

[54] **SIFT-PROOF CARTON CONSTRUCTION**
 [75] **Inventor: Frank D. Bergstein, Cincinnati, Ohio**
 [73] **Assignee: The Bergstein Packaging Trust, Middletown, Ohio**
 [22] **Filed: Dec. 29, 1971**
 [21] **Appl. No.: 213,416**

3,438,566	4/1969	Mahon.....	229/51 TC
2,248,579	7/1941	Moore.....	229/48 T UX
2,322,654	6/1943	Moore.....	229/48 T UX
3,291,369	12/1966	Crawford.....	229/37 R
3,270,946	9/1966	Reopath et al.....	229/51 TC
3,281,052	10/1966	Michels.....	229/51 TS

Primary Examiner—Davis T. Moorhead
Attorney—John W. Melville, Albert E. Strasser et al.

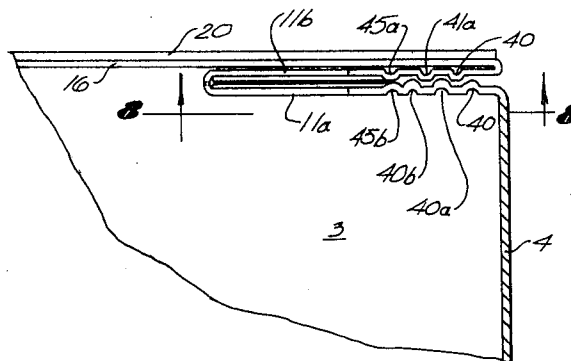
[52] **U.S. Cl.**..... 229/37 R, 229/48 T
 [51] **Int. Cl.**..... B65d 5/02
 [58] **Field of Search**..... 229/37, 48 T

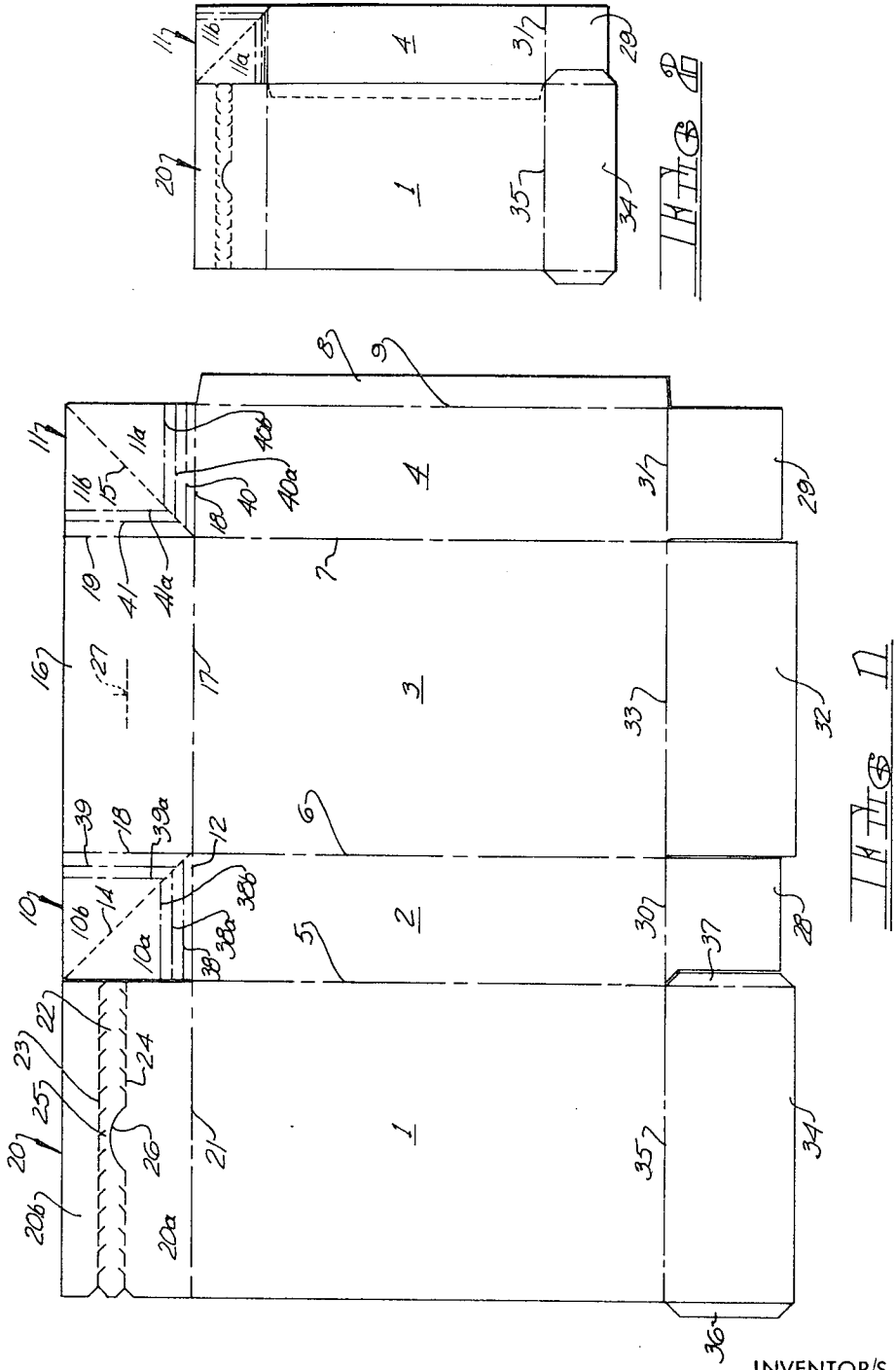
[57] **ABSTRACT**

An improved sift-proof carton construction wherein a plurality of the carton end closure flaps are provided with mating sets of ridges or grooves which interengage when the flaps are juxtaposed to provide barriers acting to prevent the sifting and leakage of powdered granular materials from between the end closure flaps.

[56] **References Cited**
UNITED STATES PATENTS
 2,501,852 3/1950 Ringler..... 229/37 R
 2,002,005 5/1935 Gottlieb..... 229/51 TC

12 Claims, 12 Drawing Figures





INVENTOR/S

FRANK D. BERGSTEIN

BY *Melville, Shasser, Foster and Hoffman*
ATTORNEYS

Patented July 17, 1973

3,746,244

3 Sheets-Sheet 2

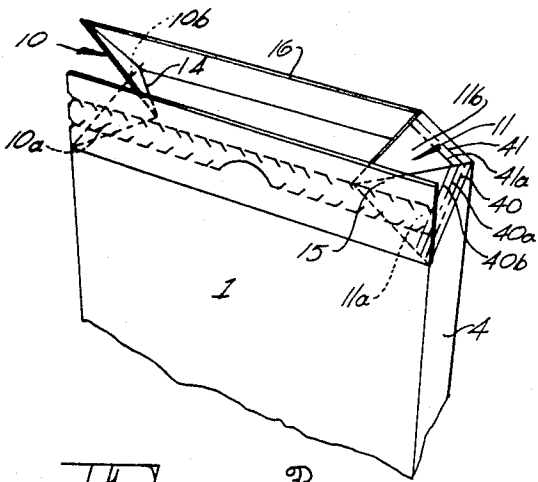


FIG 3

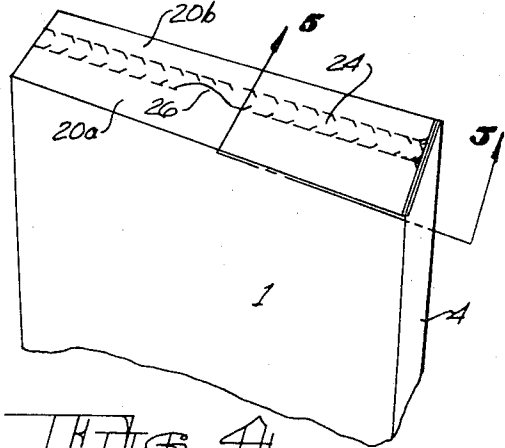


FIG 4

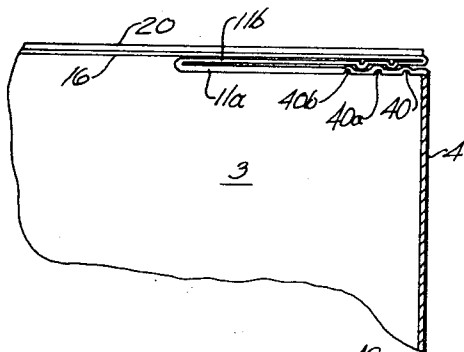


FIG 5

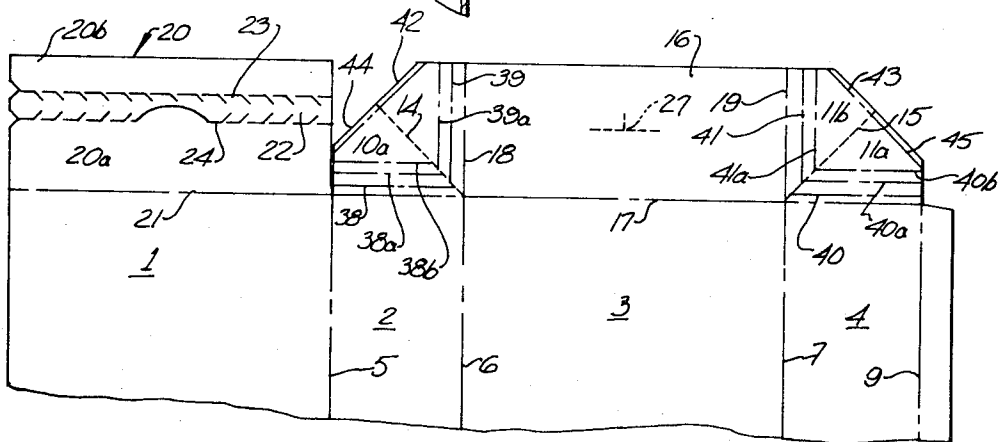


FIG 6

INVENTOR/S

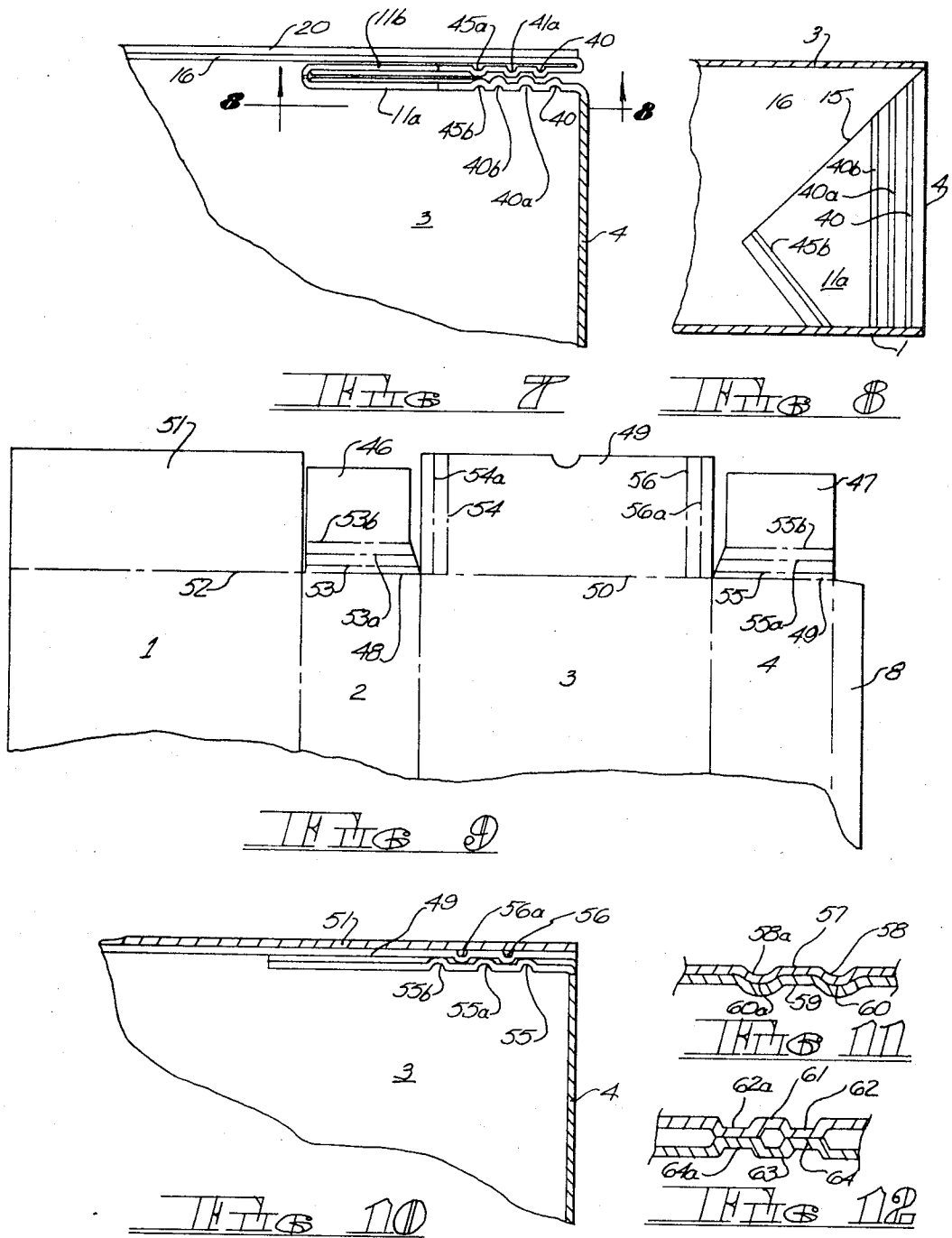
FRANK D. BERGSTEIN

BY *Melville, Strasser, Foster and Hoffman*
ATTORNEYS

Patented July 17, 1973

3,746,244

3 Sheets-Sheet 3



INVENTOR/S
FRANK D. BERGSTEIN

BY *Melville, Strasser, Foster and Hoffman*
ATTORNEYS

SIFT-PROOF CARTON CONSTRUCTION

This invention relates to paperboard cartons and has to do more particularly with cartons for packaging powdered and granular materials, such as soap powders and the like.

BACKGROUND OF THE INVENTION

The conventional paperboard carton comprises an enclosing body having front and rear wall panels and a pair of opposing side wall panels, joined together by a longitudinal glue seam. Each end of the carton is closed by a set of closure flaps, usually articulated to the end of each body wall. In the conventional folding and gluing of the end closures, the smaller flaps connected to the carton side walls are infolded first, followed by the sequential infolding of the remaining closure flaps, with the interposition of adhesive between the juxtaposed flaps. While such cartons have been in widespread use for many years, they have presented problems where powdered and granular materials are being packaged in that it is extremely difficult to tightly seal the end closure flaps, particularly in a high speed folding and gluing operation. This is due in part to the fact that the cartons, when erected, are often not truly in square condition, with the result that the flaps are out of registry. In addition, the infolded flaps, particularly the first folded pair of flaps, are unsupported from inside the carton and hence tend to flex or bow inwardly, resulting in poor adhesive contact with the overlying flaps.

Throughout the years various expedients have been proposed to improve the sift-proof character of such cartons. An important step forward was the introduction of the so-called "Van Buren" ears, which are extensions usually connected to the third flap to be infolded, such extensions being folded and secured to the marginal end edges of the carton side walls. While effectively increasing the sift-proof character of the cartons, the extensions require additional folding and gluing operations which add to the production costs of the cartons.

Another approach to the provision of a sift-proof carton is the utilization of interlocking end closure flaps, such as are taught in Cupo U. S. Pat. No. 3,074,613, dated Jan. 22, 1963 and Roth U. S. Pat. No. 2,580,477, dated May 25, 1971, wherein the innermost flaps are configured to engage in slots in the next to be folded flap, the arrangements assuring that the carton body walls will be square and the flaps in registry, the interlocking of the underlying flaps also providing support for the sealing pressure applied to secure the flaps together. While such arrangements provide improved registry and sealing of the flaps, they require extremely accurate infolding of the flaps to insure proper registry and the interengagement of the flaps, which is difficult to maintain in a high speed folding and gluing operation.

Another more recent approach to the problem is taught in a co-pending application in the name of the present inventor, Frank D. Bergstein, entitled "Easy Opening Sift-Proof Carton Construction," Ser. No. 213,384, Filed Dec. 29, 1971. In accordance with the teachings of this application, a sift-proof end closure is provided by utilizing a pair of bellows-folding flaps on the ends of the opposing carton side walls, the bellows-folding flaps also being hingedly connected to the opposite end edges of the intermediate end closure flap.

When the end closure flaps are infolded, with the bellows-folding flaps innermost, the bellows-folding flaps define juxtaposed triangular sections having coinciding free edges juxtaposed to the upper marginal edge of the adjoining carton body wall to which the outermost closure flap is connected. The end closure thus effectively has three imperforate sides, with the fourth side sealed by the coaction of the free edges of the bellows-folding flap pressing against the marginal edges of the carton body wall to which the outermost closure flap is connected, the outermost closure flap being infolded and sealed to the intermediate closure flap. Provision is also made for a tear strip in the outermost closure flap by means of which the carton may be readily opened and reclosed.

The present invention contemplates the provision of interengaging barrier means for the closure flaps of seal-end cartons which will enhance their sift-proof character. While the invention will be described primarily in conjunction with the type of end closure taught in the aforementioned Bergstein application, the invention readily lends itself for use with a conventional seal end carton to enhance its sift-proof character, as well as with the other types of sift-proof cartons hereinbefore described, the objective being to enhance the ability of the carton and closure flaps to resist leakage of the contents irrespective of rough handling or loss of accurate registry of the parts as the cartons are folded and glued.

RESUME OF THE INVENTION

In accordance with the invention, a plurality of the closure flaps, particularly the underlying flaps, are provided with interengaging sets of ridges and/or grooves which coact to provide barriers between the juxtaposed flaps acting to prevent the sifting and leakage of powdered or granular materials between such flaps.

The ridges or grooves are defined in the boxboard by scoring rules similar to those employed to define the hinge lines connecting the various wall panels and the closure flaps. Such scoring rules effectively emboss the boxboard, defining a groove on the side of the board contacted by the rule and a ridge on the opposite side of the board. By providing judiciously positioned sets of mating ridges or ridges and grooves, in the end closure flaps, preferably in close proximity to the marginal edges of such flaps, effective barriers are provided.

The barrier forming ridges may interengage in several different ways. Thus, they may be arranged in interdigitating relation, as where the facing surfaces of juxtaposed closure flaps each will be provided with a spaced apart series of ridges, with the ridges in one such surface lying in the spaces between the ridges in the other. Alternatively, ridges in one flap may be arranged to nest in grooves in another flap to which the first flap is juxtaposed; and in another embodiment, the ridges in one flap may be juxtaposed in face-to-face contact with the ridges in an adjoining flap.

A principal advantage of the present invention lies in the fact that it is applicable to substantially any carton having juxtaposed closure flaps, and no additional boxboard or other material is required, nor does the presence of the ridges or grooves in any way alter the normal folding and gluing operations. The only added expense is the addition of extra scoring rules to the die from which the carton blanks are initially formed, which is essentially negligible.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of an exemplary seal-end carton construction embodying the sift-proof feature of the present invention.

FIG. 2 is a plan view illustrating the blank of FIG. 1 in knocked-down flat-folded condition.

FIG. 3 is a fragmentary perspective view illustrating the carton of FIG. 2 in erected condition, with the top closure partially infolded.

FIG. 4 is a fragmentary perspective view similar to FIG. 3 illustrating the end closure in closed and sealed condition.

FIG. 5 is a fragmentary vertical sectional view taken along the line 5—5 of FIG. 4.

FIG. 6 is a fragmentary plan view of a carton blank illustrating a modification of the invention.

FIG. 7 is a fragmentary vertical sectional view similar to FIG. 5 but illustrating the modified end closure construction formed from the blank of FIG. 6.

FIG. 8 is a fragmentary sectional view taken along the line 8—8 of FIG. 7.

FIG. 9 is a fragmentary plan view of a blank for a conventional seal-end carton modified to incorporate the inter-engaging ridges and grooves of the present invention.

FIG. 10 is a fragmentary vertical sectional view similar to FIGS. 5 and 7 but illustrating the modified end closure of FIG. 9.

FIG. 11 is an enlarged fragmentary vertical sectional view of an alternative arrangement of the ridges and grooves.

FIG. 12 is also an enlarged fragmentary sectional view illustrating still another arrangement of the ridges and grooves.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 1, the carton blank illustrated is of the type taught in the aforementioned Bergstein application, Ser. No. 213,384, the carton blank comprising body walls 1, 2, 3 and 4 in articulation in the order named along score lines 5, 6 and 7, respectively, the body wall 4 having a longitudinal glue flap 8 articulated to its outer side edge along score line 9.

In the embodiment illustrated, the top closure comprises a pair of bellows-folding flaps 10 and 11 hingedly connected to the upper edges of the body wall panels 2 and 4, which comprise the opposing side walls of the carton, along hinge lines 12 and 13, respectively. The bellows-folding flaps are diagonally scored at 14 and 15, respectively, thereby dividing the flaps into sets of inner and outer triangular portions 10a, 10b, and 11a, 11b, respectively. An intermediate closure flap 16 is hingedly connected to the upper edge of body wall panel 3 along hinge line 17; and additionally, the opposite ends of flap 16 are hingedly connected to the outer portions 10b and 11b of the bellows-folding flaps along hinge lines 18 and 19, respectively. An outer closure flap 20 is hingedly connected to the body panel 1 along hinge line 21, and the flap 20 is provided with a tear strip 22 defined by the spaced apart lines for severance 23 and 24, the line for severance 24 including a U-shaped segment 25 defining a tongue 26 integral with the inner portion 20a of the outer closure flap, the outer closure flap also having an outer portion 20b lying outwardly beyond the line for severance 23. A

slot defining line of cut 27 is provided in the intermediate flap 16 to receive the tongue 26 upon reclosing of the end closure.

In the embodiment illustrated, the bottom end closure is of essentially conventional seal-end construction, comprising inner closure flaps 28 and 29 hingedly connected to the bottom edges of body walls 2 and 4 along hinge lines 30 and 31, respectively, and an intermediate closure flap 32 is hingedly connected to the bottom edge of body wall panel 3 along hinge line 33. An outer closure flap 34 is connected to the bottom edge of body panel 1 along hinge line 35; and in this instance, the outer flap 34 is provided with extensions 36 and 37 defining the so-called "Van Buren" ears.

In accordance with the present invention, the sift-proof character of the carton is enhanced by mating sets of ridges which are adapted to interengage when the end closure flaps are folded and sealed. Thus, the inner portion 10a of bellows-folding flap 10 is provided with a series of three spaced apart ridges 38, 38a and 38b extending parallel to hinge line 12; and the outer section 10b of the flap is provided with an interengaging set of ridges 39 and 39a extending parallel to the hinge line 18. In similar fashion, the inner portion 11a of bellows-folding flap 11 is provided with ridges 40, 40a and 40b paralleling hinge line 18; and the outer portion 11b is provided with spaced apart ridges 41 and 41a paralleling hinge line 19.

Assuming that the blank as illustrated in FIG. 1 comprises the inner surface of the carton, the sets of ridges just described will be formed by scoring rules contacting the inner surface of the blank so that the ridges will project outwardly from the under or outer surface of the carton blank. The spacing of the ridges is such that when the inner and outer portions of the bellows-folding flaps are juxtaposed during infolding of the end closure flaps, the ridges 39 and 39a will lie in interdigitating relation with respect to the ridges 38, 38a and 38b; and similarly, the ridges 41 and 41a will lie in interdigitating relation with respect to the ridges 40, 40a and 40b.

The carton blank just described is tubed into a flat-folded carton structure in conventional fashion, as by infolding the opposite sides of the blank inwardly along the hinge lines 5 and 7, with the marginal side edge of body panel 1 juxtaposed to the outer surface of glue flap 8 with the interposition of adhesive therebetween, the blank thus assuming the condition illustrated in FIG. 2, which is the condition in which the cartons are stored and shipped to the user.

In the hands of the user, the carton blanks are erected by squaring-up the body walls, followed by the infolding and sealing of the end closure flaps at one end of the carton body, whereupon the contents may be introduced into the carton followed by the infolding and sealing of the remaining end closure. Such operations are normally performed on automatic equipment which continuously advances the carton bodies through a series of operating stations at which the various operations are sequentially performed.

Referring next to FIG. 3, which illustrates the top closure in partially folded condition, it will be noted that as the bellows-folding closure flaps are infolded, the inner and outer portions fold relative to each other along their diagonal score lines 14 and 15; and at the same time the intermediate closure flap 16 automatically begins to infold. As the infolding progresses, the

opposing sets of ridges, such as the ridges 40, 40a, 40b and 41, 41a, approach each other and come into registry so that when the infolding is completed, the flaps assume the condition illustrated in FIG. 4, with the opposing sets of ridges being in interdigitating and essentially parallel relation. As will be evident from FIG. 5, the opposing sets of ridges face each other with the ridges 41 and 41a lying between the ridges 40, 40a and 40b. Even assuming that particles of the packaged material were to work their way between the coinciding free edges of the inner and outer portions of the bellows-folding flaps, egress of the particles would be obstructed by the series of barriers defined by the interdigitating ridges.

FIG. 6 illustrates a modification of the invention embodying an end closure similar to that illustrated in FIG. 1 and wherein like parts have been given like reference numerals. In this instance, however, the outer corners of the bellows-folding flaps are removed, the flaps having diagonally disposed edges at right angles to the diagonal score lines 14 and 15, respectively. In addition, ridges are defined in the bellows-folding flaps extending parallel to the diagonal edges 42 and 43. Thus, the ridge 44 parallels the edge 42, and a similar ridge 45 parallels the edge 43.

When the end closure of FIG. 6 is infolded and sealed, the parts will assume the condition illustrated in FIGS. 7 and 8 wherein it will be seen that the ridge 43 folds upon itself to define an upper portion 43a juxtaposed and in face-to-face contact with the underlying ridge portion 43b. An additional barrier is thus established to further inhibit migration of the contents of the carton between the juxtaposed flaps.

FIG. 9 illustrates the application of the invention to the closure flaps of a conventional seal-end carton having, as before, a tubular body composed of the body walls 1, 2, 3 and 4, together with a longitudinal glue flap 8. The end closure comprises inner closure flaps 46 and 47 hingedly articulated to the wall panels 2 and 4 along hinge line 48 and 49, respectively. An intermediate closure flap 50 is hingedly connected to body wall panel 3 along hinge line 51, and an outer closure flap 52 is hingedly connected to body wall panel 1 along hinge line 53. The inner end flap 46 is provided with a set of three spaced apart ridges 54, 54a and 54b adapted to mate in interdigitating relation with the ridges 55 and 55a in intermediate closure flap 50. Similarly, a set of ridges 56, 56a and 56b is formed in inner closure flap 47, with a mating set of ridges 57 and 57a formed in the adjacent end of intermediate closure flap 50. As in the case of the embodiment shown in FIG. 1, the sets of ridges 54, 54a, 54b and 56, 56a and 56b, parallel the hinge lines 48 and 49 of their respective closure flaps; and similarly, the sets of ridges 55, 55a, and 57, 57a parallel the opposite end edges of intermediate closure flap 49. In addition, it should be noted that the sets of ridges in the end closure flaps 46 and 47 project outwardly from the outer surfaces of the flaps, i.e., the scoring rules contact the inner surface of the carton blank as viewed in FIG. 9, whereas the sets of ridges 55, 55a and 57, 57a are formed on the inner surface of intermediate closure flap 50 by scoring rules which contact the outer surface of the intermediate flap.

When the end closure just described is infolded and sealed, the parts assume the condition illustrated in FIG. 10 wherein it will be seen that the sets of ridges again lie in interdigitating relation to form a series of

barriers adjacent the opposite ends of the end closure. Adhesive will be interposed between the contacting surfaces of the closure flaps; and if desired, such adhesive may cover the sets of ridges. While the sets of ridges parallel the hinge lines of the flaps in which they are formed and hence normally will lie in parallel relation to each other when the flaps are infolded, the spacing between adjacent ridges may be adjusted so that the ridges will lie in interdigitating relation even if the carton body is not truly square and the closure flaps misaligned.

While FIGS. 9 and 10 illustrate the application of the invention to a conventional set of seal-end closure flaps, it should be readily apparent that such ridges could be applied to the bottom end closure illustrated in FIG. 1, which includes the "Van Buren" ears, to further enhance the sift-proofness of the end closure.

While in the embodiments thus far described the sets of ridges have been arranged to mate in interdigitating relation, other arrangements of ridges and grooves may be employed if desired. Thus, as illustrated in FIG. 11, an overlying closure flap 58 is provided with a set of ridges 59, 59a but in this instance the underlying closure flap 60 is scored to provide mating grooves 61, 61a in which the ridges 59, 59a nest when the closure flaps are juxtaposed.

FIG. 12 illustrates still another arrangement wherein the overlying closure flap 62 is provided with a set of ridges 63, 63a, which may be relatively wide so as to define essentially flat outermost ridge surfaces, the ridges being formed by employing scoring rules of a width sufficient to produce the flat ridge surfaces. The underlying closure flap 64 is provided with a mating pair of ridges 65, 65a which are juxtaposed to the ridges 63, 63a in face-to-face contact.

It should thus be evident that numerous arrangements of ridges and/or ridges and grooves may be employed to provide barriers effective to prevent leakage of powdered or granular materials between the various end closure flaps. While the arrangements disclosed have been found to be highly satisfactory, it will be readily apparent that numerous other arrangements and configurations may be employed, as where the ridges are angularly disposed with respect to the hinge lines or end edges of the closure flaps, or where they are of curved or other non-linear configuration, the essential requisite being that the ridges will mate when the flaps are juxtaposed to effectively define barriers which will resist the sifting and leakage of the packaged materials. As employed in the claims which follow, the terms "mating" and "interengaging" are not intended to be limited to a relationship wherein the parts are interfitted in the sense of nesting one within the other, but rather to broadly contemplate juxtaposition in interdigitating relationship and face-to-face contacting relationship, as well as nesting.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a sift-proof end closure for a paperboard carton wherein the end closure is composed of a plurality of juxtaposed closure flaps, the improvement which comprises a plurality of spaced apart elongated ridges formed in one of said closure flaps, and mating elongated ridges in the next adjacent closure flap positioned to interengage with said first named ridges to define a plurality of side-by-side barriers coacting to effectively

close and seal the space between the two adjacent closure flaps in which said ridges are formed.

2. The end closure claimed in claim 1 wherein the said ridges face each other and lie in interdigitating relationship.

3. The end closure claimed in claim 1 wherein the said ridges face each other and lie in face-to-face contacting relationship.

4. The end closure claimed in claim 1 wherein the said ridges face in the same direction, wherein each said ridge also defined coinciding grooves on the opposite surface of the flap in which it is formed, and wherein the ridges in one flap are nested in the grooves in the other flap.

5. In a sift-proof end closure for a paperboard carton having enclosing body walls, a pair of innermost closure flaps hingedly connected to the end edges of an opposing pair of said body walls, an intermediate closure flap hingedly connected to the end edge of a third of said body walls, and an outer closure flap hingedly connected to the fourth of said body walls, a plurality of spaced apart elongated ridges formed in each of said innermost closure flaps, and mating ridges formed in said intermediate closure flap in positions to interengage with said first named ridges to define a plurality of side-by-side barriers extending between said intermediate and innermost closure flaps and coacting to prevent the sifting and leakage of powdered or granular materials between the said innermost closure flaps and said intermediate closure flap.

6. The end closure claimed in claim 5 wherein the ridges in said innermost closure flaps extend the full length of said flaps and parallel the hinge lines connecting said innermost flaps to the carton body walls, and wherein the ridges in said intermediate closure flap extend the full width of said intermediate flap and parallel the opposite end edges thereof.

7. The end closure claimed in claim 6 wherein the grooves in said innermost closure flaps lie in interdigitating relation to the opposing grooves in said intermediate closure flap.

8. In a sift-proof end closure for a paperboard carton having enclosing body walls, a pair of bellows-folding closure flaps hingedly connected to the end edges of an opposing pair of said carton body walls, an intermediate closure flap hingedly connected to the end edge of a third of said carton body walls, and an outer closure

flap hingedly connected to the fourth of said body walls, and wherein the opposite end edges of said intermediate closure flap is hingedly connected to the adjoining side edges of said bellows-folding flaps and said bellows-folding flaps are diagonally scored to define inner and outer flap portions, the improvement which comprises providing a plurality of spaced apart elongated ridges in the innermost portion of each of said bellows-folding closure flaps, and mating elongated ridges in the outer portion of each of said bellows-folding flaps positioned to interengage with the ridges in the coresponding innermost portion when said end closure flaps are infolded over the end of said carton body and the inner and outer portions of said bellows-folding flaps juxtaposed in face-to-face relationship, whereby to effectively close and seal the space between said flaps to prevent the sifting and leakage of powdered or granular material therebetween.

9. The end closure claimed in claim 8 wherein the ridges in the inner portions of said bellows-folding flaps extend parallel to the hinge lines connecting said bellows-folding flaps to the carton body walls, and wherein the mating ridges in the outer portions of said bellows-folding flaps extend in parallel relation to the lines of hinged connection between said bellows-folding flaps and said intermediate flap.

10. The end closure claimed in claim 9 wherein each of said bellows-folding flaps has a diagonally disposed outer edge extending at right angles to the diagonal line of fold therein, and wherein an elongated ridge is formed in each of said bellows-folding flaps extending in parallel relation to the diagonally disposed outer edges thereof.

11. The end closure claimed in claim 10 wherein said ridges are positioned to lie in interdigitating relationship when the inner and outer portions of said flaps are juxtaposed.

12. The end closure claimed in claim 11 wherein the ridges formed in said bellows-folding flaps in parallel relation to the diagonally disposed outer edges thereof are divided into inner and outer segments when said bellows-folding flaps are folded to juxtapose their inner and outer portions, with the inner and outer segments of said last named ridges lying in face-to-face contacting relationship.

* * * * *

50

55

60

65