Oct. 18, 1960 N. G. RINDAL 2,956,720

CARTON LOCKING MEANS

Filed Nov. 25, 1957 2 Sheets-Sheet 1

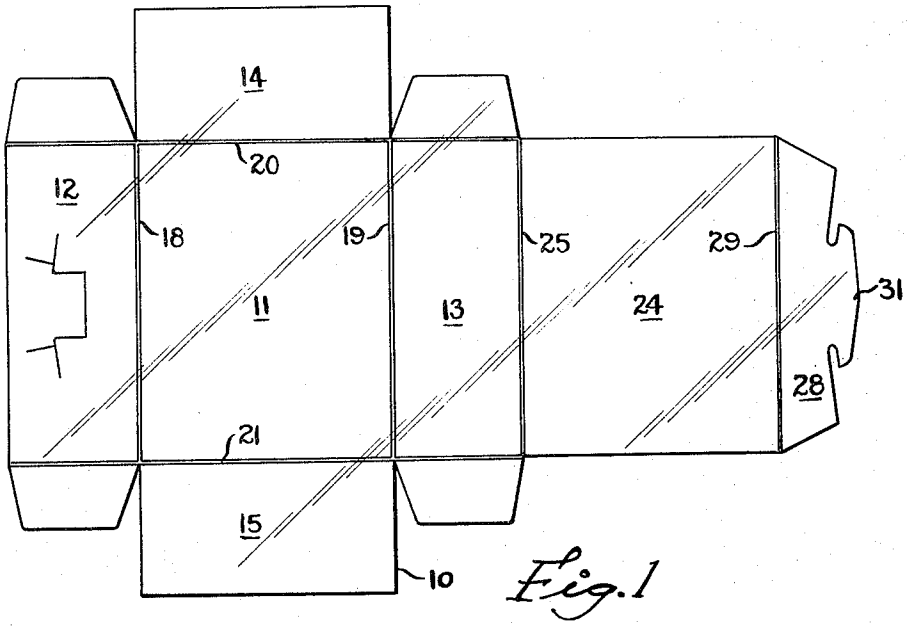


Fig. 1

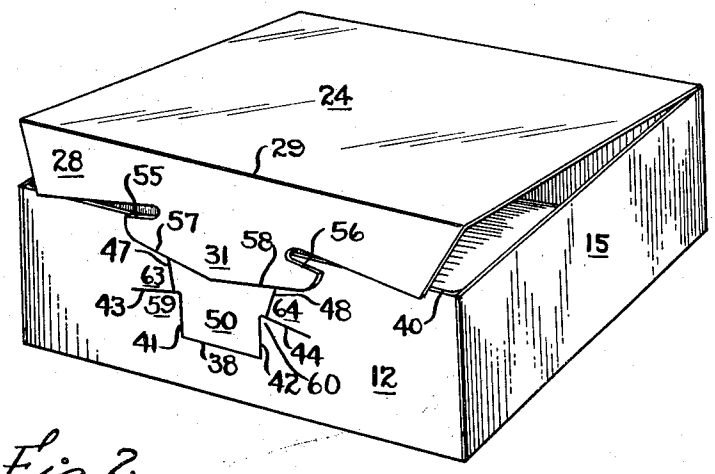


Fig. 2

INVENTOR.
NORMAN G. RINDAL
BY
ATTORNEY
AGENT

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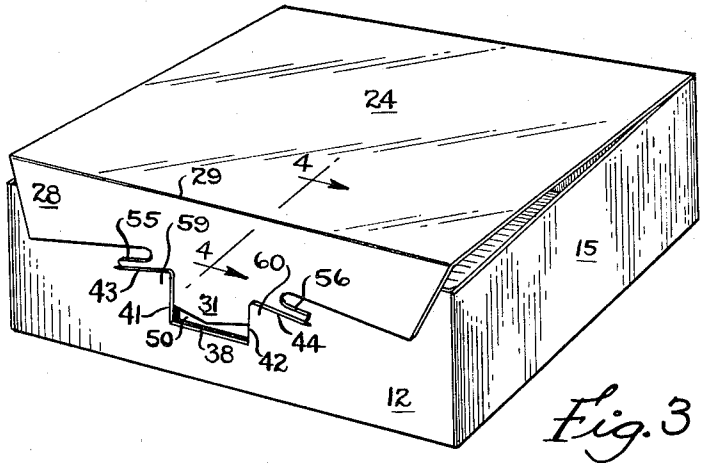


Fig. 3

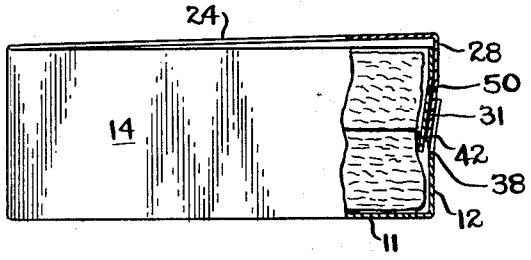


Fig. 4

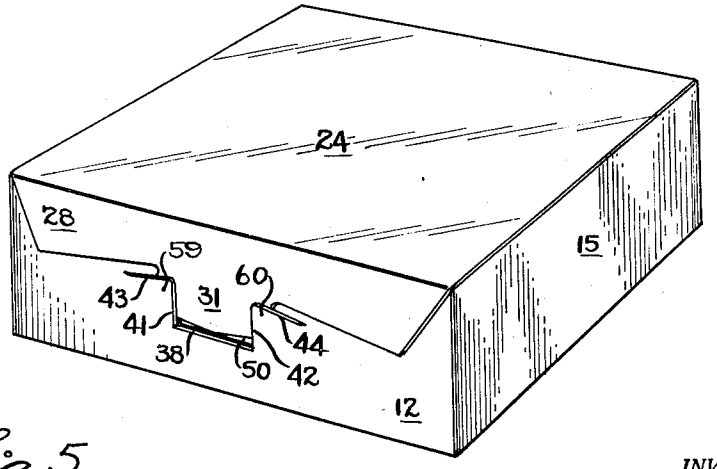


Fig. 5

INVENTOR.
NORMAN G. RINDAL
BY Joseph Rosman
ATTORNEY
F. G. Charlston
AGENT

United States Patent Office 2,956,720 Patented Oct. 18, 1960

2,956,720

CARTON LOCKING MEANS

Norman G. Rindal, Portland, Oreg., assignor, by mesne assignments, to American Can Company, New York, N.Y., a corporation of New Jersey

Filed Nov. 25, 1957, Ser. No. 698,481

1 Claim. (Cl. 229—39)

This invention relates to an improved form of locking means for cartons and boxes or the like commonly made of paperboard or similar material. It is often desirable to obtain a secure closure on such cartons without reliance on an adhesive or on a stapling device. To obtain such a closure, a number of various locking means suitable for particular purposes have been devised.

One of the general types of locking means thus devised is commonly known in the carton industry as an "arrow" lock, the name arising from the fact that the male member of the locking means commonly has a shape and appearance substantially resembling that of an arrow.

This invention relates to a carton locking means of the arrow lock type, though it includes structure and provides a certain utility previously unknown in this field. In the normal arrow locking mechanism, the female locking member comprises a slit in one of the carton panels, while the male locking member comprises an arrow-shaped tab-like extension on the edge of a panel overlying the panel containing the female locking slit. To engage the locking device, the male arrow-like member is forced inwardly through the locking slit until the barbs or shoulders of the arrow have passed inwardly beyond the slit. In attempting to reverse the motion of the male member, it will be found that the barbs tend to engage the board edges of the slit and thus lock the carton against removal of the male arrow-like locking member from the slit. Arrow locks of this type have found wide application in the carton field.

For the packaging of certain commodities, however, particularly when packaging by means of high speed mechanical carton set-up, filling and closing devices, the arrow lock just described is subject to certain serious objections. It will be clear from the above description that, in order to engage the locking members, the male arrow-like member is forced through the locking slit and protrudes into the interior of the carton itself, which involves the probability that the arrow will come into contact with the contents of the package which would then have to be displaced from position in order to allow the entrance of the arrow. Experience in the packaging of certain commodities, particularly foods such as asparagus spears, French cut green beans or wax beans, breaded fish sticks, okra and the like, has shown that these products are not readily displaced from their positions in the package and often prevent the locking action or distort and damage the locking mechanism to such an extent that the carton must be discarded and the contents repackaged with a resultant loss in time and material. Also, such damaged packages often clog or jam automatic packaging machinery resulting in further waste of time and material.

The carton locking device of the present invention provides for the positive avoidance of the damaged packages which result when the package contents prevent the proper engagement of the carton locking members.

The construction by which this improvement is provided will be readily apparent from the following description and accompanying drawings, in which:

Figure 1 is a plan view of a paperboard blank for making a carton embodying my invention,

Figure 2 is a perspective view of a carton set up from the blank shown in Figure 1, in a preliminary stage of closure before the locking elements have become engaged,

Figure 3 is a perspective view of partially closed carton in the stage of initial locking engagement,

Figure 4 is a cross-sectional view, partially cut away, taken along the line 4—4 of Figure 3, but with locking action in a more advanced stage, and

Figure 5 is a perspective view of a completely closed carton showing complete engagement of the locking elements.

Referring first to Figure 1, the carton may be cut from a single paperboard blank **10**, suitably cut and scored to provide a bottom **11**, front **12**, rear **13** and side walls or panels **14** and **15** hingedly connected to the bottom panel **11** along score lines **18**, **19**, **20** and **21**, respectively. A cover panel **24** is hingedly connected to the top edge of rear wall **13** along score line **25**, and along its opposite edge is hingedly connected to a locking panel **28** along score line **29**. The edge of locking panel **28** opposite score line **29** is formed into a male locking member **31** of substantially arrow-like configuration. The locking panel **28** is adapted to overlie the front panel **12** when the carton is in a closed position.

Front panel **12** contains the female locking member which, in coaction with the arrow-like male member **31**, comprises the carton locking mechanism. The unique configuration of the female locking member results in the improved functionality of the carton and thereby constitutes the body of the present invention. In a preferred embodiment of this invention, the female locking member comprises a slit or cut line **38** as shown in Figure 2 parallel to and spaced from and between the free top edge **40** of front wall **12** and the hinge score line **18**. Extending perpendicularly upward toward the free top edge **40** of front wall **12** from the ends of slit **38** are a pair of slits **41** and **42**. Slits **41** and **42** terminate respectively at their upper ends in downwardly angled, outwardly extending locking slits **43** and **44**, respectively. Slits **47** and **48** extend upwardly at a slight outward angle from points of junction with locking slits **43** and **44**, respectively, and together therewith define wall portions **63** and **64**. Slits **38**, **41**, **42**, **47**, **48** and portions of slits **43** and **44** thus outline a downwardly extending tab **50** defined from front wall **12**.

Referring particularly to Figure 3, when the filled carton is being closed and the locking elements are being brought into carton locking engagement, the lower, free end of tab **50** may be displaced appreciably inwardly against the contents of the carton by pressure from outside the carton. This displacement forces the carton contents inwardly away from the front carton wall in the carton locking area, thereby forming a product-free pocket-like area which insures an opportunity for free entrance of the male locking element **31** into the locking position without any obstruction by the carton contents. The tab **50** thereby performs the important and novel function of providing clearance for the entrance of the male locking member **31** into locking position.

The precise size, location and configuration of the several slits defining certain limits of the clearance-providing tab **50** are essential to the success of the present invention.

In order to insure positive clearance from the contents of the carton for the male locking member throughout the entire length of its travel into locking position, it is necessary that the clearance-providing tab **50** extend down-

wardly in the carton front wall sufficiently to underlie the male locking member **31** throughout substantially its entire length when the carton is in closed and locked condition. Thus the slit or cut line **38** defining the lower edge of tab **50** is spaced from the top edge **40** of the front wall by a distance at least equal to, and preferably very slightly greater than, the total length of the overlying locking panel **28** as measured from the score line **29** to the extended distal edge or point of the arrow-shaped male locking member **31**.

The locking slits **43** and **44** should extend outwardly toward the side edges of the carton front wall **12** sufficiently so that the straight line distance between their respective outer ends is just sufficient to allow the passage of the widest portion of the arrow-shaped male locking member without excess slack.

The male locking member **31** is generally shaped so that the locking edges **55** and **56** are either parallel to the score line **29** or at a slight angle to that score line so that the locking edges are spaced from the score line **29** by a slightly greater distance at the widest section of the arrow-like member than at the narrow throat of the arrow. In order to obtain the most secure locking action, the female locking slits **43** and **44** should extend outward and downward at an angle slightly but definitely greater than that exhibited by the locking edges **55** and **56** of the male locking member. That is, the angles between the top edge **40** of the front wall and the locking slits **43** and **44**, respectively, should be slightly but definitely greater than the angles formed between the score line **29** and the locking edges **55** and **56**, respectively, of the male locking member. It will be readily apparent that, when the carton is closed, the score line **29** overlies the top edge **40** of the front wall, so that these two reference lines essentially coincide in space. The particular angular relationship between the female locking slits and the locking edges of the male locking member described above is not essential to the locking action per se, but represents the optimum relationship for obtaining the most secure and least deformable locked carton construction of the arrow lock type.

It will be apparent that the locking action of the arrow lock type carton is achieved by the abutment of the locking edges **55** and **56** of the male locking member against the carton material constituting the upper edges of the female locking slits **43** and **44**, respectively. For satisfactory locking action, it is necessary that positive abutment of the locking elements occur at at least one of these locking areas and it is preferred that such positive abutment occur at both locking areas simultaneously. Neglecting, temporarily, certain related factors which will be hereinafter discussed, the former condition is positively assured and the latter preferred condition also occurs (unless there is extreme distortion of the closed carton) if the straight line distance between the points of junction of slits **47** and **48** with locking slits **43** and **44**, respectively, is less than the minimum width of the narrow throat or neck of the male arrow-like locking member. This preferred structural feature insures that the locking edges **55** and **56** will simultaneously bear on the upper edges of slits **43** and **44**, respectively, rather than allowing the male member to slip upwardly to an incompletely closed position by passage of the male member upward along the path formed by slits **47** and **48**. It is thus preferred that the points of junction of slits **47** and **48** with locking slits **43** and **44**, respectively, be separated by a distance somewhat smaller than the distance representing the width of the narrow throat of the male locking member.

In order for the male locking member to enter properly into its locking position as a result of its downward motion during closing of the carton, sufficient force is applied from the outside of the carton to displace tab **50** inwardly and allow the male locking member to enter the female

locking slits. As tab **50** is displaced inward, the front wall portions **59** and **60**, bounded respectively by intersecting pairs of slits **41** and **43**, and **42** and **44**, protrude outside the path of travel of the male locking member and serve to guide the arrow-shaped male member into its ultimate locking position.

It is preferred that the junctions of slits **47** and **48** with locking slits **43** and **44**, respectively, occur at points removed outwardly toward the side edges of the carton front wall from the points of junction of slits **41** and **42** with locking slits **43** and **44**, respectively. This preferred construction detail ensures that, even if the force applied to displace tab **50** inwardly is insufficient to displace the front wall portions **63** and **64** inwardly out of the plane of the main carton front wall, portions **59** and **60** of the carton front wall will nevertheless protrude outside the path of travel of the adjacent portions of the male locking member to insure initial locking engagement. The male member will then be enabled to enter the locking slits **43** and **44** behind the protruding front wall portions and be guided positively into its ultimate locking position.

It is also preferred that the portions of the front wall immediately above the locking slits **43** and **44**, respectively, exhibit a considerable degree of resilience and resistance to displacement out of the plane of the carton front wall. Thus, when forced inwardly of the carton by the passage of the male locking member through locking slits **43** and **44**, these portions will tend strongly to return to the carton wall plane and will thereby snap into locking engagement with the male member as soon as the latter has completed its travel into ultimate locking position.

I claim:

Locking means for a carton, the carton including a cover panel, an upstanding front wall and a locking panel hinged to the cover panel and adapted to overlie the front wall, said locking means comprising a substantially arrow-shaped male member formed on and extending from the free lower edge of the locking panel, the male member having barb-portions extending laterally substantially beyond a constricted throat-portion providing the connection thereof to the locking panel, and female means in the front wall comprising a pair of internal downwardly-extending slits the lower ends of which are connected by a transverse cut line to provide a downwardly-extending, deflectable tab, said downwardly-extending slits being divided into upper and lower portions, the upper portions being spaced apart a distance greater than the spacing between the lower portions, the adjacent ends of each pair of upper and lower slit portions being joined by slits extending laterally outwardly from a position above said transverse cut line, said laterally-extending slits extending outwardly beyond said upper slit portions, the distance between the points of junction of said upper slit portions with said laterally-extending slits being less than the width of the throat of the male locking member, said tab being deflectable inwardly upon insertion of the male member into locking engagement with said laterally extending slits, said transverse cut line being spaced below the upper edge of said front wall a distance substantially equal to the distance from the remote edge of said male member to the hinge connection of the cover panel to the locking panel.

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