

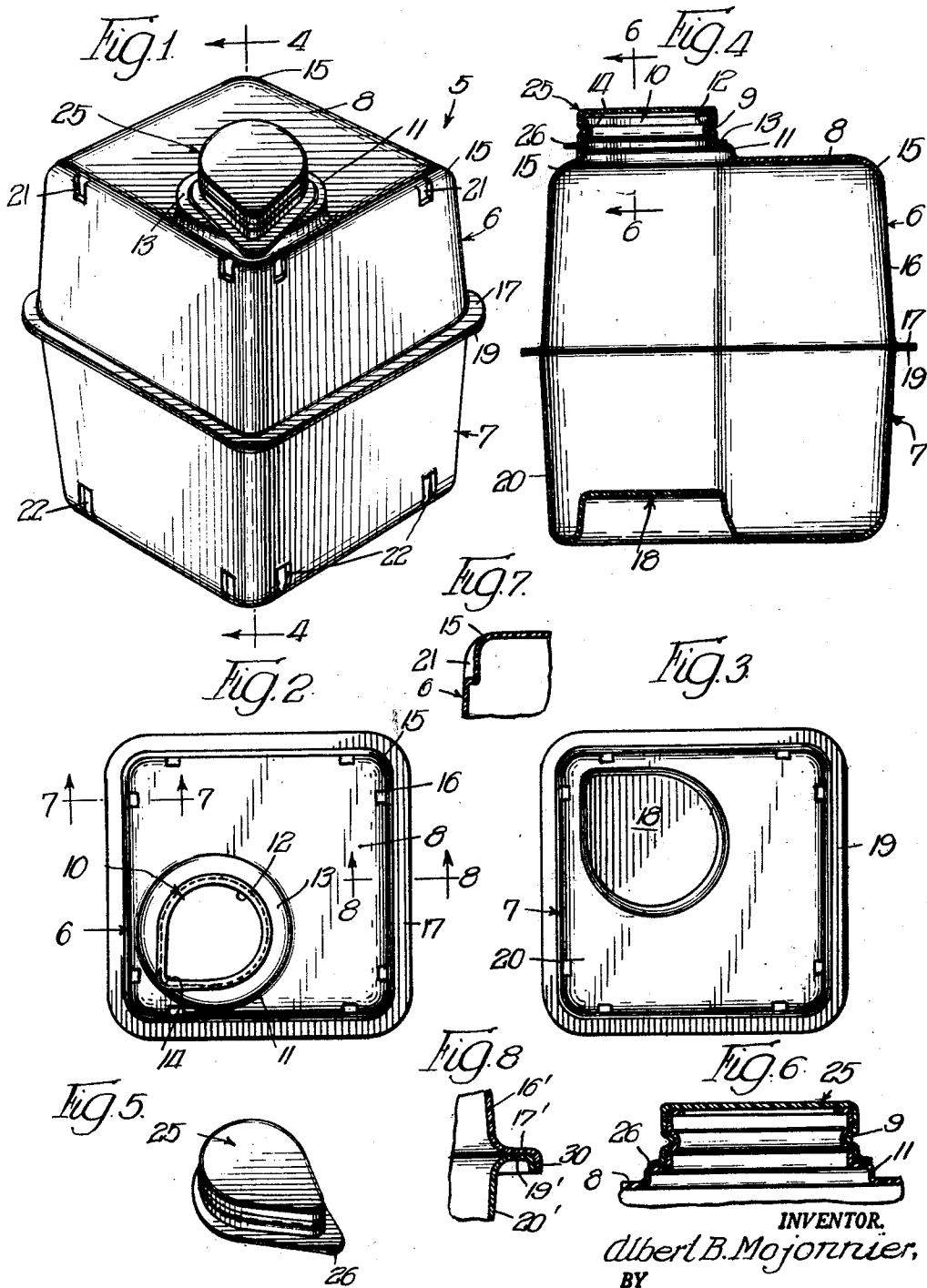
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CONTAINER

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1

3,142,422 CONTAINER

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This invention relates, generally, to innovations and improvements in inexpensive, disposable containers, for liquids such as milk. More particularly, it pertains to such cartons or containers formed of thin, membrane-like plastic sheet material.

At the present time, and for a number of years, disposable milk cartons have been formed of wax-coated paper or paperboard. In fact, wax- or paraffin-coated paper cartons are for practical purposes the only type of disposable cartons that have been used commercially to any substantial extent for milk, chocolate drink, orange juice, etc. However, the wax- or paraffin-coated paper milk containers are known to have several shortcomings, in spite of which they have gained acceptance since nothing as good was brought forth in the way of a disposable container or carton for such liquids. From the standpoint of the consumer, there are two main objections to wax- or paraffin-coated paperboard milk cartons. One objection is the encountering of scales or flakes of paraffin in the milk. The other objection is that not infrequently so-called "leakers" are encountered. Thus, almost everyone who has purchased milk in paperboard cartons has encountered those which leak or seep milk.

From the standpoint of the carton producer, or the dairy (since some of the larger dairies complete the paperboard containers from knocked-down or flattened blanks), the expense of the containers is an item and another is the fire hazard connected with the use of molten paraffin wax. In addition, the dairy often receives complaints from customers about wax in the milk and leaky cartons. Some dairies buy pre-formed paperboard cartons but they are so bulky as to prevent them from being shipped very far from the carton manufacturer and make storage costs so high that substantial stock-piling is prohibitive.

The idea of forming disposable milk cartons from plastic materials has perhaps occurred to others, but heretofore, for one reason or another, a commercial, disposable container formed of plastic, for liquids such as milk and the like, has not been developed. Apparently, it has not been possible to produce such containers from plastic materials which will meet the rigid specifications required for containers of this type, and yet which would be sufficiently inexpensive to be competitive with paperboard containers. It is difficult to over-emphasize the factor of expense. Despite their short-comings, the wax-coated, paperboard cartons are acceptable and the dairy business is so competitive that only the least expensive disposable carton will be purchased in any quantity. Therefore, practically speaking, the maximum price of disposable milk cartons is the price at which the paperboard cartons can be purchased.

It has been discovered in accordance with the present invention that containers for liquids such as milk and formed of plastic sheet materials, may be made which are competitive price-wise with the wax-coated paperboard containers and which are free from the several disadvantages associated with paperboard containers. It was necessary to make a number of departures from the features of construction present in paperboard milk containers and other containers of this type, before the plastic containers of the present invention became possible from the practical standpoint. Since the raw material cost of the plastic constitutes a considerable part of the total cost

2

of the plastic cartons, the plastic that could be afforded for each carton had to be used with upmost efficiency. Hence, it was not merely a matter of substituting one material for another (i.e. plastic for wax-coated paperboard) since problems were involved which were peculiar to the use of thin or membrane-like plastic sheet material. Taking a one-half pint milk carton formed of polystyrene plastic by way of example, stated in another way, the problem was to find a practical way to make such a carton out of about 5 to 6 grams of the plastic.

An important object of the invention is the provision of disposable containers for liquid such as milk which in respect to price and specifications are at least competitive with present-day disposable containers for milk and the like, but which are made from thin or membrane-like plastic sheet material.

A further important object of the invention is the provision of such containers for liquids such as milk and formed of light plastic sheet material, which have built-in strengthening or rigidifying features each of which serves at least one additional function or purpose besides contributing to the strength and rigidity of the cartons.

Another important object of the invention is the provision of containers for liquids such as milk formed from plastic sheet material of such over-all thinness and light weight as would not be strong enough except for a particular distribution of the material through variation of thickness between different locations in combination with certain built-in strengthening or rigidifying features which also serve other functions in the containers.

Another important object of the invention is the provision of improved containers formed from membrane-like plastic sheet materials which can be produced inexpensively by mass production techniques in the form of two mating halves which are nestable in corresponding halves so that shipping and storage costs are minimized, and which may be assembled and sealed together on inexpensive, reliable equipment which may be readily installed and easily operated at the local dairy or other filling plant.

Still another important object of the invention is the provision of an improved method of closing and sealing containers or cartons for liquids such as milk and formed of thin plastic sheet material.

Certain other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

For a more complete understanding of the nature and scope of the invention, reference may now be had to the following detailed description thereof, taken in connection with the accompanying drawings, wherein:

FIG. 1 is a top perspective view of a disposable container for a liquid such as milk, formed of thin or membrane-like plastic sheet material and constituting one embodiment of the invention;

FIG. 2 is a top plan view of the container shown in FIG. 1 but with the closure cap or seal removed;

FIG. 3 is a bottom plan view of the container shown in FIG. 1;

FIG. 4 is a vertical sectional view taken on line 4-4 of FIG. 1;

FIG. 5 is a top perspective view of a thin plastic closure or seal for the pouring spout of the container shown in FIGS. 1-4;

FIG. 6 is an enlarged, detail, sectional view taken on line 6-6 of FIG. 4;

FIG. 7 is a detail sectional view on line 7-7 of FIG. 2 through one of the indentations which assists in de-nesting; and

FIG. 8 is a detail sectional view on enlarged scale showing a modified form of out-turned flange or seam corresponding to a section taken on line 8-8 of FIG. 2.

In the drawings, a container constituting one embodiment of the invention is indicated generally at 5 and comprises an upper cup-like portion 6 and a lower cup-like portion 7. The upper and lower halves 6 and 7 may be formed on a quantity production basis from various plastic materials, particularly, thermoplastic sheeting, such as food grade polystyrene, polyethylene, acrylics, acetate, vinyls, polyvinyl chloride, nylon, or polyester base resin. High impact polystyrene comprising a co-polymer of polystyrene and butadiene rubber constitutes a presently preferred material. This plastic is commercially available in sheet and other forms from several suppliers including Dow Chemical Company and Monsanto Chemical Company.

The halves or cup-like portions 6 and 7 may be mass produced by various known forming techniques with commercially available production equipment. For example, the halves may be formed from heated plastic sheeting of the proper thickness (depending on the size of the carton) either by the so-called "drape-forming" technique or by pressure molding.

It will be seen that the container 5, and the upper and lower halves 6 and 7 thereof, are generally rectangular in configuration, both in vertical and horizontal section. However, there is an absence of sharp corners and right angle intersections in view of the preferences for rounded corners and intersections which have appreciable curvature. The halves 6 and 7 are tapered for nesting purposes.

The upper cup-like half 6 has a generally flat top panel portion 8 having integrally formed in one corner thereof an upstanding filling neck and pouring spout 10, this neck and spout 10 is preferably formed in two sections, there being a shallower, larger diameter base section or boss 11 on top of which there is a deeper, smaller diameter upstanding vertical neck portion 12, with a horizontal shoulder 13 therebetween. For better closure cap sealing and retention, the neck portion 12 is formed with an intermediate groove or necked-in section 9 (FIG. 6). The neck portion 12 has a pointed portion 14 at the outer corner to facilitate the pouring of the contents of the container 5. The filling neck and pouring spout 10 in addition to serving as such, also serves to add rigidity to the top panel 8 such as will withstand the capping or sealing operation and also permit stacking of one container on the other without damage. In the half-pint size, the base or lower portion 11 has a projected area equal to from about 10 to 15 percent of the area of the panel 8 including the portion 11.

The top panel 8 and rounded shoulder portion 15 of the upper half 6 are substantially or appreciably thicker than the remainder of the half 6 below. Thus, the side walls 16 are appreciably thinner than the shoulder portions 15. At the bottom end the side walls 16 terminate in a continuous out-turned flange 17.

In the half-pint size the plastic sheeting prior to deformation may have a thickness of from about 0.015 to 0.02 inch. The thickness of the top panel 8 and adjacent shoulder will be from about 0.013 to 0.018 inch while the flange 17 and adjacent wall portions will have a thickness of from about 0.009 to 0.011 inch. In general, the top panel and adjacent shoulder portions will be about 40-65% thicker than the flanges and adjacent thinner portions of the side walls.

The bottom cup portions or cup-like halves 7 are generally similar to the upper half 6 except instead of having a filling opening and pouring spout 10 they are provided with an integrally formed recess or pocket indicated generally at 18, this being generally of the same shape as the exterior of the pouring spout but sufficiently larger so that the containers can stack one on the other with the spouts 10 fitting in the recesses 18 without binding when the closure seals or caps are present thereon. The lower cup-like half 7 is provided with a continuous flange 19 at the upper end of the side wall or panel portions 20 which mates with the flange 17.

It will be seen that the cup-like halves 6 and 7 are tapered slightly away from the mating flanges 17 and 19. This permits any desired number of the upper halves 6 to be nested, and likewise, any desired number of the lower halves 7 to be nested. For example, the respective upper and lower halves may be nested together and then packaged in, say, polyethylene bags wherein they will be maintained in a clean and sanitary condition until ready for use. Then, stacks of nested upper portions and lower portions 6 and 7 can be inserted in de-nesting machines of known type whereby an upper half and a lower half will be automatically fed together into a machine of known type which will heat seal or otherwise secure the mating flanges 17 and 19 together into a continuous seam around the mid-portion of the containers 5.

To facilitate de-nesting it is desirable to provide a plurality of indentations 21 and 22 in the upper and lower halves 6 and 7 as shown in FIG. 1, an indentation 21 being shown in detail in FIG. 7. It will be seen that these indentations keep the nested halves slightly separated whereby they can be readily de-nested by machines of known type.

In order that the containers 5 may be formed inexpensively and from a minimum weight of plastic sheet material, it is highly desirable that the side wall portions or panels 16 and 20 be so thin adjacent their flanges 17 and 19, respectively, that they are not strong enough to resist lateral stresses that the containers are normally subjected to, e.g., as a result of tight squeezing or lateral impact. However, the liquid-tight flange seal which is formed by the joinder of the mating flanges 17 and 19 constitutes a strong rigidifying flange around the mid-portion of the container which adequately resists such lateral stresses. Furthermore, this flange serves as a convenient means for grasping and holding the containers 5 during opening and use. Thus, the flange fits very nicely between two adjacent fingers of the hand with the thumb being placed on the opposite side.

After the halves 6 and 7 have been de-nested they may be readily joined together at the mating flanges 17 and 19 in one of several manners to form a completed carton 5. The particular technique of assembly or joinder of the flanges 17 and 19 will depend upon a number of factors such as, the particular plastic of which the halves 6 and 7 are formed, the type of equipment which is available, the desired output at which the cartons are to be formed, the kind of liquid that is to be packaged in the finished cartons (e.g. edible or inedible), etc. When the halves 6 and 7 are formed of thermoplastic material, as will usually be the case, and as is the case when presently preferred thermoplastics such as polystyrenes and polystyrene co-polymers are used, the flanges 17 and 19 may be joined together in a permanent manner by heat sealing. Equipment for heat sealing plastics is commercially available in several types including the type that is based on the so-called "hot iron" method and also the type that is based on dielectric heating.

One version of the heat sealing method may be referred to as a combination heat and mechanical sealing. That is, in addition to depending on heat, the mating flanges 17 and 19 are also subjected to mechanical pressures such as clamping, crimping, seaming, etc. The application of mechanical forces in addition to heat permits less heat (i.e. lower temperatures and/or shorter times) to be used or makes stronger flanges or seams when the same amount of heat is used.

Another technique for joining the flanges 17 and 19 together involves the use of a so-called heat activated cement. These cements are commercially available for different types of plastic. They usually come dissolved or dispersed in a volatile solvent and in this form may be printed or otherwise applied on one or both of the surfaces to be joined, and then dried or allowed to dry. Only small amounts are required. When the flanges 17 and 19 are brought together after one or both of the

5

opposing surfaces is coated with one of these cements, upon application of heat from the outside of the flanges, the cement will become activated and the flanges will be permanently bonded together. Alternately the cement may be directly heated or activated by radiant heat or hot air, after which the flanges are promptly joined. One advantage of this particular technique is that a lower degree of heat (i.e. shorter times and/or lower temperatures) is required than in the case of straight heat sealing. Therefore, the operation can be carried in a less carefully controlled manner in so far as the times and temperatures are concerned.

Still another method or technique for joining the flanges 17 and 19 is the use of a so-called "solvent cement." This type of cement is actually in the nature of a solvent or plasticizer for the particular plastic materials to be joined and acts by dissolving or plasticizing the mating surfaces of the plastic so that when they are pressed together a permanent, weld-like bond may be secured. For example, benzene is a solvent cement for polystyrene and styrene base plastics.

Still another method of joining the flanges 17 and 19 together is the use of a so-called contact cement. These cements are also commercially available and after application to mating surfaces they will cohere when the surfaces are pressed together.

Those skilled in the art of fabricating plastics will readily be able to select the one or more particular sealing or cementing techniques which is or are best suited to a particular assembly operation.

It is highly desirable, especially when the contents are milk or other food drink, that the filling and pouring spout 10 be securely sealed by a hermetic or hermetic-type seal. The spout 10 lends itself to being so sealed by means of a sealing cap 25 (FIG. 5) which may be formed of a shrinkable plastic sheet material such, for example, as polyethylene (either so-called "standard" or "conventional" polyethylene formed by the so-called high pressure process and having a density of between 0.91 to 0.935 gram per cubic centimeter, or so-called "high-density" polyethylene which is formed by the Ziegler Process (low pressure process) and having a density of 0.94 to 0.97 gram per cubic centimeter). Such a cap may be formed and applied in the warm or hot condition so as to initially fit snugly over the neck 12 and conform to the groove 9. Upon cooling and shrinking, such a closure cap will intimately conform to the outer surface of the neck 12 including the groove 9 and form a hermetic-type seal which resists dislodgement through normal handling. It will require a reasonable or deliberate positive removing force to be applied to the tab 26 in order to break the seal and open the container. However, the cap 25 is tough and need not be torn or destroyed on removal, therefore, this type of seal or cap 25 has the advantage that it can be re-applied to and retained on the pouring spout 10 in case only a portion of the contents is used or emptied out.

While polyethylene is presently preferred for forming the caps 25, the other shrinkable plastic materials may be used including, polyethylene terephthalate (available from E. I. du Pont de Nemours & Co. under the designation "Mylar"), nylon (described in detail in Carothers Patent 2,071,250), and linear polyurethane (e.g. the condensation product of 1,6-hexamethylene diisocyanate with butanediol-1,4).

While in the drawings the reinforcing flange and seam formed by joining mating flanges 17 and 19 is a plain lateral flange, this can take or be given various special shapes. One of these is illustrated in FIG. 8. In this detailed sectional view primed numbers are used to indicate corresponding portions of the carton 5. Thus, the thin membrane-like wall of the upper half 5 is indicated at 16' and that of the lower half 7 is indicated at 20'. The mating flanges are designated at 17' and 19', respectively. It will be seen in FIG. 8 that the outer ends

6

of the flanges 17' and 19' are curled or bent downwardly as indicated at 30.

It will be apparent that other configurations and special formations may be given to the composite reinforcing flange and seam such as by crimping the flanges so that they have a corrugated-like configuration. However, a plain or straight flange as shown in the drawings has been found to be adequate and to serve very satisfactorily.

In the dairy, or other filling plant, after the cartons 5 have been formed they may be filled on known types of automatic filling machines and then capped or sealed. The capping or sealing operation may be conveniently carried out by unwinding a narrow strip of polyethylene or other cap sealing material of appropriate width, from a spool supply, heating the end of the withdrawn portion and passing the heated end over a female die into which the material is either drawn by vacuum or forced by positive pressure so as to conform to the die cavity. The formed closure cap may then be automatically severed (i.e. died out) from the strip and automatically applied to the filling neck or pouring spout 10 in the warm or heated condition. Obviously, the sealing caps 25 could be formed in a separate operation, shipped in bulk to the dairy, and then applied in the heated condition at the time of sealing.

It was mentioned above that the cartons of the present invention incorporate certain built-in strengthening or rigidifying features which also serve other functions in the container. For example, the composite flange 17-19 formed around the waist portion of each of the containers not only provides the means for sealing or joining the upper and lower halves 6 and 7 together, but it also greatly rigidifies the waist portions of the containers 5, provides a means whereby the containers can be securely gripped with the flange being straddled by the fingers, and provides a support for filling containers if they are set down in a supporting frame. Thus, in packaging a large number of the containers 5 they may be supported on trays or divider plates formed of corrugated paperboard, plastic or light-weight metal having holes or openings formed therein through which the bottoms of the containers 5 will project with the containers being supported on the flanges or seams 17-19.

The filling neck and pouring spout formations 10 in addition to serving these primary purposes, also serve to rigidify the top panel of the containers and also serve to lock the containers together on stacking, by projecting into the bottom recesses 18 of superposed containers. The recesses or cavities 18 not only strengthen the bottoms of the containers and provide for stacking of the containers by receiving the filling neck or spouts of other containers, but these cavities also help in the gripping of the containers, since the little finger will naturally fit and extend into these cavities as the cartons are grasped.

The indentations 21 and 22 in addition to facilitating de-nesting, also reinforce the shoulder portions of the halves 6 and 7.

While use of the containers 5 for milk and other consumable liquids has been featured it will be understood that they can be used as inexpensive disposable containers for a wide variety of liquids such as, motor oil, liquid detergents, liquid laundry starch, syrups, etc.

The construction of the container lends itself to various sizes.

It will be understood that certain changes in addition to those mentioned may be made in the specific and preferred embodiment of the invention described and shown in the accompanying drawings without departing from the spirit and scope of the invention.

What is claimed as new is:

1. A shape retaining disposable plastic container comprising, generally symmetrical upper and lower cup-like halves of approximately equal size and rectangular shape and formed of thin flexible plastic material, each cup-like half having a generally flat end panel and a side wall,

each side wall including a plurality of generally rectangular side panels joined to the respective end panel and to each other by smoothly rounded corner portions, said side panels diverging relative to each other in a direction away from the respective end panel sufficient to enable nesting of like halves after the halves are formed and prior to assembly of the halves, the end panel of the upper container half having an integral filling and pouring spout projecting upwardly therefrom, said spout having an enlarged hollow base portion for rigidifying the end panel at the juncture of the spout therewith and a reduced upstanding neck portion, said enlarged base portion having an internal opening sufficiently larger than outer dimension of the upper end of the neck portion to enable at least partial nesting of the spouts on like upper halves prior to assembly of the container halves, said side panels having an average wall thickness substantially less than the average wall thickness of said end panels and having insufficient strength in the absence of additional reinforcement to resist flexing under lateral pressures applied during normal handling of the container, said upper and lower halves having mating out-turned peripheral flanges on the ends of said side panels remote from the end panels, said flanges being rigidly bonded together in a liquid tight reinforcing flange seam providing a peripheral reinforcement on the container in a zone generally medially between the end panels for stiffening the flexible side panels in the area thereof remote from the end panels.

2. The combination of claim 1 wherein the end panels have a thickness which is about 40 to 65% greater than said side panels adjacent said flanges.

3. A shape retaining disposable plastic container comprising, generally symmetrical upper and lower cup-like halves of approximately equal size and rectangular shape and formed of thin flexible plastic material, each cup-like half having a generally flat end panel and a side wall, each side wall including a plurality of generally rectangular side panels joined to the respective end panel and to each other by smoothly rounded corner portions, said side panels diverging relative to each other in a direction away from the respective end panel sufficient to enable nesting of like halves after the halves are formed and prior to assembly of the halves, the end panel of the upper con-

tainer half having an integral filling and pouring spout projecting upwardly therefrom, said spout having an enlarged hollow base portion for rigidifying the end panel at the juncture of the spout therewith and a reduced upstanding neck portion, said enlarged base portion having an internal opening sufficiently larger than outer dimension of the upper end of the neck portion to enable at least partial nesting of the spouts on like upper halves prior to assembly of the container halves, the end panel on said lower container half having a depression therein, the sides of which depression taper upwardly and inwardly for receiving the upwardly extending filling and pouring spout of a container therebelow, said side panels having an average wall thickness substantially less than the average wall thickness of said end panels and having insufficient strength in the absence of additional reinforcement to resist flexing under lateral pressures applied during normal handling of the container, said upper and lower halves having mating out-turned peripheral flanges on the ends of said side panels remote from the end panels, said flanges being rigidly bonded together in a liquid tight reinforcing flange seam providing a peripheral reinforcement on the container in a zone generally medially between the end panels for stiffening the flexible side panels in the area thereof remote from the end panels.

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