June 16, 1964 C. I. ELLIOTT 3,137,217

METHOD OF MAKING CORRUGATED CARTONS AND BLANKS THEREFOR

Filed Feb. 12, 1963 5 Sheets-Sheet 1

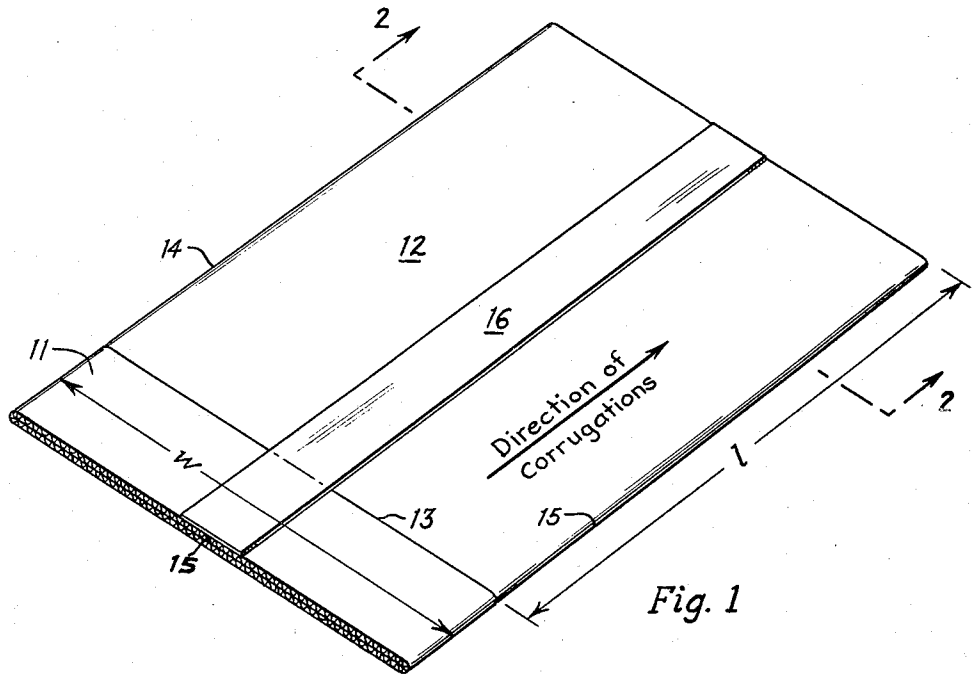


Fig. 1

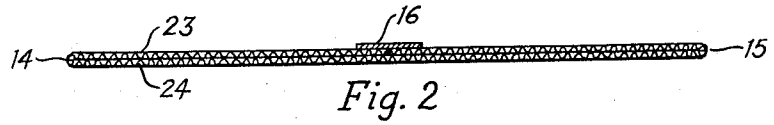


Fig. 2



Fig. 3

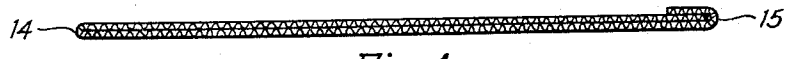


Fig. 4



Fig. 5

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METHOD OF MAKING CORRUGATED CARTONS AND BLANKS THEREFOR

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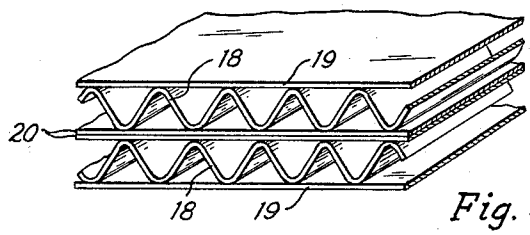


Fig. 6

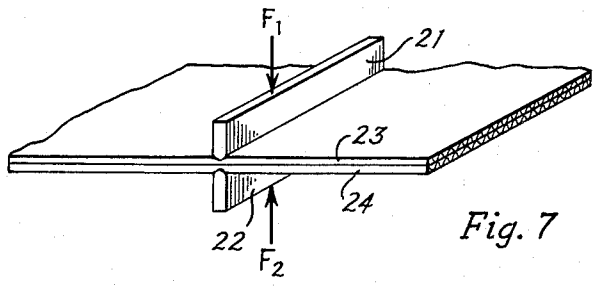


Fig. 7

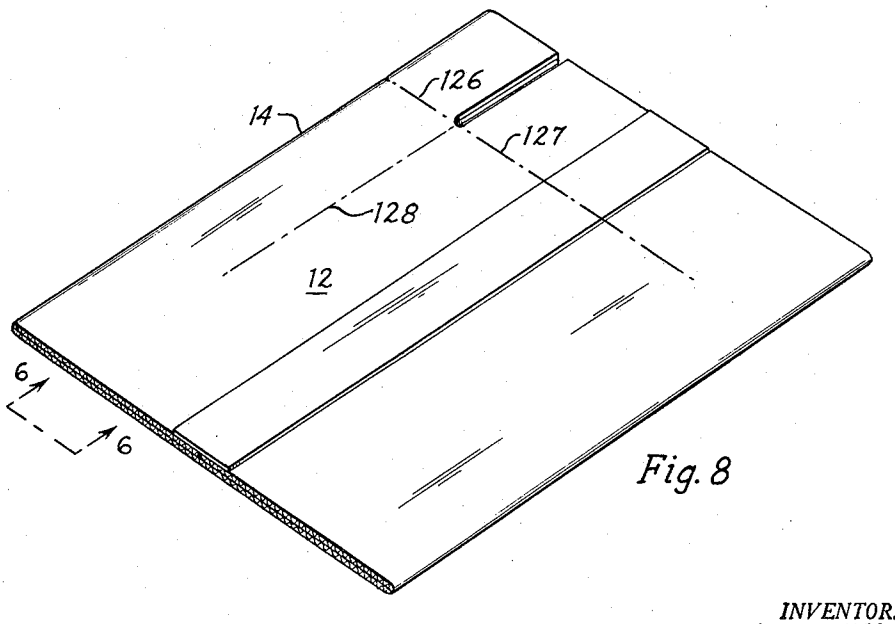


Fig. 8

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METHOD OF MAKING CORRUGATED CARTONS AND BLANKS THEREFOR

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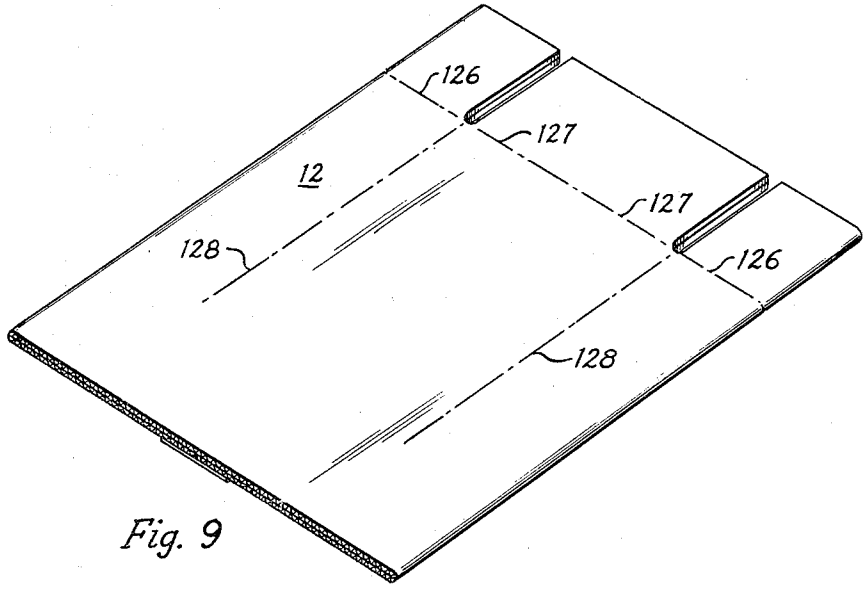


Fig. 9

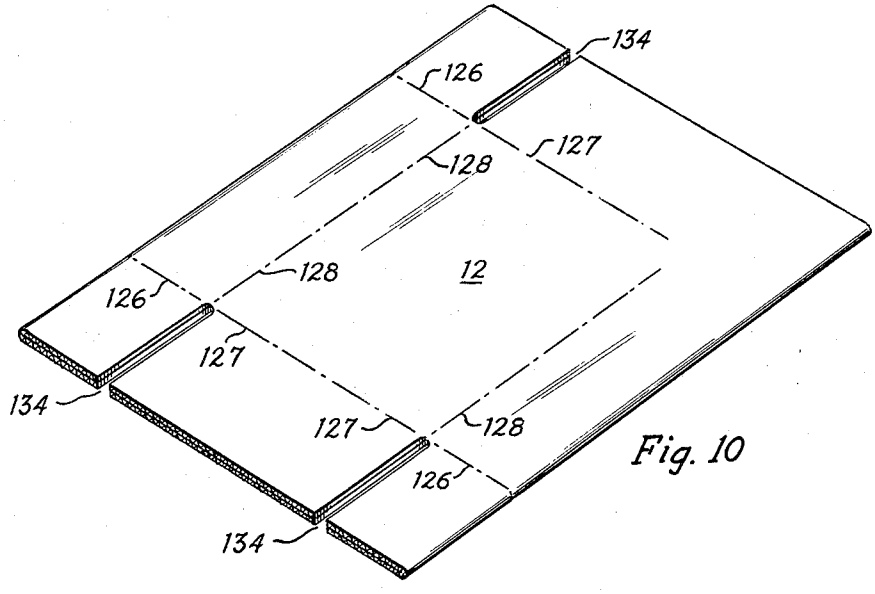


Fig. 10

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METHOD OF MAKING CORRUGATED CARTONS AND BLANKS THEREFOR

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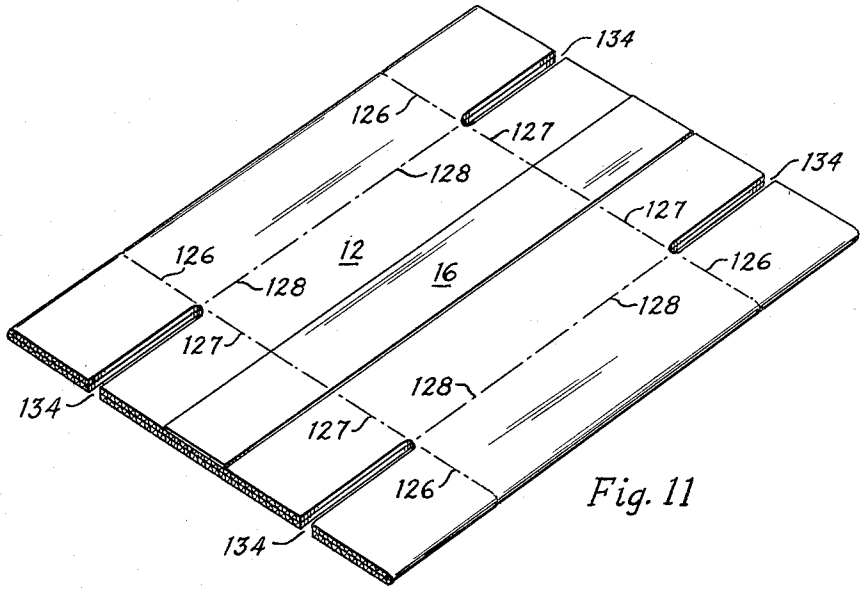


Fig. 11

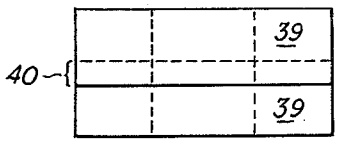


Fig. 14

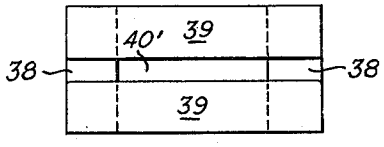


Fig. 15

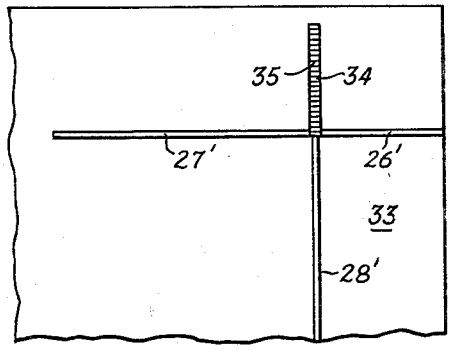


Fig. 16

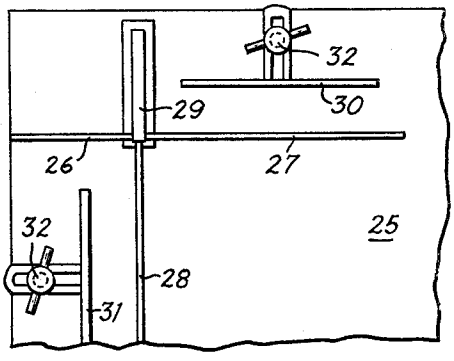


Fig. 17

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METHOD OF MAKING CORRUGATED CARTONS AND BLANKS THEREFOR

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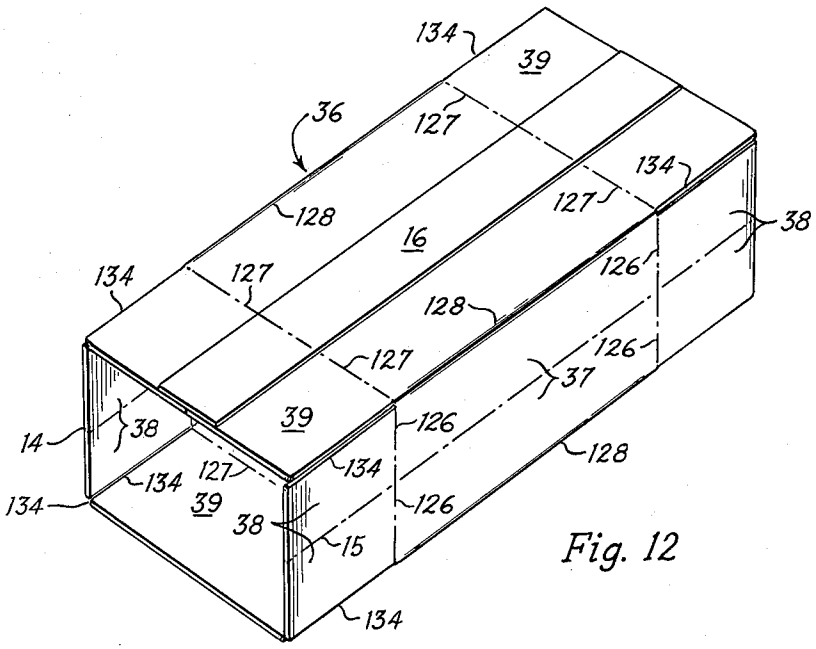


Fig. 12

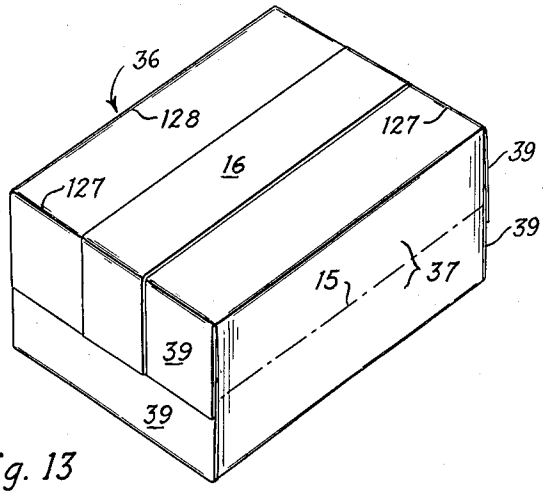


Fig. 13

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United States Patent Office 3,137,217 Patented June 16, 1964

3,137,217

METHOD OF MAKING CORRUGATED CARTONS AND BLANKS THEREFOR

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Filed Feb. 12, 1963, Ser. No. 257,914
10 Claims. (Cl. 93—36)

The packaging in corrugated cartons of merchandise which varies greatly in shape or quantity presents problems in that either individual boxes of appropriate size must be produced, involving small or one-of-a-size production runs, or boxes of standardized sizes must be employed in which excess interior space must be taken up by a filler such as excelsior, or crumpled newspaper.

It is known to produce individual box blanks or small runs of blanks by semiautomatic machinery into which box board is fed in sheet or roll form and which essentially, after appropriate presetting, transversely creases and slots the board in line with creases. After three or four such operations, between which the board is advanced in accordance with the dimension of the panels of the box to be produced, the board is cut off and the creased and slotted blank may then be formed into box form in a conventional manner.

Machines required for this purpose are large, heavy and expensive, hence generally out of reach of a small packaging firm. Also the machines require relatively involved resetting when changing from one box size to another.

The use of filler materials in oversize boxes is uneconomical, and is unsatisfactory where relatively heavy parts, such as machine parts, must be prevented from shifting inside the box as a result of compression of the filler material.

The present invention provides an improved method of making individually dimensioned boxes from tubular stock of double faced corrugated board, i.e., board composed of a corrugated central core ply and two substantially flat face plies.

The corrugated board is prefabricated into tubular shape comprising a seam in line with the corrugations. The seam may either be butted and taped, overlapped and stitched or glued, or taped at a collapsing line.

The board of the tube is folded upon itself either along two collapsing fold lines, in which event the seam lies between the fold lines, or adjacent one of the fold lines, or the board is folded upon itself along one collapsing fold line, the opposite lateral edge of the tube being formed by the two lateral cut edges of the board lying in register and a tape attached to the board adjacent the edges, the tape being folded into U shape and representing the second collapsing fold line.

Tubular starting material for the present method may be stocked in considerable lengths, the limit being set by the ability of the operator to handle it to cut off pieces, each piece to form one box and varying in length according to the length of the box to be produced.

Tubular starting material is stocked in a range of widths so as to enable the operator to produce boxes of small or large circumference, circumference being measured about the wall panels of the box.

The present method involves principally the performance of four creasing and slitting operations, one at each corner of the flat collapsed tubular unslotted and uncreased blank. The four operations are identical and each operation involves the slotting of the double thickness material, thus producing two slots at once, and the impressing of creasing rules into the material from opposite sides so that the top and the bottom thickness of the starting material are creased simultaneously.

The performance of the four operations involves turning the double thickness starting material over, side to side, as well as end to end.

Rotating of box blanks end to end is a step known per se in connection with the cutting and creasing of very large box blanks, too large to warrant the construction of a conventional cutting and creasing die for making a box blank in one operation. According to the known procedure, one-half of the blank is cut and creased first and after rotating the blank, the opposite end is inserted into the otherwise conventional cutting and creasing die to form the opposite and identically shaped end of the blank. The resultant box is of necessity a square bottom box.

The present invention permits the production of boxes of square as well as rectangular cross section and of any desired length or height. The top and bottom of the boxes may be formed to provide an overlapped closure suitable for stitching, a butted closure suitable for taping, or may even be formed with a central rectangular aperture, the latter form of closure usually involving stitching.

The various 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 manner in which the invention will be carried out. The invention also resides in certain new and original features of construction, combination of elements, steps, and sequences of steps, as 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 will better understood by referring to the following description in connection with the accompanying drawings forming a part of it, in which:

FIG. 1 is a perspective view of tubular collapsed flat corrugated starting material from which a blank may be formed;

FIGS. 2 to 5 are cross sectional views illustrating different ways of folding and securing together corrugated folding board to form the tubular starting material, FIG. 2 being a section taken on line 2—2 of FIG. 1;

FIG. 6 is a perspective view of a portion of the end edge of the blank shown in FIG. 8, the view being taken on line 6—6;

FIG. 7 is a perspective view illustrating the manner of creasing the board;

FIGS. 8 to 11 are perspective views illustrating a sequence of steps of creasing and notching a carton blank embodying the invention;

FIG. 12 is a perspective view of the blank shown in FIG. 11 after expansion of the blank into hollow tubular shape;

FIG. 13 is a perspective view of a closed carton resulting from the blank of FIG. 12;

FIGS. 14 and 15 illustrate in end view optional forms of end closing of the carton; and

FIGS. 16 and 17 are plan views of the top and bottom portion of a creasing and slotting device which may be used in practicing the invention.

In the following 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 elements in the several figures of the drawings.

The drawings accompanying, and forming part of, this specification disclose certain specific details for the purpose of explanation of broader aspects of the invention, but it should be understood that 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 manufacture of a corrugated carton starts with the selection of a length **11** of tubular material (FIG. 1) of appropriate width *w* from which a piece **12** of the desired length **l** is cut by a straight cut **13** extending across the collapsed tube. The dimension *w* yields one top wall and one side wall or, taking into consideration the peculiar way in which the box is formed, it may be stated that the width *w* of the piece **12** is equal to the width of the top panel of the resulting box plus twice the width of one-half of the side wall panel (FIG. 11).

The length **l** of the uncreased blank **12** yields the length of the box plus the length of the required end panels which may overlap, abut, or fail to abut, as will later be seen.

The tubular starting material may be folded twice upon itself along lateral fold lines **14**, **15** and joined centrally by a tape **16**, as shown in FIG. 2. The board may also be centrally overlapped as shown at **17** in FIG. 3, the overlapping portions being connected by gluing or stitching.

The overlapped seam may also be located off center, for example close to one of the lateral fold lines, as shown at **17'** in FIG. 4.

Still another way of completing the tubular structure is to fold the board upon itself once and interconnect the opposite edges by a tape **16'** as shown in FIG. 5.

As shown more particularly in FIG. 6, the corrugations of the core ply **18** of the board extend in the direction of the lateral fold lines **14**, **15** and face plies **19** and **20** represent the outer smooth surfaces of the board.

In order to permit the board to be folded, creasing rules **21** and **22** are impressed into the two thicknesses of the board, as shown in FIG. 7. The thicknesses are represented by numerals **23** and **24**. The creasing rules **21** and **22** are both male rules arranged to register and impress concave indentations into the board from opposite surfaces by application of suitable forces F_1 and F_2. Both thicknesses of the board are creased simultaneously and identically.

The manner of creasing and simultaneously slitting the uncreased double thickness blank is shown in FIGS. 9–11 and takes place in four successive steps. Preferably a slitting and creasing mechanism is employed shown in its basic outline in FIGS. 16 and 17.

FIG. 17 shows a lower die plate **25** to which male creasing rules are secured in any conventional manner. The creasing rules are in the outline of a T. The rules **26**, **27** forming the head of the T are designed to crease the board in a direction at right angles to the corrugations and a further male creasing rule extends at right angles to the rules **26**, **27**, represents the stem of the T, and lies in line with the corrugations of the board to be creased.

A female slotting or notching die **29** extends in line with the stem of the T beyond the head of the T. Adjustable stops **30** and **31** are mounted parallel to the rules **26**, **27** and **28**, respectively, and are for simplicity shown to be adjustable by wing nuts **32**.

The upper die plate **33** is shown in FIG. 16 and carries corresponding male creasing rules identified by primed reference numerals **26'**, **27'** representing the head of the T, and **28'** forming the stem of the T. A male slotting knife **34** on the die plate **33** cooperates with, and fits, the female notching die **29** and is stepped or serrated at its face **35**, as is common practice.

It is evident that the lower die plate **25** is shown in plan view and that the upper die plate **33** is shown inverted. Suitable guides (not shown) are provided to guide the upper die plate **33** for movement towards and away from the lower plate **25** while maintaining the creasing and slotting elements in accurate register.

Returning now to FIG. 1, the uncreased blank **12** is

inserted between the creasing and slotting elements with one of its corners and after performance of the first creasing and slotting step assumes the shape shown in FIG. 8. The transverse crease **126**, **127** extends from the lateral fold line **14** part way across the blank. The longitudinal crease **128** extends from the upper cut end of the blank and terminates at a distance from the opposite cut end of the blank, the length of the crease being determined by the length of the creasing elements **28**, **28'**. The stops **30**, **31** of the die are set so as to put the creases into the proper location.

As will be seen from the following description, the distance of the stop **31** from the rule **28** is equal to one-half of the height of the side wall panel. The distance of the stop **30** from the rule **27** is equal to the length of the closure flap of the box about to be made.

The slotting elements **29**, **34** are of sufficient length to slot or notch the blank from the head of the T to its cut edge.

The blank **12** of FIG. 8 is then turned over side-to-side and creased and slotted a second time, after which it has the appearance shown in FIG. 9.

The blank of FIG. 9 may then be rotated or turned over end to end to perform similar creasing and notching operations at the opposite end. FIG. 10 shows the blank of FIG. 9 after rotation and performance of the third creasing and notching operation. The blank has now three notches **134**.

The blank **12** of FIG. 10 is finally turned over side-to-side to perform the fourth creasing and notching operation, the result being shown in FIG. 11.

Assuming a blank of very large size is to be produced in which the creases **127** and **128** of successive creasing operations do not overlap, so as to leave an uncreased central portion between the ends of creases **127** and **128**, experience has shown that such uncreased portions crease readily when the box is being formed and closed as the impressed creases sufficiently weaken the board.

The blank is now readily for squaring, as shown in FIG. 12. During the squaring operation the tubular blank is expanded and the side wall portions **36** and **37** of the blank are flattened along the lateral fold lines **14** and **15**.

One end of the squared blank is then closed in a conventional manner, the box is filled, whereafter the opposite end is closed. The inner end wall panels **38** are in folded first and the outer end wall panels **39** are folded thereover and secured in any conventional manner, such as taping, gluing, stapling.

FIG. 1 shows in elevation a box end in which the outer end panels **39** are extra long and overlap by a margin **40**. FIG. 15 shows a box end in which the outer end panels **39** are short and do not meet, leaving a central aperture **40'** which may serve as a ventilation aperture. The length of the panels is preset by adjustment of the stop **30** in FIG. 17.

What is claimed is:

1. The method of making a carton blank from a sheet of double faced corrugated board which comprises the steps of

folding a sheet of said board along lateral collapsing fold lines which extend in the direction of the corrugations to form a collapsed flat tubular structure;

securing together opposite lateral portions of the folded sheet to form a seam;

and performing at the four corners of the flat tubular structure combined creasing and slitting operations, the operation at each corner comprising,

impressing into the tubular structure from opposite sides a pair of creases substantially in the shape of a T, the head of the T extending transverse to the corrugation, the stem of the T being in the direction of the corrugations,

and slitting the blank through both of its thicknesses above the head of the T substantially in

line with the stem of the T to the edge of the blank.

2. The method of making a carton ready for filling and closing from a sheet of double faced corrugated board which comprises the steps of

folding a sheet of said board along lateral collapsing fold lines which extend in the direction of the corrugations to form a collapsed flat tubular structure;

securing together opposite lateral portions of the folded sheet to form a seam;

performing at the four corners of the flat tubular structure combined creasing and slitting operations, the operation at each corner comprising

impressing into the tubular structure from opposite sides a pair of creases substantially in the shape of a T, the head of the T extending transverse to the corrugation, the stem of the T being in the direction of the corrugations,

and slitting the blank through both of its thicknesses above the head of the T substantially in line with the stem of the T to the edge of the blank;

squaring the tubular structure by folding it at the crease lines representing the stems of the respective T's, and flattening it at the lateral collapsing fold lines;

and folding the ends of the tubular structure into carton closing position, thereby also stiffening the structure against recollapsing along the said lateral fold lines.

3. The method of making a carton blank from a sheet of double faced corrugated board which comprises the steps of

folding a sheet of said board along lateral collapsing fold lines which extend in the direction of the corrugations of form a collapsed flat tubular structure;

securing together opposite lateral portions of the folded sheet to form a seam;

and performing at the four corners of the flat tubular structure combined creasing and slitting operations, the operation at each corner comprising

impressing into the tubular structure from opposite sides a pair of creases substantially in the shape of a T, the head of the T extending transverse to the corrugation, the stem of the T being in the direction of the corrugations,

and slitting the blank through both of its thicknesses above the head of the T substantially in line with the stem of the T to the edge of the blank, the distance of the stem of the T from the adjacent lateral collapsing fold line being substantially equal to the distance of the head of the T from the adjacent end of the tubular structure.

4. The method of making a carton ready for filling and closing from a sheet of double faced corrugated board which comprises the steps of

folding a sheet of said board along lateral collapsing fold lines which extend in the direction of the corrugations to form a collapsed flat tubular structure;

securing together opposite lateral portions of the folded sheet to form a seam;

performing at the four corners of the flat tubular structure combined creasing and slitting operations, the operation at each corner comprising

impressing into the tubular structure from opposite sides a pair of creases substantially in the shape of a T, the head of the T extending transverse to the corrugation, the stem of the T being in the direction of the corrugations;

and slitting the blank through both of its thicknesses above the head of the T substantially in line with the stem of the T to the edge of the blank, the distance of the stem of the T from the adjacent lateral collapsing fold line being

substantially equal to the distance of the head of the T from the adjacent end of the tubular structure;

squaring the tubular structure by folding it at the crease lines representing the stems of the respective T's, and flattening the structure at the lateral collapsing fold line;

and folding the ends of the tubular structure into carton closing position, thereby also stiffening the structure against recollapsing at the said lateral fold lines.

5. The method of making a carton blank from a sheet of double faced corrugated board which comprises the steps of

folding a sheet of said board upon itself and securing together the lateral edges of the sheet to form a collapsed flat tubular structure in which the corrugations run lengthwise of the tube;

and performing at the four corners of the flat tubular structure combined creasing and slitting operations, the operation at each corner comprising

impressing into the tubular structure from opposite sides a pair of creases substantially in the shape of a T, the head of the T extending transverse to the corrugations, the stem of the T being in the direction of the corrugations,

and slitting the blank through both of its thicknesses above the head of the T substantially in line with the stem of the T to the edge of the blank.

6. The method of making a carton ready for filling and closing from a sheet of double faced corrugated board which comprises the steps of

folding a sheet of said board upon itself and securing together the lateral edges of the sheet to form a collapsed flat tubular structure in which the corrugations run lengthwise of the tube;

performing at the four corners of the flat tubular structure combined creasing and slitting operations, the operation at each corner comprising

impressing into the tubular structure from opposite sides a pair of creases substantially in the shape of a T, the head of the T extending transverse to the corrugations, the stem of the T being in the direction of the corrugations,

and slitting the blank through both of its thicknesses above the head of the T substantially in line with the stem of the T to the edge of the blank;

squaring the tubular structure by folding it at the crease lines representing the stems of the respective T's, and flattening it at the lateral fold lines along which the tube was collapsed;

and folding the ends of the tubular structure into carton closing position, thereby also stiffening the structure against recollapsing along the said lateral fold lines.

7. The method of converting a piece of flat collapsed tubular corrugated box board whose corrugations run lengthwise of the tube into a carton blank ready for squaring into carton shape, filling and closing, the method comprising,

performing at the four corners of the piece creasing and slitting operations, the operation at each corner comprising

impressing from opposite sides into the two thicknesses of the piece male creasing elements to produce, in each thickness, two folding creases substantially in the shape of a T, the two T's being in register, the head of each T extending transverse to the corrugations, the stem of each T being in the direction of the corrugations;

and slitting the piece through both of its thicknesses above the head of the T's substantially

in line with the stem of the T's to the edge of the piece.

8. The method of converting a piece of flat collapsed tubular corrugated box board whose corrugations run lengthwise of the tube into a carton blank ready for squaring into carton shape, filling and closing, the method comprising

performing at the four corners of the piece, one at a time, creasing and slitting operations, the operations at each corner comprising

impressing from opposite sides into the two thicknesses of the piece male creasing elements to produce, in each thickness, two folding creases substantially in the shape of a T, the two T's being in register, the head of each T extending transverse to the corrugations and at a certain distance from the adjacent end of the piece, the stem of each T being in the direction of the corrugations and at a distance from the adjacent lateral edge of the piece equal to said certain distance;

and slitting the piece through both of its thicknesses above the head of the T substantially in line with the stem of the T to the edge of the piece.

9. That method of making a carton from flat collapsed tubular double faced corrugated box board stock which is characterized by the steps of

first cutting a piece of tubular stock to length;

then performing at the four corners of the piece, one at a time, creasing and slitting operations, the operation at each corner comprising

impressing from opposite sides into the two thicknesses of the piece male creasing rules to produce, in each thickness, two folding creases substantially in the shape of a T, the two T's being in register, the head of each T extending transverse to the corrugations, the stem of the T being in the direction of the corrugations,

and slitting the piece through both of its thicknesses above the head of the T's substantially in line with the stem of the T's to the edge of the piece;

then squaring the creased and slotted piece by folding it at the crease lines which represent the stems of the T's and flattening the piece at the collapsing creases along which the two thicknesses of the tubular stock were folded flat upon each other;

and then folding the portions of the piece between the crease lines representing the heads of the T's and the ends of the piece into carton closing position as carton end flaps.

10. The method of making a folding carton blank out of double faced corrugated box board which comprises,

folding the corrugated board upon itself to form a double thickness structure in which the corrugations extend lengthwise of the structure, at least one of the lateral edges of the structure being a fold line;

impressing at the four corners of the structure from opposite sides of the double thickness structure a pair of folding scores extending at right angles to each other, each such impression being adjacent a corner of the structure and being so disposed that one score extends from a lateral edge of the structure at least partially across the structure transverse to the corrugations and at a certain distance from the end of the structure, and that the other score extends from said one score in the direction of the corrugations at least partially the length of the structure and at a distance from the adjacent lateral edge equal to said certain distance;

and slitting the structure through both of its thicknesses from the right angle point of the scores to the adjacent end of the structure, the slit being in the direction of the corrugations.

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