United States Patent [19]

Bemiss

[11] **3,812,641**

[45] **May 28, 1974**

[54] **METHOD OF FORMING, FILLING AND CLOSING CARTONS, AND SPECIFIC CARTONS THEREFOR**

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[21] Appl. No.: **347,411**

[52] **U.S. Cl.** **53/14,** 53/37, 229/43

[51] **Int. Cl.** **B65b 1/00,** B65b 61/26

[58] **Field of Search** ..... 53/14, 37, 38, 39, 41, 53/47, 281, 282, 287, 296, 314, 329, 376, 377, 383; 93/55.1 R; 156/69, 266, 268, 384; 229/30, 31, 43

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Primary Examiner—Robert L. Spruill
Attorney, Agent, or Firm—Baldwin, Wight & Brown

[57] **ABSTRACT**

This disclosure is directed to a novel method of forming, filling, covering and sealing a carton which includes a bottom panel, four upstanding side panels, and a minor flange joined to each of the side panels, a product is packaged within the carton body, and a cover which preferably is post-scored but may be pre-scored is applied thereto and includes four major flanges, one overlying each of the minor flanges of the carton body, the method including the steps of deflecting the minor and major flanges relative to each other to provide an area for the receipt of a hot-melt adhesive, thereafter applying pressure to unite the flanges, and subsequently securing the adhered flanges to the carton side panels. The covers may be individually fed from a stack of blanks, severed from a web drawn from an appropriate roll or as another alternate the carton body and cover would be of an integral one-piece construction.

From a carton standpoint both the carton and cover are preferably coated on each side with an over-all barrier coating of moisture impervious material and minor-flange to major-flange adhesion as well as adhesion of the latter flanges to the side panels is preferably though not exclusively achieved by the use of in-line applied hot-melt adhesives, although adhesive pre-coating may be employed along with other adhesives or equivalents.

11 Claims, 38 Drawing Figures

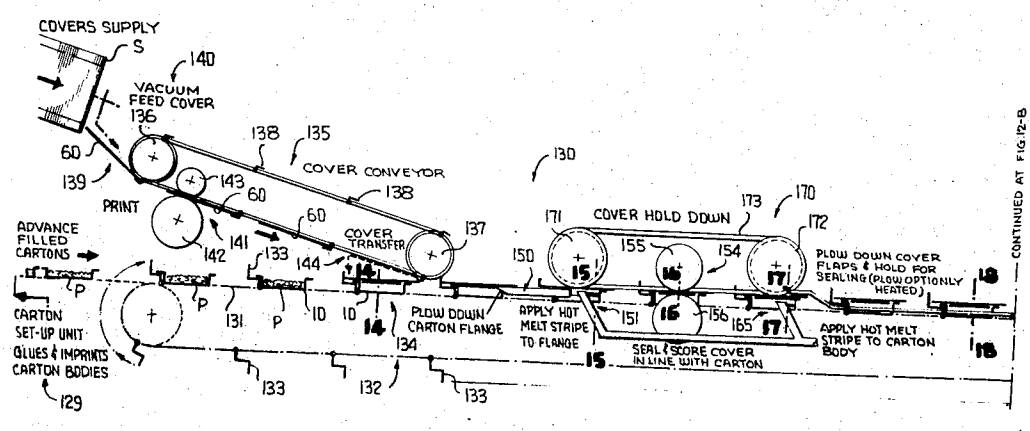


FIG.1

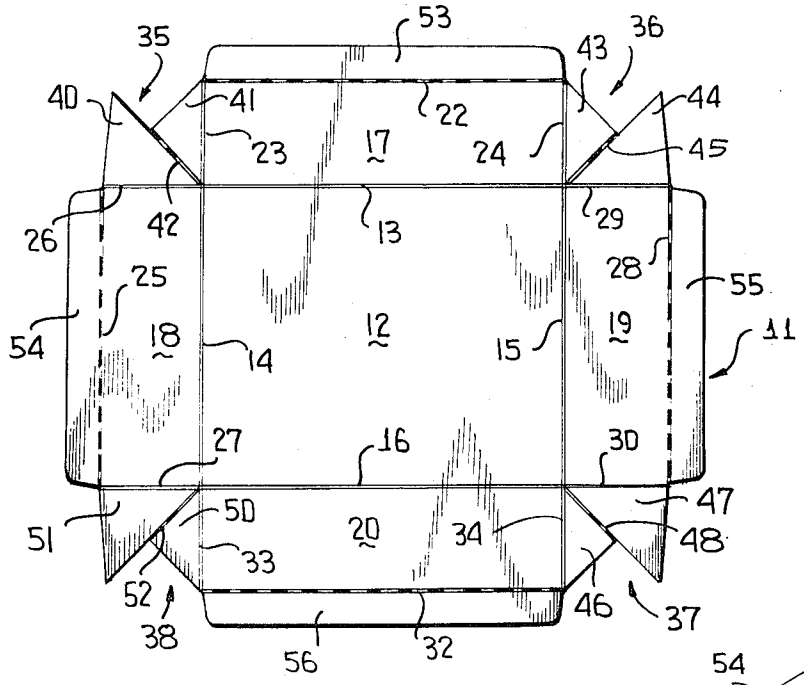


FIG.2

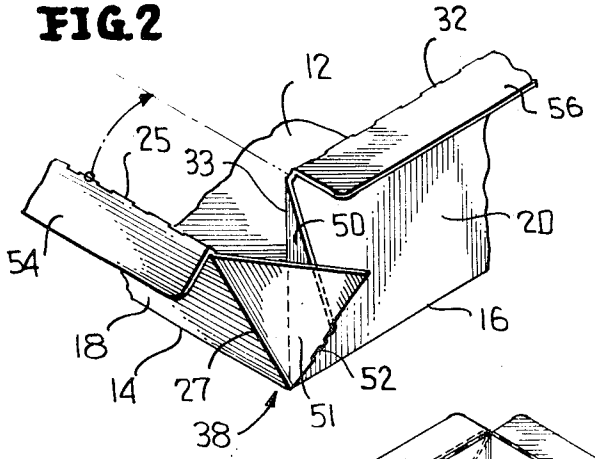
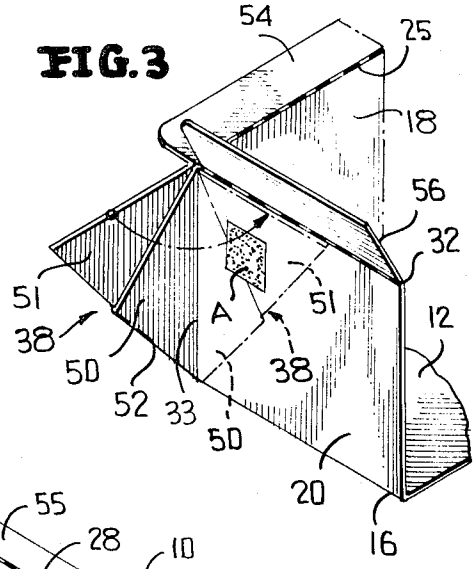


FIG.3



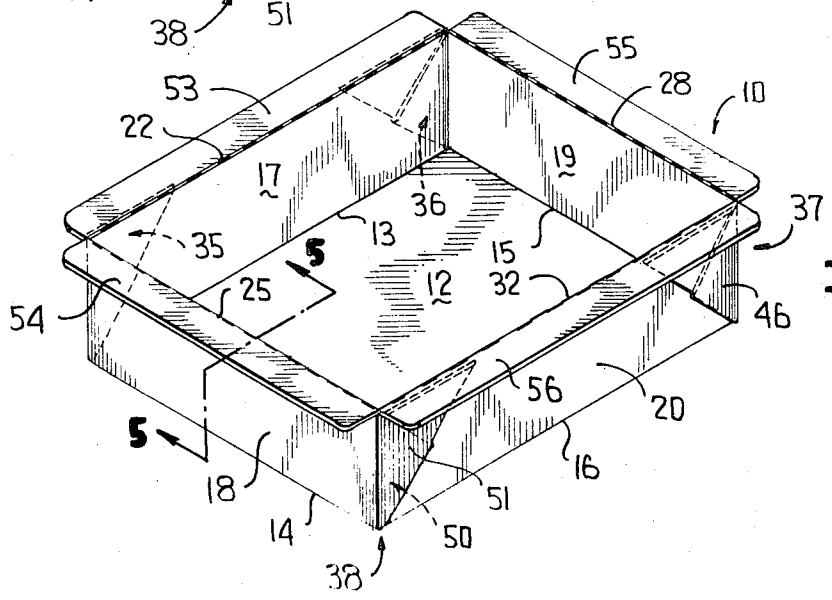


FIG.4

FIG.5

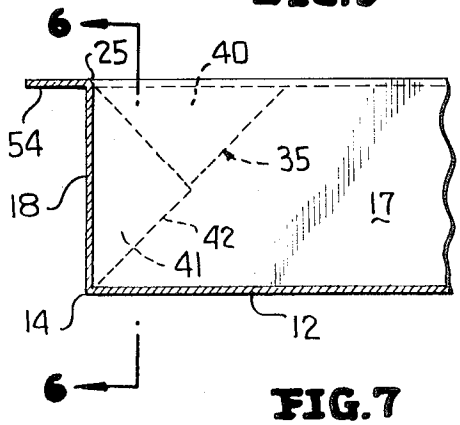


FIG.6

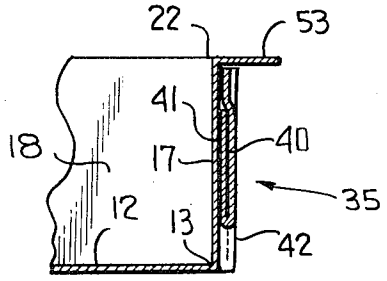


FIG.7

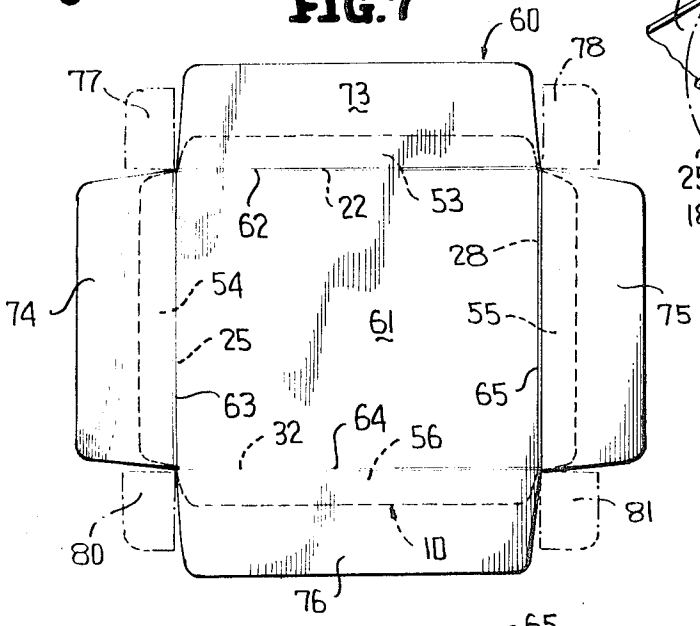


FIG.8

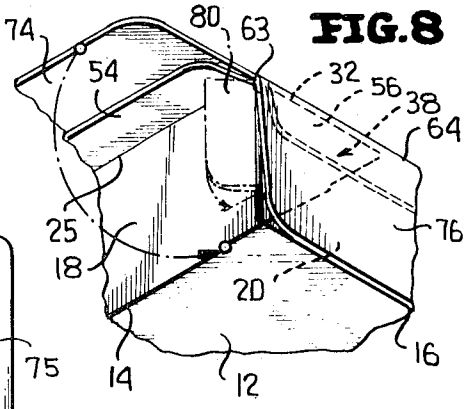


FIG.10

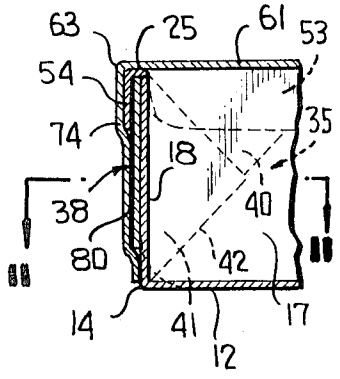


FIG.9

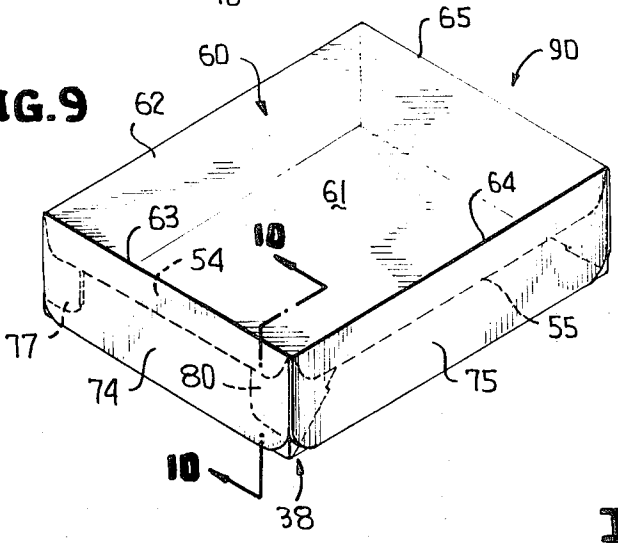


FIG.11

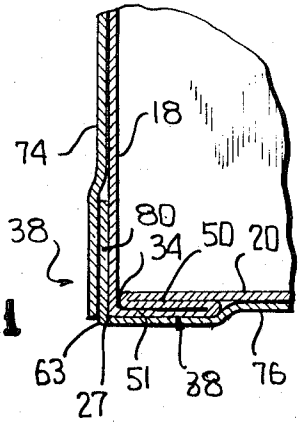


FIG.14
FIG.12-A
FIG.13-A
CONTINUED AT FIG.12-B
CONTINUED AT FIG.13-B
COVERS SUPPLY
VACUUM FEED COVER
COVER CONVEYOR
COVER TRANSFER
PRINT
ADVANCE FILLED CARTONS
CARTON SET-UP UNIT
GLUES & IMPRINTS CARTON BODIES
COVER HOLD DOWN
PLOW DOWN COVER FLAPS & HOLD FOR SEALING (PLOW OPTIONALLY HEATED)
APPLY HOT MELT STRIPE TO CARTON BODY
SEAL & SCORE COVER IN LINE WITH CARTON
APPLY HOT MELT STRIPE TO FLANGE
PLOW DOWN CARTON FLANGE
CONVEY FILLED CARTONS

FIG. 12-B

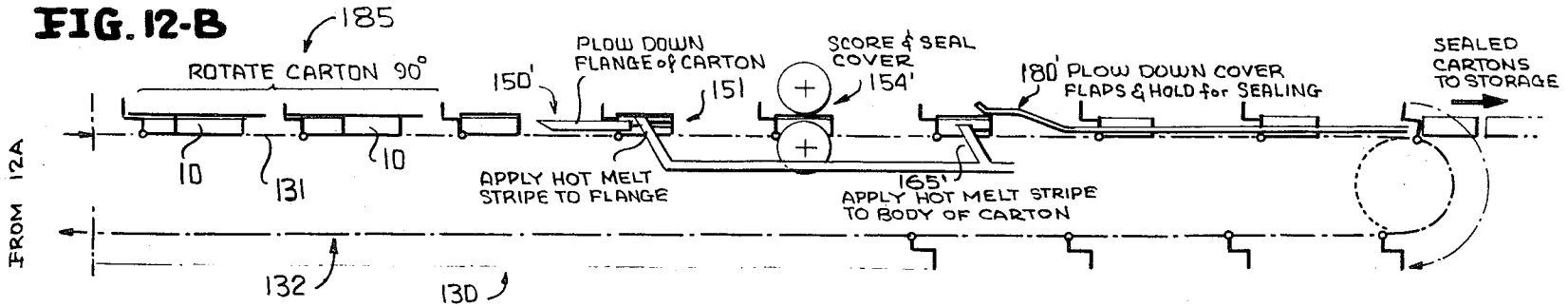


FIG. 13-B

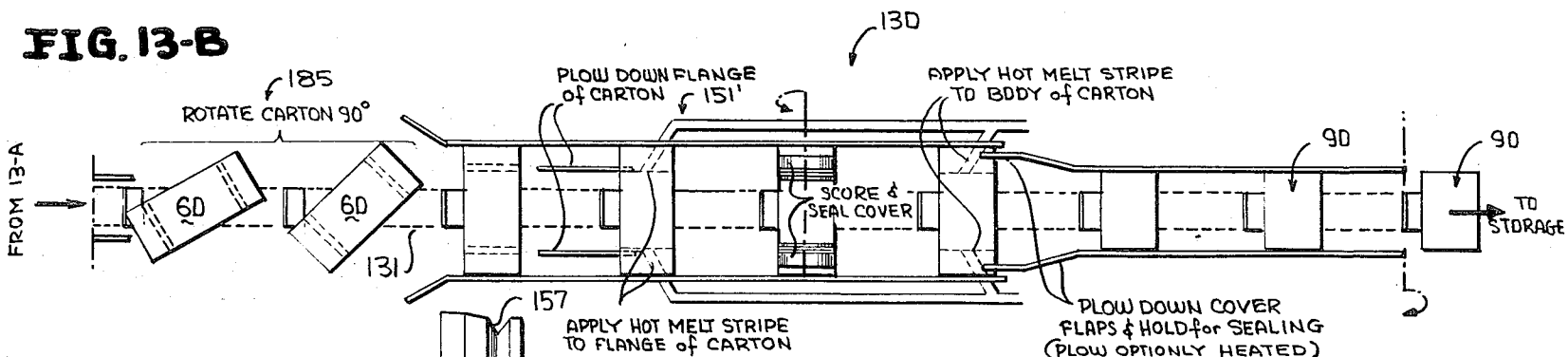


FIG. 15

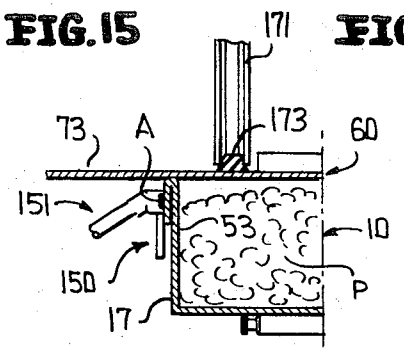


FIG. 16

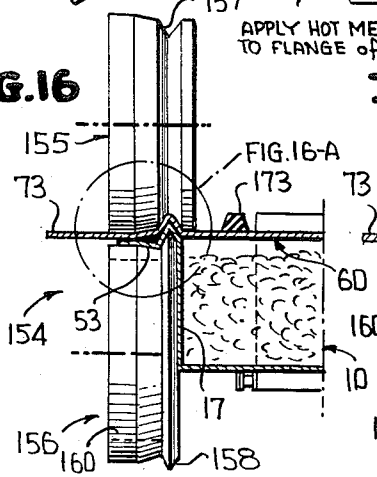


FIG. 16-A

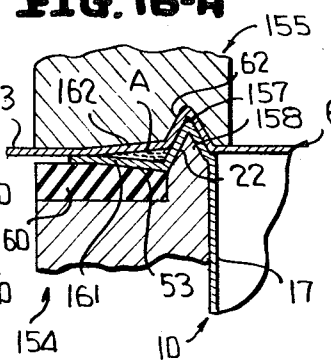


FIG. 17

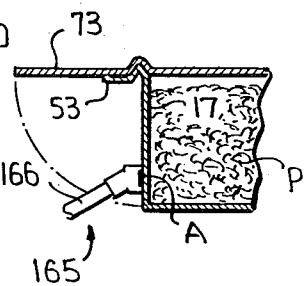


FIG. 18

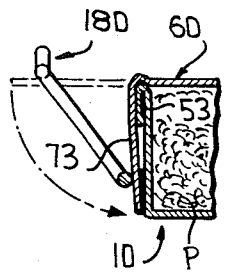


FIG.19

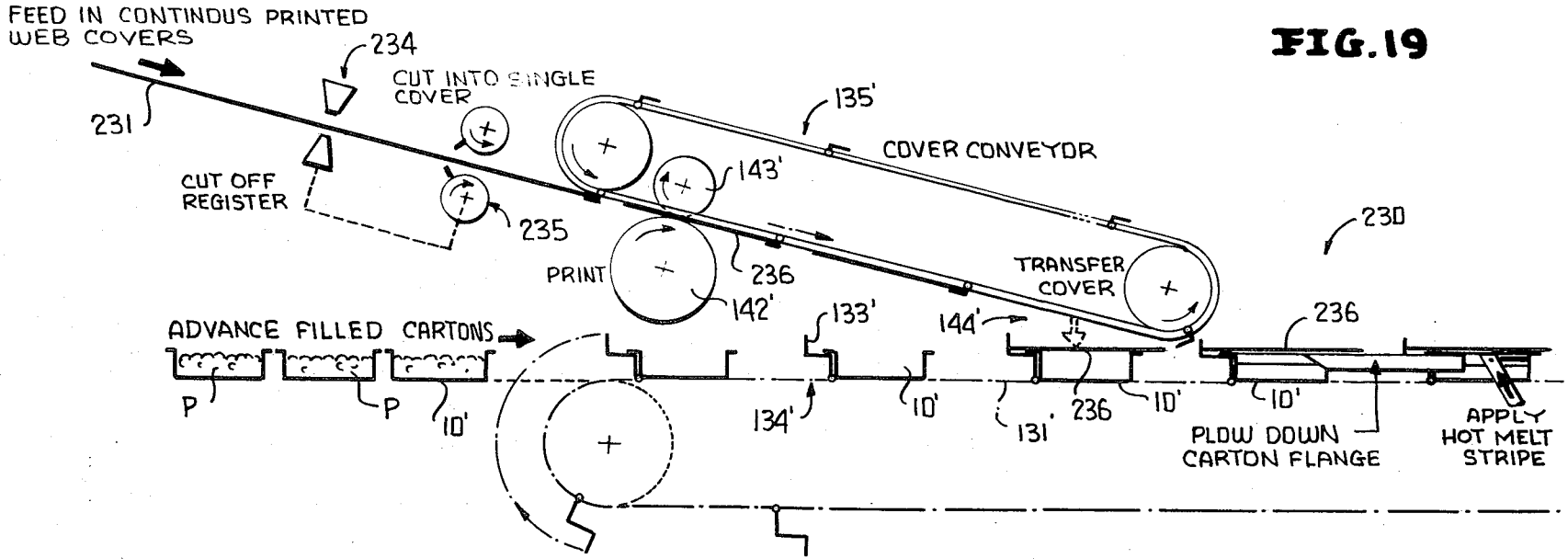

FEED IN CONTINDUS PRINTED WEB COVERS
234
CUT INTO SINGLE COVER
231
135'
COVER CONVEYDR
143'
CUT OFF REGISTER
235
230
PRINT
236
142'
TRANSFER COVER
133'
144'
236
ADVANCE FILLED CARTONS
P
P
10'
134'
10'
131'
236
10'
10'
PLOW DOWN CARTON FLANGE
APPLY HOT MELT STRIPE

FIG.20

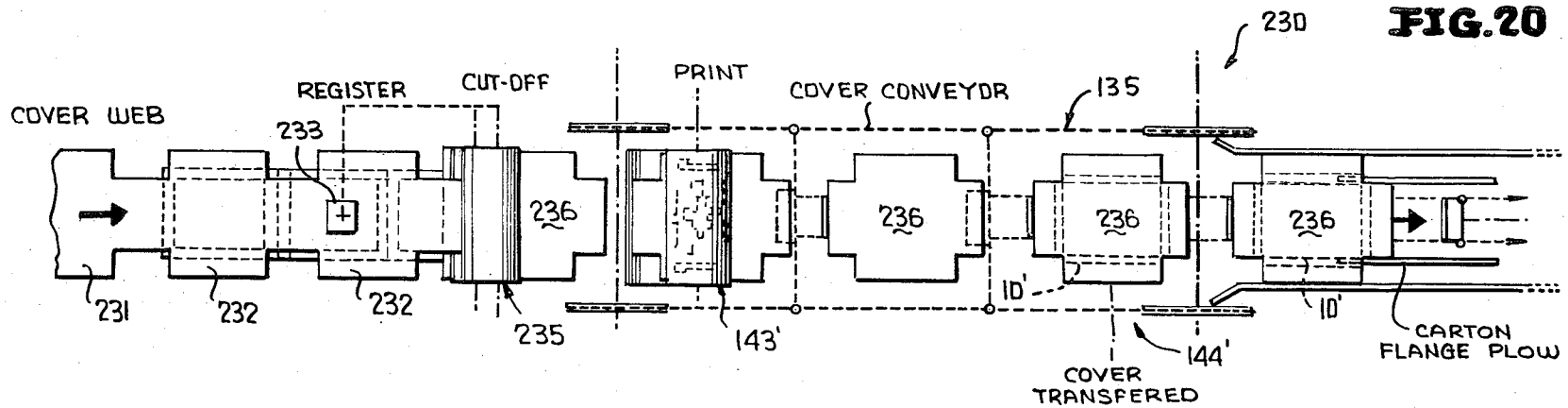

230
COVER WEB
REGISTER
CUT-OFF
PRINT
COVER CONVEYDR
135
233
236
236
236
236
231
232
232
235
143'
10'
144'
10'
COVER TRANSFERED
CARTON FLANGE PLOW

FIG. 21

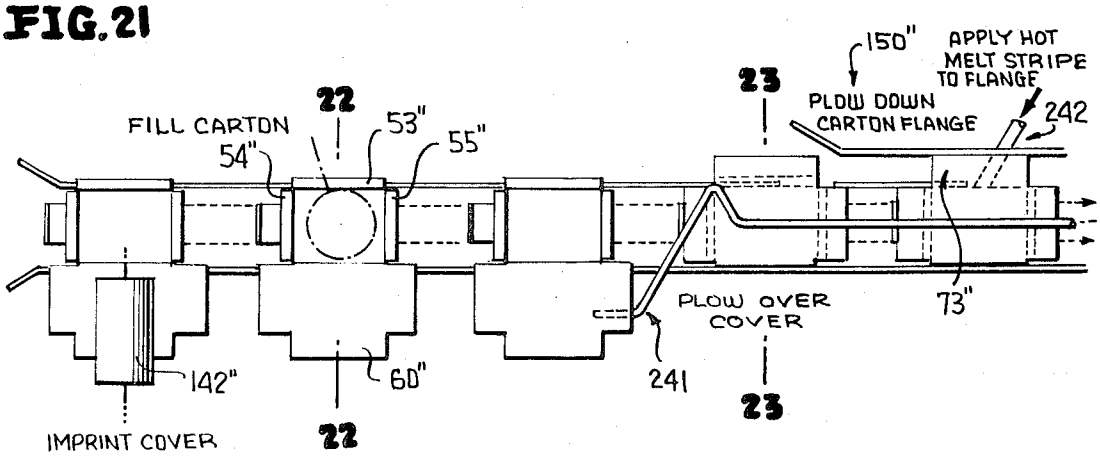


FIG. 22

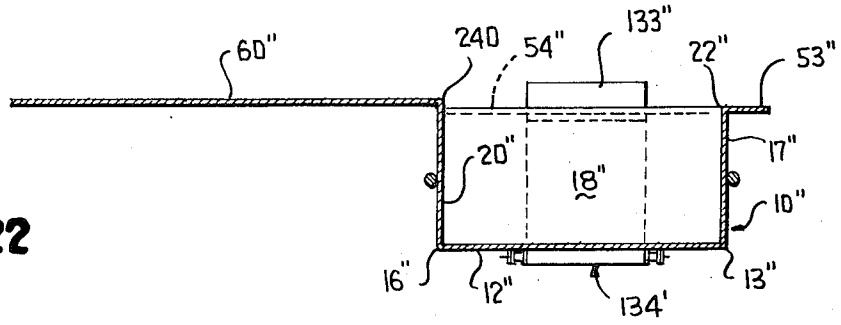
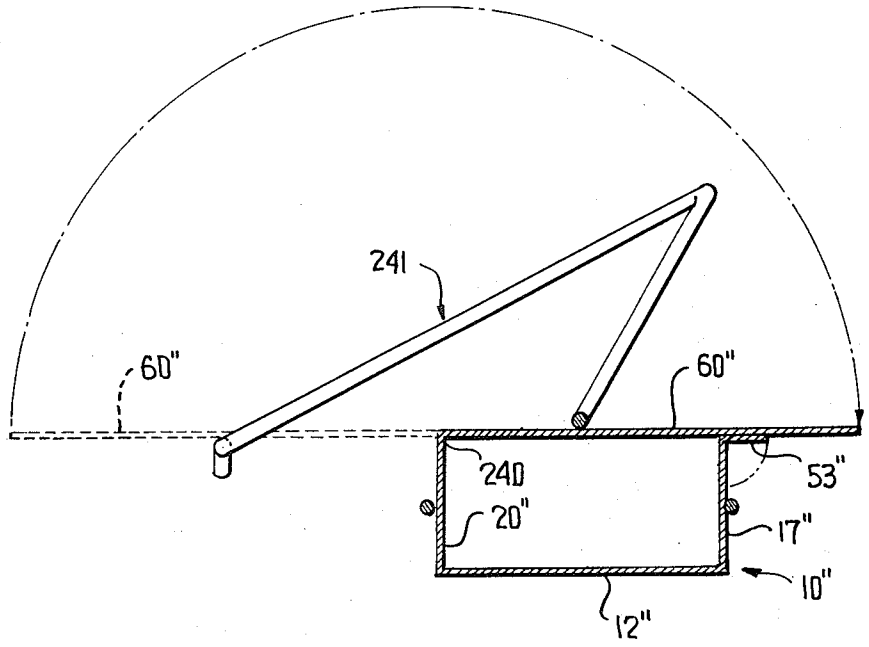


FIG. 23



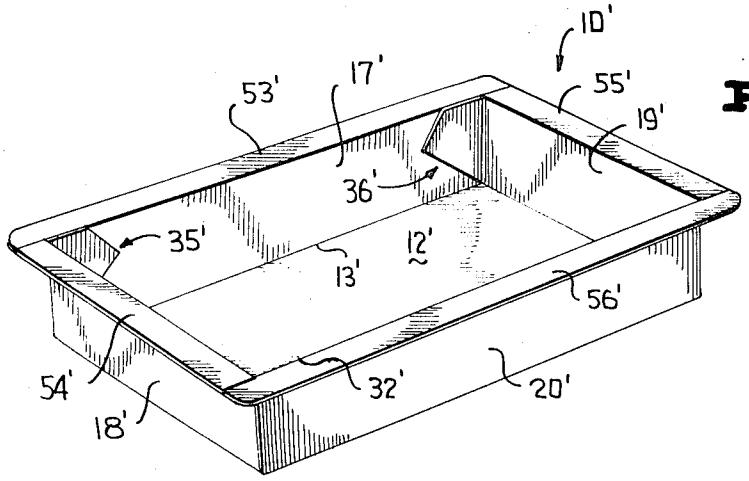


FIG. 27

FIG. 24

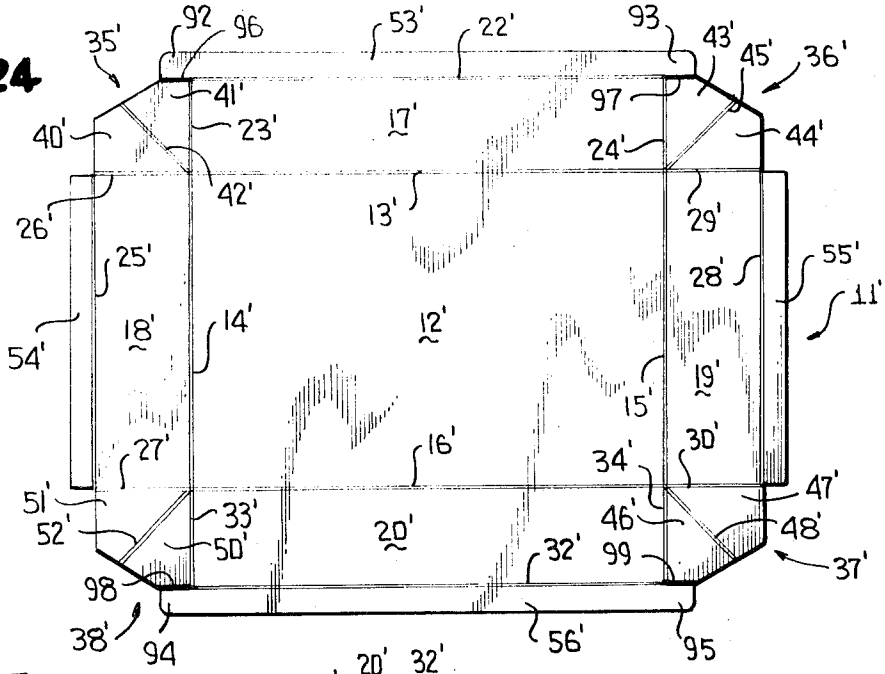
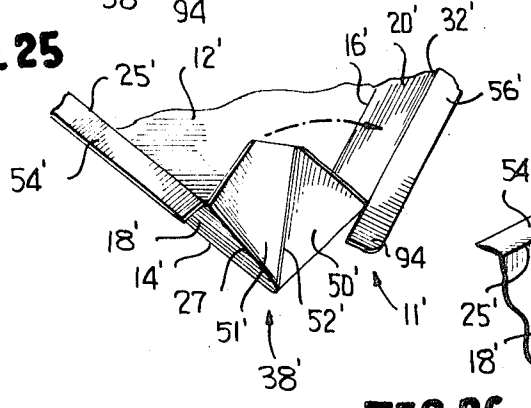


FIG. 25



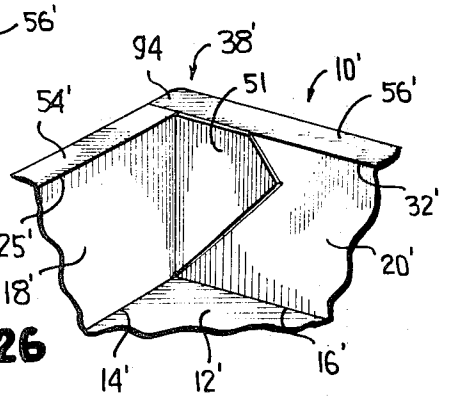


FIG. 26

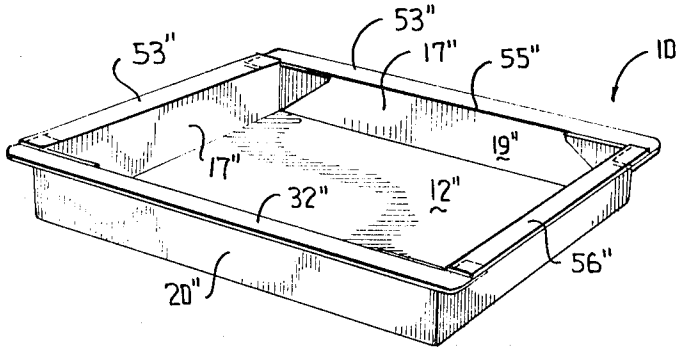


FIG.31

FIG.28

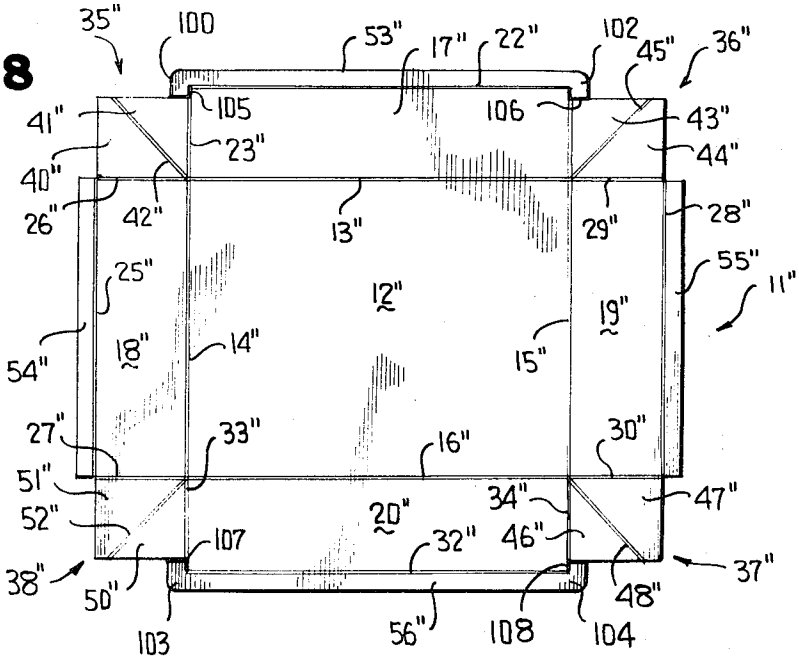


FIG. 29

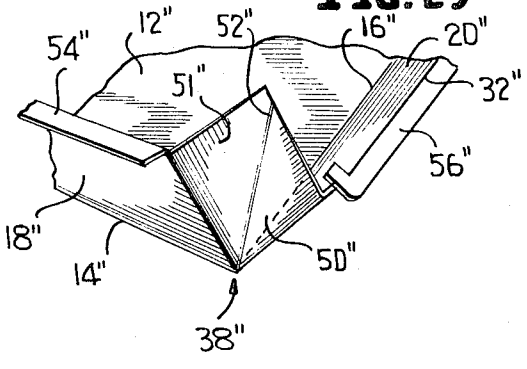


FIG.30

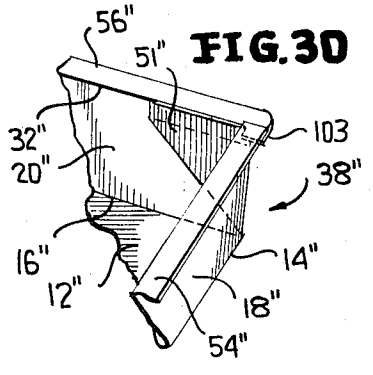


FIG. 32

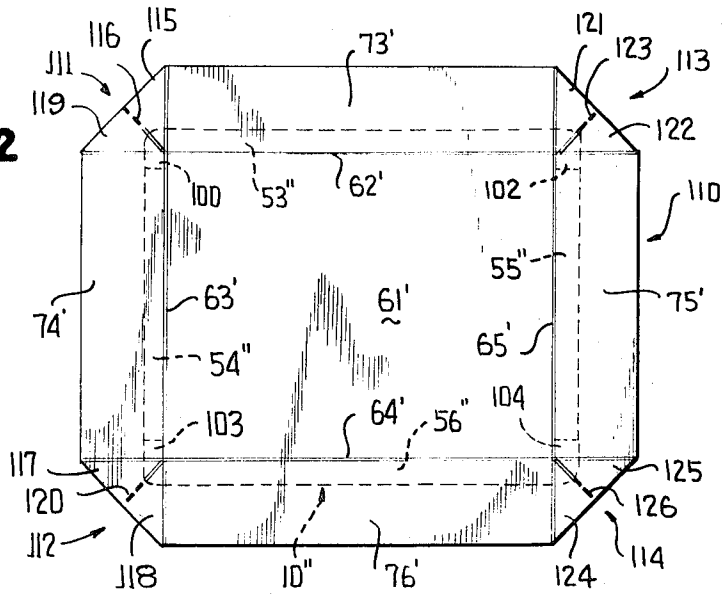
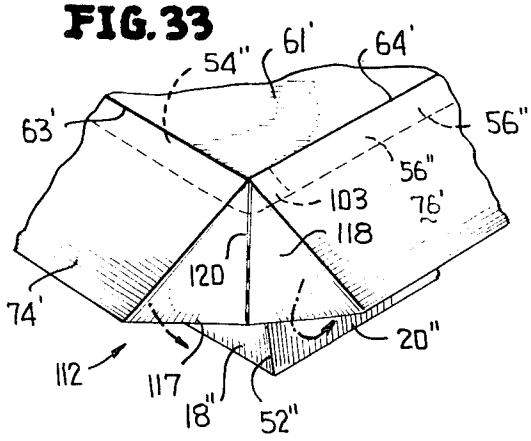


FIG. 33



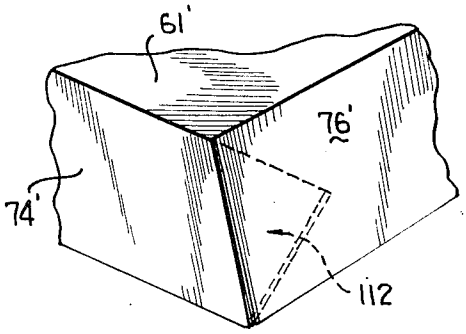


FIG. 34

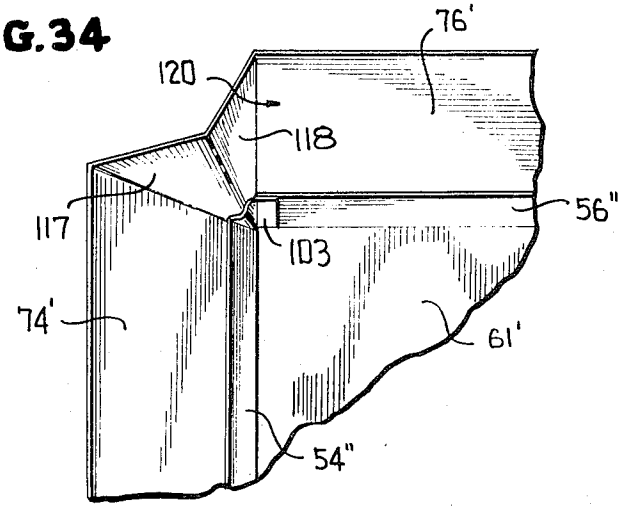


FIG. 35

METHOD OF FORMING, FILLING AND CLOSING CARTONS, AND SPECIFIC CARTONS THEREFOR

The present invention is directed to the manufacture of hermetically sealed cartons which are particularly designed for the packaging of frozen foods which are normally of a perishable nature as, for example, vegetables and similar edible products. Several problems particular to the frozen food industry, and especially in the case of vegetables, is undesired loss of moisture, changes in temperature which cause thawing and refreezing which results in a less nutritious product, not to mention esthetics and taste, different private labeling for use on the same package, multiple style cartons for different products, the bulky nature of cartons presently being used which interfere with packing operations, and the cost and annoyance of the over-wrap operation, particularly in the case of change-over for different private labels. Though these examples of present problems are not all inclusive they do represent items which have caused re-thinking in the packaging field to achieve a balance between low cost, high efficiency, and retain acceptance.

In keeping with the present invention a two-piece style or a one-piece hinge style carton or tray is provided, although the two-piece style carton offers some economies as to materials and forms a more hermetically sealed carton. Moreover, by constructing the cartons from two pieces both the carton body and the cover are devoid or cuts, slits or similar weakened areas, and if coated with moisture impervious material, which is preferably thermosetting, the cartons are capable of maintaining products in excellent condition for long periods of time. Such high storage life characteristics are highly desirable, and the same are further augmented by gusseted corner designs which provide multiple material thickness for stacking strength.

In each of the carton constructions side panels or side walls terminate at a "minor" or "body" flange which is sealed to a "major" or "cover" flange of a cover after which the flanges are folded toward the bottom of the carton body and adhered in various ways to the side panels. Considering that the carton cover would therefor include a top and four flanges this presents five panels for printing and/or decoration which is an approximate one-fifth increase as compared to present style containers. Moreover, nothing would preclude the bottom panel of the carton from being printed, typically with the usual cooking instructions, when in its blank state or during movement along the packaging line. The latter offers an economy in the printing process since the cover has less material than the carton body and thus it is more economical to print the tops in their flat state and the bottom panels of the cartons any time prior to erection, after erection, or through discharge from the packaging line.

One advantage of a two-piece carton of the type described is that of avoiding the use of conventional over-wraps which at best offer a packager flexibility for changing brand names from customer to customer, but over-wrapping is not an entirely neat, clean and tightly performed operation which is acceptable at present purely because of a lack of a better carton design. In addition, the cost of over-wrap material has increased over the last several years and there are no indications that this trend will dissipate or be reversed.

It is also highly desirable for industry to be able to employ only one style carton in which all products could be packaged thereby saving considerably in inventory, and again this problem is believed overcome by the present invention in which the carton body can be plain unprinted paperboard and only the covers need be printed as desired by individual customers. A customer could, for example, in keeping with this invention employ the same plain unprinted carton for all products involved and the packager would have on hand differently printed covers to indicate the different products and/or packagers involved. The only change in the packaging system would be then that of replacing one stack of covers for another during the operation and perhaps the substitution of one printing wheel or platen for another to indicate a change in cooking directions which would be printed upon the bottom panel of the cartons. This would be an extremely marked advantage over present over-wrap systems.

Another fact which should be appreciated is that conventionally wax paper and wax paperboard are used as over-wrap stock and carton stock, respectively, but these materials do not provide desired barrier characteristics to air, moisture and the like because the wax fractures easily during folding, wrapping and the like. Moreover, the absorption characteristics of the wax are detrimental from an esthetic standpoint because they absorb oils, greases and similar materials which produce a characteristically darker area (stain) upon the package than non-stained areas.

A final advantage of the present invention is that of simplicity because beginning with the starting material (two paperboard blanks in the preferred embodiment of the invention) both the cover and carton are rectangular or substantially rectangular and therefore waste material from scoring and cutting dies in minimal. Also, because of the rectangular nature of both designs the cover in particular can be supplied in the form of material drawn from a roll which can be preprinted and cut off to register appropriately with the cartons to which it is applied. Obviously, the latter objective of providing the cover material in roll form simplifies shipping and handling because at the fabricating end casing would not be necessary as blanks would not be packaged whereas at the packing end roll changes can be handled automatically. Also, a one-piece carton and cover can be as easily filled, closed and sealed in essentially the same machine as that employed for the two-piece or roll form structure.

In keeping with the foregoing a primary object of this invention is to provide not only novel cartons which achieve the sound commercial objective set forth heretofore, but additionally herein is provided a novel method which produces uniformity of carton design for a wide variety of products, ease of packaging and closure, superiority of shelf life characteristics, minimal packaging inventory, rapid turn over time and thus low downtime during any transition between two runs, and a high degree of adaptability irrespective of the particular product or products involved.

With the above and ther objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter, and the several views illustrated in the accompanying drawings.

IN THE DRAWINGS

FIG. 1 is a plan view of a novel carton blank constructed in accordance with this invention and particularly illustrates the manner in which adjacent side panels are joined to one another by gusset panels and with each side panel being provided with an associated flange.

FIG. 2 is an enlarged fragmentary perspective view of the carton blank of FIG. 1 in a partially erected condition thereof, and illustrates the manner in which two adjacent side walls are upwardly folded to initiate the folding of the gusset panel therebetween.

FIG. 3 is a fragmentary perspective view of the carton corner illustrated in FIG. 2, and illustrates the gusset panels abutting one another prior to completing the folding thereof as indicated in phantom outline.

FIG. 4 is a perspective view of a carton in its fully erected or set up condition with a gusset at each corner and each side wall having its associated flange directed generally normally thereto.

FIG. 5 is an enlarged sectional view taken generally along line 5—5 of FIG. 5, and illustrates one of four identical views of a gusset located externally and adhered to a side wall or panel of the carton body.

FIG. 6 is a cross-sectional view taken generally along line 6—6 of FIG. 5, and illustrates details of the manner in which each of the four gussets is adhered, preferably by anyone of a plurality of adhesives, to its associated side panel.

FIG. 7 is a top plan view of a cover overlying the carton of FIG. 4 which is illustrated in phantom outline, and illustrates the components prior to folding the flanges to contact the side panels to produce the completed carton of FIG. 9, as well as optional connecting tabs in phantom outline to two of the flanges.

FIG. 8 is a fragmentary perspective view looking upwardly at the left-hand lowermost corner of the carton and cover of FIG. 7, and illustrates the manner in which a flange of the cover and carton body have been folded downwardly against the adjacent side panel, a succeeding step in which one of four connecting tabs, if provided, of the downwardly folded carton flange is folded upon an adjacent side panel, and a succeeding step of downwardly folding the next adjacent flanges to sandwich the tab between the side panel and the lattermentioned flanges.

FIG. 9 is a perspective view of the completely formed carton or package, and illustrates each of the four corners formed in the manner described with respect to FIG. 8.

FIG. 10 is an enlarged fragmentary sectional view taken generally along line 10—10 of FIG. 9, and illustrates the manner in which the cover and carton body flanges are folded downwardly and adhered to the infolded tab and/or side panel.

FIG. 11 is an enlarged sectional view taken generally along line 11—11 of FIG. 10, and more clearly illustrates the gusset at one corner, the in-folded tab, and the overlying of the latter by the cover flange.

FIG. 12–A is a schematic side elevational view of the first adhesive applying and folding section of an apparatus for performing the method of this invention, and illustrates the manner in which the conveyed filled cartons are covered, hot-melt adhesive applied, flange sealed accomplished, flange plowing, and transport to a second adhesive applying and folding section of the apparatus.

FIG. 12–B is a schematic side elevational view of the apparatus of the invention forming a continuation of FIG. 12–A, and illustrates the second adhesive applying and folding section of the apparatus.

FIG. 13–A is a top plan view of FIG. 12–A, and illustrates details of the apparatus.

FIG. 13–B likewise is a top plan view of FIG. 12–B, and similarly illustrates details of the apparatus.

FIG. 14 is an enlarged sectional view taken generally along line 14—14 of FIG. 12–A, and illustrates in cross-section one cover upon an associated carton with the respective major and minor flanges on opposite sides in over-lying relationship.

FIG. 15 is an enlarged fragmentary sectional view taken generally along line 15—15 of FIG. 12–A and illustrates one of the minor flanges of the carton being plowed down and hot-melt adhesive applied thereto.

FIG. 16 is an enlarged fragmentary sectional view taken generally along line 16—16 of FIG. 12–A, and illustrates the weakening, creasing, fold line forming scoring or the like and pressurizing of a pair of flanges by a score and counter-score rolls with the latter including frusto-conical surfaces to squeeze the hot-melt adhesive toward the score to achieve a hermetic seal.

FIG. 16A is an enlarged fragmentary sectional view of the encircled portion of FIG. 16, and more particularly illustrates the manner in which the frusto-conical surfaces squeeze or extrude the hot-melt adhesive toward the score in a direction toward the carbon interior through the application of peripherally inwardly decreasing pressure.

FIG. 17 is a fragmentary sectional view taken generally along line 17—17 of FIG. 12–A and illustrates the manner in which hot-melt adhesive is applied by an applicator to a side panel of the carton body.

FIG. 18 is a fragmentary sectional view taken generally along line 18—18 of FIG. 12–A, and illustrates the manner in which one of a pair of adhesively bonded flanges is plowed down against the adjacent side panel.

FIG. 19 is a diagrammatic fragmentary side elevational view of a modified apparatus constructed in accordance with this invention, and illustrates the cover material being supplied in web form with means for achieving web and carton registration, means for cutting covers from the web, and the association of each cover with an associated carton.

FIG. 20 is a diagrammatic top plan view of FIG. 19, and illustrates further details of the modified apparatus including means for imprinting the covers.

FIG. 21 is a diagrammatic fragmentary top plan view of another modified apparatus of this invention, and illustrates the manner in which one-piece cartons and covers are fed and eventually formed into a package which, contrary to the earlier embodiments, excludes flanges on one side thereof.

FIG. 22 is a sectional view taken generally along line 22—22 of FIG. 21, and illustrates the cross-sectional configuration of the one-piece hinged carton and cover which is flangeless on one side thereof.

FIG. 23 is an enlarged sectional view taken generally along line 23—23 of FIG. 21 and illustrates the one-piece cover in its closed position prior to the perform-

ance of plowing, adhesive applying, and sealing steps.

FIG. 24 is a top plan view of another blank constructed in accordance with this invention, and illustrates a gusset adjoining adjacent side panels with each side panel including a flange of which at least two include extensions for providing an edge abutment between adjacent flanges upon erection of the carton blank.

FIG. 25 is an enlarged fragmentary perspective view of the left-hand lowermost corner of the carton blank of FIG. 24, and illustrates the manner in which each of the four gusset panels are folded inwardly to produce the configuration of FIG. 26.

FIG. 26 is a fragmentary perspective view of the corner illustrated in FIG. 25 having been fully erected and rotated, and illustrates the disposition of the gusset inboard of the side panels and an abutment between the adjacent side panel flanges.

FIG. 27 is a perspective view of the carton formed from the blank of FIG. 21, and illustrates inner gussets and abutting flanges at each corner of the carton body.

FIG. 28 is a top plan view of another carton blank constructed in accordance with this invention, and illustrates gusset panels between adjacent side panels, a flange associated with each side panel, and a pair of opposite flanges of a generally shallow U-shaped configuration to provide an overlap or underlap at each corner when erected, as shown in FIG. 30.

FIG. 29 is a fragmentary perspective view of the left-hand lowermost corner of the blank of FIG. 23, and illustrates the partially erected condition thereof as the gusset panel is folded inboard of the side panels.

FIG. 30 is a fragmentary perspective view of the corner illustrated in FIG. 29, and shows the completion of the corner and the overlap between adjacent flanges.

FIG. 31 is a perspective view of a carton formed from the blank of FIG. 28, and illustrates inwardly disposed gussets and overlapped flanges particularly at the two right-handmost carton corners.

FIG. 32 is a top plan view of another carton and cover constructed in accordance with this invention, and illustrates flanges of both having gussets between adjacent side panels at each corner.

FIG. 33 is an enlarged fragmentary perspective view of the left-hand lowermost corner of the carton of FIG. 32, and illustrates the progressive in-folding and underfolding of the gusset to sandwich the same between an associated side panel and major flange.

FIG. 34 is a fragmentary perspective view looking upwardly in FIG. 33, and illustrates details of the gusset and flange folding to achieve the final arrangement of FIG. 35.

FIG. 35 is a fragmentary perspective view of the same corner illustrated in FIGS. 33 and 34, and illustrates the complete folding of the corner with the gusset panel being sandwiched between a side panel and the adjacent corner flange.

Before describing machines for performing methods of this invention reference is made to a first of a plurality of novel cartons constructed in accordance with this invention which is best illustrated in FIG. 4 of the drawings and is generally designated by the reference numeral 10. The carton 10 is constructed from a blank 11 (FIG. 1) of paper-stock, plastic or similar material initially of a generally rectangular outline which is appropriately blanked and scored to the illustrated configuration. The blank 11 includes a generally polygonal bottom panel 12 set off by fold lines 13 through 16 which adjoin to the bottom panel 12 respective side panels 17 through 20.

The side panel 17 is set-off by the fold line 13, a perforated fold line 22 parallel thereto, and opposite fold lines 23, 24.

Likewise, the side panel 18 is set-off by the fold line 14, a perforated fold line 25 parallel thereto, and opposite parallel fold lines 26, 27.

The side panel 19 is set-off by the fold line 15, a perforated fold line 28, and opposite parallel fold lines 29, 30.

The final side panel 20 is set-off by the fold line 16, a perforated fold line 32 parallel thereto, and opposite parallel fold lines 33, 34.

Between each pair of adjacent side panels is disposed a gusset panel, generally designated by reference numerals 35 through 38.

The gusset panel 35 includes a pair of generally triangular panel portions 40, 41 separated from each other by a fold line 42.

The gusset panel 36 likewise includes panel portions 43, 44 separated from each other by a fold line 45.

The gusset panel 37 includes panel portions 46, 47 separated from each other by a fold line 48.

The gusset panel 38 includes gusset panel portions 50, 51 separated from each other by a fold line 52.

Adjoining the respective side panels 17 through 20 are respective minor or body flanges 53 through 56. Though the flanges 53 through 56 are illustrated as being adjoined to the respective side panels 17 through 20 by the respective perforated fold lines 22, 25, 28 and 32, in keeping with one major and novel aspect of this invention the latter-mentioned four perforated fold lines may be post-overscored, post-overweakened, post-overcreased, post-overfold line formed or the like in conjunction with the "post scoring", "post-weakening," "post-creasing," "post-fold line formed" or the like of coincident fold lines in a cover, to be also described more fully hereinafter, as will be more apparent in conjunction with the description of FIG. 16.

The term "post overscore" refers to the performance of a scoring weakening, creasing, foldline forming or the like operation upon (over) the perforated fold lines 22, 25, 28 and 32 after (post) they have already been formed in the blank 11 with the post overscoring being accomplished during the packaging operation to be described more fully hereinafter with respect to the apparatus of FIGS. 12–A, 12–B, 13–A and 13–B. The term "post scoring" refers to the use of an initially unscored cover or cover blank (FIG. 7) which is first scored after (post) being applied to the carton, again as will be described more fully hereinafter with respect to FIGS. 12–A, 12–B, 13–A and 13–B.

Assuming that the blank 11 is constructed from paperstock material, the inner and/or outer surfaces thereof may and preferably are coated with barrier material, as for example, polyethylene or similar material which will adhere to itself under heat and pressure. An adhesive pattern may be employed in lieu of the outer surface coating to achieve adherence of the gussets 35 and through 38 to the associated side panels and, if desired, selective pre-pattern coatings of hot-melt or other adhesives may be applied to the carton blank 11 at areas found necessary which will be apparent when

it is appreciated the manner in which the blank **11** is erected or set up to form the carton **10.**

The specific manner of erecting the blank **11** to form the carton **10** is best understood by referring to FIG. **2** which illustrates the side panel **20** being first folded 90° with respect to the bottom panel **12** about the fold line **16** and the flange **56** being folded 90° with respect to the side panel **20** about the perforated fold line **32.** This folding automatically draws the adjacent side panel **18** in an upwardly direction and with the same folding of the side panel **17** the side panel **19** is likewise drawn upwardly commensurate with the illustrated position of the side panel **18.** The gusset panel portions **50, 51** of the gusset **38** are progressively folded relative to each other about the fold line **52** and in so doing the fold lines **27, 33** are drawn progressively closer to each other until they are generally in abutting relationship in the manner readily apparent from FIG. **3.** Prior to, simultaneously with or after the folding of the panel **18,** as well as the panel **19,** the flanges **54, 55,** respectively, associated therewith are also folded normal to their associated side panels. Assuming, as has been described earlier, that the paperboard blank **11** has a coating on both its inner and outer surfaces which can be adherent by heat or pressure the gusset panels **50, 51** are thereafter folded against the side panel **20** to the phantom outline position shown in FIG. **3** after which heat and pressure will adhere the abutting surfaces of the panel portions **50, 51** to each other and the exterior surface of the panel **20** to the exterior and interior surfaces of the gusset panel portions **50, 51,** respectively. Of course, the final corner construction described with respect to the gusset **38** is equally applicable to the gussets **35** through **37** resulting in the configuration of the carton **10** shown in FIG. **4.** If found necessary or desirable hot-melt adhesive can be applied to the side panels **17** and **20** at opposite ends prior to the folding of the gusset panels **35, 36** and **37, 38** against the side panels **17** and **20,** respectively, as best indicated at A in FIG. **3.**

The specifics of each of the gussets are detailed in FIGS. **5** and **6** relative to the gusset **35** from which it will first be noted that both gusset portions **40, 41** are not only adhered to each other but to the side panel **17.** Moreover FIG. **6** emphasizes the three-ply cross section across the triangular area of the gusset **35** (FIG. **5**) which achieves a reinforcement of each of the corners and thus facilitates not only a more impervious corner seal but reinforcement for stacking, shipping, and similar purposes.

Reference is now made to FIG. **7** of the drawings which illustrates a cover **60** overlying and resting atop the flanges **53** through **56** of the carton **10.** The cover **60** includes a top panel **61** bounded by fold lines **62** through **65** which are coincident with respective perforated fold lines **22, 25, 32** and **28** of the carton **10.** However, as noted earlier with respect to the carton blank **11** the cover **60** need not be provided with the fold lines **62** through **65** in the blank state thereof but instead these may be post-formed or "post-scored" during the packaging operation, particularly in the manner which will be described hereinafter.

The cover **60** includes major or cover flanges **73** through **76** which overlie the respective minor or cover flanges **53** through **56** of the carton **10.** Though "major" and "minor" have been used, it is to be understood that the flanges may be of any size desired and the terms are not intended to connote a difference in areas but instead merely distinguish one set of flanges from the other.

The flange **73** is set-off by the fold line **62** and portions of the fold lines **63, 65** which form hinges for connecting tabs **77, 78,** respectively. The tabs **77, 78** are shown in phantom outline because in a preferred embodiment of the invention they are eliminated.

The flange **76** is likewise set-off by the fold line **64** and portions of the fold lines **63, 65** which adjoin to the flange **76** connect in tabs **80, 81.** Likewise, the tabs **80, 81** are shown in phantom outline since they may be eliminated as in the case of the tabs **77, 78.**

The flanges **74, 75** are joined by the respective fold lines **63, 65** to the top panel **61** and are devoid of connecting tabs corresponding to the tabs **77, 78, 80** and **81.**

The cover **60** is constructed from paperstock, plastic or similar material, and may be precoated on one or both sides with adhesive, hot-melt coating, coextrusions, or the like much in the same manner as that described in connection with the blank **11.** For purposes of the present description it will be assume that the cover **60** is coated with a material on both surfaces compatible with an adherent to the coating applied to the carton **10.**

Assuming, as will be described more fully hereinafter with respect to FIGS. **12–A, 12–B, 13–A** and **13–B,** that a product has been packaged within the carton **10** prior to the application of the cover **60** thereto, the steps in forming the eventually sealed package, generally designaged by the reference numeral **90** of FIG. **9,** are initiated by first folding either or both of the flanges **73, 76** downwardly along with the associated underlying flanges **53, 56** with the latter being illustrated in FIG. **8.** The flanges **56, 76** are therefore adhered to the gusset **38** as well as the side wall **20** after which the tab **80** is folded about the fold line **63** into contact with the side panel **18** by a conventional in-line tucker. Thereafter the flanges **74, 54** are folded downwardly, as indicated by the unnumbered headed arrow associated therewith, to complete the sealing of the illustrated corner with like sealing occurring at the remaining three corners and in all cases the tabs **77, 78, 80** and **81** are sandwiched between the side walls against which they are folded and the overlying associated carton body and cover flanges.

Reference is made to FIGS. **10** and **11** which illustrate with respect to the corner including the gusset **38** the manner in which the cover folding just described increases the rigidity of each corner. With respect to the side panel **20** it becomes reinforced its entire height by the cover flange **76** between its fold line **33, 34** which results in a minimum over-all thickness of two plies which is increased to three plies across the top due to the flange **56** (not shown) and a maximum of five plies at the corner, again at the uppermost portion due to the carton flange **56.** Thus the minimum reinforcement at the panel **20** at the corner is a four ply construction, as is illustrated in FIG. **11** and a five ply construction at the uppermost edge due to the panel **56.** In much the same manner the minimum across the length thickness along the panel **18** between its fold lines **26, 27** is of a two ply construction due to the cover flange **74.** At the top there is also included the carton flange **54** (FIG. **10**) which renders the uppermost portion of this side of the triple reinforcement and the corner of a four ply construction which includes the tab **80** illus-

trated in FIG. 11, the flange 74, the panel 18, and the unillustrated flange 54. Accordingly, the compression strength of the package 90 is exceedingly high and thus stacking problems are virtually eliminated or rendered negligible.

A novel apparatus representative of one system for performing the novel method of filling, covering, sealing and closing the carton and cover heretore described to form the package 90 of FIG. 9 is illustrated in FIG. 12–A, 12–B, 13–A and 13–B, and is generally designated by the reference numeral 180. The description of the apparatus 130 will be made with respect to the carton and cover of FIGS. 1–11 although the connecting tabs 77, 78, 80, 81 (FIG. 7) are considered absent from the over-all cover 60 as are the fold lines 62–65. It is also assumed that the carton 10 of FIG. 4 has been erected or set up previously at a downstream position by a set-up unit 129 (FIG. 12–A) which imprints upon the carton blank and/or body, as found necessary or desirable, applies adhesive A (FIG. 3) to the four corners to assure satisfactory gusset formation at 35–38, after which a product P (FIG. 12–A) is conventionally packaged in each of the schematically illustrated cartons 10.

The cartons 10 are carried by an upper run 131 of a conventional endless conveyor 132 which is suitably entrained about drive and driven pulleys (unnumbered) which move the upper run or flight 131 from left-to-right as viewed in FIGS. 12–A, 12–B, 13–A and 13–B. The upper flight 131 of the conveyor 132 carries a plurality of pusher lugs 133 which engage a side panel of the cartons 10 and carry the same toward a cover-carton assembly or unification station 134. (FIGS. 12–A and 13–A).

A cover feed mechanism 135 (FIG. 12–A) includes an appropriately driven conventional endless conveyor 135 entrained about pulleys 136, 137 which carries a plurality of clips 138 which are conventionally mechanically opened at a station 139 and promptly closed thereat to receive and grip each cover 60 as is withdrawn from a stack S by a conventional oscillatory vacuum mechanism 140 which is conventionally provided with vacuum cups operative in timed relationship to the over-all machine 130. Thus, due to synchronization of the apparatus 130 each cover blank 60 is individually removed from the stack S and positioned within a clip 138 of the cover feed mechanism 135, after which the vacuum of the feed is cut-off, the clip closes, and the mechanism 140 returns to withdraw another cover 60 from the stack S with the latter function being continuous during the operation of the apparatus 130.

Each cover 60 travels along the lower flight or run (unnumbered) of the cover feed mechanism 135 through a conventional printing or imprinting mechanism 141 which includes a lower back-up roll 142 and a printing roll 143 suitably supplied with printing material. The uppermost surface of the blanks 60 are appropriately pre-printed before being supplied to the stack S and the imprinting roll 143 of the imprinting mechanism 141 is provided to encode upon the upper surface thereof such information as might be required by, for example, the Food and Drug Administration, such as percentages of product contents (protein, fats, etc.)

Each cover 60 travels along the lower flight or run toward a cover release mechanism 144 (FIG. 12–A) which opens the clips 138 in timed relationship to a carton 10 arriving thereunder whereupon the cover 60 drops upon an associated carton 10 upstream of the pusher lugs 133. Inasmuch as the cover 60 has a tendency to vibrate during the motion of the conveyor 132 the pushers 133 assure that alignment is maintained between each cover and its associated carton due to the step-configuration of the pusher 133. In other words, an upper portion (unnumbered) of each pusher lug 133 is offset to engage an edge of each cover 60 whereas a lower portion (unnumbered) of each pusher 133 is in contact with a side panel of each carton 10. Thus, alignment between the carton body and cover flanges is maintained by the lugs 133 whereas transverse alignment with respect to the direction of travel is achieved by suitable lateral or side guides for both the cartons 10 and the covers 60 illustrated but unnumbered.

Assuming that a cover 60 has been applied to the carton 10 in the manner illustrated in FIG. 7 and, as noted earlier, the same is devoid of the connecting tabs 77–81, and further assuming that the side panel 19 of the cartons 10 is initially leading, the first operation is to adhere flanges 56, 76 and 53, 73 to each other simultaneously. In keeping with one aspect of the invention it is desirable to apply hot-melt adhesive to either the undersides of the flanges 73, 76 or the upper sides of the flanges 53, 56, although preferably the hot-melt adhesive is applied to the latter flanges. Therefore, as the cartons 10 move upstream a conventional plow mechanism 150 (FIGS. 12–A and 13–A) at each side of the conveyor 132 is aligned to deflect the flanges 53, 56 downwardly, as is best illustrated in FIG. 15 which is a downstream view illustrating the flanges 53, 75 and therefrom it is readily apparent that the flange 56 is folded similar to the flange 53. Thus the flange 53, 56 are deflected downwardly by the plows 150 and remain in this position as the cartons 10 and covers 60 move toward, past and beyond hot-melt adhesive applying applicators or nozzles 151, one at each side of the conveyor 132, which apply hot-melt adhesive A (FIG. 15) to the flanges 53 and 56. In keeping with one aspect of this invention the plows 150 and other plows to be described hereinafter may be optionally heated if it is desired to maintain a particular temperature of the hot-melt adhesive for a particular time period prior to subsequent operations or if other adhesives, such as thermosetting or thermocuring, are employed.

The cartons 10 and covers 60 are next conveyed by the conveyor 132 to a score and pressure applying station, generally designated by the reference numeral 154 which includes a pair of upper counter-score rolls 155, 155 (FIG. 13–A) and aligned lower counter-score rolls 156, 156, only one pair of which is illustrated in FIG. 16. The rolls 155, 156 are aligned relative to each other such that a groove 157 of each roll 155 is in alignment with a bend 158 of the underlying score roll 156. Moreover, each pair of aligned grooves 156 and beads 158 are positioned such that they are in alignment with the fold lines 22, 32 of each carton 10, it being again noted that the cover is devoid of the fold lines 62–65. The rolls 155, 156 are appropriately driven in synchronism with the motion imparted to the cartons and covers by the conveyor 132 and each of the rolls 156 preferably includes a sleeve or cover 160 of material having a high co-efficient of friction to assure that the flanges 53, 75 and 56, 76 will be gripped and thereby drawn past the station 154 without relative slippage. As each carton and cover passes through the station 154 and fold lines 22, 32 of each carton are "post-overscored"

to form a downwardly opening concave post-scored fold (FIG. 16) whereas each cover 60 is, for the first time, provided with the corresponding post-score lines 62, 64 (FIG. 16–A). Since the carton body fold lines 22, 32 were initially formed in the blank 11 they are considered to have been pre-scored within the terminology of this disclosure and after having passed through the station 154 they are considered both pre-scored and post-scored fold lines 22, 32. However, since the covers 60 are not pre-scored and are plain blanks the fold lines 62, 64 are considered only to be post-scored, although pre-scoring thereof prior to passage through the station 154 is considered an alternate arrangement in keeping with this invention.

Reference is made specifically to FIG. 16–A in which the sleeve 160 is illustrated as having a frusto-conical surface 161 opposing a like frusto-conical surface 162 of the roll 155. Due to the opposing nature of the frusto-conical surfaces 161, 162 and the manner in which the same diverge toward the interior of the carton 10 adhesive A is squeezed, extruded or otherwise forced toward the scores or folds 22, 62 and insure a hermetic fold therebetween which is at least liquid-tight.

Upon passing the station 154 hot-melt adhesive A (FIG. 17) is applied to the side panels 17, 20 by a pair of applicator nozzles 166, although the applicators 166 could as well apply the hot-melt adhesive A to the flanges 73, 76. The purpose of applying the adhesive to either the flanges 73, 76 or the side panels 17, 20 is to achieve adherence therebetween upon the downward folding or plowing of the flanges 53, 73 and 56, 76, in the manner best illustrated in FIG. 18.

Prior to the down-folding or plowing of the flanges, as best shown in FIG. 18, it is to be noted that during the passage of the cartons 10 and covers 60 through the stations 151, 154 and 165 means 170 (FIG. 12–A) are provided for holding the covers down against the cartons. The hold-down mechanism 170 includes two pairs of transversely spaced pulleys 171, 172 having entrained thereabout hold-down belts 173 with the pulleys 171, 172 being driven in synchronism with the conveyor 132 to assure absence of slippage between associated covers and carton. Due to the hold-down mechanism 170 accurate alignment between the covers and cartons beyond that achieved by the pushers or lugs 133 is maintained until an adequate seal is achieved at the station 154 hence not requiring a like hold-down mechanism 170 at further upstream stations corresponding to the stations 151, 154 and 165.

After the hot-melt adhesive A is applied to the side panels 17, 20 at the station 165 in the manner heretofore described the flanges 33, 73 and 56, 76 pass beneath flows 180 on each side of the conveyor 132 which are contoured to plow down or fold down the flanges in the manner clearly illustrated in FIG. 18 such that each flange 73, 76 is adhered against the adhesive applied to its associated adjacent side panel 17, 20, respectively. (FIG. 18). Once having passed beyond the plows 180, 180 the cartons arrive at a station 185 which includes a conventional mechanism for rotating the cartons 90°. Thereafter either of the earlier sealed side panels 17 or 20 of the cartons are leading as each carton and cover approaches mechanisms corresponding to the mechanism 150, 151, 154, 165 and 180 of FIG. 12–A and 13–A, and have therefore been designated by the same though primed reference numerals. As each carton and cover passes the mechanism 150', 151', 154', 165' and 180', the same functions are performed as earlier described with respect to the mechanism 150, 151, 154, 165 and 180, namely, the plowing of the flanges (55, 75; 54, 75) to separate the same for the application of adhesive at the station 151', the formation of scores at the station 154', the application of hot-melt adhesive to the panels 18, 19 at the stations 165', and the eventual down-folding or plowing at the stations 180' after which the carton and covers form the package 90 which exit the apparatus 130 for storage, shipment or the like.

Reference is now made to FIG. 19 which illustrates a downstream section of another apparatus 130 in which components identical to the apparatus 130 have been designated by like though primed reference numerals. The primary difference between the apparatuses 130, 230 is the fact that a roll (not shown) of web material 231 is provided from which is drawn appropriately die-cut cover portions 232 which bear registration indicia 233 which can be sensed by a mechanism 234 to permit the cover portions 232 to be cut by severing means 235 into individual covers 236. After being imprinted at 142', 143' each cover 236 is transferred by the cover conveying mechanism 135' to a transfer station 144' at which time each cover 236 is applied to an associated carton 10' after which the apparatus 230 functions in the manner heretofore described with reference to FIGS. 12–A through 13–B.

Reference is now made specifically to FIG. 22 of the drawings in which a one-piece carton is illustrated and the same includes like though double primed reference characters corresponding to the carton and cover of FIGS. 1 through 11 except, of course, the cover 60'' is joined to the carton body 10'' by a hinge or fold line 240. Essentially the fold line 240 replaces the fold line 32 of the carton body blank 11 (FIG. 1) and the flange 56 of the latter is supplemented by the cover 60''. In keeping with this aspect of the invention the same apparatus 130 excluding the cover conveying mechanism 135 is employed to convey the cartons from left-to-right as viewed in FIG. 21 at which time the covers 60'' are imprinted on their underside by reversing the position of the back-up and printing rolls 142, 143 of FIG. 12–A such that printing occurs on the underside of the cover as viewed in FIG. 21 which in the closed position is the exposed exterior thereof. Thereafter each cover 60'' passes by a plow mechanism 241 which closes the cover 60'', in the manner apparent from FIG. 23. After passing the plow mechanism 241 it is to be noted from FIG. 21 that only a single hot-melt applicator 242 is employed at but a single side of the conveyor to apply hot-melt adhesive to the flange 53'' after the latter has been plowed or folded downwardly by the plow 150''. Subsequently the flanges 73, 53'' are scored, pressurized, plowed down and adhered to the adjacent side panels, the carton is rotated, and downstream the remaining opposite sides are secured in the manner described with respect to the upstream mechanism 150', 151', 154', 165' and 180' of the apparatus 130.

Reference is now made to FIGS. 24–27 of the drawings wherein a carton blank and carton similar to that illustrated in FIGS. 1 through 4 is illustrated with like elements being identically numbered but primed. Thus the blank is designated by the reference numeral 11' and the carton by the reference numeral 10'. Considering first the blank of FIG. 24 the flanges 54', 55' of the carton blank 11' are identical to the like flanges 54, 55

of the blank **11**. However, the flanges **53'**, **56'** of the blank **11'** have respective extensions **92, 93** and **94, 95** in part defined by short cut lines **96** through **99**. the extensions **92** through **95** are in edge abutment as is most obvious in FIGS. **26** and **27**. More specifically, in forming the corner at the gusset **38'** the gusset panel portions **50'**, **51'** are folded inwardly, as opposed to outwardly with respect to the disclosure of FIGS. **2** and **3**, and are adhered to each other and to the side panel **20'**, in the manner best illustrated in FIG. **26**. When so joined the projecting portion **94** of the flanges **56'** will be in edge abutment with the flange **54'**. In a like manner the portion **92** is in edge abutment with the flange **54'** and the portions **93, 95** of the flanges **53'**, **56'**, respectively, are in edge abutment with the flange **55'** adjacent the respective gussets **36'**, **37'**.

The carton **10'** is filled, covered and sealed in the same manner as that described with respect to the formation of the package **90** of FIG. **9**. However, an additional reinforcement and added sealing quality occurs at each corner of the eventually formed package due to the edge abutment formed by the projecting portions **92, 93** of the flange **53'** and the projecting portions **94, 95** of the flange **56'**. Furthermore, upon the downward folding of the flanges **54'** through **56'** the edge abutment created by the portions **92** through **95** will be folded at a 45° angle bisecting the finally formed corners in the manner illustrated in FIG. **28**. It is also noted that though the gussets **35'** through **38'** are folded inwardly in keeping with this embodiment, with this invention the construction may likewise include an outward folding thereof as early described with respect to FIGS. **2** and **3** in particular.

Reference is now made to FIGS. **28** through **31** of the drawings wherein another blank and carton are illustrated with elements thereof corresponding to those heretofore described with respect to FIGS. **1** through **11** of the drawings being double primed. Accordingly, the carton blank is designated by the reference numeral **11''** and the carton by the reference numeral **10''**.

Referring particularly to FIG. **28** the blank **11''** includes flanges **54''**, **55''** identical to the flanges **54, 55** of the blank **11**. However, the flanges **53''** and **56''** include respective extensions **100, 102** and **103, 104**. The extensions or projections are formed by respective angled cut lines **105** through **108** which, in effect, rob material from the gusset portions **41''**, **43''**, **50''** and **46''**.

Upon erecting the blank **11''** to form the carton **10''** in the manner heretofore described with respect to the blanks **11**, like folding occurs with the gussets **35''** through **38''** again being inboard of the carton **10''**. Once so folded the projections **100** through **104** are adhered to the associated ends of the flanges **54''**, **55''**, as is most apparent from the FIG. **30** illustration in which the projection **103** is illustrated adhesively secured to the undersurface of the end (unnumbered) of the flange **54''**, although it may likewise be secured to the uppermost surface of the latter flange. The other projections **101, 102** and **104** are likewise secured to their associated flanges, and thereafter the carton is filled and a cover **110** (FIG. **32**) is applied thereto.

The cover **110** is similar to the cover **60** and therefore like elements have the same reference numerals applied thereto except they have been primed. In lieu of the latching tabs **77, 78, 80** and **81** of the cover **60** the cover **110** includes at the corners of adjacent side panels **73'** through **76'** respective gussets **111, 112, 113** and **114**. The gusset **111** includes a pair of triangular gusset portions **119, 115** separated by a fold-score line **116**.

The gusset **112** likewise includes a pair of triangular gusset portions **117, 118** separated from each other by a score-fold line **120**.

The gusset **113** includes a pair of triangular gusset portions **121, 122** which are spaced from each other by a score-fold line **123**.

The gusset **114** includes gusset portions **124, 125** which are spaced from each other by a score-fold line **126**.

The manner of folding is exemplified best in FIGS. **33** and **34** wherein the unnumbered headed arrows indicate the folding of the gusset panel portions **117, 118** inwardly and downwardly which automatically draws downwardly therewith the flanges **74'**, **76'** and the flanges **54''** and **56''** bonded thereto. As viewed in FIG. **33** the gusset panel portion **117** is folded downwardly and to the right and the gusset panel portion **118** is folded inwardly, downwardly and to the right resulting in the movement of the score-fold line **120** in a downward inward and rightward direction resulting in the automatic folding of a portion of the projecting tab **103**, as is illustrated in FIG. **34**. After the completion of the folding (FIG. **35**) the gusset panel portion **120** is sandwiched between the side panel **20''** and the gusset panel portion **118** whereas the gusset panel portion **118** is sandwiched between the gusset panel portion **120** and the body flange **76'**. The remaining corners are, of course, likewise folded resulting in a package which is completely square, as is readily apparent from FIG. **35**.

While preferred forms and arrangement of parts have been shown in illustrating the invention, it is to be clearly understood that various changes in details and arrangement of parts may be made without departing from the scope and spirit of this disclosure.

I claim:

1. A packaging method comprising the steps of providing a carton body defined by a bottom panel, four upstanding side panels and a flange carried by at least one of said side panels, packaging a product within the carton body, spanning the carton body including the flange thereof with a cover with a flange of the latter atop the body flange, folding the flanges into external side-by-side relationship with an associated side panel, securing the flanges in the latter folded position, and post-forming a weakening line in the cover flange prior to the performance of the last-mentioned securing step.

2. A packaging method comprising the steps of providing a carton body defined by a bottom panel, four upstanding side panels and a flange carried by at least one of said side panels, packaging a product within the carton body, spanning the carton body including the flange thereof with a cover with a flange of the latter atop the body flange, securing the flanges to each other, folding the thus secured flanges into external side-by-side relationship with an associated side panel, securing the flanges in in the latter folded postion post-forming contiguous common fold lines in said carton body and cover, and said common fold lines are of a concave configuration as viewed in transverse cross-section opening in a direction toward said bottom panel.

3. The packaging method as defined in claim 1 wherein the step of post-scoring is performed by rotatable score and counterscore rolls.

4. The packaging method as defined in claim 3 wherein one of said rolls includes a resilient peripheral friction surface.

5. The packaging method as defined in claim 3 wherein a peripheral surface of at least one of said rolls tapers generally frusto-conically converging in a direction toward the carton interior.

6. A packaging method comprising the steps of providing a carton body defined by a bottom panel, four upstanding side panels, and a flange carried by at least two opposite ones of said side panels, packaging a product within the carton body, spanning the carton body including the flanges thereof with a cover having cover flanges overlying said carton body flanges, conveying said carton body and cover in a direction parallel to said two opposite side panels, simultaneously securing each cover flange to its underlying carton body flange, folding the thus secured flanges simultaneously into external side-by-side relationship with the adjacent one of said two opposite side panels, securing the flanges in the latter folded positions, and simultaneously post-scoring common fold lines in at least the cover flanges in parallel relationship to each other with each fold line being immediately adjacent its associated side panel.

7. The packaging method as defined in claim 6 including the further step of rotating the secured carton and cover to bring the remaining two side panels parallel to the direction of travel, and repeating the first-mentioned securing step, the folding step, and the second-securing step to at least one additional flange of the cover and an additional underlying flange of the carton body.

8. The packaging method as defined in claim 7 including the step of printing the exterior of the carton body bottom panel during the movement thereof in said predetermined direction.

9. A packaging method comprising the steps of providing a carton body defined by a bottom panel and four upstanding side panels collectively defining a carton interior and a flange carried by at least one of the side panels, packaging a product within the carton body, spanning the carton body including the flange thereof with a cover with a flange of the latter atop the body flange, disposing flowable adhesive between the cover flange and the body flange, applying peripherally inwardly decreasing pressure between said cover and body flanges to extrude the flowable adhesive in a direction toward fold lines of said flanges and toward the carton interior, folding the flanges into external side-by-side relationship with an associated side panel, and securing the flanges in the latter folded position.

10. The packaging method as defined in claim 9 including the step of post-forming a weakening line in the cover flange prior to the performance of the folding step.

11. The packaging method as defined in claim 9 including the step of post-forming a weakening line in the cover flange prior to the performance of the step of applying the peripherally inwardly decreasing pressure to the cover and body flanges.

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