United States Patent

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[54] **INTERLOCKS FOR FOLDING BOX PANELS**
10 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **229/35,** 229/32, 229/39
[51] **Int. Cl.** **B65d 5/26,** B65d 5/30
[50] **Field of Search** 229/31, 32, 33, 34, 35, 36

[56] **References Cited**

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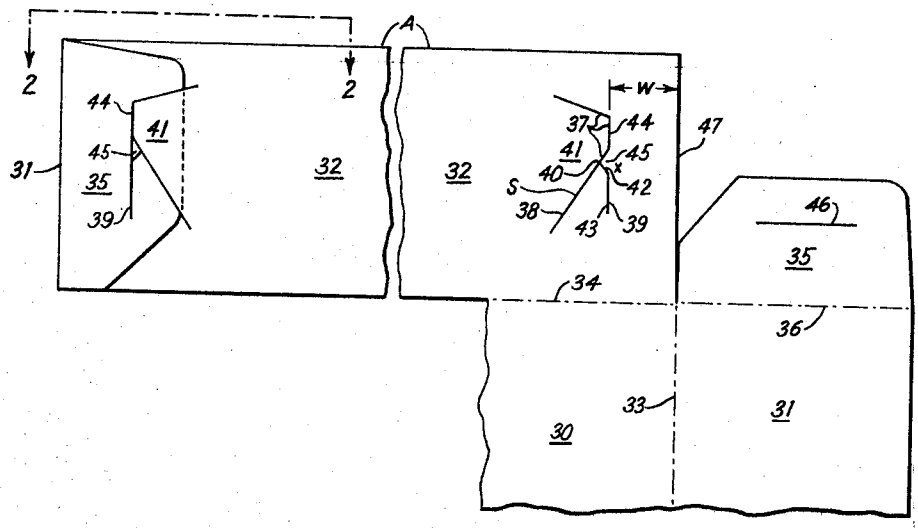
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ABSTRACT: A glueless interlock is provided in which two arms of a three-armed star cut in one box panel define an insertion slot outlining an internal tongue which points towards the box corner, under which tongue a second panel or flap is insertable. The second panel or flap has an internal engagement slot in it, one portion of which, in fully inserted position, coincides with, and engages, a portion of the insertion slot and another portion of which coincides with, and engages, the third arm of the star cut. The third arm is of curved or angular outline adjacent the star center and forms at the that point a lock tab or tip which, when snapped past an edge of the engagement slot, maintains the coinciding edges in load-bearing engagement.



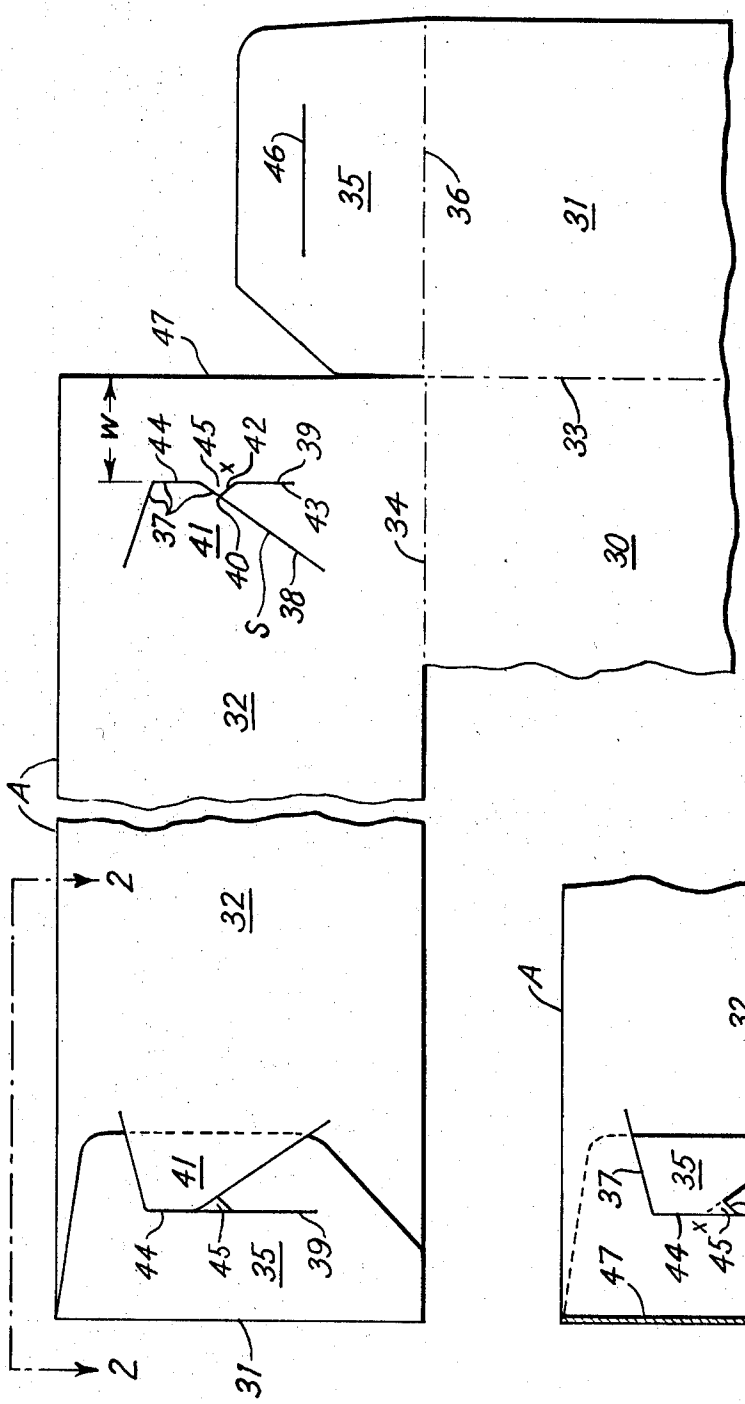


Fig. 1

Fig. 2

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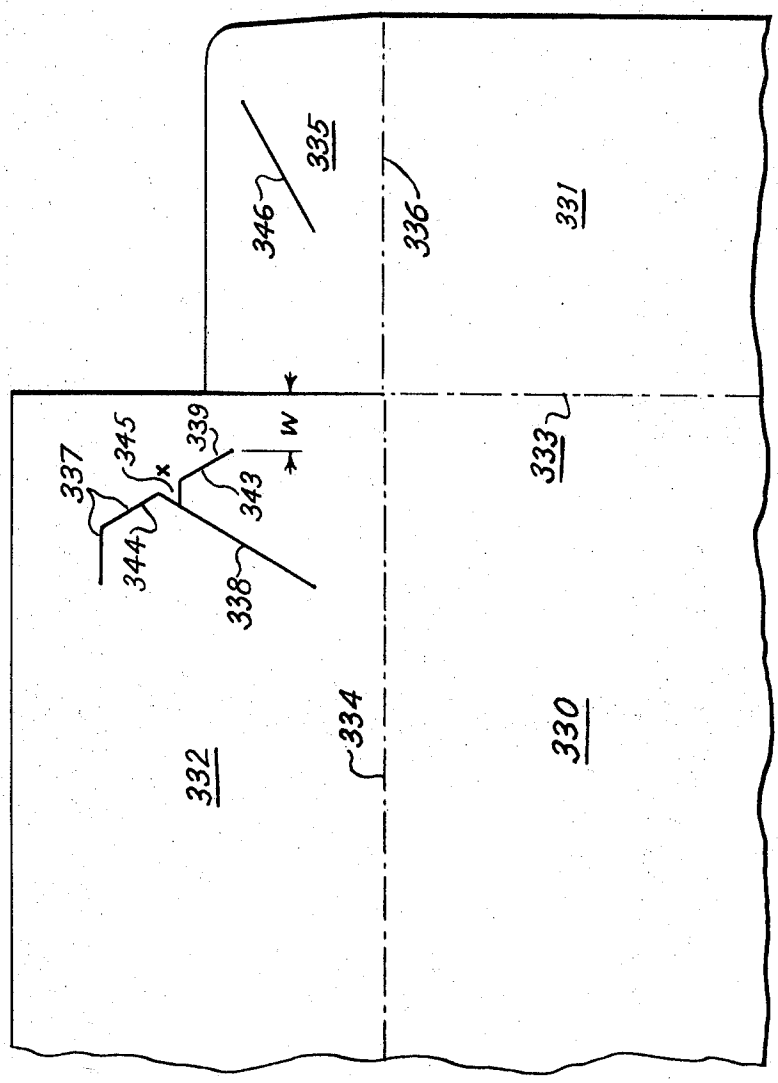


Fig. 3

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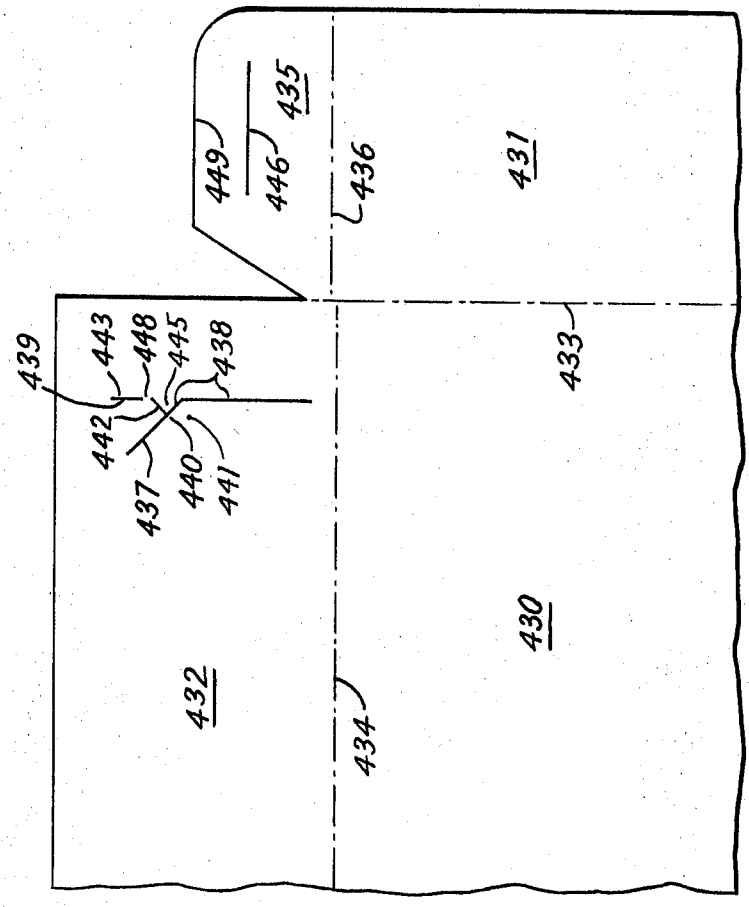


Fig. 4

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INTERLOCKS FOR FOLDING BOX PANELS

The present invention provides an improvement of the general style of folding box panel interlock disclosed and claimed in my earlier copending application Ser. No. 749,647, filed Aug. 2, 1968, now U.S. Pat. No. 3,481,525 and characterized mainly by the provision of a three-armed star cut in one box panel, two arms of which define an insertion slot outlining an internal tongue under which a second panel or flap is insertable.

The second panel or flap has an internal engagement slot in it which, in fully inserted position, coincides with portions of the star cut. A tab or tip at the star center serves as a safety catch for the coinciding and engaging edges, once the tab or tip is snapped past an edge of the engagement slot from a position overlying one surface of the second panel or flap into a position overlying the opposite surface.

There is presently a tendency in the packaging industry to package increasingly heavier merchandise in boxes of lighter caliper or in boxes of a lower grade of paperboard, such as laminated newsboard. It was observed that under unfavorable conditions a corner lock may fail as a result of distortion of the panels under load in such a manner as to pull the safety tip back past the edge of the engagement slot. This, in turn, involves sever bending of the tip, consequent delamination and a loss of its stiffness.

A related, unfavorable condition exists if one of the arms of the star cut is disposed substantially normal to the vertical edge of the wall panel at the box corner, as in such a case low grade board may tear in continuation of the arm if subjected to extraordinary forces.

For example, the corner lock is subjected to extraordinary forces if an open hinge-cover box loaded with hardware is picked up by grasping the box by an end panel. In such a case the entire weight of the contents acts on a single corner lock with unfavorable leverage and subjects the lock to stresses under which the board may tear or distort.

The present improvement eliminates weakness of the wall panel by maintaining the wall area adjacent the box corner free from slots or cuts directs toward the vertical box panel edge at the corner.

The engagement slot and the coinciding portions of the star cut may be made essentially straight-linear, and may extend parallel to the box corner.

Such disposition of interengaging slots is known per se from a lock design of the prior art which, however, does not comprise a deflectable tongue for the insertion of the second panel or flap thereunder.

The present improvements further eliminate the danger of the safety catch tip being pulled back out of its locking position by placing it so that the load-bearing engagement of the star cut with the engagement slot represents a line-to-line engagement on either side of the tab in an arrangement in which the load-bearing engagement to one side of the safety catch is with arms of the star cut which define the deflectable tongue, and, on the other side of the safety catch, with the third arm of the star cut which forms a continuation, as regards direction, of the engaging star cut arm on the one side of the catch.

Another feature of the present improvement is that the engagement cut in the corner lock flap may be straight-linear or only slightly curved, in distinction from angular shape, and that the load-bearing engagement of the interengaging edges of the star cut and of the engagement slot sustains the load at right angles or nearly at right angles to the direction of the force exerted by the box contents on the box end wall.

The lock is engaged by insertion of the corner flap into the insertion slot, and its safety catch may be set by pressing the lock tab past the edge of the engagement slot, as in the lock forms disclosed in my prior application. This is an operation which may be carried out during travel of the box-forming plunger through the die and need not await the arrival of the box at the end of the plunger stroke. This permits high production rates.

The objects, features and advantages of this invention will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, preferred and representative embodiments of the invention, it being understood that in view of the widely varying shapes of folding boxes and of specific packaging requirements no one particular form can be called the preferred embodiment.

The invention also resides in new and original construction and combination of elements and configurations herein set forth and claimed.

Although the characteristic features of this 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 description taken in connection with the drawings forming a part of the disclosure.

Certain of the FIGS. will be referred to as combination of elevation box end views and blank plan views. These FIGS. show a lock-up box corner at the left in elevation and show the blank portion for the right box corner at the right. This blank portion is shown in plan view and appears as if a portion of the box bottom and of the box side panel had been torn from the finished box and laid flat.

FIG. 1 is a combination of an elevational box end and blank plan view;

FIG. 2 is an elevational view of the left corner lock, as viewed from the box inside, bottom and end wall being shown in section taken on line 2–2 in FIG. 1;

FIG. 3 is a plan view of a blank corner portion incorporating a corner lock of modified configuration; and

FIG. 4 shows a modification of the lock shown in FIG. 1.

In the following description and in the claims various details will be identified by specific names for convenience. The names, however, are intended to be primarily descriptive and generic in their application. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

Corresponding elements of modified locks are given three digit reference numbers, the first digit being identical with the number of the FIG. Thus an element numbered 38 would in a modification shown in FIG. 3 have the number 338.

The drawings accompanying, and forming part of, this specification disclose certain specific details of construction for the purpose of explanation of broader aspects of invention, but it should be understood that structural details may be modified without departure from the principles of the invention and that the invention maybe incorporated in other structural forms than shown.

Referring to FIGS. 1 and 2, the folding box A comprises a bottom panel 30 to which end panels 31 and side panels 32 are articulated along end and side fold lines 33 and 34, respectively. Corner flaps or lock flaps 35 are articulated to the end panel 31 along corner fold lines 36.

Adjacent each corner the wall panel 32 has an internally disposed star cut S in it whose three arms 37, 38 and 39 meet at a common point 40 termed the star center.

Two arms of the star cut, more particularly arms 37 and 38 define an internal tongue 41 pointed towards the adjacent box corner.

The third arm 39 of the star cut is of curved or angular configuration and comprises a near portion 42 adjacent the star center 40, which near portion extends at an angle to the bordering edge of the tongue 41. The third arm further comprises a terminal portion 43 which is remote from the star center and extends in a direction substantially in continuation of a portion 44 of the arm 37 of the star cut S.

The angular disposition of the arms 38, 37 and 39, more particularly section 42 of the latter, results in the formation of a tab 45 which, as will hereinafter appear, serves as a lock tab or safety catch for the corner lock.

The tab 45 points away from the corner or, in other words, in the direction of insertion of a corner lock flap later to be described.

The precise configuration of the tab 45 is not important, it may be angular, as shown, or rounded. Its tip lies at the star center 40.

The corner flap 35 comprises an internal engagement slot of such configuration that, in the condition of full insertion of the flap 35 into the insertion slot 37, 38 or, in other words, under the tongue 41, one section of the engagement slot 46 lies in coincidence with a portion of the star cut arm 37 which forms the insertion slot 37, 38 and that another section of the engagement slot 46 lies in coincidence with the third arm 39 of the star cut, more particularly the terminal portion 43.

The assembly and interlock of the box corner proceeds in a basically known manner which involves the erection of the wall panels 31, 32 with respect to the bottom panel 30 and the insertion of the corner flap 35 into the insertion slot 37, 38. Preferably, although not necessarily, the end of the panel 32 lies in substantial continuation of the fold line 33 so that its edge 47 abuts the end panel 31 adjacent the corner fold line 36.

In the inserted end position the engagement slot 46 is in substantial coincidence with portion 44 of the insertion slot 37 above the lock tab 45 and with the terminal portion 43 of the arm 39 of the star cut S.

A force applied at the X mark adjacent the tab 45 from the inside of the box causes the tab to snap past the edge of slot 46 from a position overlying the inside surface of the flap 35 into a position overlying the outside surface of the flap. The left portion of FIG. 1 shows the tab 45 in the position in which it acts as a safety catch for the lock whose load bearing portions are the edges of slot 46 and slots 44, 39. These edges lie in edge-to-edge engagement for substantial lengths.

It will be noted that a zone of a width W adjacent the terminal edge of the panel 32 is entirely free from cuts or slots. It is for this reason of substantial strength and may be made relatively narrow, if desired.

In the modification shown in FIG. 3 the engagement slot 346 is aimed at the corner point defined by the intersection of fold lines 334 and 333. The portions of the star cut with which edges of the engagement slot 346 interengage are correspondingly inclined to the vertical.

Forces exerted by the box content on the erected end wall are sustained, as they were in the lock form of FIG. 1, by interengaging cut edges to either side of the lock tab 345 and there is no twisting or warping of the board which would tend to pull the tab out of its safety catch position once the tab is snapped past the edge of slot 346. As a result of the inclination, the width W is somewhat reduced as compared to FIG. 1 in which slot portions 44 and 39 are perpendicular to the bottom side fold line 34.

Manifestly the engagement slot 46 or 346 may be slightly curved rather than straight-linear without changes of any essential functions.

In the modification shown in FIG. 4 the third arm 439 of the star cut extends upwardly towards the top of the box rather than towards the box bottom.

Two arms of the star cut, 437 and 438, define an insertion tongue 441. The arm 438 is angled and a portion thereof would extend substantially parallel to the corner fold line 436, if the corner were assembled.

The arm 439 of the star cut is interrupted at 448 to leave a weak severable bridge between the board to the right of the arm 439 and a downwardly extending tongue bordered by cuts 437 and 439.

The purpose of this bridge is to prevent the leading edge 449 of the flap 435 from striking the tongue at the edge formed by the cut 439.

The bridge is ruptured when the lock tab 445 is snapped into safety-catch position.

The terminal portion 443 of the third arm 439 represents substantially a continuation of the vertical portion of the arm 438.

I claim:

1. An interlock for two corner-forming wall panels of a folding box of paperboard, one of the wall panels having a flap articulated to it along a corner fold line, said flap being foldable over, and insertable into an insertion slot in the other wall panel, the insertion slot being formed by two arms of a three-armed star cut, said two arms being so disposed as to define a tongue in said other wall pointing in a direction opposite to the direction of insertion, the third arm of the star being curved and comprising a near portion adjacent the star center, which near portion extends at an angle to the bordering edge of said tongue, said third arm further comprising a terminal portion remote from the star center, which terminal portion extends in a direction substantially in continuation of one of the said two arms of the star cut, said flap comprising an internal engagement cut, one section of which, in fully inserted position of the flap, coincides with said terminal portion of the said third arm and another section of which coincides with said one of the two arms with respect to which said remote portion forms a continuation, said angular near portion defining a lock tab at the star center pointing in the direction of insertion, which lock tab may be snapped past one of the edges of said engagement cut from a position overlying one surface of the flap to a position overlying the opposite surface of the flap, in which latter position the engagement cut is in coincidence with said terminal portion and with said one of the two arms.

2. An interlock according to claim 1 in which the engagement slot is substantially straight-linear.

3. An interlock according to claim 1 in which the engagement slot extends substantially parallel to said corner fold line.

4. An interlock according to claim 1 in which the star cut comprises a first arm substantially parallel to the corner fold line, considering the corner in assembled condition, a second arm extending from said first arm downwardly towards the box bottom and away from the corner, and a third arm extending from the star center which lies on said second arm, said third arm representing substantially a continuation of the said first arm, and in which the first arm comprises an angled terminal portion extending in a direction away from the corner.

5. An interlock according to claim 1 in which the star cut comprises a first arm, at least a portion of which extends substantially parallel to the corner fold line, considering the corner is assembled condition, a second arm extending from said first arm upwardly towards the top of the box and away from the corner, and a third arm extending from the star center, the said terminal portion of the third arm representing substantially a continuation of said first arm portion.

6. An interlock according to claim 1 in which the star cut comprises a first arm, at least a portion of which extends substantially parallel to the corner fold line, considering the corner in assembled condition, a second arm extending from said first arm upwardly towards the top of the box and away from the corner, and a third arm extending from the star center, the said terminal portion of the third arm representing substantially a continuation of said first arm portion, the third arm being an interrupted cut forming a weak severable bridge of paperboard closely adjacent said lock tab, said bridge being adapted to be severed by the snapping of said tab past said one of the edges of said engagement cut as recited in claim 1.

7. In a folding box comprising a plurality of interconnected panels forming walls of the box, at least one pair of said panels being interconnected by means of an extension of one of a pair of panels, which extension is inserted into a curved insertion slot in the other panel of said pair to an inserted end position, the curved insertion slot defining a tongue pointing in the direction substantially opposite to the direction of insertion, there being an engagement slot in said extension, which engagement slot is in coincidence with a certain section of said insertion slot in the condition of full insertion, a further section of the insertion slot being out of coincidence with the engagement slot, the improvement comprising a further slot in the said other panel communicating with said insertion slot and extending in a general direction to represent a lineal continuation of said certain section, at least a portion of said

further slot being in coincidence with said engagement slot except for a tab defining section adjacent the point of junction of the further slot with the insertion slot, said tab pointing in the direction of insertion and being adapted to be snapped from a position overlying one face of said extension, past the edge of said engagement slot, into a position overlying the opposite face of said extension.

8. A folding box construction as defined in claim **7** in which the engagement slot is a substantially straight line.

9. A folding box construction as defined in claim **7** in which said pair of panels forms a corner, in which the engagement slot is substantially straight-linear and in which said further slot forms a substantially straight line continuation, beyond said tab, of said certain portion of the insertion slot;

10. A folding box construction as defined in claim **7** in which:

a. said pair of panels forms a corner, in which;

b. said extension is a flap articulated to said one panel along a corner fold line and in which; and

c. said engagement slot is substantially parallel to said corner fold line.