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BOX BLANK

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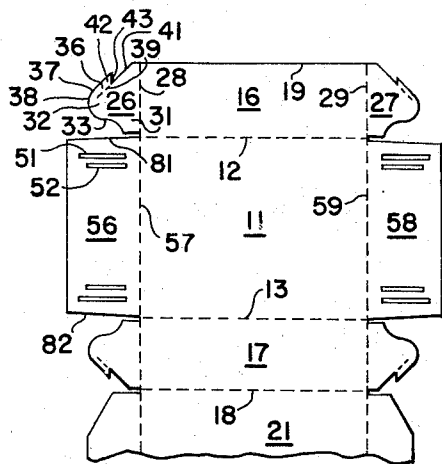


Fig. 1.

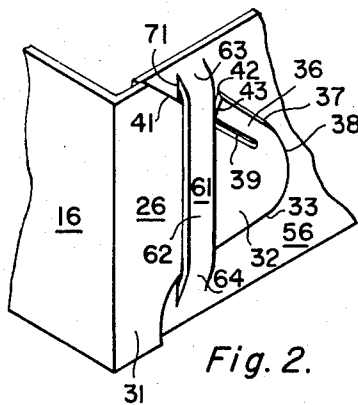


Fig. 2.

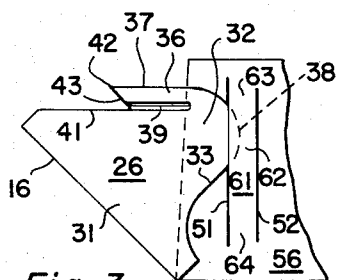


Fig. 3.

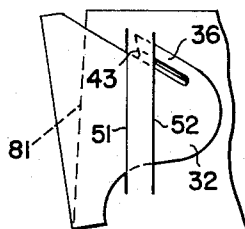


Fig. 4.

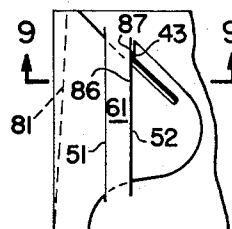


Fig. 5.

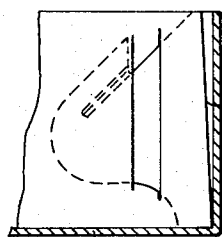


Fig. 6.

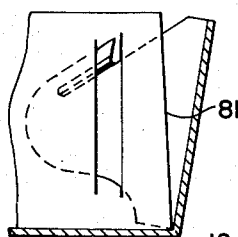


Fig. 7.

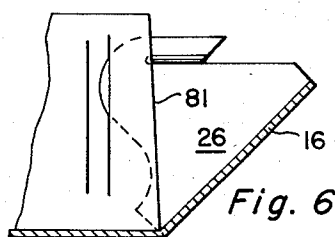


Fig. 8.

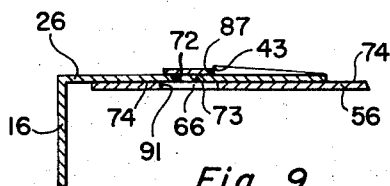


Fig. 9.

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2,901,158

BOX BLANK

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4 Claims. (Cl. 229—35)

The invention relates to box blanks, and, more particularly, to box blanks foldable into finished or semi-finished box form and being lockable in such form without the use of adhesives.

Heretofore, numerous types of box blanks having interengaging or interlocking flaps and slots have been known and used, one of the more widespread uses of such blanks being the packaging of frozen foods, the frozen food cartons being customarily lined with some type of transparent protective material, such as cellophane.

Previous box blanks have effected locking by inserting notched locking flaps through appropriately configured cuts in the box wall. In order to prevent interference between the flaps and the liner it has been necessary either to trim and place the liner on the blank so that the liner does not extend outwardly far enough to cover the cuts, or to affix the liner to the blank at locations removed from the cuts. In either case, the additional care and effort required has added to the costs of production.

It is therefore an object of the invention to provide a box blank having an interengaging lock structure which quickly and easily effects a complete locking of the box panels and walls.

Another object of the invention is to provide a box blank in which the liner, for example cellophane, can be cut so as completely to cover the box blank and thus render maximum protection to the contents when the box is ultimately packed.

It is another object of the invention to provide a box blank in which the locking tab does not project into the interior of the box, but which, instead, smoothly overlies the outer face of the box wall.

It is a further object of the invention to provide a box blank in which, if necessary, the liner can be glued or otherwise affixed to the inner side of the box blank and in the area immediately adjacent the cuts provided without the liner interfering with the locking flaps or being ruptured thereby.

It is a further object of the invention to provide a box blank in which the locking elements are foldable into locking position at a high rate of speed, yet with a consistently high degree of security and positiveness.

It is another object of the invention to provide a box blank which is foldable and lockable by high speed machinery having a relatively simple and uncomplicated folding and locking mechanism.

It is still another object of the invention to provide a box blank which is securely and positively locked even through the dies for cutting the box blanks possess or are worn to dimensions which are not at their optimum values.

It is yet another object of the invention to provide a box blank in which the finished blank represents a high degree of utilization of the stock from which the blank is cut.

It is a still further object of the invention to provide a box blank having a lock wherein even though for some reason the locking tab is dislodged from its original lock-

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position, a secondary locking structure automatically becomes operative.

It is another object of the invention to provide a generally improved box blank.

5 Other objects, together with the foregoing, are attained in the embodiment described below and shown in the accompanying drawings in which—

Figure 1 is a plan of the blank, a portion of the showing being broken away to reduce the extent thereof.

10 Figure 2 is a perspective, to an enlarged scale, of one corner of a folded box using the slit lock of my invention.

Figure 3 is an outer side elevation showing the lock flap at an early stage in its interlocking movement.

15 Figure 4 is a showing comparable to that of Figure 3, but with the locking flap at a later stage in its locking movement.

Figure 5 is a view comparable to Figures 3 and 4 but with the locking flap in a fully engaged and fully interlocking position.

20 Figure 6 is an inner side elevation of the interlocking components in a position comparable to that of Figure 3, the bottom panel and end panel being shown in section.

Figure 7 is an inner side elevation of the components in the position in which they appear in Figure 4.

25 Figure 8 is an inner side elevation of the components in their position as shown in Figure 5.

Figure 9 is a section, the plane of section being indicated by the line 9—9 in Figure 5.

30 While the slit lock box blank of my invention is susceptible of numerous physical embodiments, depending upon the particular use and environmental requirements of the situation, a substantial number of the herein shown and described blanks have been made and used and have performed in an eminently satisfactory manner.

35 In common with a number of other box blanks, the blank of my invention comprises a bottom panel 11 having on each side and hingeably attached thereto, along fold lines 12 and 13, a side panel 16 and a side panel 17, respectively. Where no box top is used the top edge 18 of the side panel 17 is cut to form an edge comparable in all respects to the top edge 19 of the side panel 16. 40 Where, however, as in the frozen food packaging industry, it is customary to include a top, there is provided a top panel 21 hingeably attached to the top edge 18 of the side panel. Since the top panel construction does not affect the subject matter of the invention, no further explanation of it is deemed necessary.

45 As previously stated, it is customary, at least in the food packaging industry, to line the box with a sheet of material such as cellophane. In this event the sheet (not shown) is placed over the blank and appropriately affixed thereto on the blank's inner surface. Preferably, the outline of the liner assumes approximately the same size as the overall outline or envelope of the box blank 50 itself. Heretofore, however, the liner has had to be cut so that its margins do not cover the cuts through which the flaps are projected, or if the liner is trimmed so that its margins do overlie the cuts the liner cannot be glued adjacent the cuts. This has been necessary to avoid interference between the liner and the inwardly projecting flaps.

55 Owing to the construction and operation of the elements of the box blank of my invention, however, the liner can not only be made of any suitable size, even to extending the liner somewhat beyond the periphery, or envelope, of the blank, but it can also be affixed to the box blank at any location.

60 At the opposite ends of each of the side panels 16 and 17 is a lock flap 26 and 27 respectively. Since each of the side panels 16 and 17 is substantially identical with the other, a description of one side panel will serve adequately to describe the other. The lock flaps 26 and 27

are hingeably mounted on the ends of the side panel 16 along score lines 28 and 29, respectively.

Each of the lock flaps 26 and 27 is disposed in mirror symmetry with respect to the other and, therefore, a description of one serves equally to describe the other. The lock flap 26, for example, includes not only a root portion 31 having considerable beam strength by virtue of its extending the height of the flap, but it also includes an outwardly projecting and considerably more flexible, tapering tongue portion 32. The tongue 32 is outlined, as appears in Figures 1 and 2, for example, by a generally recurved and arcuate lower edge 33 and an upper edge which is offset or interrupted in a substantially central location so as to form a tab 36, assuming roughly the shape of a parallelogram. The tab 36 is defined by an upper edge 37 merging smoothly into the leading edge 38, or tip, of the tongue, and a deep scoring 39 parallel to the edge 37 and running toward the tip 38 for a considerable fraction of the distance. A linear edge 41 is downwardly offset or displaced from the edge 37 and serves to define a point 42 bounded on one side by a substantially vertical edge 43, or face, as can be seen most clearly in Figures 1 and 2.

Adapted cooperatively to mate, or engage, in locking relation with the lock flap 26 is a pair of substantially parallel locking slits 51 and 52 in the adjacent portion of an end panel 56 hingeably mounted on the bottom panel 11 along a fold line 57. In comparable fashion, and in mirror symmetry with the end panel 56, is a corresponding end panel 58 hingeably mounted on the bottom panel 11 along a fold line 59 and being provided with a comparable pair of slits at each end thereof for locking engagement with the adjacent locking flaps. As can be seen by reference to the figures, the outermost one of the slits 51 is preferably somewhat longer than the innermost slit 52 by a predetermined amount depending upon the dimensions of the cooperating or coacting components of the lock flap 26. With especial clarity, Figure 5 shows that the upper ends of the slits 51 and 52 form an approximate radius with the corner 12 as a center, the radius being slightly greater than the distance between the corner 12 and the upper point of the vertical face 43.

Customarily, the box blank is folded into finished or partially finished form by the operation of a machine (not shown) having a plunger urging against the bottom panel 11 and forcing the blank downwardly through a rectangular die throat bounded by suitably contoured and proportioned shoulders which cause the side and end panels to fold upwardly in predetermined order.

In the form of carton illustrated, for example, the end panels 56 and 58 are first folded upwardly, around the corresponding fold line 57 and 59, so as to assume a normal or upright attitude with respect to the bottom panel. Concurrently, but lagging slightly, the locking flaps 26 and 27 are folded about lines 28 and 29, respectively, to an attitude normal to the plane of the side panel 16, followed by a folding upwardly of the side panel 16 to an upright attitude, around the fold line 12, so that the locking flaps 26 and 27 assume the attitude shown most clearly for example in Figures 3 and 6 and are in a partially overlapping and face to face relation with the adjacent portion of the end flaps 56 and 58.

Immediately prior to the entry of the leading point 38 of the lock flap 26 through the first slot 51, suitable mechanism (not shown) urges outwardly from the panel 56 a vertical band 61 defined by the bounding slits 51 and 52. The band 61 comprises a central portion 62, an upper root portion 63, and a lower root portion 64, the root portions adjoining the band to the material of the panel 56. As the band 61 is urged outwardly by the mechanism, the band is slightly deformed; but, owing to the resiliency of the band, particularly the root portions 63 and 64, there is a constant tendency for the band 61 to be pulled backwardly into the corresponding

recess 66 opened as the band is urged outwardly, the recess 66 being shown most clearly in Figure 9. The band 61 is deformed outwardly an amount sufficient for the leading point 38 of the lock flap 26 to enter and pass through a narrow, vertically elongated slot 71 defined on one side by the inner wall 72 of the band 61 and on the other side by the plane 73 of the outer wall surface 74 of the end panel 56. As folding proceeds, the tongue 32 of the locking flap is urged through the opening or slot 71 between the band 61 and the adjacent wall 74 of the end panel 56 and assumes the intermediate attitude shown most clearly in Figures 4 and 7. The face 43 of the locking tab 36 has, in the meantime, passed beyond the first slot 51 adjacent the upper root portion 63 thereof and, upon further motion, also clears with a slight degree of clearance the uppermost portion of the slit 52 so as to assume the upright position shown in Figures 5 and 8.

As can be seen most clearly in Figures 1, 6, 7 and 8 the opposite ends 81 and 82 of the end panels are beveled or chamfered slightly so that when the end panels 16 and 17 are in upright position the edges 81 and 82 incline or slope upwardly and slightly inwardly from the fold line 12 and thereby permit the side panel 16, for example, to be overfolded by a slight degree. The slight relief provided by the chamfering of the edges 81 and 82 enables the machine folding the box to overfold the side panels by a degree sufficient to enable the vertical locking face 43 to move somewhat beyond or past the second slit 52 even though the dies which cut the blanks have become slightly worn or its dimensions have been improperly executed.

Then, as soon as the folded box leaves the die throat the natural or inherent resiliency in the paper causes the side panel 16 to spring outwardly again so that full locking action can take place.

Locking is effected by reason of the abutment between the vertical edge face 43 of the lock tab 36 and the adjacent face or edge 87 of the band 61, as appears most clearly in Figures 5 and 9. The central portion of the band 61 is displaced from the plane 74 of the adjacent wall of the end panel 56 by an amount substantially equal to the thickness of the flap material, and as appears most clearly in Figure 9. However the uppermost or root portion 63 of the band 61 merges with the end panel 56 and thus coincides or is coincident with the plane 74 of the end panel wall. It therefore follows that in an intermediate portion of the band, between the uppermost portion of the root 63 and the central portion 61 there is an area designated 87 of the band edge which projects outwardly or is offset from the plane 74 of the wall by an amount less than the thickness of the lock tab material. Consequently, the vertical edge 43 of the lock tab is in interference or abutment with such intermediate portion 87 and is disposed in face to face relation therewith, as appears in Figure 9. The flap consequently is prevented from withdrawing backwardly through the slit 52.

It can therefore be seen that whereas the locking tab 36 is able to wedge or cam its way through the opening 71 behind the band 61 when proceeding in a locking direction, the band being initially opened by suitable elements (not shown) on the carton locking machinery, the inherent resiliency of the material causes a slight closure of the opening 71 adjacent the root portion 63 as soon as the tab point 42 is clear. The band root portion 63, in other words, has considerable beam strength, which is at first overcome by the wedging action of the tab point 42 but which acts to close the gap 71 somewhat once the tab face 43 moves beyond the edge 87. The slight closure is adequate to prevent a return of the locking flap to an open position.

While the locking elements heretofore described are

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highly effective under ordinary conditions of use, it sometimes happens that after the box is loaded with material and the box has been subjected to unusual shocks or vibrations the tab locking face 43 slips into the gap 71 and assumes the position shown approximately in Figures 4 and 7. In this event, it has been found that the vertical face 43 of the locking tab under inward urgency of the strong upper root portion 63 of the band causes the tip or point 42 of the locking tab to be urged or deformed inwardly so that the vertical face 43 of the locking tab abuts the edge face 91 of the recess boundary, as appears most clearly in Figure 9. Consequently, even though on the rare occasions when the first lock is dislodged the tendency in the vast majority of the cases is for the lock to become again lodged, this time against the second vertical face confronting it. This feature lends a highly useful safety lock aspect to the blank.

The deep score 39, or groove, not only places a slight outward set to the tab 36 but gives the tab a springiness which causes the tab, and thus the locking face 43 of the tab, to spring outwardly slightly as soon as the tab clears the second slit 52 during the folding and locking step. Abutment between the face 43 and the area 87 on the side of the band 61 is thus even more positively obtained.

It can therefore be seen that the box blank of the invention provides not only a lock mechanism which does not require the locking flap to enter to a location inside the box itself and thus interfere with or rupture a liner, and which, furthermore, does not interfere with any products packed within the box, but it also provides a lock which is doubly secure in its locking operation, is foldable and lockable by relatively uncomplicated machinery, and is positive even when the blank cutting die is not held to close tolerance.

What is claimed is:

1. A box blank comprising a sheet of box stock, means forming fold lines on said sheet positioned to define a rectangular bottom panel, a rectangular side panel con-

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nected to said bottom panel along one of said fold lines, a substantially rectangular end panel having an end and being connected to said bottom panel along another of said fold lines, a flap connected to the end of said side panel along a flap fold line which is substantially an extension of said other fold line, said flap having a contour narrowing outwardly from said flap fold line to form a tongue, means forming an outstanding tab on the narrowing contour of said tongue with a straight edge on said tab parallel to said tab fold line and spaced from said tab fold line a predetermined distance, means on said end panel defining a first slit substantially normal to said other fold line and having a length only slightly more than the distance across said tab parallel to said tab fold line at a location in said narrowing contour of said tab spaced from said tab fold line about as far as said first slit is spaced from said adjacent end of said end panel, and means on said end panel defining a second slit substantially normal to said other fold line and having a length only slightly more than the distance across said tab parallel to said tab fold line at a location in line with said straight edge.

2. A box blank as in claim 1 in which said second slit is shorter than said first slit.

3. A box blank as in claim 1 in which said first slit and said second slit define between them a band of lesser width than the distance between said straight edge and said flap fold line.

4. A box blank as in claim 1 in which said straight edge of said outstanding tab is isolated from the remainder of said tongue by a scoring substantially parallel to said narrowing contour of said flap.

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