Sept. 26, 1950 M. I. WILLIAMSON 2,523,488

FOLDING BOX

Filed June 8, 1946 3 Sheets-Sheet 1

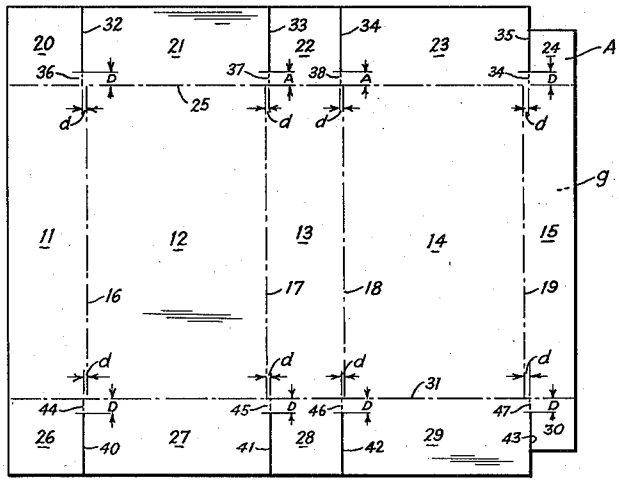


Fig. 1

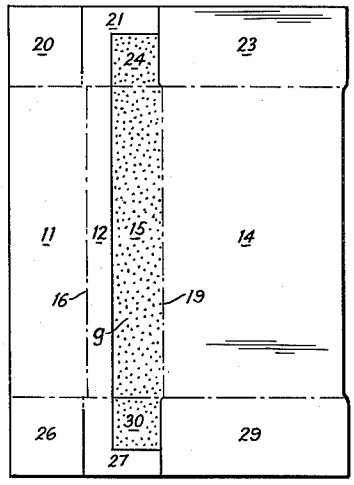


Fig. 2

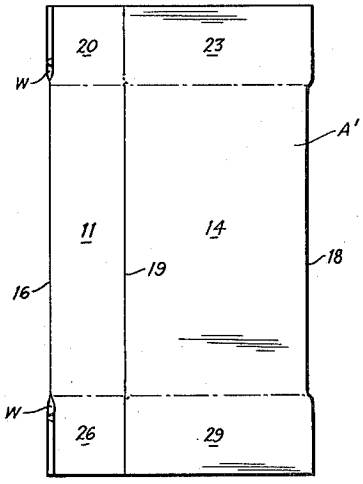


Fig. 3

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FOLDING BOX

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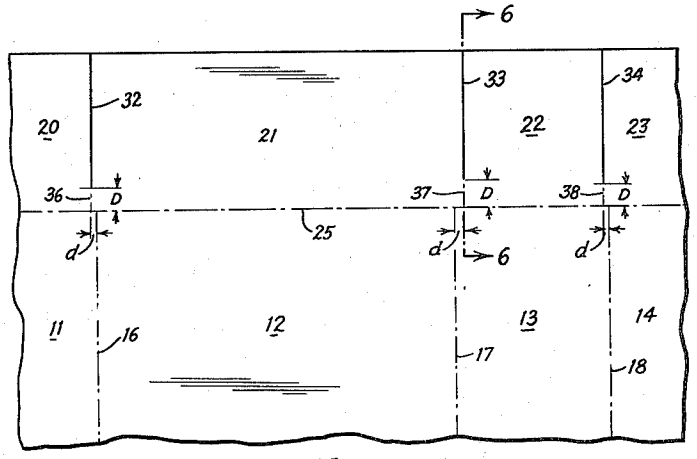


Fig. 4

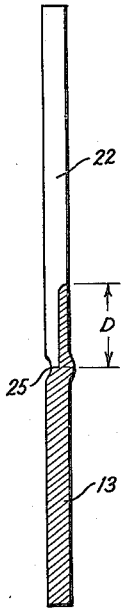


Fig. 6

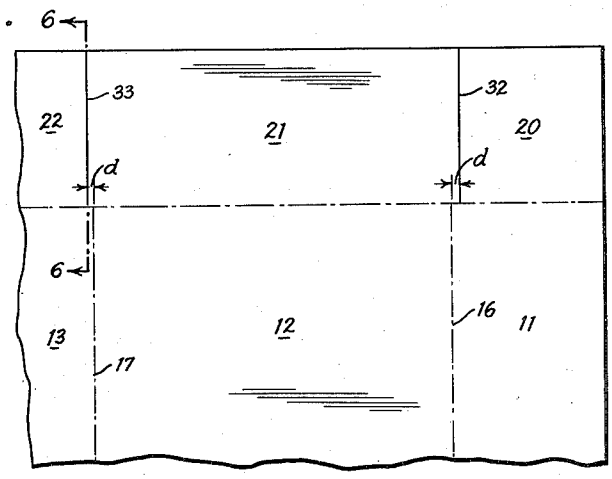


Fig. 5

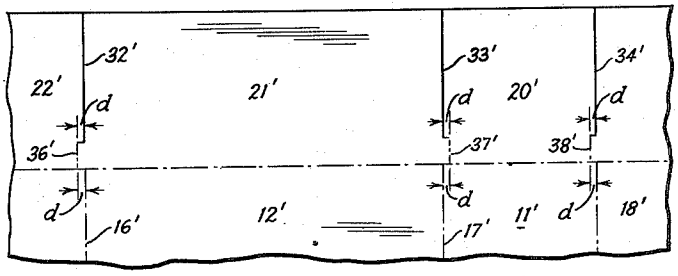


Fig. 9

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Sept. 26, 1950 M. I. WILLIAMSON 2,523,488

FOLDING BOX

Filed June 8, 1946 3 Sheets-Sheet 3

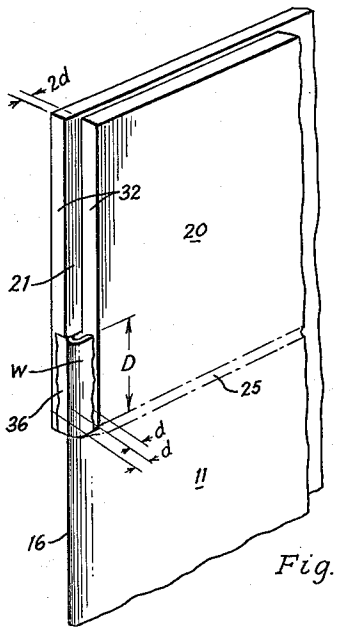


Fig. 7

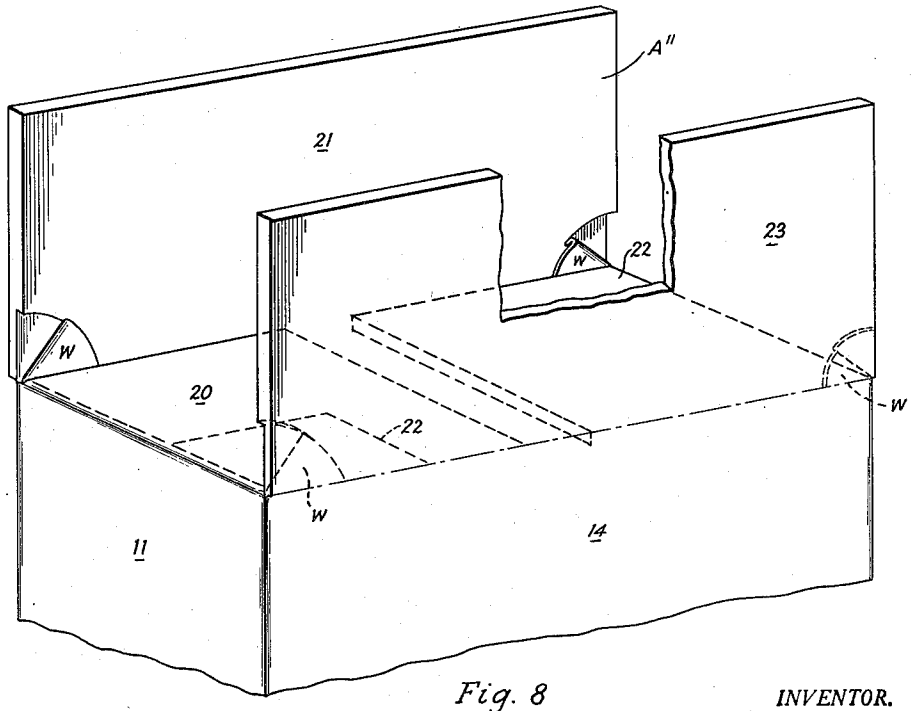


Fig. 8

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UNITED STATES PATENT OFFICE

2,523,488

FOLDING BOX

Marshall I. Williamson, New Haven, Conn., assignor, by mesne assignments, to National Folding Box Company, Incorporated, a corporation of Connecticut

Application June 8, 1946, Serial No. 675,413

3 Claims. (Cl. 229—37)

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This invention relates to improvements in folding boxes or cartons and has particular reference to cartons for the sift proof packaging of powdered or granular material or other merchandise which must be tightly inclosed in the carton.

The invention provides a carton, a blank for making the carton, and a method of forming and assembling and closing a carton whereby a structure is formed which is tightly sealed at the corners without the aid of an inner bag or liner, or any other means except the carton blank itself to prevent sifting of contents from, or entrance of air into, the carton.

It has been previously suggested to close the corners of a carton by webs or gussets formed from the carton blank itself by peeling or splitting of the material at the carton corners. In a carton having wall panels hingedly interconnected along side fold lines, with end flaps hinged to the wall panels along end fold lines at right angles to said side fold lines, it has been proposed to separate the end flaps by cut lines running in line with the side fold lines but terminating at a point short of the end fold line. Between the said point and the end fold line the end flaps were only partially severed, according to the previous proposal, by surface cut lines, forming continuations of the previously mentioned cut lines. These surface cut lines extend only part way through the stock from the outer surface of the blank.

Upon folding of the end flaps of the carton into carton end closing position it was expected that the carton stock would peel at the corners forming corner sealing webs.

In the use of such blanks in actual production it is found that very frequently the web does not form as and where desired, and that often the blank tears along the surface cut line, thus rendering the proposed carton construction very unreliable.

In order to overcome these difficulties it has further been suggested to provide additional surface cut lines on the inside surface of the blank to define precisely the lines along which the material is to peel from the inner surface of the blank to form a web. The latter proposal leads to increased cost because of the necessity of surface cutting both the outside and the inside surface of the blank but does not eliminate the difficulties of controlling the tearing or peeling of the stock during the folding of the end flaps into carton closing position.

According to the present invention the tearing of the stock which leads to the formation of corner sealing webs is initiated at the proper places

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before the carton is filled and sealed by a novel arrangement of the surface cut lines with respect to the side fold lines in such a manner that the corner webs begin to form when the blank is folded about the side fold lines, for example during the folding and gluing of the tubular, yet flat and unexpanded blank. When a blank thus prepared is expanded into hollow tubular form the corner sealing webs are partially formed, final folding of the end flaps into carton closing position automatically completes the previously initiated tear into full corner sealing webs.

The invention thus provides the formation of the webs in two steps or stages. The web is first partially retorn, and the formation of the web initiated at the exact points intended before the carton is expanded to contents receiving form. Thereafter the carton is expanded, filled and closed on conventional machinery. During the closing operation the formation of the webs is completed. The webs thus form at the proper places and failure is eliminated because the critical initial tearing of the stock does not take place on the closing machine nor is it dependent on the speed and accuracy of the closing machine.

According to the present invention the surface cut line is arranged out of line with the respective side fold line and offset a predetermined distance with respect thereto. If the blank is folded along the side fold line the stock must of necessity tear at the proper places because of the misalignment of the surface cut line and the side fold line. The blank peels from the surface cut lines and the resulting web has exactly the length of the surface cut line. Folding of the end flaps into carton end closing position then completes the formation of the web by causing the material to peel through an arc of approximately 45 degrees.

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

Although the characteristic features of the invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following detailed description, and the accom-

panying drawings forming a part thereof, in which,

Figure 1 is a plan view of a blank embodying the invention, the inside surface of a blank facing the observer;

Figure 2 shows the blank of Fig. 1 after a first folding and gluing operation;

Figure 3 shows the blank of Fig. 2 after a further folding operation whereby a tubular blank is formed;

Figure 4 is a detailed view, on an enlarged scale, of a portion of the blank shown in Fig. 1, the inside surface of the blank facing the observer;

Figure 5 is a detailed view on an enlarged scale of a portion of the blank of Fig. 1, the outside surface of the blank facing the observer;

Figure 6 is a sectional view, the section being taken on lines 6—6 of Figs. 4 and 5;

Figure 7 is a perspective view, on an enlarged scale, of the edge of the folded blank shown in Fig. 3 illustrating the tearing of the material near a carton corner, whereby the formation of a corner sealing web is initiated;

Figure 8 is a perspective view on an enlarged scale of a carton end in the process of closing;

Figure 9 illustrates a modified manner of cutting and scoring a carton blank.

In the following description and in the claims various details will be identified by specific names for convenience. These names however are intended to be as generic in their application as the art will permit. Like reference characters refer to like parts in the several figures of the drawings.

In the drawings accompanying and forming part of, this specification, certain specific disclosure of the invention is made for the purpose of explanation, but it is understood that details may be modified in various respects without departure from the broad aspects of the invention and that the invention may be applied to other structures than the ones shown.

Referring to the drawings, the blank A shown in Figure 1 comprises side wall panels 11, 12, 13 and 14 and a glue flap 15 hingedly connected along side fold lines 16, 17, 18, and 19. End flaps 20, 21, 22, 23 and a glue lap 24 are hingedly connected to the respective side wall panels 11, 12, 13 and 14 and to the glue flap 15 along an end fold line 25 running at right angles with respect to the side fold lines 16, 17, 18, and 19. Similar end flaps 26, 27, 28, 29 and a glue lap 30 are hingedly connected to the respective side wall panels 11, 12, 13, 14, and to the glue flap 15 along an end fold line 31.

The end flaps 20, 21, 22, 23 and the glue lap 24 are separated by cut lines 32, 33, 34, and 35 extending from the outer boundary of a blank and terminating a distance D from the end fold line 25. The cut lines extend through the entire thickness of a blank and sever adjacent flaps entirely. Surface cut lines 36, 37, 38, and 39 run from the ends of the cut lines 32, 33, 34 and 35 extend from the outer surface of a blank part way into, but not entirely through, the material. The length of the surface cut lines is equal to the distance D and the depth may be approximately one half the thickness of the blank.

The surface cut lines 36, 37, 38 and 39 extend parallel to, but are spaced from the respective side fold lines 16, 17, 18 and 19 by a distance *d* preferably of about two to five times the thickness of the board from which the blank is made.

Similar cut lines 40, 41, 42 and 43 extend entirely through the board and separate the end flaps 26, 27, 28, 29 and the glue lap 30. The cut lines 40, 41, 42 and 43 terminate a distance D from the end fold line 31 and surface cut lines 44, 45, 46 and 47 extend from the end of the cut lines 40, 41, 42 and 43, respectively to the end fold line 31.

The surface cut lines 44, 45, 46 and 47 extend into the board from the outside surface of the blank. The depth may be approximately one half of the thickness of the board and the length of the surface cut lines is equal to the distance D. The surface cut lines 44, 45, 46 and 47 are likewise spaced a predetermined distance *d* with respect to the corresponding side fold lines 16, 17, 18 and 19 in order to cause corner sealing webs to form at the intersection of the end fold lines 25 and 31 with the side fold lines 16, 17, 18 and 19, as will presently be described.

A flat collapsed tubular blank may be made from the blank A of Figure 1 as follows:

Adhesive *g* is first applied to the outside surface of the glue flap 15 and to the glue laps 24 and 30 hinged thereto. The blank A is then folded about the side fold line 18 to bring the inside surface of the wall panels 12 and 13. Thus folded the blank is shown in Figure 2. Thereafter the blank is folded about the side fold line 16 to bring the inside surface of the wall panel 11 face to face with the adhesive coated outside surface of the glue flap 15 and of the glue laps 24 and 30. The wall panel 11 and the end flaps 20 and 26 are firmly pressed on the adhesive coated surface of the glue flap 15 and of the glue laps 24 and 30 causing a tubular blank A' to be formed as shown in Figure 3.

When the blank is folded about the side fold lines it peels or tears near the intersections of the side fold lines with the end fold lines by reason of the misalignment of the surface cut lines with respect to the corresponding side fold lines. This condition is illustrated on an enlarged scale in Figure 7 showing the end flaps 20 and 21 entirely separated by the cut 32 and partially separated by a surface cut 36 which is offset with respect to the side fold line 16. Folding of the blank about the side fold line 16 causes the edges of the end flaps 20 and 21 to become spaced by a distance equal to 2*d*. Being unable to stretch or yield near the intersection of the end fold line 25 with the side fold line 16 the material of the blank tears along the distance D and forms the beginning of a web W as is plainly apparent from the perspective Figure 7.

Similar webs may be formed at the intersections of the end fold lines 25 and 31 with the side fold lines 17 and 19 simply by refolding the blank A' about the side fold lines 17 and 19 to bring the inside surfaces of the panels 11 and 14 and the inside surfaces of the panels 12 and 13 face to face.

However, it was found in actual production that such refolding of the collapsed flat tubular blank A' is rarely necessary, since sufficient peeling of the board at the intersection of the side fold lines 17 and 19 takes place when the blank is expanded into hollow tubular shape. In other words, folding the blank by 180 degrees, as it occurs in the initial folding of the blank A' at side fold lines 16 and 18 is not necessary for forming similar webs at the side lines 17 and 19. It suffices, if the panels at the side lines 17 and 19 are folded into right angular position with respect to each other, as it occurs when the flat

tubular blank is expanded into hollow carton form.

The flat collapsed tubular blank A' of Figure 3 may be expanded into hollow carton form A' in the usual manner for example by application of pressure at the side fold lines 16 and 18 to square the blank. The bottom end flaps are then folded and glued in the usual manner whereafter the carton may be filled and closed by folding and gluing the top and flap.

During the folding of the end flaps the corner sealing webs are automatically completed. Formation of the corner sealing webs is illustrated on an enlarged scale in Figure 8 illustrating the end flaps forming the carton top.

By the folding of the blank about side fold lines 16 and 18 as shown in Figure 3, by refolding of the blank along side fold lines 17 and 19, or simply by squaring of the tubular blank A' formation of the corner sealing webs is initiated at the four corners of the carton, the length of the tear measured from the side edge of the end flap being approximately equal to the amount *d* as is apparent from Figure 7. Infolding of the end flaps 20 and 22 causes the material to peel further at the four corners, continuing the tear which was previously initiated. Folding of the end flaps 20 and 22 into right angular position with respect to the corresponding side walls 11 and 13 causes the tearing or peeling of the material to continue through an angle or arc of 45 degrees resulting in a wedge-shaped web W at the four corners. These webs tightly seal the corners of the carton and prevent sifting at the corners after closure.

After infolding of the end flaps 20 and 22 the end flaps 21 and 23 are folded thereover and adhesively secured thereto in the usual manner, whereby the closure of the carton is completed.

The formation of the four corner sealing webs at each carton end, more particularly the exact place where the material is intended to peel is not affected by, nor dependent on, the accuracy of the carton sealing machine, nor the speed at which the cartons are being sealed. In distinction from prior practice where the entire peeling operation took place during the folding of the end flaps into carton closing position by the carton sealing machine, the formation at the corner sealing webs is divided into two phases according to the invention, the first phase being pretearing of the web and the second phase completion of the web.

The practice of initiating the formation of corner sealing webs prior to folding of the end flaps into carton end closing position by offsetting of the surface cut lines from the side fold lines by a distance *d* effectively eliminates the predominant cause of failure of corner sealing webs peeled from the blank itself, the uncertainty as to whether and where the material would actually peel. The invention thus renders practical a means for sealing the corners of the carton which previous to the invention was unreliable and uncertain.

The offset arrangement of the cut lines with respect to the respective side fold lines offers a further advantage. It reduces the width of the end flaps 20 and 22 and provides additional space for the corner sealing webs W which in the closed carton extend along either side edge of the two end flaps 20 and 22.

It is of course not necessary that the cut lines which extend entirely through the material, for example the cut lines 32, 33, 34, and 35 are in alignment with the corresponding surface cut

lines 36, 37, 38, and 39. The cut lines may be continuations of the side fold lines, and the surface cut lines be offset with respect to both the cut lines and the side fold lines. This modification is illustrated in Figure 9 where the cut lines 32', 33' and 34' are in line with the side fold lines 16', 17', and 18'. The surface cut lines 36', 37', and 38' are offset by a distance *d* with respect to both the cut lines 32', 33', and 34' as well as the side fold lines 16', 17' and 18'.

Use, operation and advantages of the modified blank of Figure 9 are the same as those of the blank of Figure 1. Preformation of the corner sealing webs takes place automatically by reason of the spacing of the surface cut lines with respect to the corresponding side fold lines. Additional space for the corner sealing webs is provided on either side of the end flaps by reason of the reduction in width of the end flaps at the place where the corner sealing webs lie.

The invention thus provides a simple and effective method of tightly sealing the corners of cartons by webs automatically formed in two stages during the folding, squaring and closing of the carton.

Obviously the present invention is not restricted to the particular embodiments shown and described but may be applied to numerous other forms of carton blanks as will be apparent to persons skilled in the art. Various changes, substitutions, additions, omissions and other modifications may be made without departure from the spirit or the essence of the invention.

What is claimed is:

1. A carton blank of fibrous board for tight sealing folding cartons comprising wall panels hingedly connected along side fold lines and end flaps connected to said wall panels along end fold lines extending substantially at right angles to said side fold lines, the end flaps being separated by cut lines extending entirely through the board and running parallel with said side fold lines and terminating at points short of the respective end fold line, the end flaps being partially separated between said points and said end fold line by surface cuts extending from the outside surface of the blank part way through the board, said surface cuts running parallel with, but spaced from, said side fold lines.

2. A carton blank of fibrous board for tight sealing folding cartons comprising wall panels hingedly connected along side fold lines and end flaps connected to said wall panels along end fold lines extending substantially at right angles to said side fold lines, the end flaps being separated by cut lines extending entirely through the board and running parallel with, but spaced from said side fold lines and terminating at points short of the respective end fold line, the end flaps being partially separated between said points and said end fold line by surface cuts extending from the outside surface of the blank part way through the board said surface cuts running in line with said cut lines but being spaced from said side fold lines, whereby upon folding of said blank along the side fold lines the material is caused to tear at said surface cut lines automatically initiating the formation of corner sealing webs, said webs being adapted to be completed by folding of the end flaps along the end fold lines.

3. A folding box of fibrous board having wall panels hingedly connected to one another along side fold lines, end flaps hingedly connected to said wall panels along end fold lines extending at right angles to said side fold lines, and corner

sealing webs at the corners at which said side fold lines and end fold lines meet, each corner sealing web being integral with one end flap and consisting of a peeled off layer, of a thickness less than the total thickness of the board, peeled from the adjacent end flap at the respective corner, characterized in that the width of the end flap from which the web is peeled, measured at the webs, is greater than the width of the side panel to which end flap is hinged, width of the side panel being measured between the side fold lines bordering said side panel, the inequality in width of the end flaps and their respective associated wall panels leading to automatic initiation of the peeling of said webs from the flaps when, in the process of setting up the box, the board is

folded about the side fold lines extending to said webs.

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