermediate the two superposed foil walls and parallel to the outer edge of the handle carrier, an essentially rigid pipe made preferably of plastic material. In order to retain this rod in its predetermined position, a correspondingly wide rim strip of the carrier handle may be welded off by means of an additional welding seam and the pipe may be removably inserted into the rim strip whereby the latter has to remain open, of course, on one side thereof. If the cross section of this pipe is dimensioned in correspondence with the inner opening of the foil spout welded into the container, it may also be utilized in an advantageous manner for filling and emptying of the container in that it is pulled out of the carrier handle and is inserted into the foil spout. For purposes of easy realization of this measure, it is recommended in accordance with the present invention to so dimension the length of the pipe that in the inserted condition, it projects with one end thereof laterally beyond the carrier handle.

Insofar as an additional securing is desired in order that even under unfavorable drop conditions, no loss in fuel occurs, at least the container portion receiving the fuel may be of double-wall construction according to a further feature of the present invention by means of an outer or external casing of plastic foil.

According to one proposal of the present invention, provision is made in connection therewith to make the outer casing of the same material as the container and to construct the same as an outer container which is closed tightly against the outside, surrounds on all sides with play the container part receiving the fuel in the filled condition thereof and is welded to the carrier handle within the area of the end of the carrier handle at the side of the container and possibly also to the filling spout along the rim of an insertion aperture for the filling spout. The space between the container, properly speaking, and the outer container may thereby be additionally filled with a pressure-transmitting medium whereby not only a protection of the fuel container, properly speaking, against direct impact, but also a considerably uniform distribution of the force of the impact over the entire container surface is achieved.

According to another proposal of the present invention, the outer casing may also be made of a material having lesser elasticity than that of the container material. In that case, the present invention proposes to construct the outer casing as a cover, tightly abutting everywhere against the entire container including the carrier handle, which cover is provided again with an aperture for the insertion of the filling spout and possibly also of a filling and emptying pipe. No fastening of the cover is thereby provided at any place, i.e., neither at the container nor at the carrier handle. With such a construction of the aerial drop container, not only a protection of the fuel container is again achieved against direct impact, but also a considerable relief of the fuel container from the forces becoming effective upon impact in the sense of a tensional stress since these forces initially now stress the less elastic cover and are thereby absorbed to such a large extent by this cover that the fuel container, properly speaking, withstands with certainty the residual forces, even if the cover should be destroyed.

Both in one as in the other case, it is of course possible to make the outer casing in the same manner as the container; that is, of foil blanks or foil hose sections.

Accordingly, it is an object of the present invention to provide an aerial drop fuel container which eliminates by simple means the aforementioned shortcomings and drawbacks encountered with the prior art constructions.

Another object of the present invention resides in an aerial drop fuel container which minimizes losses during aerial drops yet avoids the need for parachutes.

A further object of the present invention resides in a fuel container for use in connection with aerial supply of troops which is capable of withstanding all forces normally encountered upon impact with the ground without bursting or tearing open.

Another object of the present invention resides in the provision of an aerial drop fuel container which is made of such elastically deformable material as to be capable of absorbing nearly in all cases the impact energy without causing damage to the fuel container.

Still another object of the present invention resides in the provision of a fuel container for use in aerial drops which assures a uniform distribution of the impact forces over the entire container.

These and further objects, features, and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing, which shows, for purposes of illustration only, several embodiments in accordance with the present invention, and wherein:

FIGURE 1 is an elevational view of a first embodiment of a container of rectangular shape in accordance with the present invention provided with oppositely disposed ends constructed as carrier handles.

FIGURE 2 is an elevational view of a modified embodiment of a container in accordance with the present invention having an essentially trapezoidal shape; and

FIGURE 3 is an elevational view of a still further modified embodiment in accordance with the present invention of circular shape.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to FIGURE 1, reference numeral 1 designates therein the container which, depending on whether made of two foil blanks of identical dimensions or of only a single foil blank folded in the center to provide complete dimensional coincidence between the two halves or of a foil hose section, is provided with a welding seam either along all four outer edges or only along the two end-face edges as well as one longitudinal edge or only along one of the two end-face edges, respectively. The two end face terminal portions of the container 1 are welded off by means of welding seams 2 into carrier handles 3 which are provided with an insertion aperture 4 for the hand. Depending on the size of the container 1 or on the length of the carrier handle 3, the carrier handles may, of course, also be provided with two or more apertures 4 disposed one adjacent the other. Furthermore, the two carrier handles 3 at opposite ends of the container 1 may also be provided with a different number of apertures 4, for example, one carrier handle with only one aperture and the other, in contrast thereto, with two apertures 4 which would permit the container 1 to be handled at one carrier handle 3 by only one person and at the other carrier handle by two persons.

The carrier handles 3 are provided with a further welding seam 5 parallel to the outer edge of the respective end face, whereby the distance between the outer edge and the welding seam 5 is so dimensioned that within the area of the rim strip 6 created thereby, the substantially rigid plastic pipe 7 may be readily inserted between the two superposed foil walls and again removed therefrom through the aperture originally left by an interruption of the welding seam at a lateral end of the rim strip 6 or subsequently formed therein, whereby—as illustrated in FIGURE 1—the plastic pipe 7 is so dimensioned that in the completely inserted condition, it projects slightly out of the aperture and thus can be gripped correspondingly well. As further illustrated in FIGURE 1, it would suffice as such to provide a single plastic pipe 7 as also a single carrier handle 3 would suffice. However, in order to avoid with the illustrated embodiment of two carrier handles 3 that the plastic pipe 7, serving for the uniform distribution of the absorbed load over the entire width of the container and additionally serving for filling and emptying of the container 1, has to be changed from one carrier handle to the other, depending on whether the container 1 is picked up at one or the other carrier handle, whereby, of course, also the lower rim strip illustrated without the pipe 7 has to receive a lateral aperture, it is recommended according to the present invention to provide also this lower rim strip with a pipe 7. With containers of larger capacity, it may also prove appropriate to reinforce the carrier handles 3 by inserts of cardboard, wood, plastic, material, or the like.

For purposes of filling and emptying the container 1, a funnel-shaped spout 8 is welded-in between the two superposed walls so that the spout 8 extends with its narrow part loosely into the container interior and projects with its wider part toward the outside beyond the container 1. At the same time, this spout 8, which of course is so dimensioned that the pipe 7 may be readily inserted, is operable as container closure means because with a filled container, the two walls of the spout, made from two foil blanks of identical dimensions and welded together along the lateral edges or from a single foil blank folded in the center to provide dimensional coincidence and welded along one lateral edge or again from a foil hose section, are pressed tightly against one another by the liquid pressure whence in general a

sufficient seal of the container aperture is achieved. Additionally, provision may be made for safety reasons to bond, glue, or cement together tightly, the mutually contacting surfaces of the projecting part of the spout **8** by applying thereto a fast-drying glue or cement or bonding means of conventional type. In contrast to the known container closure devices, the present invention provides a completely metal-free closure means which does not impair disadvantageously in any manner by the requisite elasticity of the container for purposes of the elastic absorption of the impact energy.

The emptying of the dropped container **1** takes place in the most simple manner in that the pipe section **7** inserted into the carrier handle **3** is pulled out of the rim strip **6** and is inserted into the spout **8**, possibly after dissolving the gluing or bonding or also after cutting og the glued or bonded spout part, whereby a rapid discharge of the fuel is assured out of the completely metal-free elastic foil container which is adapted to be folded.

According to FIGURE 2, in which the same parts are again designated by the same reference numerals as in FIGURE 1, the container **1** storing the fuel has a trapezoidal configuration. A casing **1** not shown may be tightly welded to the container end of the carrier handle **3** on both sides of the welding seam **2** by means of a further welding seam but otherwise would surround the fuel container part loosely and with play on all sides thereof. An aperture may be provided in the casing for the extension of the spout **8**; the rim of the aperture would be tightly welded together with the spout **8**. The enclosed intermediate space between the container **1** and the casing may be filled with a medium, for example, with water that assures the uniform pressure transmission and at the same time acts as buffer during impact.

As indicated by the dash and dot lines in FIGURE 2, the entire container is provided with a casing **11** which tightly abuts thereagainst but is not connected with the container **1** at any place. A material of lesser elasticity is used for the casing **11** than for the container **1**. It is intended thereby that the tearing stresses occurring during impact are absorbed essentially by the casing **11** by reason of the lesser elasticity thereof whereby the casing **11** may also tear while the container **1** is stressed correspondingly only to a considerably lesser extent and thus survives the impact without damage.

What has been stated hereinabove in connection with FIGURES 1 and 2 also applies to the substantially circular container **1** of FIGURE 3 which, with a construction as blow-molded body, of course, does not require any welding seams along the circular edge **12** thereof.

While I have shown and described several embodiments in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art; and I, therefore, do not wish to be limited to the details shown and described herein, but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. An aerial drop fuel container consisting essentially of a synthetic polymer plastic, comprising: a container body comprising first superimposed walls of sheet material sealed along their adjacent periphery except for filling opening means to form an inner container for receiving the fuel, and second superimposed sheet walls sealed along their adjacent periphery except for filling opening means corresponding to said first mentioned filling opening means to form an outer container completely enclosing said inner container; said inner and outer containers being of substantially identical configuration; said outer container and said inner container being completely separate, independent and devoid of any connections between them; said outer container tightly engaging said inner container throughout its entire inner surface; said outer container having considerably less elasticity than said inner container so that said outer container will resist heavy tensile loading when dropped and tear while said inner container will elastically resist heavy pressure variations without tearing; at least one of said containers including at least two superimposed sheet material walls having a portion welded into a carrier handle and being provided with at least one aperture for the insertion of the carrier's hand; said welded potion having a rim strip welded to form a tube between said carrier handle aperture and the adjacent outer edge; a substantially rigid filing and discharge pipe of a plastic removably inserted into the correspondingly wide rim strip tube between the two superimposed walls; said pipe and tube extending substantially parallel to said adjacent outer edge of said carrier handle.

2. The device of claim **1**, wherein said synthetic polymer plastic is a thermoplastic; said superimposed walls of said inner container each having a thickness in the range of 0.5 to 2 mm.; and said superimposed walls being tightly sealed about their periphery by welding seams except for a filling and emptying aperture, said tube extending in the entire transverse dimension of said carrier handle and being closed at one end.

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