Feb. 22, 1966 W. E. CHEELEY 3,236,436

GUSSETED CORNER CARTON

Filed June 27, 1963 2 Sheets-Sheet 1

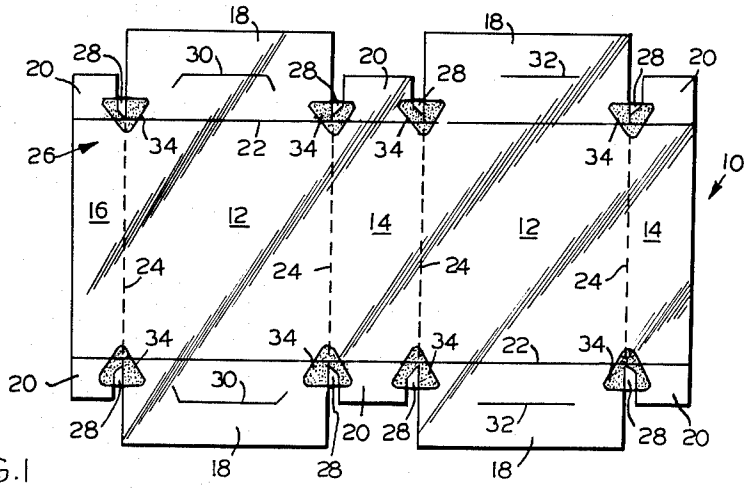


FIG. 1

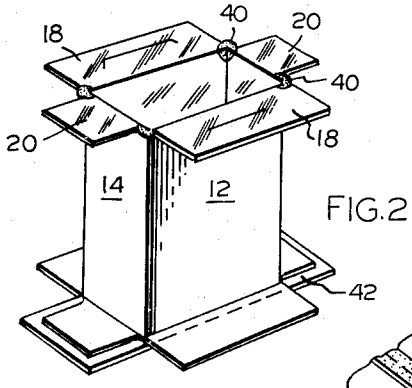


FIG. 2

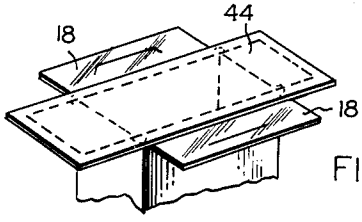


FIG. 4

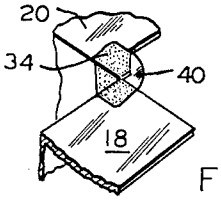


FIG. 3

FIG. 5

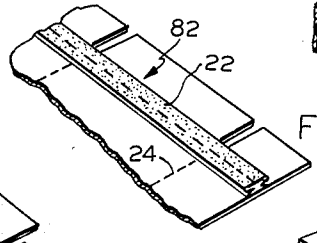
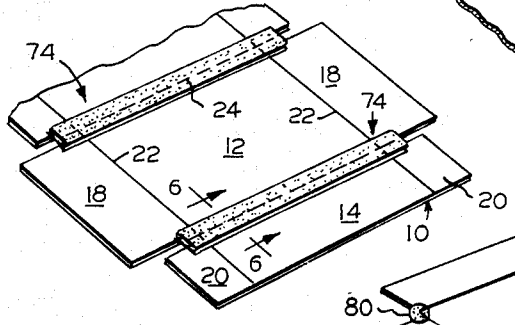


FIG. 8



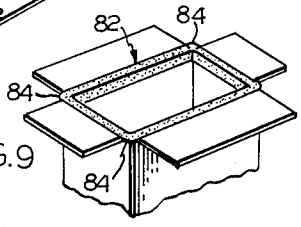
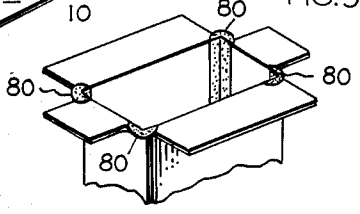


FIG. 9



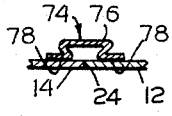


FIG. 6

FIG. 7

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GUSSETED CORNER CARTON

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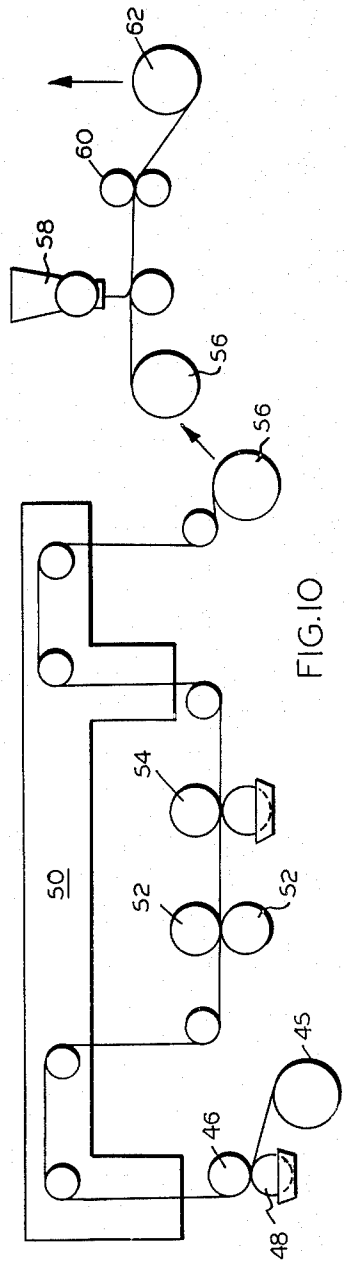


FIG.10

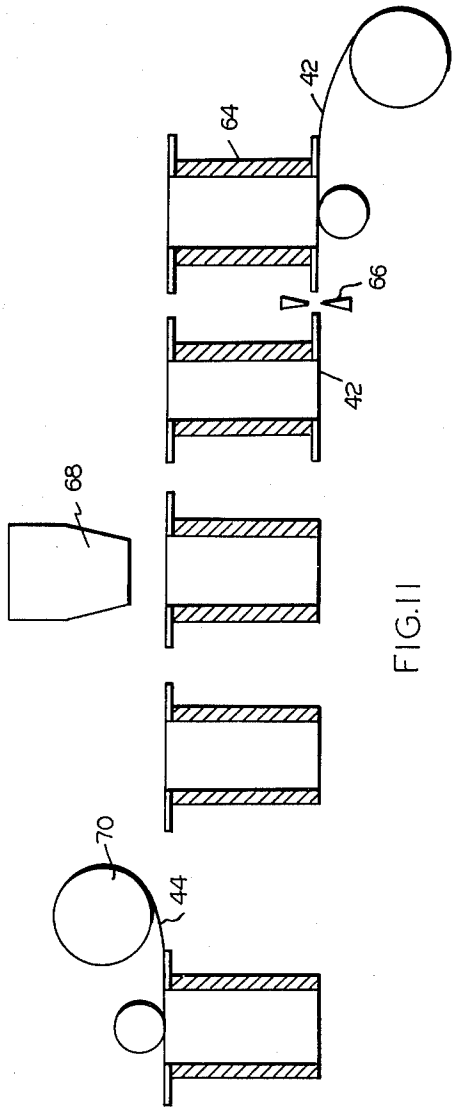


FIG.11

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3,236,436

GUSSETED CORNER CARTON

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Filed June 27, 1963, Ser. No. 291,138
8 Claims. (Cl. 229—37)

This invention relates to a folding carton construction, and more particularly to an improved gusseting and sealing arrangement for carton corners to insure that the sealed carton will be leakproof and siftproof, which is particularly necessary in an hermetically sealed carton, but which is also important in cartons which need not be hermetically sealable.

In a rectangular or similar polygonal fibrous carton, difficulty is encountered in effecting a tight closure seal at the corners thereof adjacent the carton flaps. While the outwardly extending carton end and side flaps themselves provide a substantial seal area when overlaid with a sealing membrane closure or when the several flaps are inwardly folded to overlie one another in sealed relation, the carton corners between the flaps commonly provide little if any surface area to which an effective leakproof seal can be made. Thus, during subsequent handling small cracks or gaps occur at the corner ends permitting leakage or sifting of the contents therethrough, or conversely, entry of air, moisture or other contaminants inwardly to the carton contents.

To obviate this difficulty, it has been proposed to provide corner gussets torn from the carton stock having sufficient area to effect a seal in infolding and sealing the container flaps, as exemplified by Weselman 2,107,096. More recent developments are exemplified by Benzon-Peterson 2,795,364 wherein adjacent carton side and end flaps are not fully severed from one another outwardly of the transverse fold lines thereof, whereby upon outward folding of the side and end flaps the uncut material therebetween is torn to provide a rough fibrous or tufted surface to which a drumhead membrane can be reasonably secured. Such constructions, however, have not produced an entirely satisfactory sealable corner construction for cartons, partly in view of the fact that reliance is placed upon tearing or breaking of the carton material, which is not necessarily uniform in character and cannot insure the reliable provision of like uniform areas to which a seal can be readily effected by a drumhead membrane or by infolding the container end flaps.

In order to overcome the defects of tufted or torn-gusseted corners, it has been further proposed to line the carton with a stretchable material bonded thereto. Thus when the carton flaps are folded outwardly at right angles to one another, the liner material is stretched across the angular gap between adjacent flaps to thereby form a gusset which, along with further tearing of the carton stock per se to form corner tufts, assists in facilitating end sealing of the carton, as exemplified by Benzon-Peterson 2,886,231.

In such a construction, however, there exists at most only a thin line of stretchable material between adjacent flaps before the same are folded outwardly, and when the flaps are outfolded, this narrow area is required to stretch through a 90° arc, causing tearing and rupturing of the liner material, and thereby preventing the effective formation of gussets. This likelihood of tear is increased by the further necessity of tearing the fibre body material to form corner tufts, as the force exerted thereon in such tearing additionally overstresses the narrow liner area available for gusseting. It is readily apparent that the effective radial extent of such a gusset is sharply limited, as the greater the radius of the film material outwardly of the carton corners, the greater are the thinning and tearing stresses thereon.

I have found that these and other disadvantages of present corner gusset formations can be overcome by the provision of a simple and highly effective cooperation between the carton blank and the gusset-forming material wherein the latter is not bonded or otherwise secured to the carton blank adjacent the corners whereby effective gusseting can be achieved.

It is therefore a principal object of my invention to provide a carton which may be effectively sealed to form an air-tight and sift-proof closure of either the drumhead or folded-flap type.

It is a further object of my invention to provide a carton which may be hermetically sealed in a tight leakproof manner.

A further object of my invention is to provide a gusseted corner carton construction wherein there is sufficient material at the corners of the carton to insure ample area for sealing purposes, and wherein the gusset-forming material is not stretched beyond the point of rupture, and indeed may not be stretched at all, depending upon the particular form of the carton or nature of its intended use.

Other objects and advantages will be apparent from the following description taken in connection with the drawings, in which:

FIGURE 1 is a plan view of a preferred form of my invention showing a box blank prior to folding thereof into tubular form;

FIGURE 2 is a perspective view of the carton after tubing thereof having its flaps outfolded and with the lower closure applied thereto;

FIGURE 3 is an enlarged fragmentary perspective of the gusseted carton corner;

FIGURE 4 is a perspective view of the carton after the application of a drumhead top closure;

FIGURE 5 is a fragmentary perspective view of a carton blank showing a first modified form of my invention;

FIGURE 6 is a section along the lines **6**—**6** of FIGURE 5;

FIGURE 7 illustrates the carton blank of FIGURE 5 in tubular form prior to filling and sealing;

FIGURE 8 illustrates a second modified form of my invention;

FIGURE 9 illustrates the carton blank of FIGURE 8 in tubed form prior to filling and sealing thereof;

FIGURE 10 illustrates in diagrammatic form a sequence of steps in preparing the carton blank of FIGURE 1;

FIGURE 11 is illustrative of a further sequence of steps in one form of closing and filling the preferred carton.

Referring to the drawings, in FIGURE 1 there is shown a preferred form of my invention wherein a carton blank **10** comprises die-cut cardboard stock, and includes side panels **12, 12**, end panels **14, 14**, and side seam panel **16**. Closure flaps **18** extend from the side panels **12**, while similar flaps **20** of shorter length project from the end and side seam panels **14, 16**. The blank **10** is transversely scored in conventional fashion at **22** to provide fold lines for the several flaps while longitudinal scores **24** permit tubing of the blank to carton form and define the carton corners.

In laminated overlying relation to the blank **10**, is an inner liner **26** which in the preferred embodiment comprises a stretchable moisture-proof and heat-sealable film material, such as polyethylene. The liner **26** substantially conforms to the contour of the blank, with the exception of a part of the ultimate gusset areas at **28** which extend between adjacent flaps **18, 20**. The side panel flaps **18**

are slit at **30**, **32** to provide an interlocking closure employed in connection with a separate drumhead seal. Such arrangement, however, is for purposes of illustration only and it is apparent that any well known interlocking configuration could be employed, or alternatively, an end flap may itself carry the sealing membrane as in Turpin 3,040,963 rather than being separate therefrom, or the carton flaps may seal to each other and the corner gussets without any separate seal membrane, without departing from my invention.

The carton as thus far described is similar in many respects to that of the prior art, as for example Benzon-Peterson 2,886,231, with the significant exception that adjacent carton flaps **18**, **20** are fully severed from one another, rather than remaining integral part way outwardly from fold lines **22**.

A significant and important feature of the present invention in the preferred form thereof resides in the novel construction of the carton corner areas at the intersection of scores **22**, **24**. In these corner areas of the blank, the stretchable liner material **26** is not bonded or otherwise secured to the underlying blank **10** as it is throughout the remainder of the blank, but rather is free of any attachment thereto over an area **34** laterally spaced inwardly from the flap marginal edges and generally around the intersection of fold lines **22**, **24**. The provision of such non-secured liner areas **34** is accomplished by preprinting or otherwise treating the carton body stock with a release agent, which may be a wax-like substance, in those areas **34** to which it is desired that the subsequently laminated liner not adhere. Thus when the liner **26** is applied to the blank, the same will not attach to the pretreated areas **34**. These areas **34** are preferably of generally triangular or sector-like configuration as seen in FIGURE 1, to provide substantially uniform elongation or stretch of the liner **26** thereat when the carton flaps are outfolded as hereinafter described.

Following tubing and side seaming of the carton, the side and end flaps **18**, **20** are folded outwardly as seen in FIGURE 2, causing the stretchable liner material at the unattached areas **34** to fan outwardly forming generally arcuate and substantially planar gussets **40** which provide considerable surface area at the corners of the carton, thereby affording sufficient surface area for the tight sealing thereto of for example a drumhead membrane **44**, FIGURE 4. In this connection it is noted that gussets **40** span substantially a 90° angular gap between adjacent flap margins, as clearly shown in FIGURE 3. Inasmuch as relatively large portions **34** of the polyethylene or other liner are not positively affixed to the flaps, the same provide a large area to absorb the stretch stresses resulting from outfolding of the end flaps, permitting the formation of a relatively large-radius gusset without tearing the material. This contrasts sharply with previous efforts wherein the liner material has been bonded to the blanks up to and adjacent the carton flap edge margins, whereby only a very narrow area of liner at the most has been free for stretching and gusset formation. When the carton flaps are outfolded in such constructions, this narrow film area cannot withstand the 90° stretch necessary, and ruptures, thereby preventing the formation of gussets having sufficient area to effect the desired leakproof sealing. Even if a successful gusset can be achieved in this manner, it is manifest that the same cannot extend radially outwardly very far from the carton corner, as the outermost curved terminal edge of the gusset increases in length at a rapid rate with increased radial outward distance from the corner, thereby maximizing tear stresses along such edge.

Of further note in this connection, as the carton flaps **18**, **20** are fully severed from one another outwardly of the fold line **22**, it is unnecessary to exert additional pressure upon the end flaps as the same are folded outwardly to effect tearing of the flap stock, thereby further reducing the likelihood of tearing of the gusset-forming liner areas **34**.

In the exemplary carton shown, both the top and bottom carton flaps are similarly provided with these release areas **34**, whereby a lower sealing membrane as at **42** (FIGURE 2) may be applied, and subsequent to filling of the carton, the cover drumhead **44** (FIGURE 4) may be secured to the carton, after which the carton flaps are infolded in conventional fashion to complete the package for shipping.

In FIGURE 10 I have diagrammatically illustrated a method by which the carton blank of the preferred embodiment may be made. Thus, carton stock is supplied in web form from supply roll **45**, passing between the nip of rolls **46**, **48**, the lower of which is contoured to apply the release agent at the desired areas of the blank. Thereafter the web passes into an oven **50** to dry the release agent thereon, passing from the oven **50** between die-cut rolls **52** which notch the carton flaps to the desired configuration, including the spaced confronting relationship of adjacent flap edges in the open areas **28** which are subsequently covered and spanned by the stretchable liner. One or more printing stations **54** may be provided to imprint advertising or other copy on the exterior face of the stock. Such printing may obviously be eliminated and the resultant carton enclosed in a wrapper of any well known type. The cardboard web then again passes through the oven to dry and printing thereon, delivering therefrom to a takeup roll **56**. Roll **56** is then transferred to another station wherein the same becomes the supply roll, delivering the web beneath a conventional extruder **58** which extrudes a thin liner of stretchable plastic mateiral, as polyethylene, on the inside surface of the carton blank. From the extruder, the laminated stock passes through pinch rolls **60** and thence to take-up roll **62**, or the laminated web may pass directly to a die cutting station for severance into individual carton blanks.

FIGURE 11 diagrammatically represents a method of sealing and filling the carton blanks after tubing thereof and outfolding of the end flaps. The individual carton tubes are carried in suitable conveyor pockets **64** and have a lower sealing membrane **42** applied and sealed to the outwardly extended lower carton flaps and gussets. The membrane is then severed from its supply web by knife elements **66**. The lower flaps are then infolded and either interlocked or adhesively secured to one another to fully enclose the bottom of the carton. Thereafter the conveyor carries the carton beneath the filler head **68** which deposits the desired liquid, granular or solid charge into the carton. The carton is then transported beneath the upper membrane supply roll **70** from which a top closure membrane **44** is adhesively secured or heat sealed to the upper open carton flaps and corner gussets, thereby hermetically sealing the carton contents, after which the upper flaps are closed.

In FIGURES 5–7 I have shown a first modified form of my invention which is characterized in part by a minimal use of gusset-forming material. This form of the invention is desirable when a fully lined carton is not necessary, but which otherwise possesses the desirable siftproof corner characteristics of the preferred embodiment. To this end, a similar carton blank **10** is provided, and lengths **74** of gusset-forming material are adhesively secured to the blank on either side of and generally parallel with the transverse score lines **24** which define the four resultant corners of the carton. The strips **74** are not in coplanar laminated contact with the carton stock as is the case with the fully lined carton in FIGURE 1, but rather are of substantially "Omega" cross-section as clearly seen in FIGURE 6, including marginal portions **78** secured to the blank in parallel relation to the score lines **24**, and a central bulged portion **76** which loosely upstands from the blank, overlying the axis of score line **24**. The strips **74** extend beyond the transverse scores **22** into the area of the carton flaps as seen in FIGURE 5.

Accordingly, when the blank of FIGURE 5 is tubed and the end and side flaps thereof folded outwardly as

seen in FIGURE 7, the central portions of the strips **76** spread to form the desired gussets **80** which lie substantially coplanar with the carton flaps to permit overlay of a sealing membrane as at **44** (FIGURE 4), or to which the closure flaps themselves may be overlaid and secured to insure leakproof seals at the corners of the carton.

Depending upon the amount of excess material at **76**, there may be only a limited amount of stretching of the film at the corners in forming the gussets **80**, or if the free material **76** is of sufficient relative width, no stretching may occur at all. The amount of strip material employed for this purpose depends upon the seal desired for the container or the product packaged therein as to whether the same will be stretched as in FIGURE 3, or of sufficient width to form a non-stretched gusset **80**. In the latter event, non-stretchable materials such as cellophane, parchment, etc., may be employed for strips **74**. A collateral feature of this modified construction is that the full-length strips **74** illustrated also serve to protect the carton corners along fold lines **24** from contact with the carton contents, and thus tend to reenforce these relatively weak areas.

A further modified form of the invention is shown in FIGURES 8 and 9. Similar Omega-shaped strips **82** of stretchable or non-stretchable material are secured along the axes of transverse score lines **22** on either side thereof, rather than along the longitudinal scores **24**, as in FIGURE 5. While thus similar to the form of FIGURE 5, portions of strip **82** comparable to those at **78** (FIGURE 6) are not secured to the carton flaps **18**, **20** for short distances inwardly of adjacent flap edges to thereby permit proper gusseting when the carton flaps are outfolded. Thus, when the carton is tubed and the flaps folded as shown in FIGURE 9, the strip **82** lies around the entire mouth of the carton. As before, the material will be extended at the corners to form gussets **84**, and depending upon the excess material in the central portion of the strip **82**, the gusset portions **84** will either be drawn taut without stretching, or stretched as before. This form of the invention permits a sealing membrane as at **44**, FIGURE 4, to be sealed tightly around the entire peripheral mouth of the carton prior to end folding and interlocking or securing of the end flaps thereof.

The forms shown in FIGURES 5 and 8 may also be employed with a carton having a full liner of foil, plastic, etc. laminated thereto, in which case the gusset-forming strips **74** or **82** would overlie and be secured to such inner liner. Further, while the strips **74** and **82** extend substantially the full length or width of the carton, thereby affording additional protection to the relatively weak corner folds **22**, **24**, the strips may comprise only short lengths located at the corners when full-length protection is unnecessary, without adversely affecting proper formation of the corner gussets.

Similarly, in both FIGURES 5 and 8, the strips may be of stretchable film material laminated flatwise to the blank, without any excess central bulged portion. In this form, of course, comparable unattached areas as at **34**, FIGURE 1, are provided to permit the desired novel gusset formation.

In all forms of my invention it is apparent that a release agent may be applied to the blank in a pattern or patterns as required for the specific form of gusseting material provided, prior to lamination or other securing of the gusset forming sheets or strips.

From the foregoing it will be seen that I have invented a novel and effective means for gusseting the corners of cartons or similar structures to provide a substantial area for effecting a seal at these normally difficultly-sealed points. In each instance, the gusset-forming material at the ultimate carton corners is characterized by portions which are clearly free of attachment to the underlying stock, whereby the same may be extended to a taut or stretched condition without likelihood of rupture or tearing of the material.

While I have described my invention in connection with a substantially conventional rectangular carton in which the same finds particular utility and advantages, it will be apparent that the principles and concept thereof may be readily applied to any environment wherein it is desirable or necessary to provide a web of material between adjacent spaced surfaces for purposes of effecting seals or the like. In carton applications, the carton may of course be of other polygonal forms than rectangular, or may be curved, the criterion being that the gusset-forming material has portions thereof at the area at which a gusset is desired which are unattached to the body to thereby permit spreading or widening thereof at such locales as taught herein.

While in the exemplary embodiments of my invention I have illustrated the carton as being sealed by drum heads **42**, **44**, a hermetically sealed carton may be achieved using other closures, as earlier mentioned. Thus the end flaps **18**, **20** may be selectively die-cut in initial formation thereof whereby one flap **18** is of sufficient breadth when finally infolded to partially overlie and be sealed to the end flaps **20**, **20**, remaining side flap **18**, and the corner gussets **40**. Thereafter, the flaps **20**, **20** are infolded and secured to flap **18**, and remaining flap **18** is infolded into overlying sealed relation to complete the carton and thereby fully and tightly seal the same.

What I claim is:

1. A carton comprising an open-ended tubular body having a plurality of panels, a closure flap extending from the end of each body panel and hingedly connected thereto by a fold line, and gusset-forming sheet material capable of extension overlying and extending between each pair of adjacent flaps on the inside of said body adjacent said fold lines, said material being secured to said flaps at locales spaced laterally inwardly of adjacent flap side margins, said locales defining with said respective flap side margins flap portions in underlying relation to said sheet material, said flap portions having a release agent thereon to positively prevent adherence of said overlying material thereto, whereby upon outward folding of said carton flaps, the unattched portions of said material will shread to span the angular gap at the carton corners between adjacent flaps thereby to form a substantially planar gusset to which a seal can be effected in final closing and sealing of the carton.

2. A carton comprising an open-ended polygonal tubular body having a plurality of panels, a closure flap extending from the end of each body panel and hingedly connected thereto by a fold line, and an inner liner of stretchable sheet material substantially coextensive with said body and flaps and further including liner portions extending between adjacent flaps outwardly of said fold lines, said liner being laminated to said body and flaps except at the flap portions disposed immediately adjacent and inwardly of the lateral margins of said flaps and adjacent said fold lines, at which flap portions said liner is in overlying unattached relation thereto, said flap portions having a release agent thereon to positively prevent adherence of said overlying material thereto, whereby upon outward folding of said flaps, said liner at said unattached areas stretches to form a gusset extending between and in substantially coplanar relation with adjacent end flaps to provide an areal surface to which a seal can be effected in final closing and sealing of the carton.

3. A carton comprising a tubular fibre body having a plurality of panels hingedly connected to each other by longitudinal fold lines defining the carton corners, flaps extending outwardly from the ends of each panel and hingedly connected thereto by a transverse fold line, and a length of gusset-forming sheet material extending between adjacent flaps and having portions thereof secured to said flaps at points laterally spaced from the side edges of each flap, the central portion therebetween being free of attachment to said carton and having a width in excess of the distance between the secured portions of

said material causing said central portion to bulge loosely away from said carton at adjacent flap side edges, whereby upon outward folding of said flaps, said excess central portion spreads to span the gap between adjacent corners and form a gusset to which a closure may be secured.

4. The carton of claim 3 wherein said sheet material comprises strips extending the full length of said longitudinal fold lines to protect and reenforce the carton corners.

5. A carton comprising a tubular fibre body having a plurality of panels hingedly connected to each other by longitudinal fold lines defining the carton corners, flaps extending outwardly from the ends of each panel and hingedly connected thereto by a transverse fold line, and a length of gusset-forming sheet material extending on either side of said transverse fold lines internally of said carton and having marginal portions thereof secured to said panels and flaps along lines substantially parallel to and laterally spaced from the axes of said transverse fold lines with said marginal portions adjacent the side edge of each flap being unsecured thereto, the central portion of said material being free of attachment to said carton and having a width in excess of the distance between the secured margins of said material causing said central portion to bulge loosely away from said carton along said transverse fold lines, whereby upon outward folding of said flaps said central portion spreads to span the gap between adjacent flaps thereby forming a gusset to which a closure may be secured.

6. The carton of claim 5 wherein said sheet material comprises a strip extending substantially the full length of said transverse fold line to thereby bound the entire internal mouth of the open carton.

7. A carton comprising an open-ended polygonal tubular body having a plurality of panels hingedly connected by fold lines, a closure flap extending from the end of each body panel and hingedly connected thereto by a fold line intersecting said panel fold line, and an inner liner of stretchable sheet material substantially coextensive with said body and flaps and further including liner portions extending between adjacent flaps outwardly of said flap fold lines, said liner being laminated to said panels and flaps except for areas thereof adjacent the intersections of said panel and flap fold lines, at which areas said liner is free of attachment to the panel and flap portions therebeneath, whereby upon outward folding of said flaps into substantially coplanar relation, said liner at said unattached areas stretches over the underlying flap and panel portions in forming a gusset extending between and in substantially coplanar relation with adjacent end flaps to provide an areal corner surface between said flaps to which sealing attachment may be made in closing the carton.

8. The carton of claim 7 wherein said liner unattached areas are of substantially triangular configuration and wherein the three corner portions thereof are disposed, respectively, upon each flap of an adjacent pair thereof and on said panels at the hinge connection therebetween thereby to insure substantially uniform stretching of said liner material upon subsequent outfolding of said end flaps.

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