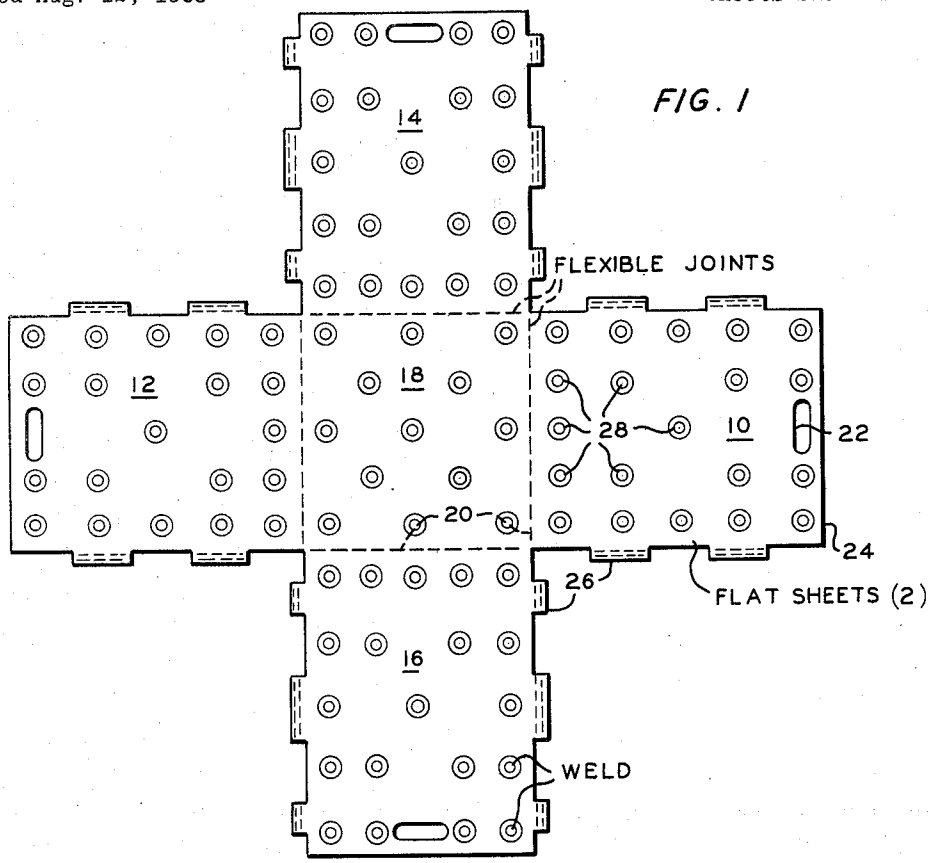
April 19, 1966 T. E. BRANSCUM ETAL 3,246,828

COLLAPSIBLE CARTONS

Filed Aug. 12, 1963 2 Sheets-Sheet 1

FIG. 1



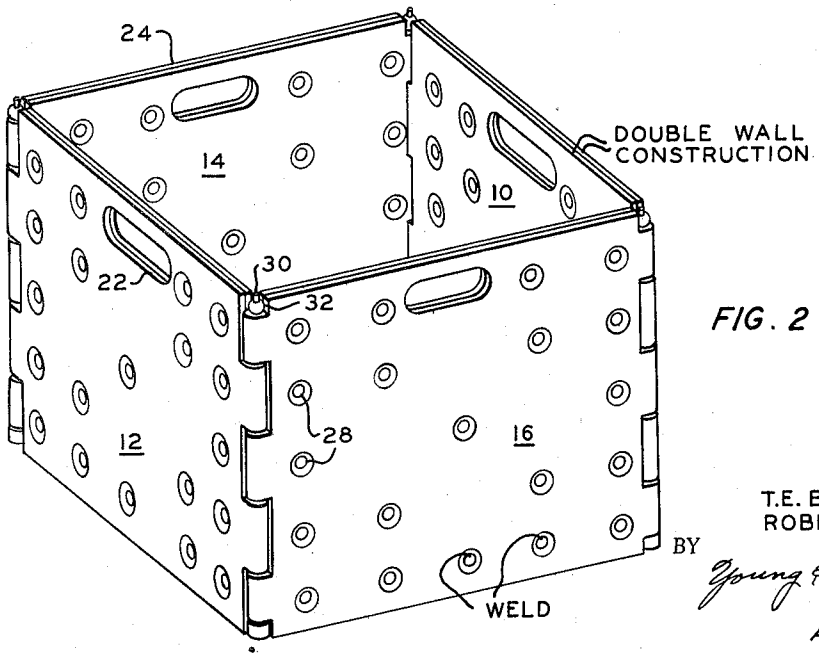




FIG. 2

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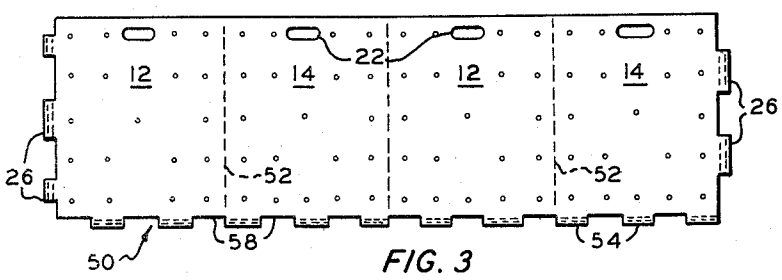


FIG. 3

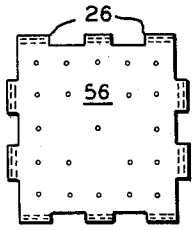


FIG. 3a

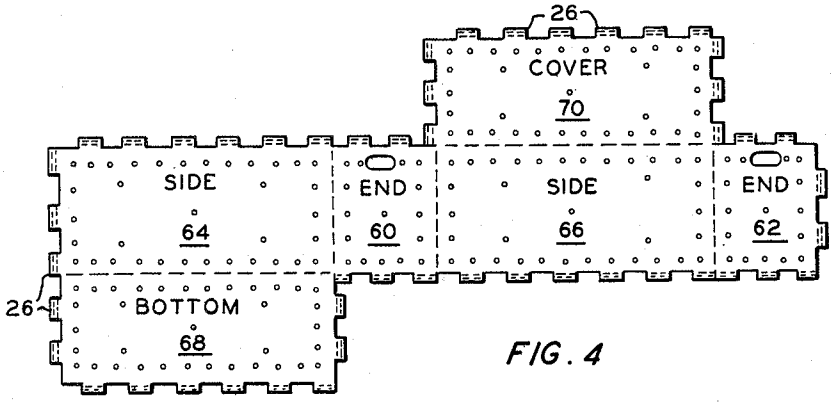


FIG. 4

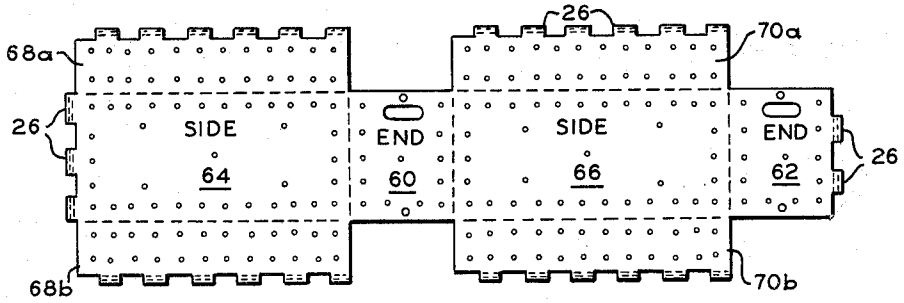


FIG. 5

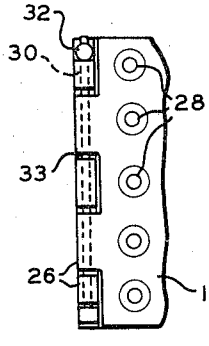


FIG. 6

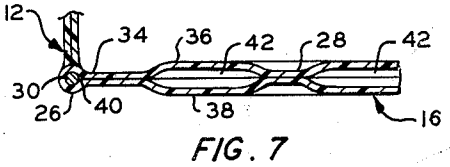


FIG. 7

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United States Patent Office 3,246,828 Patented Apr. 19, 1966



3,246,828

# COLLAPSIBLE CARTONS

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Filed Aug. 12, 1963, Ser. No. 301,277
2 Claims. (Cl. 229—30)

This invention relates to collapsible or knockdown cartons, to flat blanks for forming such cartons, and to a method of making same. Another aspect of the invention is concerned with a method of transporting goods in cartons.

Thermoformed plastic cartons are becoming common in the field of distributing and dispensing goods in commerce. Such cartons as plastic beverage bottle cases and similar cartons for sizeable goods are sufficiently costly to warrant reuse by shipping the empty cartons from the dispensing area to a refilling site. The shipping cost of the empty cartons is rather high because of the space occupied by the assembled cartons. This invention is concerned with knockdown or collapsible cartons formed of plastics which are amenable to thermoforming or heat shaping, such as blow molding, stamping, pressing, etc.

Accordingly, it is an object of the invention to provide a plastic knockdown or collapsible carton of novel construction and a process for making same. Another object is to provide an improved shipping carton of economical construction. A further object is to provide a shipping carton and a shipping method which are simple and economical. Other objects of the invention will become apparent to one skilled in the art upon consideration of the accompanying disclosure.

A broad aspect of the invention comprises a knockdown carton formed from a flat blank of thermoformed sheets having wall sections joined by knuckle joints with removable pintles for knockdown by removal of the pintles, whereby the carton is returned to its original flat blank form for convenience in shipping and handling. The carton may have a bottom integral with one of the sides, the other three sides of the carton being joined to the bottom by knuckle joints.

The bottom of the carton may also be provided with knuckles on each edge for intermeshing with knuckles on the bottom edge of each side of the carton to form knuckle joints therewith. In one flat blank construction, the bottom of the carton is integral with one side or end and has knuckles on the free edges of the bottom, while the cover is integral with the opposite side of the carton along the top edge thereof so that the blank is readily foldable into a carton with top and bottom closure members to entirely enclose the same. Knuckle joints are provided between the free edges of the top and the free edges of the carton. However, it is also feasible to provide only a knuckle joint between the edge of the cover opposite the integral edge and the opposite upper edge of the carton, leaving the ends of the cover unattached.

In a further embodiment of the invention, the blank comprises an end-to-end alignment of the sides of the carton with knuckles on the free ends of the blank (first and last sides) and with sections of the top and bottom integrally attached on corresponding edges of opposite sides of the assembled carton. To illustrate, where the carton has two ends and two sides, bottom sections are attached to each lower edge of the two opposite sides and a top section is attached to each of the two upper edges of the side members so that, when the carton is assembled, the sections of the bottom are joined by a knuckle joint intermediate the sides of the carton and the sections of the top are similarly joined.



The carton of the invention may be formed of any plastic amenable to thermoforming. Preferred plastics are polymers and copolymers of ethylene and propylene and/or other olefins. Any of the high or low pressure processes for forming these polymers may be used for preparing same; however, high density polymers, particularly, those formed at low pressure in the presence of a chromium oxide-on-silica-alumina catalyst are preferred. Other plastics which may be utilized are vinyl chloride polymers and copolymers, polystyrene and related compounds of the cellulosic plastics, etc. Different plastics may be utilized in the two layers of the carton blank for specific uses, if desired.

A more complete understanding of the invention may be had by reference to the schematic drawing which forms a part of this disclosure and comprises FIGURE 1, which is a plan view of a blank for forming a carton; FIGURE 2, which is a pictorial view of a carton assembled from a blank such as that of FIGURE 1; FIGURES 3 and 3*a*, which are plan views of a blank for forming the walls of a carton and a blank for the bottom of the carton, respectively; FIGURE 4, which is a plan view of another form of blank; FIGURE 5, which is a plan view of still another form of blank for forming a carton; FIGURE 6, which is a fragmentary view of an end or side section of a carton showing the knuckle joint arrangement; and FIGURE 7, is a fragmentary cross section of a carton along a plane perpendicular to the pintle of the knuckle joint attaching end and side sections together.

Referring to FIGURES 1 and 2, a blank for forming a carton comprises two opposite side sections **10** and **12** and two other opposite side sections **14** and **16** and a bottom **18** integral with the side sections along lines **20**. Handles **22** are punched, or thermoformed as recesses, into their respective walls along the upper edge thereof. The blank is made more flexible along lines **20** for the purpose of facilitating bending or folding. This may be accomplished by scoring the blank along the outside or bottom surface thereof or it may be formed in the manner disclosed in U.S. Patent to D. L. Stinson, No. 3,019,486 by flexing. This latter method comprises repeatedly flexing semi-rigid plastic sheets along a line forming the axis of flexibility so that there is formed along said line a reoriented necked-down portion. The flexing imparts greater flexibility to the sheet without impairing the strength of the resulting joint.

The blank is formed of two sheets of plastic which are bonded together along the outer edges **24** by heat and formed into knuckles **26** along the edges to be joined when the blank is folded to form a carton. It is preferred to spot weld or bond the two layers together at selected intervals as illustrated in FIGURES 2 and 6 by dimples or indentures **28**. These indentures may be formed by any suitable thermoforming or welding, as by application of hot punches or dyes to either or both layers of the blank, as desired. This adds rigidity and durability to the carton. In one embodiment of the invention, the blank is blow molded in the form of a flat double sheet or tube with spot reinforcement and knuckles along the hinge edges. It is also feasible to thermoform the blank from separate individual sheets of plastic of the same or different type which must be compatible for bonding.

In assemblying the carton of FIGURE 2 from the blank of FIGURE 1, the sides are rotated around axes **20** into a position perpendicular to the bottom so that knuckles **26** intermesh for locking with a pintle, shown more clearly in FIGURE 6. A small amount of clearance **33** is provided for bringing the knuckles of the two edges into intermeshing relationship. Pintle **30** is provided with a ball **32** on its upper end to facilitate withdrawal from the tunnel or eye of the knuckle joint. After bringing the

four sides of the carton into upright position with respect to the bottom and the knuckles in meshing relationship, pintle 32 is inserted at each corner of the carton so as to hold the sides thereof rigidly in position until knockdown is desired.

In the double wall construction of the blank and carton, knuckles 26 are formed by separating the layers to form an arcuate continuous section of the two sheets and by bonding the two sheets together at the base 34 of the knuckle by welding or other means. Reference to FIGURE 7 illustrates the structure being described wherein sheet 36 is bonded to sheet 38 at the base of knuckle 26, designated 34, to provide an eye or tunnel 40 slightly larger than pintle 30. This pintle may be formed of plastic but it may also be formed of metal, such as steel, aluminum, brass, copper, or any other rigid, strong material. It is also feasible to form threads on the inner end of the pintle and matching threads on the last or bottom knuckle of the joint so that the pintles do not readily fall out when the carton is inverted. FIGURE 7 illustrates the double-wall construction wherein spaced-apart sections of the wall provide air space 42 for insulating effect from both mechanical shock and heat.

Referring to FIGURES 3 and 3*a*, an elongated blank 50 comprises opposite side components 12 and 14 of the carton to be assembled, layed end-to-end and joined by flexible joints 52 extending from edge to edge of the blank and perpendicular thereto, when walls at right angles to the bottom are desired. Here again, the blank is of double-wall construction formed either from two sheets of plastic or from a tubular extrusion. Knuckles 26 are formed along the ends of the blank for intermeshing when assembling the carton and knuckles are also provided along the bottom edge 54 of the blank. In this arrangement, the walls of the carton are integral except at the single knuckle joint connecting the opposite ends of the blank and forming one corner of the carton. The bottom blank 56 is formed in similar manner to the previously described blank and is provided with knuckles 26 along its four edges and these knuckles are shaped and spaced to mesh with the knuckles of the corresponding section of the edge of blank 50.

Blank 50 may be formed by extruding a tubular member having walls of desired thickness and a width in the flattened position corresponding substantially with the width of blank 50. It is then a simple process to stamp the selected length of tubing for a length of the blank in accordance with the perimeter of the carton desired and form on the three edges of the blank the required knuckles 26. The knuckles along the edge 54 are formed simply by stamping out sections 58 of the required size and spacing and bonding the two walls of the tube along the base of the knuckles, leaving the correct tunnel or eyelet size in knuckles 26. The knuckles 26 at the end of the blank 50 are formed by cutting out the material between knuckles, welding the cut edges of the layers of plastic together and bonding the two layers along the base of the knuckles. Here again, the blank and resulting carton are preferably reinforced and by spot welding or otherwise bonding the two layers of plastic at selected intervals as in FIGURES 2 and 6.

FIGURE 4 illustrates a blank from which a covered carton is readily assembled. This blank comprises two end walls, 60 and 62, two side walls, 64 and 66, a bottom 68 and a top or cover 70. Flexible joints previously described are formed between integral wall members and between bottom 68 and side wall 64, as well as between cover 70 and the top edge of side wall 66. Alternatively, bottoms 68 and cover 70 may be formed integrally with end walls 60 and 62, respectively, in the end to end position, in other words, rotated 90° from the position shown. The structure of this blank is similar to that of the previously described blanks, there being formed along the edges to be joined knuckle joints with removable pintles. While cover 70 is shown with knuckles along its three free edges, it may be desirable to attach the free edge of this cover opposite the hinged or integral edge to the upper edge of side 64 by a knuckle joint and omit the knuckle joints at the ends of cover 70 so that the ends of the cover merely form a lap or butt joint with the upper edges of ends 60 and 62.

The blank in FIGURE 5 is similar to that of FIGURE 4 in that it lays out the walls of the carton end-to-end with attaching knuckles at the free ends of the blank and provides for both a bottom and top or cover for the carton. However, the bottom and cover are layed out in split sections, one section of the cover being integral with the upper edge of one side while the other section of the cover is similarly attached directly to the upper edge of the opposite side of the carton. The bottom sections are similarly attached integrally with the lower edges of the same sides of the carton to which the cover sections are attached. In this manner, upon bringing the ends of the blank together and flexing the blank at the boundaries of the walls and sections, the knuckle joints at the ends of the blank (forming an upright corner of the carton), and the sections of the bottom and cover, being provided with intermeshing knuckles, are also in position for insertion of pintles to form a complete closed carton. In the arrangement shown in FIGURE 5, the bottom and cover sections may be attached to the end sections, if desired, by rotating same 90° from the position shown.

The thickness of the layers of plastic to be used in the blank and cartons described and illustrated herein depends upon the size of the carton and the intended use. Cartons designed for transportation of heavy goods must be fabricated of heavier plastic sheet than cartons designed for lighter service. Generally, sheets or layers of 3 to 250 mil thickness are suitable for this use. While the bottom of the carton is preferably double-walled, it is also feasible to fabricate the bottom section, particularly of the blank of FIGURE 1, of a single thickness substantially heavier than the thickness of the layers of the side walls. This may be done by welding the side walls in their respective positions directly to the bottom of the carton, thereby forming a flat blank with flexible joints 20 at the intersection of the walls with the bottom.

The knockdown carton described herein may be provided with partitions in known manner for packaging various items, such as bottles containing liquids, particularly, beverage bottles, and other containers or items subject to shock damage in transit. The partitions may also be fabricated of double-walled plastic.

Certain modifications of the invention will become apparent to those skilled in the art and the illustrative details disclosed are not to be construed as imposing unnecessary limitations on the invention.

We claim:

1. A knockdown carton formed from a flat blank comprising two layers of semi-rigid moldable plastic having outlined thereon side and bottom sections, said side sections being continuous with said bottom and the boundary lines of said sides with said bottom being hinges formed by repeatedly bending said plastic along said lines as axes until said plastic is oriented and rendered flexible along said lines, said side sections being joined at their respective adjacent edges by knuckle joints providing for a knockdown condition, said layers being spaced apart over a substantial portion of their area and welded together in each side at selected points and separated at said knuckles to form the eye or tunnel for housing the pintle of each said joint, said layers being bonded together along the base of said knuckles and along the top and bottom edges of each side.

2. The carton of claim 1 including hand holes in a pair of opposite sides of said carton adjacent the top edges thereof, said sides and bottom being otherwise imperforate.

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