Jan. 21, 1969 L. G. MYKLEBY 3,423,008

SEALED CARTON

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Fig. 1.

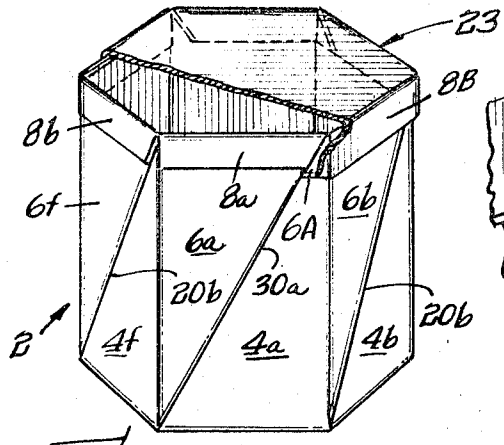


Fig. 2.

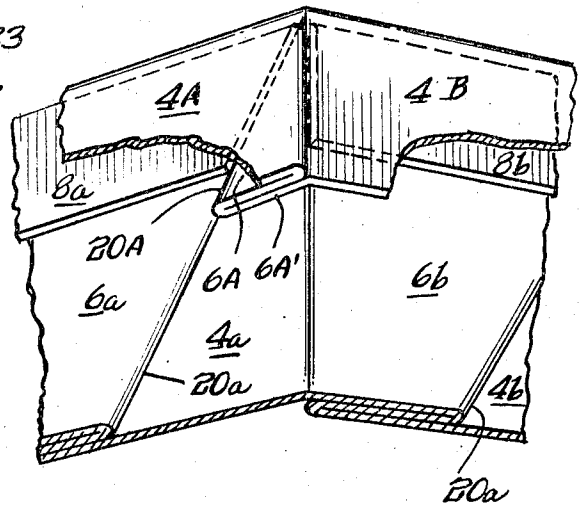


Fig. 6.

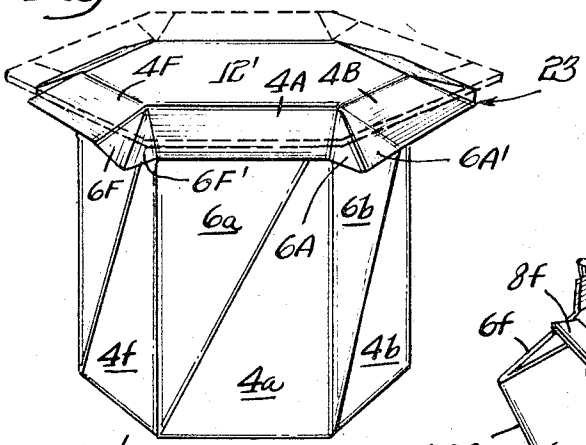


Fig. 5

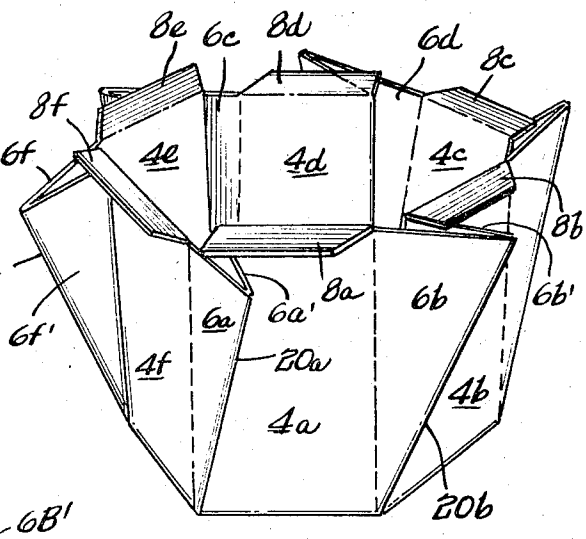
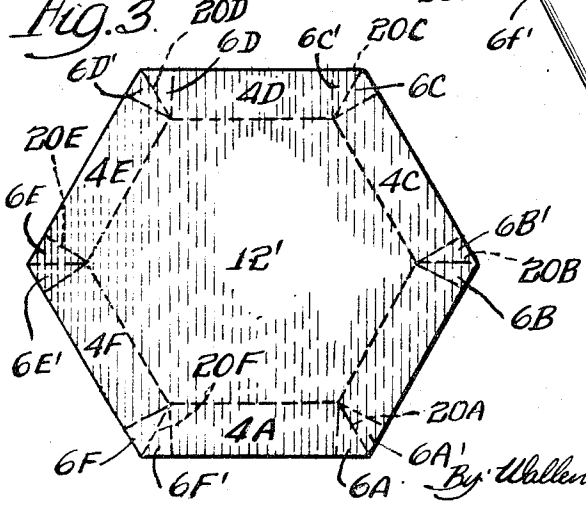


Fig. 3.



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Fig. 9.

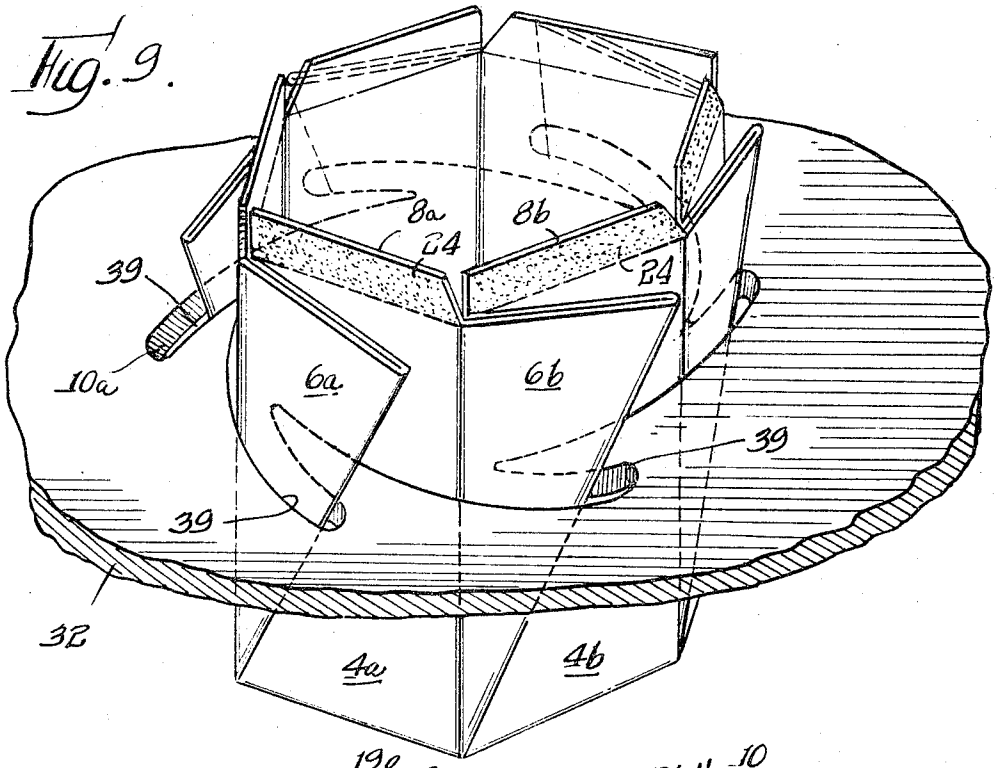
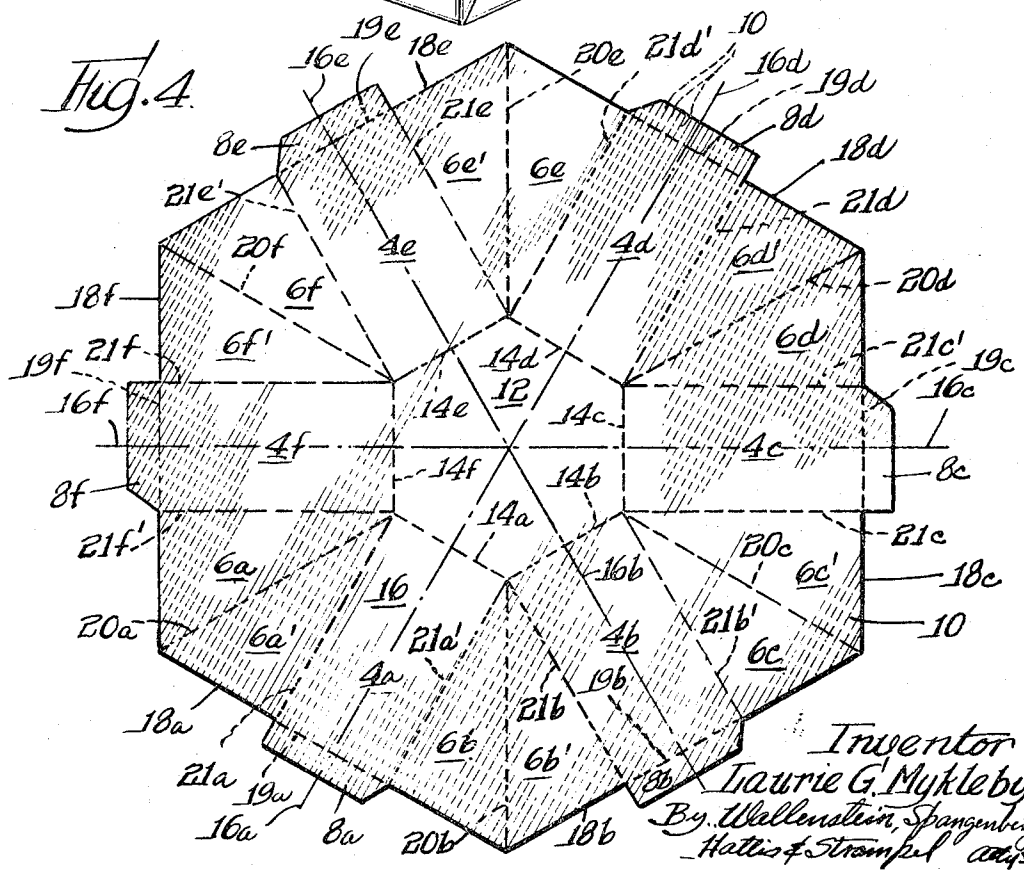


Fig. 4.



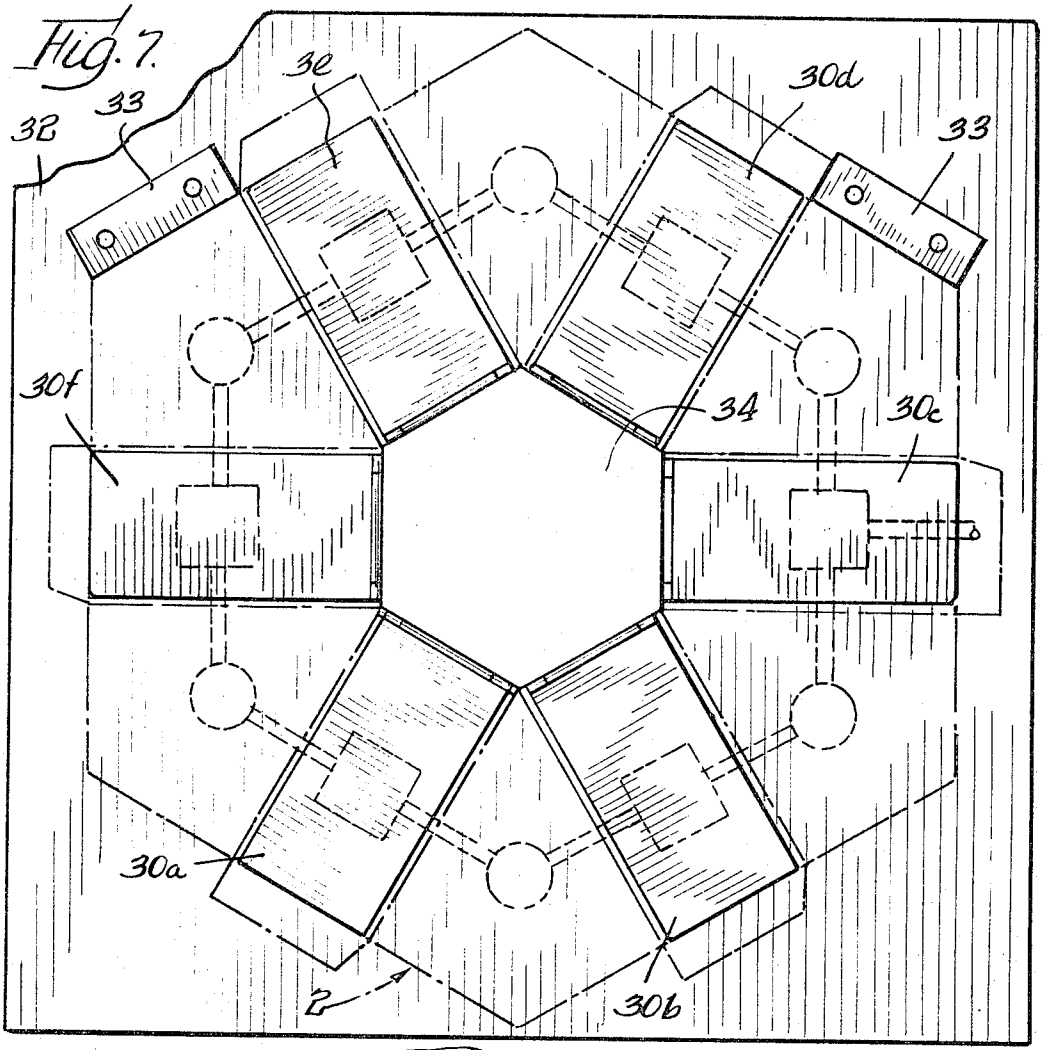
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Fig. 7.



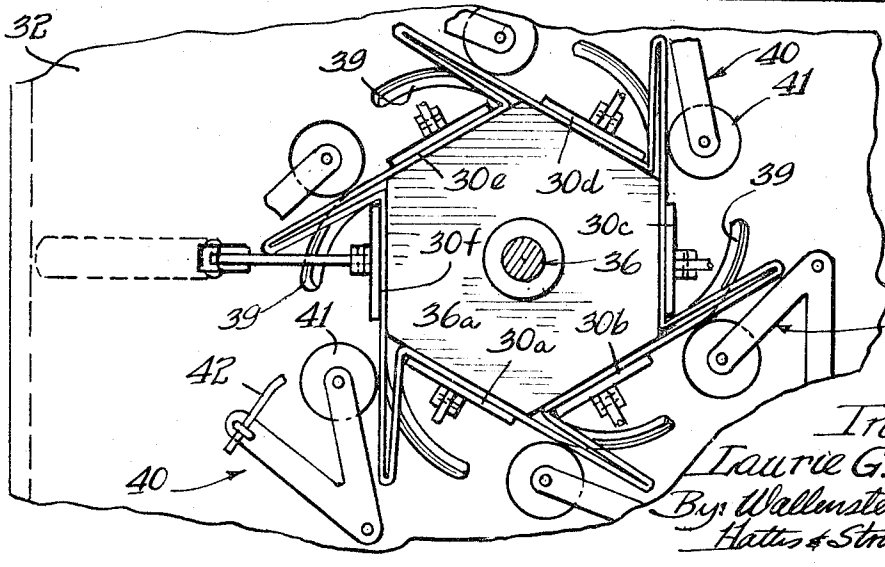


Fig. 12.

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Fig. 8.

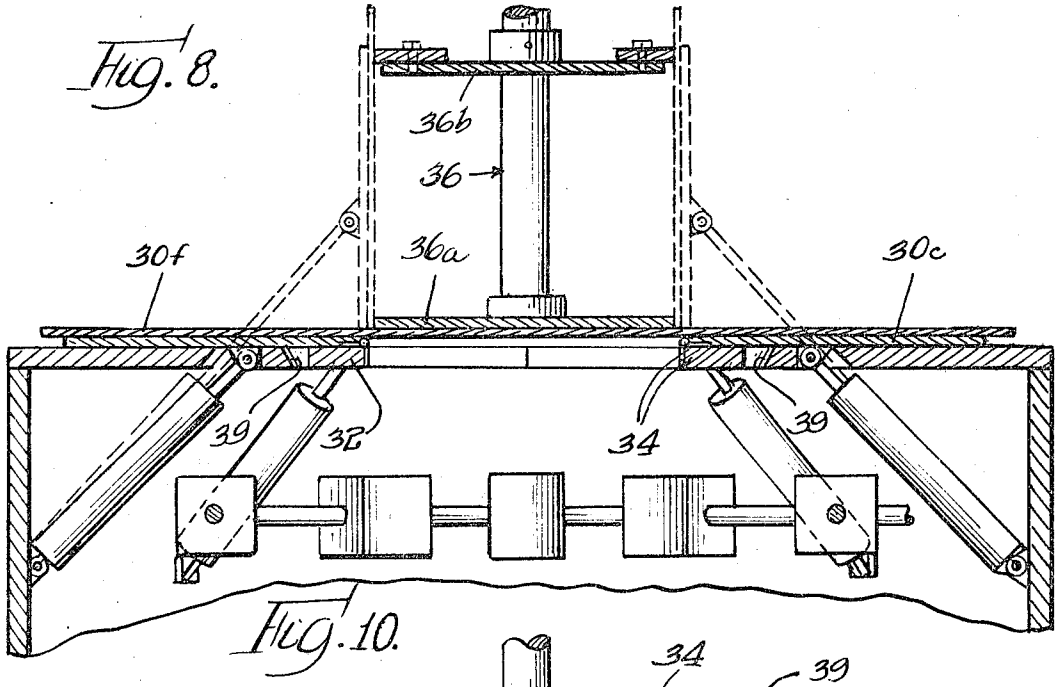


Fig. 10.

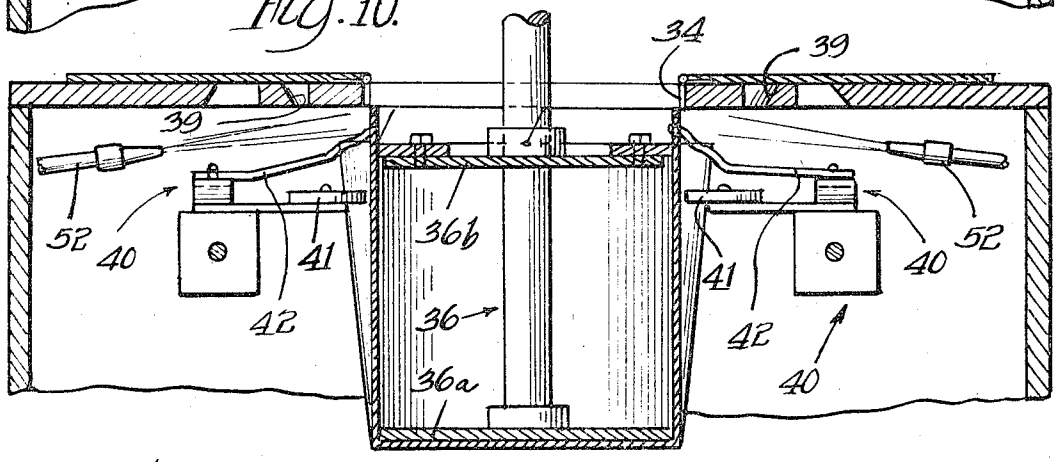
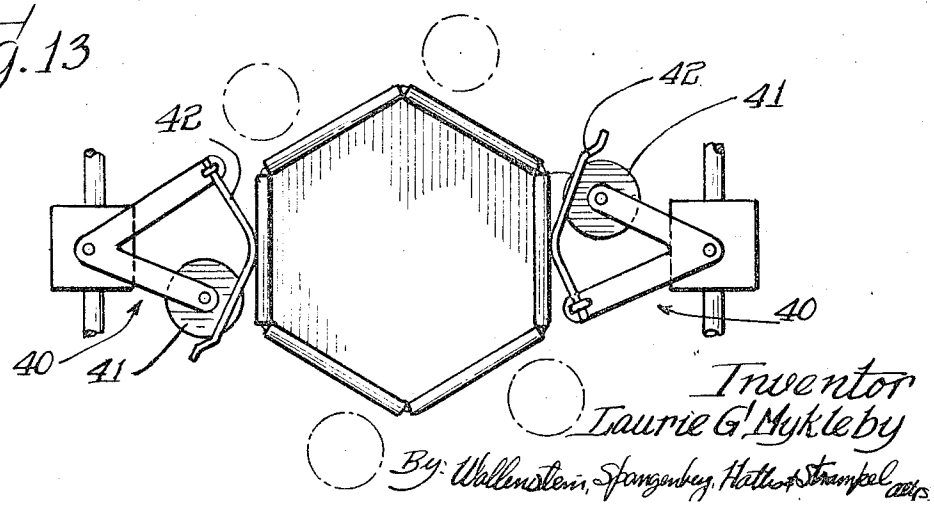


Fig. 13



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Fig. 11.

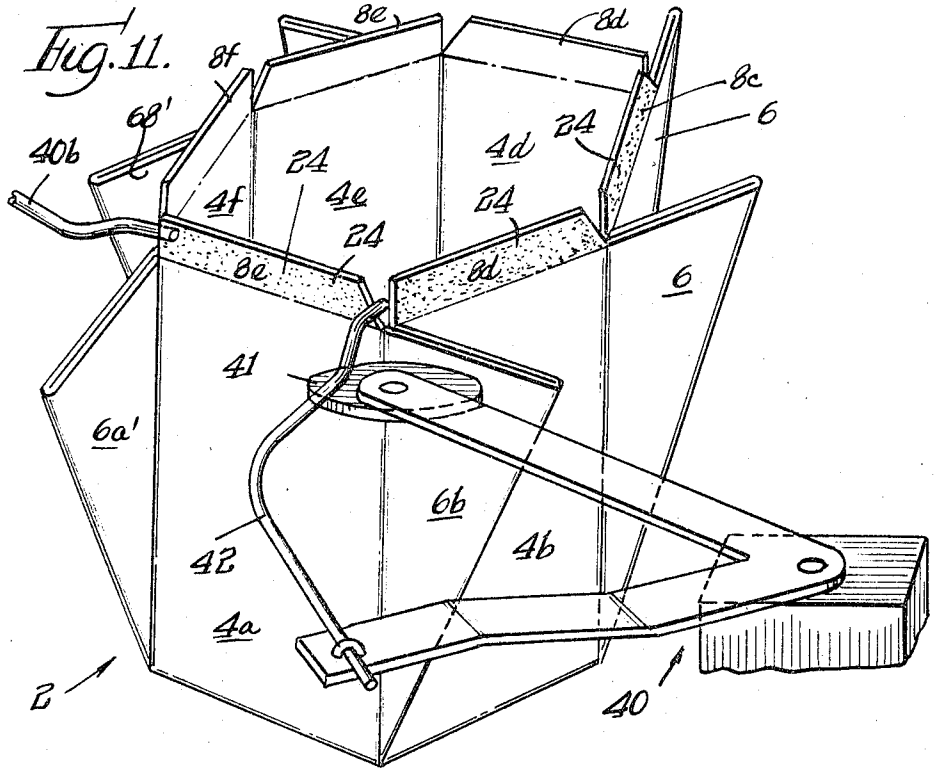
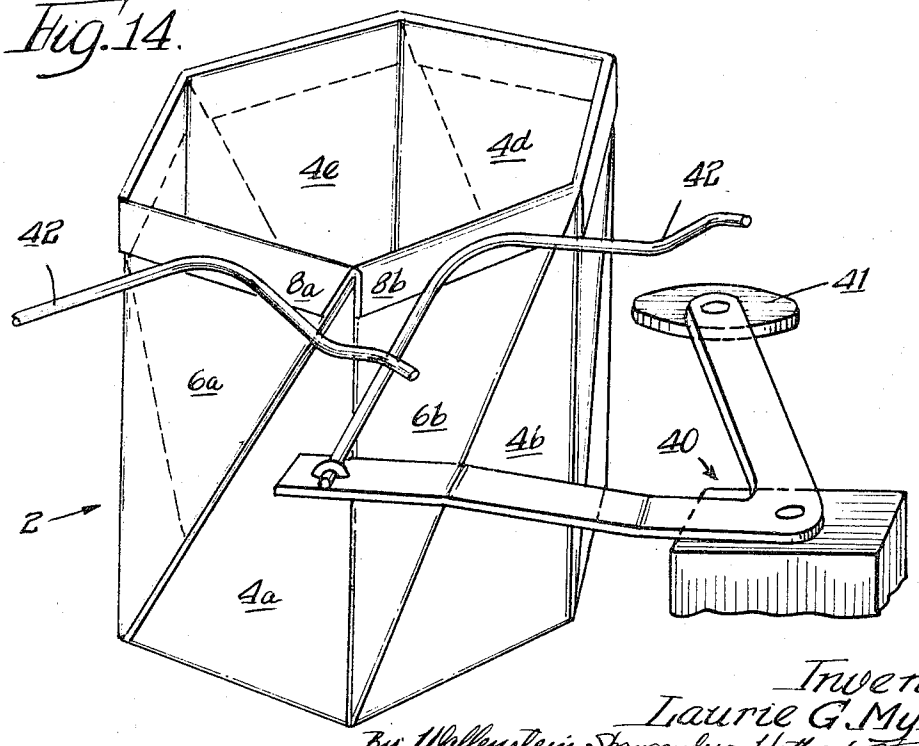


Fig. 14.



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United States Patent Office 3,423,008
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3,423,008

SEALED CARTON

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Filed Dec. 2, 1966, Ser. No. 598,713
U.S. Cl. 229—31 9 Claims
Int. Cl. B65d 5/12, 81/18

ABSTRACT OF THE DISCLOSURE

A liquid-tight carton formed from a single blank of sheet material which is folded so as to provide a carton body open at the top and having a polygonal shape with five or more substantially identical sides formed by vertical rectangular panels extending upwardly from the margins of a polygonal bottom wall. The adjacent confronting vertical margins of each pair of side panels are interconnected by a continuous liquid-tight section of material which is folded to form confronting folded pairs of triangularly shaped gusset panels. These confronting pairs of triangular shaped gusset panels are folded in the same direction around the outside surface of the carton body over the various rectangular side panels. The confronting folded pairs of triangular shaped gusset panels are held in place by downwardly turned locking flaps extending from the upper margins of the rectangular side panels of the carton body. A cover can be provided and the same is adapted to interlock with the gusset panels to affix the cover to the carton body.

This invention relates to liquid tight cartons preferably made from folded flat blanks of cardboard, paperboard or other similar foldable sheet materials. The most important application of the development is in cartons made of corrugated cardboard used to hold frozen food products.

It has been customary to package in large quantities (bulk form) frozen food products for institutional and restaurant use in relatively large cylindrical containers made of metal or cardboard. These containers are completely pre-fabricated and shipped to the ultimate user, the food processor who fills the containers with the particular product involved. The size of these pre-fabricated containers makes them inconvenient and costly to handle, ship and store prior to the filling thereof by the food processor.

The containers for holding bulk frozen food products are generally stacked to the ceiling in refrigerated rooms or railroad cars in which they are stored or shipped, and so these containers must have a high stacking strength. Although there has been a definite need for flat, folded, knock-down carton blanks of corrugated cardboard which are readily unfoldable into sturdy, sealed cartons for holding bulk frozen food products, no such carton blanks have been successfully developed prior to the present invention.

Accordingly, it is one of the objects of the invention to provide a relatively inexpensive, sealed carton for receiving liquid containing materials which can be frozen in the carton and which has an especially high stacking strength so that large numbers of such cartons can be stacked one on top of the other.

Another object of the invention is to provide a carton as described which can be readily made from a flat, foldable carton blank preferably made of corrugated cardboard.

Still another object of the invention is to provide a carton as described which is provided with a cover which interlocks with the carton body so as to support the weight thereof when lifted and which preferably has projecting

portions at the periphery thereof which can be readily grasped for moving or carrying the carton about.

A further object of the invention is to provide an assembly of a sealed carton and cover as described which are adapted to be readily set up and interlocked either manually or with automatic equipment.

A still further object of the invention is to provide a carton as described which comprises an open top body made from a folded flat blank and a cover which is also made from a flat blank which can be folded down over the top of the open top of the carton body into interlocking engagement with the body.

Another object of the invention is to provide a carton as described which has uniform side walls so that the freezing of the contents of the carton proceeds uniformly and takes a minimum time.

Accordingly, a carton body embodying the invention is most advantageously made from a flat, cut and creased corrugated cardboard blank which may be folded and secured manually or preferably by automatic machinery into a carton which is liquid tight, has a high burst and stacking strength, and has a large surface area to volume ratio and uniform side walls for most effective use in holding liquid products during and subsequent to a freezing operation. The carton body is open at the top and has a polygonal shape with five or more substantially identical sides, most advantageously six such sides, formed by vertical rectangular panels extending upwardly from the margins of a polygonal bottom wall along liquid tight lines of juncture therebetween. The adjacent confronting vertical margins of each pair of side panels are interconnected by a continuous liquid tight section of material which is folded to form confronting folded pairs of triangularly shaped gusset panels. These confronting pairs of triangularly shaped gusset panels are folded in the same direction around the carton body over the various rectangular side panels and preferably terminate completely within the panels involved. Each confronting triangularly shaped gusset panel preferably has the shape of a right triangle with the hypotenuse thereof being coextensive with the diagonal of the rectangular carton body side panel which it overlies and the other two sides thereof preferably fall respectively along the vertical and top margins of the associated rectangular side panel.

The confronting folded pairs of triangularly shaped gusset panels are most advantageously held in place by downwardly turned locking flaps extending from the upper margins of the rectangular side panels of the carton body, which locking flaps are secured as by an adhesive to the outside of the gusset panels involved to hold them against or adjacent the rectangular side panels.

The various confronting pairs of triangularly shaped gusset panels have downwardly facing shoulders which are most advantageously engaged by corresponding upwardly facing shoulders on the inside of the short vertical side panels of a cover which overlies the open top of the carton body. The blank from which the cover is made has substantially the same construction as the blank forming the carton body except that it is a much smaller blank so that the vertical rectangular side panels thereof extend only over a small fraction of the height of the carton body. Also, the cover-forming blank is folded in the opposite direction from the blank forming the carton body so that the resulting confronting pairs of triangularly shaped gusset panels are on the inside of the cover to form the aforesaid upwardly facing shoulders engaging the downwardly facing shoulders at the hypotenuse of the confronting pairs of triangularly shaped gusset panels formed on the carton body. This interlocking between the cover and the carton body forms an especially strong interconnection between the cover member and the carton body so the cover can support the entire weight of a filled carton

body when the cover is grasped and raised to lift the carton assembly.

As previously indicated, in the preferred form of the invention is a carton which has six sides. This forms a much more rigid structure than a five sided box structure, and more importantly, provides the strongest possible box construction consistent with simplicity in the blank design when corrugated cardboard is utilized as the blank material. In such case, the corrugations are arranged to extend parallel to one of the three axes of the hexagonally shaped margins of the blank. This provides a maximum vertical component of the corrugations in the completed carton body which materially increases the rigidity thereof. The carton construction described above has a very high stacking and bursting strength in addition to being relatively inexpensive to manufacture. Also, the construction of the carton body and cover member described makes it very easy to fabricate from flat blanks by the use of automatic folding equipment.

The above and other objects, advantages and features of the invention will become apparent upon making reference to the specification to follow, the claims and the drawings wherein:

FIG. 1 is a perspective view of the preferred carton assembly of the invention;

FIG. 2 is a greatly enlarged fragmentary view of the carton assembly of FIG. 1, showing the manner in which the cover interlocks with the carton body;

FIG. 3 is a plan view of the blank from which the cover of the carton of FIGS. 1 and 2 is made;

FIG. 4, which is drawn to a different scale than FIG. 3, is a plan view of the blank from which the carton body of the carton of FIGS. 1 and 2 is made;

FIG. 5 illustrates the manner in which the carton body-forming blank of FIG. 4 is folded to form a completed carton body;

FIG. 6 illustrates the manner in which the cover-forming blank is folded in place over the top of the completed carton body to interlock with the same;

FIG. 7 is a plan view of a blank-receiving table of a carton body forming apparatus which is utilized to fabricate automatically the carton body shown in FIGS. 1 and 2;

FIG. 8 is a vertical sectional view of the apparatus shown in FIG. 7 as a carton body-forming panel is delivered to the apparatus;

FIG. 9 illustrates the first step performed by the apparatus of FIGS. 7 and 8 in folding the blank, namely the pushing of the blank through openings in the blank-receiving table;

FIG. 10 is a vertical sectional view through the box-forming apparatus after the carton blank has been completely pushed through the openings in the blank-receiving table;

FIG. 11 is a perspective view of the panel-folding parts of the box-forming apparatus at the stage of their operation shown in FIG. 10;

FIG. 12 is a plan view of the panel-folding parts of the box-forming apparatus in the process of making the final folds in the blank; and

FIG. 13 is a perspective view of the panel-folding parts of the box-forming apparatus shown in FIG. 12.

Referring now more particularly to FIG. 1, the preferred exemplary carton assembly thereshown includes an open top carton body **2** forming a hexagonally shaped container with six contiguous identical rectangular side panels **4***a* to **4***f* to approximate, in a simple straight sided container, a cylindrically shaped container which, aside from the important disadvantage that it cannot be inexpensively made from a simple, single piece blank, is an ideal shape because it has a maximum stacking strength, surface area to volume ratio and uniformity. As previously indicated, the high strength stacking of the carton assembly is of especial importance since it permits the stacking to ceiling height, where desired, of cartons filled with relatively heavy contents, such as fruit frozen in its own syrup. The burst and stacking strength of the carton is aided materially by the fact that the corners of the hexagonally shaped carton are reinforced by the inner or base portions of confronting folded pairs of triangular shaped gusset panels **6***a*–**6***a*′ to **6***f*–**6***f*′ preferably extending diagonally across the corners of the rectangular side panels **4***a* to **4***f* of the carton. Narrow locking flaps **8***a* to **8***f* fold downwardly from the tops of the rectangular side panels over the upper portions of the folded triangularly shaped gusset panels against which they are held by adhesive or other means.

Another factor materially affecting the stacking strength of the preferred form of the invention is the use of a corrugated cardboard blank to form the carton body and the orientation of the corrugations **10** thereof. FIG. 4 shows that the blank for the carton body most advantageously comprises a generally hexagonally shaped blank with a central hexagonally shaped panel **12** having scored fold lines **14***a* to **14***f* defining the margins of the bottom wall of the completed carton body. These scored fold lines also define the inner margins of the six rectangular panels **4***a* to **4***f* which are centered along lines **16***a* to **16***f* radiating at angles of 60 degrees with respect to each other. Three pairs of these lines are in alignment and thus there are three pairs of rectangular panels located at diametrically opposite sides of the aforementioned central hexagonal panel **12**. For maximum stacking strength, the carton body blank is cut so that the corrugations **10** in the cardboard extend parallel to one of said aligned pairs of lines **16***a*–**16***d*, **16***c*–**16***f* or **16***b*–**16***e* along which a pair of rectangular panels of the blank are disposed. With this arrangement, there will be a maximum component of the corrugations of the rectangular panels and the gusset panels in the completed carton body extending vertically, which maximizes the rigidity and hence the stacking strength of the carton body.

The outermost margins of the rectangular panels **4***a* to **4***f* of the blank preferably fall along lines **18***a* to **18***f* which form an outer hexagon, and the blank has radially extending severance fold lines **20***a* to **20***f* extending between the corners of the outer hexagon and the corners of the central hexagon panel **12** to define between each adjacent pair of rectangular panels of the blank the pairs of opposed confronting triangular gusset panels **6***a*–**6***a*′ to **6***f*–**6***f*′. (Severance lines cut part way through the cardboard while score lines are indentations in the cardboard.) Scored fold lines **21***a*–**21***a*′ to **21***f*–**21***f*′ separate the side margins of the aforesaid rectangular and triangular panels. Each of the radially extending severance fold lines **20***a* to **20***f* have the same length as the diagonal across the adjacent rectangular panel **4***a* to **4***f*. The locking flaps **8***a* to **8***f* extend outwardly from the rectangular panel **4***a*′ to **4***f*′ and are separated therefrom by scored fold lines **19***a* to **19***f*.

The carton body is formed by folding the rectangular panels **4***a* to **4***f* of the blank at right angles to the central hexagonal panel **12** of the blank while folding the pairs of triangular gusset panels **16***a*–**16***a*′ to **16***f*–**16***f*′ outwardly into confronting relation along the aforementioned radially extending severance lines **20***a* to **20***f* and the confronting pairs of gusset panels are folded in the same direction against the rectangular panels **4***a* to **4***f* which brings the fold lines **20***a* to **20***b* between the confronting pairs of gusset panels along the diagonals of the rectangular panels. The locking flaps **8***a* to **8***f* are then bent down over the upper margins of the gusset panels and are secured thereto by an adhesive or otherwise. The locking flaps are shaped to expose the diagonally extending folded margins of the gusset panels.

The open top carton body **2** is overlaid by a cover **23** (FIG. 1) which is most desirably constructed from a flat blank (FIG. 3) having the same general panel arrangement as the carton body blank but wherein the rectangular panels **4A** to **4F** thereof are only a small fraction of the

length of the rectangular panels **4***a* to **4***f* of the carton body blank, so the cover will extend for only a small fraction of the height of the carton body. After a container body is filled, a flat cover blank is placed over the top of the filled carton body **2** and is folded down over the top of the carton body (FIG. 6). The triangular gusset panels **6**A–**6**A′ to **6**F–**6**F′ of the cover blank are folded inwardly into confronting relation rather than outwardly as in the case of the gusset panels **6***a*–**6***a*′ to **6***f*–**6***f*′ of the carton body, and the confronting gusset panels **6**A–**6**A′ to **6**F–**6**F′ are folded in the opposite direction than the confronting gusset panels of the carton body blank over the adjacent surfaces of the rectangular panels. Severance fold lines **20**A to **20**F are formed on the downwardly facing side of the cover blank between the confronting pairs of gusset panels **6**A–**6**A′ to **6**F–**6**F′. When the cover **23** is placed on the carton body, the edges of the cover gusset panels along which the severance fold lines **20**A–**20**F extend face upwardly (FIG. 2) and abut and interlock with the downwardly facing diagonally extending margins **20***a* to **20***b* of the carton body gusset panels **6***a*–**6***a*′ to **6***f*–**6***f*′. Adhesive or other means secure the cover member in place around the top portion of the carton body. (As will appear, it is preferred to use a fast drying adhesive to hold the carton body and cover member in a set-up condition.) With the interlocking of the cover **23** with the carton body as explained, the carton can be simply raised by grasping the projecting margins of the cover and lifting the carton, the interlocked margins of the gusset panels of the cover member and the carton body readily supporting the weight of the carton assembly. Since the cover overhangs the carton bodies thereof, spaces between adjacently stacked carton assemblies are left for circulation of air horizontally between the carton assemblies.

The carton body and cover blanks described above are particularly suitable for handling and folding by automatic carton folding machinery used by the filler of the carton bodies. As previously indicated, the blanks for forming the carton body **2** and the cover **23** are initially shipped in a flat condition to the plant involved where the food or other product to be packaged is located. The machinery for setting up the boxes most advantageously includes a carton body forming station shown in FIGS. 7–14, at which the carton body blanks may be stacked and then fed one at a time to blank folding equipment. In the most preferred application of the present invention, the carton blanks are made from a corrugated cardboard, preferably a B-flute cardboard which has a thickness of rougly one eighth of an inch. Cardboard of such thickness is not easy to fold and adhesively secure because of the weight and resiliency thereof. In the preferred blank folding equipment to be described, the carton body blanks are provided with dried liquid impervious adhesive coatings **24** (FIG. 11) on the initially downwardly facing surfaces of the locking flap portion 8*a* to 8*e* of the carton body blank. The carton body blanks are fed one at a time upon pivotable folding plates 30*a* to 30*f* (FIGS. 7, 8, and 10) which respectively underlie the rectangular panels 4*a* to 4*f* of the blank. The plates 30*a* to 30*f* overlie a platform **32** having guide blocks **33** (FIG. 7) for positioning the blanks, and a hexagonally shaped openings **34** therein conforming generally to the central hexagonal panel **21** of the blank involved with which it is aligned. A piston member **36** having vertically spaced hexagonal plates 36*a*–36*b* conforming to the size of the central heragonal panel **12** of the carton body blank involved is brought downwardly against the panel **12** to push the blank thorugh the heragonal opening **34** of the platform **32**, and the folding plates **30***a* to **30***f* are simultaneously raised into generally vertical planes to permit the entire blank to pass through the hexagonal opening **34** in the platform. As the rectangular panels **4***a* to **4***f* of the blank are folded upwardly, the contiguous pairs of gusset panels **6***a*–**6***a*′ to **6***f*–**6***f*′, due to the severance fold lines **20***a* to **20***f* on the lower sides thereof, extend outwardly into confronting relation, and, as the blank is moved downwardly through the opening **34** in the platform **32**, the six confronting pairs of confronting gusset panels **6***a*–**6***a*′ to **6***e*–**6***e*′ pass through curved slots **39** (FIGS. 8–10 and 12) in the platform **32** which slots progressively rotate the confronting pairs of gusset panels in the same direction toward the rectangular panels **4***a* to **4***f*. As the piston pushes the blank completely through the platform opening **34**, panel-folding assemblies **40** simultaneously engage the confronting pairs of gusset panels and push the same against the adjacent rectangular panels **4***a* to **4***f* and pull down the locking flaps at the top of the various rectangular panels **4***a* to **4***f* simultaneously. Each panel-holding assembly preferably comprises a unitary assembly pivoted about a vertical axis and including a gusset panel engaging wheel **41** which progressively completes the folding of the gusset panels, and a curved rod **4***a* (see FIGS. 11 and 14) which is positioned behind the associated carton locking flaps **8***a* to **8***e* and progressively folds the locking flaps down around the front of the adjacent confronting carton body gusset panels as the assembly rotates as a unit.

Where the carton body is to be adhesively held in its set-up condition, the dry adhesive coatings **24** on the locking flaps **8***a* to **8***f* is softened and then cured to a hard dry state by application of a suitable curing agent applied automatically at the proper instant by nozzles **52** (FIG. 10) at the carton blank-folding station, one such nozzle being opposite each locking flap **8***a* to **8***e* as the blank is pushed by the piston **36** into the position where the panel-folding assemblies being to fold the gusset panels. The adhesive is preferably one which can completely dry in one or two seconds after the rods **42** have pulled down the locking flaps over the gusset panels. The rods **42** remain in contact with the pulled down locking flaps and push with substantial force against the locking flaps (FIG. 14) to force the same snugly into the softened adhesive coating **24**. The edges of the piston plate **36***b* (FIG. 10) back up the carton body behind the folded locking flaps during the locking flap folding and adhesive drying operations.

Where a slow drying adhesive is utilized, the folded over locking flaps can be held in place by some external means for a sufficiently long period to enable the adhesive to dry as the carton body is moved toward a filling station. This can be accomplished, for example, by moving the completed container bodies through a hexagonally shaped tube (not shown), the walls of which hold the box together until the adhesive can dry. Alternatively, the carton bodies can be overlaid by temporary clamps (not shown) which hold the folded locking flaps snugly around the gusset panels. The clamps are attached to an overhead moving conveyor while the carton bodies are carried on an overhead conveyor to the filling station. The container bodies are then delivered to a cover applying station where the flat cover member blanks are deposited in proper position over the open top carton bodies, preferably under automatic control, and then the rectangular panels 4A to 4F thereof are folded down and the confronting pairs of gusset panels **6**A–**6**A′ to **6**F–**6**F′ are folded inwardly and flattened against the outer surface of the rectangular carton body panels **4***a* to **4***f* and secured preferably by a fast drying adhesive. The adhesive is applied as a coating to the cover member blank when the blanks is manufactured, and is softened and dried by a curing agent sprayed on the coating as described above.

It should be understood that numerous modifications may be made in the most preferred form of the invention without deviating from the broader aspects thereof.

I claim:

1. A liquid tight carton comprising: an open top carton body formed from a folded single piece blank of sheet

material and having a polygonal bottom wall with at least five sides, a vertical rectangular side panel extending upwardly from the margin of each side of the polygonal bottom wall, each vertical side panel joining the margin of the polygonal bottom wall through liquid tight lines of juncture, the confronting vertical margins of each adjacent pair of vertical side panels being interconnected by a continuous section of material folded to form confronting pairs of triangular gusset panels, the various confronting pairs of triangular gusset panels being positioned over the outside surface of one of the vertical side panels of each adjacent pair of vertical side panels, and each confronting pair of triangular gusset panels forming a rigid, liquid-tight interconnection between the confronting margins of a different adjacent pair of said vertical side panels.

2. The liquid tight carton of claim 1 wherein said confronting pairs of triangular gusset panels are held over the outside surfaces of the vertical side panels by relatively narrow locking flaps extending downwardly from the upper margins of the vertical side panels and secured to the outermost faces of the confronting pairs of triangular gusset panels.

3. The liquid tight carton of claim 1 wherein each confronting pair of triangular gusset panels have aligned margins following the outline of a right triangle whose hypotenuse inclines upwardly from the adjacent confronting bottom corners of the associated pair of vertical side panels.

4. The liquid tight carton of claim 3 wherein one of the other aligned margins of each confronting pair of triangular gusset panels extend respectively along the adjacent margin of the associated vertical side panel.

5. The liquid tight carton of claim 4 wherein the other aligned margins of each confronting pair of triangular gusset panels follow substantially along the upper margin of the vertical side panel over which they extend.

6. The liquid tight carton of claim 5 wherein the hypotenuse of the right triangle formed by the aligned margins of each pair of confronting triangular gusset panels is coextensive with the diagonal of the vertical side panel and which the gusset panels extends.

7. The liquid tight carton of claim 1 wherein each confronting pair of triangular gusset panels extends over the corresponding vertical side panels and has aligned vertical margins intersecting at one of the corners of the polygonal bottom wall, and the other margins of each confronting pair of triangular gusset panels being wholly within the margins of the associated vertical side panel.

8. A liquid tight carton comprising: an open top carton body having a polygonal bottom wall with at least five sides, a vertical rectangular side panel extending upwardly from the margin of each side of the polygonal bottom wall, each vertical side panel joining the margin of the polygonal bottom wall through liquid tight lines of juncture, the confronting vertical margins of each adjacent pair of vertical side panels being interconnected by a continuous section of material folded to form confronting pairs of triangular gusset panels, the various confronting pairs of triangular gusset panels being positioned over the outside surface of one of the vertical side panels of each adjacent pair of vertical side panels, each confronting pair of triangular gusset panels forming a rigid, liquid-tight interconnection between the confronting margins of a different adjacent pair of said vertical side panels, one of the aligned margins of each confronting pair of triangular gusset panels intersecting one of the corners of the polygonal bottom wall, another of the aligned margins thereof inclining upwardly from the latter corner of the polygonal bottom wall and forming a downwardly inclining and facing shoulder, and a cover for the open top carton body, the cover having a top wall overlying the top of the carton body and rectangular vertical side depending walls respectively extending downwardly over the confronting pairs of triangular gusset panels on the outside of the carton body, said cover having upwardly facing inclined shoulders on the inside thereof which respectively engage and interlock with the downwardly facing shoulders of said confronting pairs of gusset panels, the bottom margins of the cover projecting beyond the sides of the carton body to form downwardly facing shoulders which can be readily grasped to lift the entire carton.

9. A liquid tight carton comprising: an open top hexagonally shaped carton body formed from a folded single piece blank of corrugated cardboard material and having a hexagonally shaped bottom wall with six identically shaped vertical rectangular side panels extending upwardly from the margins thereof, the confronting vertical margins of each adjacent pair of vertical side panels being interconnected by a continuous section of material folded to form confronting pairs of right triangularly shaped gusset panels, the various confronting pairs of gusset panels being positioned over the outside surface of one of the vertical side panels of each adjacent pair of vertical side panels, and each confronting pair of gusset panels forming a rigid, liquid-tight interconnection between the confronting margins of a different adjacent pair of said vertical side panels, the single-piece blank from which the carton body is formed being a piece of corrugated cardboard divided by fold lines into a central hexagonally shaped panel forming said bottom wall and having fold lines at the margins thereof from which the six rectangular panels extend, the rectangular panels at opposite sides of the central hexagonally shaped panel being centered along axes lines which are 60 degrees apart, the blank between the confronting margins of each adjacent rectangular pair of panels comprising the two right triangularly shaped gusset panels joined to one another along a radial fold line which at its inner end intersects the margins of the adjacent rectangular panels on the outside surface thereof and at a corner of the central hexagonally shaped panel, and the corrugations of the blank running parallel to one of said axis lines.

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