April 23, 1957 KAIJI NEGORO 2,789,745

SEALED PAPERBOARD CARTON

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Fig. 1

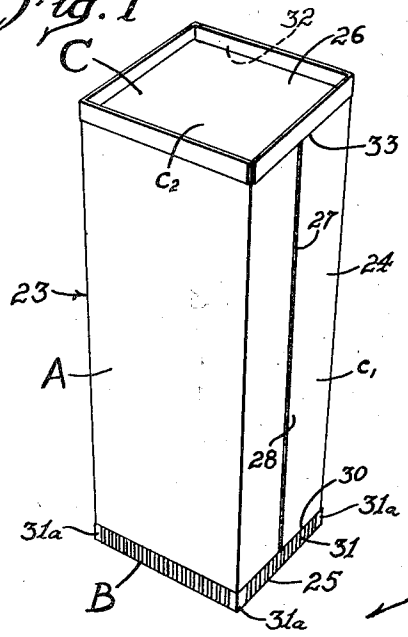


Fig. 3

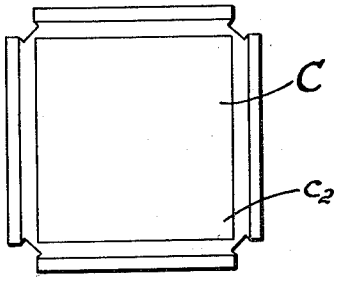


Fig. 2

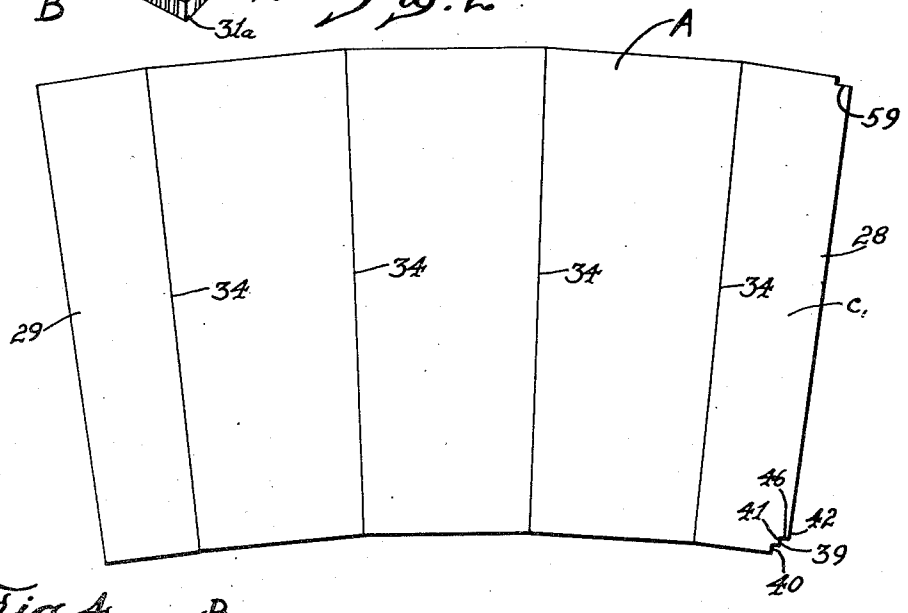
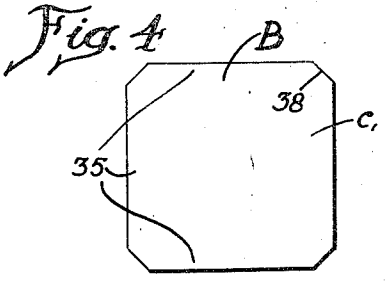


Fig. 4



Inventor:
Kaiji Negoro
Andrew F. Wintercorn
Atty.

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Fig. 5

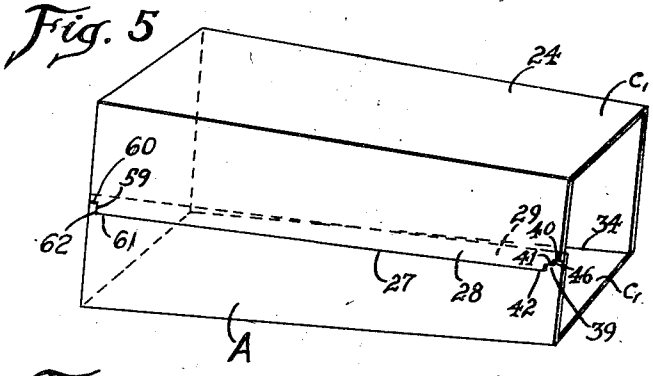


Fig. 6

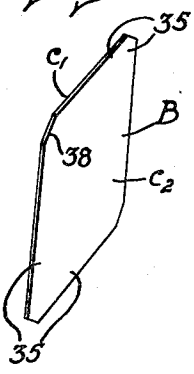


Fig. 7

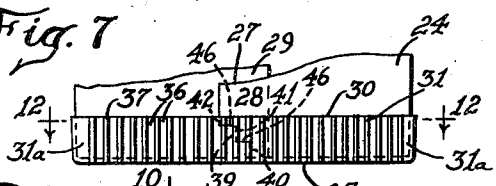


Fig. 8

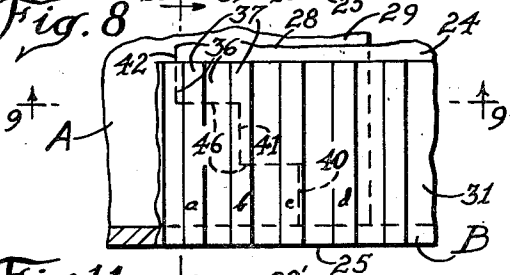


Fig. 14

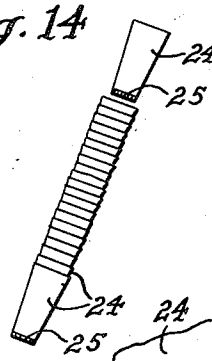


Fig. 11

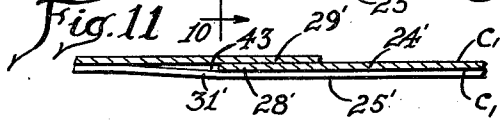


Fig. 9

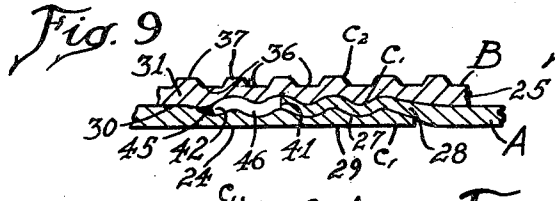


Fig. 12

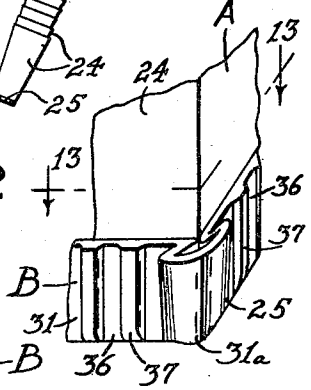


Fig. 10

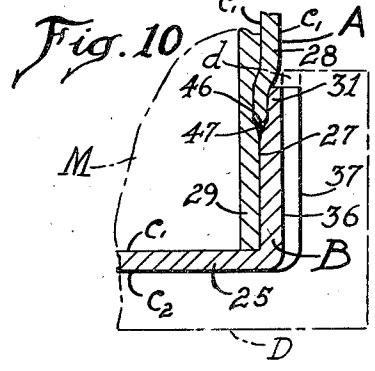
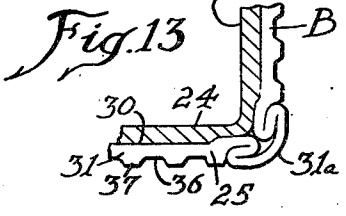


Fig. 13



Inventor:
Kaiji Negoro
Andrew F. Wintercorn
Atty.

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2,789,745

SEALED PAPERBOARD CARTON

Kaiji Negoro, Rockford, Ill., assignor to Dairy Containers, Inc., Rockford, Ill., a corporation of Illinois

Application February 1, 1952, Serial No. 269,458

9 Claims. (Cl. 229—5.6)

This invention relates to improved sealed paperboard cartons or containers, and, more particularly, ones especially designed and adapted for use as milk cartons, although, of course, they are not limited to that or any other specific use.

The principal object of my invention is to provide a carton or container of the kind mentioned of generally improved construction, with a view to increased strength and durability of the carton so that it will not be apt to rupture and spill its contents, even when dropped, and also will not evidence any tendency to leak at any of the joints when subjected to rough handling.

More specifically stated, the carton or container of my invention embodies:

(1) An improved bottom construction in which a flat paperboard blank that is left unnotched at the corners is applied to the bottom of the carton and the marginal edge portions of the blank are turned upwardly and applied evenly in the form of a finely vertically corrugated rim to the sides of the bottom portion of the carton, without any evidences of bunching up of paper at any point along the rim and particularly at the corners, because of excess paper. Such application is made possible by the employment of a die having flanges corrugated on their inner sides, whereby a large portion of the excess paper in the rim is taken up in two controlled folds at each corner and the rest of the excess in controlled fine folds or gathers immediately on opposite sides of each corner. The paper stock puckers out in the form of extruded ribs into the grooves in the die as a result of the high compression to which the paper is subjected and a lot of excess paper is taken up in this manner in a short dimension on each side of each corner, thereby avoiding any tendency for excess paper to bunch up along the rim. The bottom blanks are coated on the inner side with Vinylite or other thermoplastic material and on the outer side with alkyd or other thermosetting material so that the die can be operated at a heat high enough instantly to plasticize the Vinylite coating on the inner side and cement the bottom rim to the carton and at the same time seal the joint, without causing the blanks to adhere to the die. The thermosetting material coating the outer side of the blanks contains a lubricant to assist in stripping the blanks out of the die. The taper on the upturned rim of the bottom and the corresponding taper of at least the lower end of the sides to which the rim is applied, taken with the extremely high pressure with which the bottom is applied, insures an unusually good joint, and the bottom is also stretched evenly in all directions as a result of the method of application described.

(2) An improved joint between the flange on the bottom and the lower end of the lap joint on the side is obtained by providing a stepped zig-zag edge on the outer ply at the lower end of the lap joint, which, taken with the novel method of application of the bottom to the carton using the corrugated die, insures a reliable seal, by insuring that one or the other of the vertical edges of the stepped portion will register properly with a rib on

the die so as to locate an impression on or immediately alongside one of these edges leaving no open channel for leakage in the joint that is formed when the bottom is applied to the carton, the steps being purposely spaced laterally differently from the corrugations formed in the rim so that the vertical edge on one or the other of the steps will be certain to register with the impression in the rim formed by one of these ribs on the die. Further insurance against leaving any open channel for leakage is afforded by impressing paper of the rim across each of the horizontal edges of the stepped portion where the impressed portions between the vertical corrugations in the rim intersect and deeply dent these horizontal edges to close off the channels that would otherwise be left adjacent these edges and form transverse barriers or seals therefor by leakproof adhesion of the impressed portions at all of these points.

(3) An improved joint is also provided in a similar way between the upper end of the lap joint and the rim of the top by providing a stepped edge on the outer ply at that end, good seals being effected along the vertical and horizontal portions of this stepped edge similarly as at the bottom of the carton.

The cartons, ready for filling, are in the form of open tapered cups and are adapted to have the tops applied as caps in a filling and capping machine at the end of the filling operation. This enables nesting of the cartons so that a small dairy plant can keep a much larger stock of unfilled cartons on hand ready for use than was heretofore possible with other constructions, and, of course, cleanliness and sanitation are improved by the nesting of cartons, and shipping costs and the likelihood of damage to cartons in shipment are reduced. Incidentally, the preformed top blanks are also adapted to nest, so that the same advantages are derived, and the nested top blanks can, moreover, be handled in the filling and capping machine in stacks similarly as other caps have heretofore been handled. The filled cartons, when they reach the consumer, are adapted to be cut open across one corner of the top and the top portion so cut is adapted to be folded back to form a pouring opening, the opened corner portion of the carton providing a good pouring spout.

The invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of a filled and capped carton or container made in accordance with my invention;

Fig. 2 shows the scored flat paperboard blank for the four-sided tapered body of the carton;

Fig. 3 shows the scored flat paperboard blank for the square top of the carton;

Fig. 4 shows the flat paperboard blank for the square bottom of the carton;

Fig. 5 is a perspective view of the open-ended carton body as it appears after the blank of Fig. 2 has been wrapped around a mandrel and the overlapping ends cemented together by the Vinylite or other thermoplastic coating under heat and pressure;

Fig. 6 is a perspective view of the bottom blank of Fig. 4 showing it on the same scale as Fig. 5 and adjacent the small end of the carton body to which it is adapted to be applied;

Fig. 7 is a full size side view of the bottom portion of a carton body with the bottom applied and illustrating the ribs formed on the rim portion of the bottom in the application of the bottom to the carton body;

Fig. 8 is an enlargement of the middle portion of Fig. 7;

Figs. 9 and 10 are sections on the correspondingly numbered lines of Fig. 8, Fig. 10 indicating in dotted lines the tapered body supporting mandrel inside and the closure supporting and applying die outside;

Fig. 11 is a horizontal section through the lap joint of the carton body and illustrating along the outside thereof

the upturned rim of the bottom showing an open channel next to the lap joint that must be closed in order to seal the carton;

Fig. 12 is an enlarged perspective detail of a bottom corner of the carton showing the corner opened slightly to show how the excess paper in each corner of the upturned rim on the bottom is gathered in controlled folds;

Fig. 13 is a section on line 13—13 of Fig. 12, but showing the corner closed, and

Fig. 14 shows how the cartons ready for filling and capping are adapted to be nested like paper cups to facilitate handling, storage and shipment and also to promote sanitation.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to Figs. 1 to 4, the reference numeral 23 designates a filled and sealed carton or container made in accordance with my invention, consisting of a square tapered body 24 that is made from the paperboard blank A shown in Fig. 2, a bottom 25 made from the paperboard blank B shown in Fig. 4, and a top or cap 26 made from the paperboard blank C shown in Fig. 3. The square bottom of the carton is small enough to fit in the recessed square top of another carton so that these filled cartons may be stacked on top of one another, as required in storage and transportation. The blanks A, B and C are made of a paperboard like that commonly used for waxed paper cartons used as containers for milk and dairy products, but, in lieu of a wax coating, the blanks B and C have a thermoplastic coating c_1 of Vinylite or the like applied to the inner side, and a coating c_2 of alkyd or other thermosetting material applied to the outer side, blank A having both sides coated with the thermoplastic coating c_1. These coatings serve to render the paper non-absorbent, and the coating c_1 serves also as an adhesive and sealing medium under heat and pressure. In that way the lap joint 27 is heat-sealed lengthwise of the body 24 where the edge portion 28 of the blank A overlaps the edge portion 29, and the joint 30 is heat-sealed between the upturned rim 31 of the bottom 25 and the sides of the body 24, and the same is true of the joints 32 and 33 which join the rim of the top or cap 26 to the inner and outer sides, respectively, of the mouth of the carton. The thermoplastic coating c_1, in other words, makes it unnecessary to provide glue in the various joints, which is required in waxed containers, and production is simplified and cost accordingly greatly reduced. In addition, these coatings c_1 and c_2 offer many advantages over wax; for example, a carton thus coated is nicer to handle, being less slippery and hence less likely to be dropped, and these coatings will not rub off like wax on the hands or clothing and leave smears on shelves and counters. These coatings are, furthermore, not perceptibly affected by changes in temperature, and are odorless and tasteless and virtually unnoticeable on the carton except for a certain sheen that they give to the finish, which improves the general appearance of the carton. In short, the coatings c_1 and c_2 give all of the advantages of a wax coating without any of its disadvantages.

Referring to Figs. 2 and 5, the blank A is scored lengthwise along the lines 34 to facilitate folding the same to define the corners of the body 24. The blank is adapted to be wrapped around a square tapered mandrel, and the joint 27 is sealed the full length of the body under heat and pressure while the folded blank is still tightly enclosing the mandrel, whereby to insure that all of the cartons will have the same dimensions. Then, while the open ended carton, as it appears in Fig. 5, is still in position on the mandrel and supported thereby internally, as indicated in dotted lines at M in Fig. 10, the bottom 25 is applied using a blank B like that shown in Figs. 4 and 6. In the application of the bottom 25, a recessed square die, indicated in dotted lines at D in Fig. 10, the marginal flange portion of which has a taper corresponding to the taper of the mandrel supporting the open-ended carton body 24, folds the edge portions 35 of the blank B against the outer sides of the body 24 at the smaller lower end thereof in the form of the upturned rim 31, and the joint 30 between the portions thus overlapped is sealed under heat and pressure. The pressure is accentuated as a result of the wedging action of the die D in the telescoping thereof on the end portion of the mandrel M. Due to this unique method of application of the bottom 25, the paperboard bottom of the carton is stretched radially substantially equally in all directions as the edge portions 35 are folded and drawn outwardly and upwardly and pressed wedgingly upwardly and inwardly against the sides of the body in defining the upturned rim 31. It must be understood, however, that I do not limit the application of my invention to tapered cartons, because the tapered rim 31 is applicable in the same way to a carton of uniform size from top to bottom but tapered only at the very bottom, in which event only the corresponding end portion of the mandrel would, of course, be tapered and be adapted to have wedging engagement in the bottom applying die when surrounded by the open ended carton. The ribs in the marginal flange on the die D indicated at *d* in Fig. 10, make the vertical impressions 36 in the rim 31 and ribs 37 are defined on the rim 31 between these impressions. Now, in the turning up of the edges of the blank B to define the rim 31, two controlled folds at each corner 31*a* take up the bulk of the excess, and these folds are flattened as shown in Fig. 13 under heavy pressure so that they are not evident to the naked eye on the smooth corners of the finished rim 31. In this flattening of the folds at the corners 31*a* under such heavy pressure there is a tendency for excess paper to "flow" laterally in both directions from each corner, but this tendency is overcome by gathering excess paper in controlled fine folds or gathers on opposite sides of each corner. These fine folds or gathers are crowded into the first two ribs 37 on each side of the smooth corners 31*a*. In other words, the ribs on the flange of the die that form the impressions 36 keep the excess paper at the corners from bunching up along the rim 31 between the corners. Due to the novel method of gathering up the excess paper in the fine folds the blank B does not have to be notched at the corners; it is sufficient if the corners are merely cut away diagonally, as indicated at 38. Cutting the corners diagonally avoids having the upturned rim 31 of greater height at the corners of the carton, the rim 31 being of substantially the same height all around.

Attention is now called to the stepped cut-out lower corner 39 on the edge portion 28 of the blank A in Fig. 2, this cut-out corner portion overlapping the lower end of the edge portion 29 when the blank A is wrapped around the mandrel and the overlapped ends are sealed together, as shown in Fig. 5. This multi-stepped or zig-zag cut-away corner defines three vertical edges 40, 41 and 42, either one of which is bound to come into approximate register with one of the impressions 36 in the rim 31 formed by one of the ribs on the flange of the recessed die that applies the bottom. Hence, one of these vertical edges 40, 41, or 42, as the case may be, will be more or less flattened out in the forming of the impression 36, whereby to close up an otherwise open channel 43 that would be left alongside the edge of the outer lap 28' between the upturned flange 31' on the bottom 25' and the wall of the carton body 24', as shown in Fig. 11. In other words, in the forming of the laterally spaced impressions 36, at least one of these impressions 36 will be certain of location in register with or immediately alongside one or the other of the three edges 40, 41 and 42 of the stepped cut-away corner portion 39, due to the fact that the steps 40–42 are differently spaced from the ribs in the die, and accordingly are differently spaced from the impressions 36 made by these ribs, and it is immaterial whether the seal thus effected comes at 40, 41 or 42. In the case illustrated, a

definite and positive seal is provided at 42 and a partial seal is also provided at 41. See Fig. 9, where the first mentioned seal is indicated as 45. Despite the three stock thicknesses involved in the overlapping of edge portions 28 and 29 and the enclosing flange 31, it is evident in Fig. 9 that the stock is subjected to enough compression (approximately ⅓) so that there is no apparent bulge on the flange 31 adjacent the joint 27, the wall thickness at the bottom of the carton being substantially the same all the way around. Also, as indicated in Fig. 9, in the compression of the stock and the consequent reduction in thickness of the edge of portion 28, whatever small void or channel might otherwise still be left despite the approximate registration of the impression 36 with the edges 42, 41, 40, as the case may be, will be certain of being filled with thermoplastic material, as indicated at 45, so as to give an absolute seal. The same is true in regard to any small void or channel that might be left adjacent the horizontal edges 46 between edges 40–42, such small voids being filled with thermoplastic material, as indicated at 47 in Fig. 10. It is apparent, therefore, that there is no danger whatsoever of the carton springing a leak at this otherwise critical joint. Furthermore, at the point of each intersection of an impression 36 with one of the horizontal edges 46, as shown in Figs. 8 and 10, the edge 46 is dented deeply by the relatively narrow impressed portion 36, so that the channels that would otherwise be left adjacent these edges are closed and a seal is provided equivalent to what was relied upon in other constructions as the sole means of sealing the carton. Therefore, although the relatively elongated seal at 45 lengthwise of one of the vertical edges 40–42 is sufficient by itself, the spot seals effected transversely of the horizontal edges 46 as at 47 to provide further insurance against leakage.

Cartons with bottoms applied are adapted to be nested, as shown in Fig. 14, and hence large quantities can be stored in a small fraction of the space that would otherwise be required for a comparable number of such cartons. The nesting is of further advantage in keeping cartons clean and in sanitary condition, besides protecting the individual cartons from being crushed in shipment.

Attention is now called to the notched upper corner 59 on the edge portion 28 of the blank B in Fig. 2. This corner portion with its single step cut-out overlaps the upper end of the edge portion 29 when the blank A is wrapped around the mandrel M and the overlapped ends are sealed together, as shown in Fig. 5. This single step cut-out corner is defined by vertical edges 60 and 61 and connecting horizontal edge 62. The cut-out corresponds generally in shape and dimensions to the rabbetted interfitting ends of the L-shaped jaws that move inwardly diagonally of the top 26 at the four corners thereof to heat-seal the outer portion 50 of the rim. By virtue of the single step notching of the corner 59, the ends of the jaws of the capping die can be made flat on their inner side instead of having to allow for an extra thickness of paper, and I have found that a much more reliable seal is effected, principally along the full length of the horizontal edge 62 and vertical edge 60, by reason of the impression made by the rabbetted end of the jaw that matches more or less the cut-out corner 59. A small extra dab or fillet of Vinylite or other thermoplastic coating material may be applied in the corner of the notch 59 when the carton is still on the mandrel. This extra plastic helps to insure a perfect seal in the heat sealing of the top on the carton by filling up any voids in the joint, this plastic being, of course, liquified by the application of heat the same as the coating c_1 on the body blank A and top blank C.

In closing, while at present I prefer direct heat application by hot dies in the application of the carton bottoms and tops, it should be understood that the thermoplastic coating c_1 may be rendered plastic for adhesive and sealing purposes in other ways, as by dielectric heating, or by radiant heating.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. In a paperboard carton, comprising an open end body and an end closure closing one end thereof, said body comprising a generally rectangular paperboard blank, the opposite end portions of which are overlapped and form a sealed lap joint, that end portion which forms the inner ply of the lap joint being flat and having an unbroken straight vertical edge the full length thereof, that end portion which forms the outer ply of the lap joint being also flat and at least one corner thereof having a portion of an appreciable height and width but less than the width of the lap and less than the height of the flange on the closure cut away to define a stepped edge consisting of at least one substantially horizontal edge in transverse relationship to at least one substantially vertical edge, the end closure being secured on one end of said body by means of a finely vertically corrugated flange applied externally to said body over said stepped edge and under heat and pressure.

2. In a paperboard carton, comprising an open end body and an end closure closing one end thereof, said body comprising a generally rectangular paperboard blank, the opposite end portions of which are overlapped and form a sealed lap joint, that end portion which forms the inner ply of the lap joint being flat and having an unbroken straight vertical edge the full length thereof, that end portion which forms the outer ply of the lap joint being also flat and at least one corner thereof having a portion of an appreciable height and width but less than the width of the lap and less than the height of the flange on the closure cut away on a zig-zag line, alternate portions of the zig-zag line being substantially parallel with one adjoining edge of the blank and intermediate portions of the zig-zag line being substantially parallel with the other adjoining edge of the blank, the end closure being secured on one end of said body by means of a finely vertically corrugated flange applied externally to said body over said cut-away portion under heat and pressure.

3. In a paperboard carton comprising an open end body and an end closure closing one end thereof, said body comprising a generally rectangular blank, the opposite end portions of which are overlapped and form a sealed lap joint, and the end closure comprising a blank of larger size than the closure receiving end of the body and having marginal edge portions folded in the form of a rim enclosing the end of the body externally, the corner of the outer ply of said lap joint at the closure end of the body having a portion of an appreciable height and width but less than the height of the rim and width of the lap cut away to define a stepped edge, said rim having gathers formed at least in that portion covering the lap joint between closely spaced, parallel, narrow, inwardly impressed portions substantially parallel to a substantially vertically extending portion of the stepped edge and in transverse edge denting and sealing relation to a substantially horizontally extending portion of the stepped edge.

4. A carton as set forth in claim 3 wherein the stepped edge has a plurality of steps and the inwardly impressed portions are spaced differently from the substantially vertically extending portions of the stepped edge.

5. A carton as set forth in claim 3 wherein the closure is applied under heat and pressure and wherein the inner and outer sides of the blank of said body and the inner side of the blank of said end closure are coated with a thermoplastic material which becomes tacky when heated to the heat sealing temperature.

6. In a paperboard carton comprising an open end body

and an end closure closing one end thereof, said body comprising a generally rectangular blank, the opposite end portions of which are overlapped and form a sealed lap joint, and the end closure comprising a blank of larger size than the closure receiving end of the body and having marginal edge portions folded in the form of a rim enclosing the end of the body externally, the corner of the outer ply of said lap joint at the closure end of the body having a portion of an appreciable height and width but less than the height of the rim and width of the lap cut away to define transversely extending edges, said rim having at least in that portion covering the lap joint an inwardly impressed portion substantially filling the cut away portion of the outer ply, said inwardly impressed portion effecting seals at said edges by the impression of portions thereof at these points.

7. A carton as set forth in claim 6 wherein the closure is applied under heat and pressure and wherein the inner and outer sides of the blank of said body and the inner side of the blank of said end closure are coated with a thermoplastic material which becomes tacky when heated to the heat sealing temperature.

8. In a paperboard carton comprising an open end body and an end closure closing one end thereof, said body comprising a generally rectangular blank, the opposite end portions of which are overlapped and form a sealed lap joint, and the end closure comprising a blank of larger size than the closure receiving end of the body and having marginal edge portions folded in the form of a rim enclosing the end of the body externally, the corner of the outer ply of said lap joint at the closure end of the body having a portion of an appreciable height and width but less than the height of the rim and width of the lap cut away on a zig-zag line, consisting of substantially horizontal segments substantially at right angles to substantially vertical segments, said rim having gathers formed at least in that portion covering the lap joint between closely spaced, parallel, narrow, vertical, inwardly impressed portions, said inwardly impressed portion effecting seals at said edges by the impression of portions thereof at these points.

9. A carton as set forth in claim 8 wherein the inwardly impressed portions are spaced differently from the vertical segments of the zig-zag line.

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