Nov. 15, 1966 T. R. BAKER 3,285,494

FOLDING BOXES AND BLANKS, PARTICULARLY IN REGARD TO SEALING BY MEANS OF A THERMOPLASTIC COATING PREAPPLIED TO BOTH SIDES THEREOF

Filed Feb. 25, 1965 2 Sheets-Sheet 1

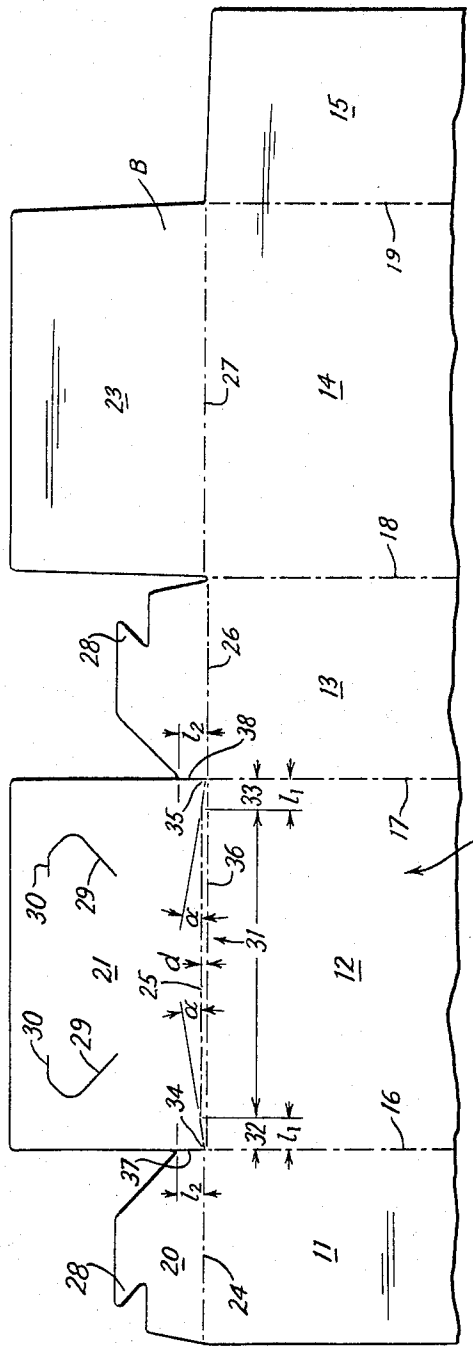

Fig. 1

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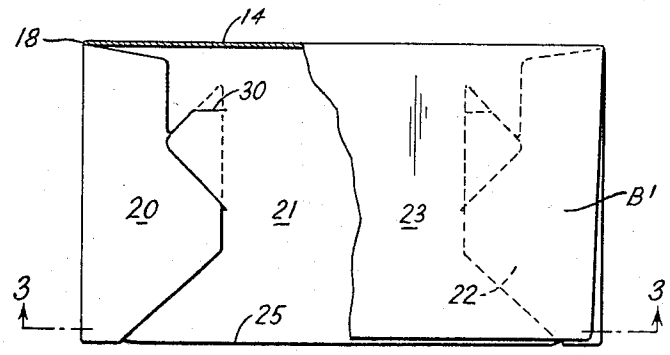

Fig. 2

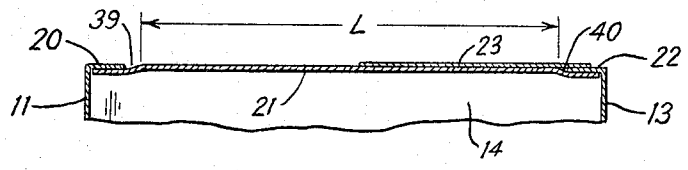

Fig. 3

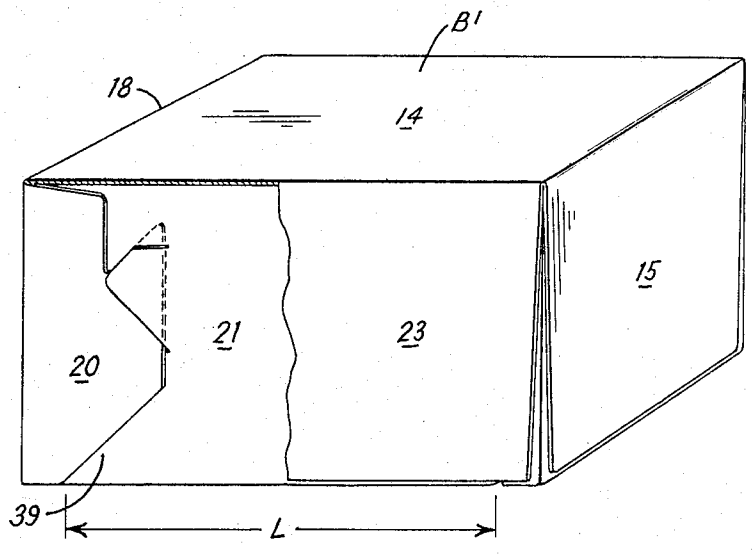

Fig. 4

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United States Patent Office 3,285,494 Patented Nov. 15, 1966

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FOLDING BOXES AND BLANKS, PARTICULARLY IN REGARD TO SEALING BY MEANS OF A THERMOPLASTIC COATING PREAPPLIED TO BOTH SIDES THEREOF

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Filed Feb. 25, 1965, Ser. No. 435,212
5 Claims. (Cl. 229—36)

Folding boxes for the packaging of frozen foods or other moisture or liquid containing contents are customarily coated with a film of a thermoplastic material. This material may be a wax composition having a relatively high melting point, as are presently available from nearly all major oil refining companies, or it may be a synthetic resin, for example polyethylene.

These coatings or films are extremely thin, the thickness being of the order of two to four hundredths of a millimeter per film. A representative box sample of 0.34 mm. thickness measured 0.41 mm. with a coating on both surfaces. It is common practice to make the inside coating, whose principal purpose is to liquid-proof the board, somewhat thicker than the outside coating which is generally treated to impart a high gloss thereto, which enhances the appearance of printing or lithographic art work on the box.

It is the practice in the United States box industry to express the coating or film thickness in terms of weight per surface area. For example, the aforementioned box which had a board caliper of 14 points (14 thousandths of an inch) uncoated, had a total of seven pounds of high melting points applied to 1000 sq. feet of board (3.5 kg./100 sq. meters), more particularly at the rate of four pounds per one thousand square feet for the inside and three pounds per thosuand square feet for the outside. With both coatings the caliper increased to 17 points. In metric terms the four pound coating amounts to approximately 2 kg. per 100 square meters and the three pound coating to 1.5 kg. per 100 square meters.

Boxes of the aforementioned kind were previously sealed either by mechanical means, such as flaps or tabs inserted into slits or behind edges, followed generally by overwrapping, or they were sealed by means of an adhesive applied prior to, or at the time of, sealing in predetermined areas.

The thickness of the applied adhesive layer exceeds the thickness of the aforementioned coating considerably and because of its thickness the adhesive is capable of bridging gaps in the closure.

For example, it was possible by conventional sealing procedure to produce a reliable bond between a flat panel, for example a cover flap and the box end wall over which the flap was folded, even though the plane of the box end wall was uneven, as a result, for example, of corner flaps overlying certain portions of the end wall. The differences in thickness correspond to approximately the blank caliper, or slightly more in the event additional unevenness is produced by the insertion of corner flap portions through slits in the box end wall.

The present invention is based on the recognition that a reliable seal can be produced without any additional adhesive by means of the thin board coating alone even though the coating possesses no gap bridging properties whatever, which is readily appreciated when one compares the thickness of the total available coating material (for example 0.07 mm.) with the caliper of the board in uncoated condition (for example 0.34 mm.).

Perhaps the most extensively used form of frozen food box is the one in which the end wall structure comprises a box body end wall panel over which two corner lock flaps are folded which partially extend through slits in the

end panel to form a mechanical corner lock. The resulting unevenness of the box body end wall exceeds the thickness of the board.

According to the present invention the unevenness is reduced to zero and all major portions of the end wall are brought into the same plane by mechanical bowing out of the end wall panel, the bowing out, in turn, being produced automatically by a particular configuration of the fold line along which the end wall panel is articulated to the bottom panel.

More particularly, the fold line comprises three portions, viz., a central portion and two terminal portions. The terminal portions are out of line with the central portion so that an imaginary chord passing through the far ends of the terminal portions is spaced from, and substantially parallel to, the central portion, the offset of the central portion with respect to the chord being to the outside of the box.

I am of course aware of the fact that it is conventional practice in the art of folding box making to offset fold lines of certain panels with respect to fold lines of other panels. It is also known to bow fold lines in order to arch a box wall so as to sustain considerable sealing pressure without the danger of caving in.

In none of the known instances however was the present invention's goal attained, namely the sealing of box panels by means of its thin water or moisture proofing coating. It therefore appears that the bowing of portions of an otherwise uneven box wall for the purpose of reducing the unevenness in combination with the thin thermoplastic coating produces a heretofore unattained effect and eliminates the need for the application of special adhesives. This, in turn, simplifies the closing and machinery greatly.

The objects, features and advantages of this invention will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, a preferred embodiment of the invention. The invention also resides in certain new and original features of construction and combination of elements hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of it in which:

FIG. 1 is a plan view of a folding box blank incorporating the invention, only one-half of the blank being shown;

FIG. 2 is an elevational end view, partly in section, of the closed box;

FIG. 3 is a section taken on line 3—3 of FIG. 2; and

FIG. 4 is a perspective view, partly in section, of the sealed box.

In the description and in the claims various details will be identified by specific names for convenience. The names, however, are intended to be generic in their application. Corresponding reference characters refer to corresponding figures of the drawings.

The drawings accompanying, and forming part of, this specification disclose certain specific details of construction for the purpose of explanation of broader aspects of the invention, but it should be understood that structural details may be modified in various respects without departure from the principles of the invention and that the invention may be incorporated in other structural forms than shown.

The blank B shown in FIG. 1 comprises a central series of panels, more particularly a front wall panel **11**, a bottom panel **12**, a rear wall panel **13**, a cover panel **14** and

a cover front flap **15** articulated to one another along a front bottom fold line **16**, a rear bottom fold line **17**, a cover hinge line **18**, and a front flat fold line **19**, respectively.

Two lateral series of panels extend from certain of the aforesaid panels. Only one-half of the symmetrical blank is shown in FIG. 1, it being understood that the half which is not shown is a mirror image of the illustrated half.

The lateral series of panels comprises, in order, a corner lock flap **20**, a box body end panel **21**, a further corner flap shaped as a lock flap **22**, and a cover flap **23** articulated to the central panels along a corner fold line **24**, a bottom end fold line **25**, a corner fold line **26**, and a cover end flap fold line **27**, respectively.

The corner lock flaps **20** and **22** are shown to have the familiar lock configuration as indicated at **28**, and the end panel **21** comprises internal cuts or slits **29** into which the male lock elements **28** are insertable.

The paperboard from which the blank B is cut is coated on both surfaces with the usual thin coats of thermoplastic material which may be a high-melting point wax or a synthetic resin such as polyethylene. The thickness of the coating or film is of the order above given.

The blank B is converted into box form B′ in the usual manner by folding the wall panels **11**, **13** and **21** upright with respect to the bottom panel, folding the lock flaps **20** and **22** over the outside of the end panels **21**, inserting the lock tips into the slits **29** and forcing the very points of the tips behind the flat portions **30** of the slits **29**. This is known procedure.

The box B′ is then filled and the cover folded into closing position ready for sealing. In the closing position the cover panel **14** lies parallel to the box bottom and the cover flaps **15** and **23** overlie the front and ends of the box (FIGS. 2 and 4).

In order now to produce a good adhesive bond between the cover flap **23** and the end panel structure **20**, **21**, **22** in spite of the absence of gap bridging properties of the thermoplastic films, the central portion of the end wall **21** is bowed out between the lock flaps **20** and **22**, as best shown in FIG. 3. This is accomplished by a particular configuration or outline of the bottom end fold line **25**.

The bottom end fold line comprises a central straight portion **31** between terminal portions **32**, **33**. The terminal portions **32**, **33** extend at an angle α with respect to the central portion and terminate at the corner points **34**, **35**. An imaginary chord **36** may be drawn connecting these two points. The chord is indicated by a dash-double-dot line. This chord line **36** is not physically present in the blank, but is shown in the drawings to indicate the outward offset "*d*" of the bottom fold line portion **31** with respect to the location occupied by the bottom end fold line in conventional boxes.

The length 1_1 of the terminal portions **32**, **33** is somewhat longer than, or equal to, the length 1_2 of the bottom edge **37**, **38** of the lock flaps **20**, **22**.

The effect of this arrangement is illustrated in FIG. 3. It is seen that upon folding of the end panel **21** the central portion of the end panel **21** bows out along a length L. The cover flap **23** can therefore make full contact with the panel **21**, particularly in the critical area immediately above the bottom fold line **25**, except for small spaces or depressend areas **39**, **40** immediately adjacent the lateral edges of the lock flaps.

Tests were conducted to compare the performance of boxes embodying the invention with conventional boxes having straight bottom end fold lines and, accordingly, an end wall structure in which the end wall and the corner flaps lie in different planes.

The tests proved that in the boxes embodying the invention a fiber tearing bond was obtained between the cover flap and the box end close to the bottom fold line and substantially uniformly across the entire width of the box end.

In conventional boxes having a straight bottom end fold line the length of the fiber tearing area was considerably shorter.

It was further noticed that in the boxes embodying the invention a secure fiber tearing bond was consistently formed between the cover flap and the corner flaps immediately above the level of the box bottom. By way of contrast, in none of the conventional boxes was a bond formed at that area. A reasonable explanation for this appears to be that exertion of sealing pressure on the corner flap tends to bow the flaps towards the inside of the box into contact with the end panel which lies in a plane farther removed than the corner flaps. The edges of the corner flaps then act as a fulcrum causing the terminal portions of the cover flap to flare up and thus move out of contact with the face of the corner flaps.

In distinction, no such bowing of the cover flap occurs in the boxes embodying the invention. The cover flap remains flat and adheres not only to the end wall, but also to the corner flaps.

What is claimed is:

1. The end construction of a folding box of paperboard comprising a bottom panel; a pair of side panels articulated to opposite sides of the bottom panel, an end panel articulated to one end of the bottom panel along a bottom end fold line and a pair of corner lock flaps articulated to said side panels along corner fold lines and folded over the end panel; a cover panel; and a cover flap articulated to said cover panel in a position to overlie said end panel and said corner flaps at least partially, in which said bottom end fold line comprises three portions, viz., a central portion and two terminal portions, said central portion being offset toward the outside of the box with respect to an imaginary chord connecting the far ends of the terminal portions, a curvature resulting in the end panel when folded at said bottom end fold line with respect to the bottom panel, said curvature being convex as viewed from the box outside which curvature brings the central portion of the wall panel into substantially the same plane as the corner lock flaps which overlie the end portions of the wall panel adjacent said corner fold lines.

2. A folding box of paperboard coated on both sides with a film of a thermoplastic material, the box comprising a bottom panel; a front panel and a rear panel articulated to the sides of the bottom panel along a front and a rear bottom fold line, respectively; a pair of end panels articulated to the ends of the bottom panel along bottom end fold lines; corner lock flaps articulated to said front and rear panels along corner fold lines, folded to overlie the said end panels except for a flap portion which extends through slits in the respective end panels; a cover panel articulated to said rear panel along a cover hinge line; and a pair of cover side flaps articulated to the ends of the cover panel, said cover side flaps overlying the outside surface of the said end panels and that portion of the corner flaps which overlies the end panels and being bonded thereto by the thermoplastic coating material on the inside of the cover side flaps and on the outside of the end panels and corner lock flaps, the said bottom end fold lines comprising, each, a central line portion and terminal line portions, the distance between the central portions of opposite lines being greater than the distance between imaginary chords connecting the far ends of the respective terminal line portions, causing the central end panel portion lying above the central bottom end line portions to bulge out substantially into the plane of the said overlying corner lock flap portions.

3. In a folding box blank of paperboard coated on both sides with a film of thermoplastic material, the blank comprising a bottom panel; a front panel and a rear panel articulated to opposite sides of the bottom panel

along a front and a rear bottom fold line, respectively, and having slots therein for insertion of portions of the corner lock flaps hereinafter recited; a pair of end panels articulated to opposite ends of the bottom panel along bottom end fold lines; corner lock flaps articulated to the ends of said front and rear panels along corner fold lines; a cover panel articulated to said rear panel along a cover hinge line; and a pair of cover side flaps articluated to opposite ends of the cover panel along side flap fold lines, the improvement which is characterized by the said bottom end fold lines, each, comprising a central line portion and a terminal line portion at each end of the central line portion, the distance between the central portions of opposite fold lines being greater than the distance between hypothetical chords connecting the far ends of the terminal line portions, the end panels when folded along said bottom end fold lines being bowed out centrally.

4. A folding box blank as defined in claim 3 in which the length of each terminal bottom end fold line portion exceeds the length of the bottom edge of the respective corner lock flap as measured in line with a hypothetical extension of the respective front and rear bottom fold line.

5. A folding box of paperboard comprising a box body, a box cover panel articulated to said body, and a cover flap articulated to said cover in a position to overlie a

body wall, said body wall being constructed of a wall panel and two corner lock flaps overlying said wall panel, said wall panel being articulated to the remainder of the box body along a bottom fold line comprising three portions, viz., two terminal portions and a central portion, an imaginary chord connecting the far ends of the terminal portions being offset towards the box inside in relation to the central portion causing the central panel portion above said central fold line portion to bulge out when the panel is folded along said bottom fold line, the length of the terminal portions being such as to limit the bulge of the wall panel to that portion which lies between the overlying corner flaps.

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