Jan. 23, 1968 E. E. MACCHI 3,365,114

BOX CLOSURES

Filed June 17, 1966

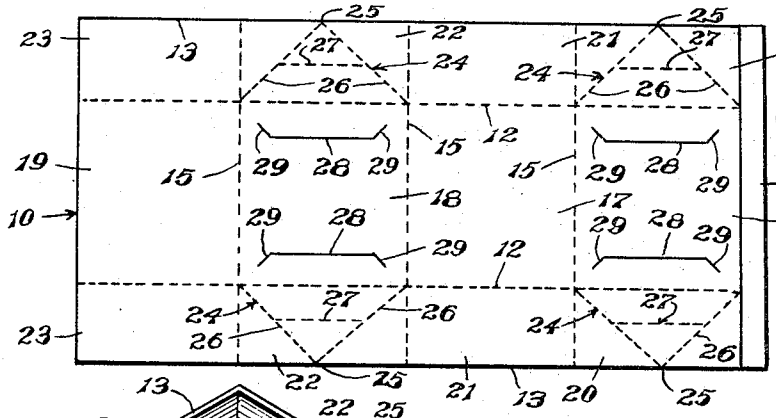


FIG. 1

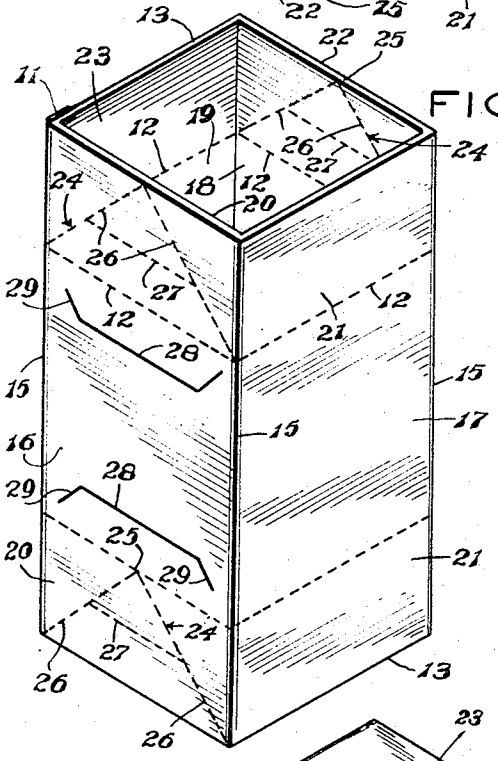


FIG. 2

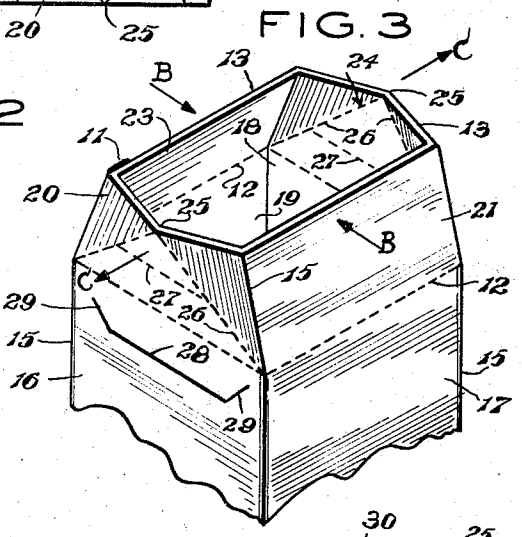


FIG. 3

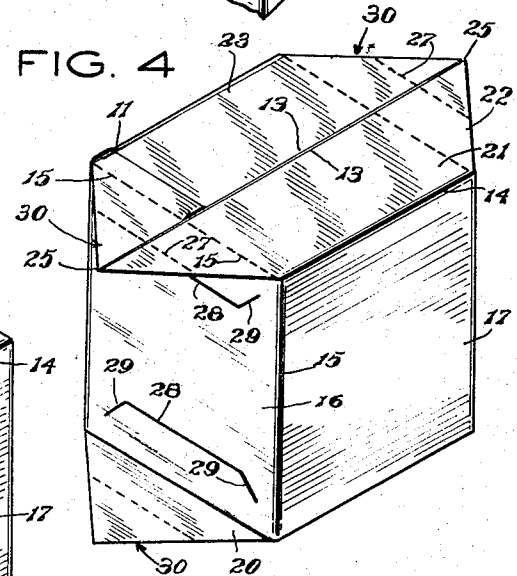


FIG. 4

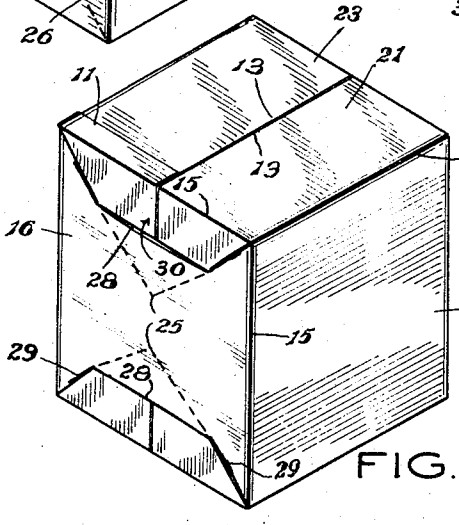


FIG. 5

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BOX CLOSURES

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ABSTRACT OF THE DISCLOSURE

A box closure effected by a complete series of integral end flaps of which two opposite ones form an end closure when folded down and the other two flaps have each an A-crease enabling each of those flaps to be folded within its own bounds to form a tongue of double thickness, said tongue being insertable in a slit in a side panel of the box.

Description

The broad concept of the invention is provision of a closure which not only makes a full end closing of the box, but also interlocks with other walls of the box in novel manner to retain the closure in its operative closing condition.

More specifically, the invention proposes retention of all of the end flaps on the box body integral with the body and with each other and utilizes two of the flaps as the end closure and the two other flaps as the lock to hold the first two in their closing position.

Another important object of the invention is to provide a closure which cannot be sprung open by pressure from within the box, and yet can be readily released when desired.

A further object of the invention is to provide a box adapted to formation on box-making machines without requiring trimming cuts producing and accumulating waste material.

Corollary to the foregoing, an object of the invention is to form the box from a completely rectangular blank inclusive of the locking means.

Other objects, advantages, constructional features and beneficial results will appear to persons skilled in the art to which the invention appertains, as the description proceeds, both by direct recitation thereof and by implication from the conext.

Referring to the accompanying drawing, in which like numerals of reference indicate similar parts throughout the several views;

FIGURE 1 is an out-stretched plan of the box blank as produced ready to be folded;

FIGURE 2 is a perspective view of the tubulated blank ready for folding of the end flaps;

FIGURES 3, 4 and 5 are perspective views showing folding and locking in process and completion.

In the specific embodiment of the invention illustrated in said drawing, a fully rectangular blank **10** comprising all of FIG. 1, of suitable material, is provided by usual process on a box-making machine (not shown) and there provided with desired creases and slits, tubulated and flat folded for stacking and future use. While the invention is well adapted to utilization of single-face corrugated stock, with the corrugations at the inside of the box and the smooth-face at the exterior, such material is not a prerequisite to employment of the invention, and for the sake of clarity, no attempt has been made to specifically show corrugations. With the use of corrugated as well as other materials, the facing material thereof may be permitted to project at one side and consequently in the blank of FIG. 1, constitutes a thin

sealing flap **11** which can be lapped over and sealed to the opposite end of the blank in the usual tubulation step performed on the box-making machine. The requisite folding and sealing productive of a flattened tubulated formation in condition to ship flat to a user is well known in the art.

According to the present invention and before tubulation of the blank, certain creases are applied and slits introduced by appropriate mechanisms of the box-making machine. As shown, there are two creases **12** parallel to each other and parallel to the top and bottom edges **13** of the blank those creases being herein referred to for identification purposes as horizontal creases or ultimately as horizontal folds **14**, and when the box is fully folded, constitute the peripheral top and bottom in-turned edges of the box. What will be termed vertical creases or folds **15** are made at right angles to the horizontal creases at appropriate intervals between side edges of the blank in parallelism thereto. In the present showing, which is arbitrarily a cubical box, the vertical creases **15** are shown spaced successively equally from the ends of the blank body and from each other. Consequently, by limitation of these vertical creases **15** and the horizontal creases **12** the blank is divided crosswise into successive panels **16, 17, 18** and **19** (numbering beginning with the panel next to sealing flap **11**). Said vertical creases **15** extend beyond the horizontal creases to the respective top and bottom edges **13** of the blank, forming at each side edge, merging inwardly therefrom as far as the respective horizontal creases **12**, a series of four end flaps **20, 21, 22** and **23** successively integral with each other and each integral with its respective side panel **16, 17, 18** and **19**. As the bottom series of flaps is the same as the top series, only one of the series, in the interest of brevity will be explained, and arbitrarily the top series has been selected for that purpose.

Alternate ones of the said end flaps remain plain, that is, without any further creases or folds, and in the present showing the selected ones to remain plain comprise end flaps designated by numerals **21** and **23**. The other two end flaps, **20** and **22**, each have A-shaped creases **24** therein, the apex **25** of each A-shaped crease being located midway of the length of the flap at the horizontal edge **13** of the blank. Each A-shaped crease **24** comprises crease-legs **26** of equal length which diverge from each other from said apex **25** and extend to the respective corners formed by the horizontal crease **12** with the flap ends. These divergent creases **26** ultimately become folded edges in the completely formed and closed box. The cross-bar crease **27** of each A-shaped crease extends from one to the other of the diverging crease-legs **26** in parallelism to and intermediate of horizontal edge **13** of the flap and horizontal crease **12** of the blank **10**. This cross-bar crease **27** is not intended for making a fold thereat, but permits a bending or bowing to be accomplished in the otherwise folded flap in manipulating the same to its ultimate locking position.

The panels **16** and **18** which subtend the flaps **20, 22** having the A-shaped creases **24**, are each provided with two predominantly straight slits **28** parallel and proximate to a respective cross-bar crease but with a horizontal crease **12** therebetween. In each instance, the said most proximate slit and cross-bar crease are not only on opposite sides of the intervening horizontal crease, but at substantially equal distances therefrom. Each slit is straight as here illustrated for a length simulating that of the cross-bar crease **27**, and therebeyond has sloped ends **29** corresponding to the angle of slope of the divergent leg creases **26** in the flap. Direction of slope of the slit ends is toward the proximate corners of the panel in which situated and to the same corners toward which

the leg-creases **26** of A-shaped crease **24** also are directed. It will be recognized that decrease of spacing of the straight portion of the slit **28** from the horizontal crease **12** will require increase in the length of the said straight portion of the slit, and vice versa, increase of spacing will require less length of slit, but the angularity of the sloped ends remains consistent with the divergent leg-creases **26**.

The blank acquires the above-described creases and slits while in the box-making machine, and is doubled on a middle one of the vertical creases **15** to bring end edges of the blank into juxtaposition, whereupon said end edges are secured together for their entire lengths, as by the thin sealing flap **11**. The box is then in tubulated form, but laid out flat in a doubled condition, enabling a plurality to be stacked and occupy minimum space for shipment to the user and for storage. The user opens the flat tubulation to a spread-out hollow form as shown in FIG. 2, with each respective panel and its subtended end flaps in planar relation with each other. The bottom end is of course folded first to make the box effective as a container, and after filling the box with its intended contents, the top end is folded and closed. Folding and closing is performed correspondingly at both ends, so single description of what will be termed the upper end closing operation will be sufficiently explanatory for both ends.

The closing is accomplished by first bending the plain end flaps **21** and **23** on the portions of the horizontal crease **12** continguous thereto, inwardly toward each other in direction indicated by arrows B, FIG. 3. The flaps are proportioned to meet at their inwardly directed edges so that the end of the box thereby becomes fully closed. While the plain flaps **21, 23** are folding inwardly as just mentioned, the creased flaps **20** and **22** are being bent in direction of the arrows C of FIG. 3 on their portion of horizontal crease **12** to a wing-like outward attitude to attain position shown in FIG. 4 wherein the triangular corners outside of the A-shaped crease **24** assume locations in the same plate with the box-closing plain end flaps **21, 23** and by virtue of the diverging creases **26** overlie the portion of the flap included within the A-shaped crease. Thus there is produced an entity or tongue **30** of isoceles triangular shape the apex whereof is the aforesaid apex **25** of the A-shaped crease. Said entity or tongue **30** as thus produced from folding the flap, has a double thickness of material, thereby presenting a very high resistance to being bent from its generally flat condition. However, by benefit of presence of cross-bar crease **27** in this tongue **30** as thus produced, the user may bow said tongue medially outwardly, at the same time pointing the apex **25** inwardly into slit **28** and forcing said tongue down flat. The basal end of the triangular tongue **30** integral thereat with the panel having the slit,

engages flatwise against the outside of that panel, whereas the pointed end portion of the tongue bears flatwise against the inside of the same panel and with the tongue gripped in the slit. It should also be noted that the perpendicular relation of the plain box-closing flaps **17** and **19** with the triangular corners of the creased flaps **16** and **18** not only reenforces the box-closing flaps, but also prevents said box-closing flaps from swinging to open position.

The structure provided by this invention, obtains a secure locking of the closure, and no internal pressure developed within the box can possibly result in release of the triangular tongue, which consequently has the attribute of constituting a most secure lock holding the box closed. Yet if access is desired to the interior of the box, a user may bow the triangular tongue outwardly to release it from the slit and permit unfolding in reverse order to the above-described closing and locking procedure.

I claim:

1. A box of the character described having a peripheral series of side panels, and a peripheral series of flaps at an initially open end of the box, each said flap being constituted as an extension of a respective one of said side panels at said open end, said flaps being successively integral each with the next adjacent flap of said series, a first pair of opposed said flaps adapted to be bent down and cooperate to constitute a cover for said open end of the box, and a second pair of opposed said flaps each being creased within its own bounds and thereby adapted to be folded to each form a tongue of double thickness, and the side panel from which said creased flap is an extension having a slit in a location adapted to receive said tongue inserted in part therein, said creases in said creased flap extending from the middle of the outermost edge of the flap divergently to the corners of said creased flap where said flap joins with its respective panel and with a next successive flap, said creased flap having a cross-bar crease extending between and to each of the divergent creases thereby providing an A-shape configuration by said creases.

2. A box in accordance with claim **1**, wherein said slit is in part parallel to said cross-bar crease and in part slopes in agreement with the slope of said divergent creases.

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