Feb. 17, 1959 A. JOHNSON ET AL 2,873,655

CARTON LOCKING MECHANISM

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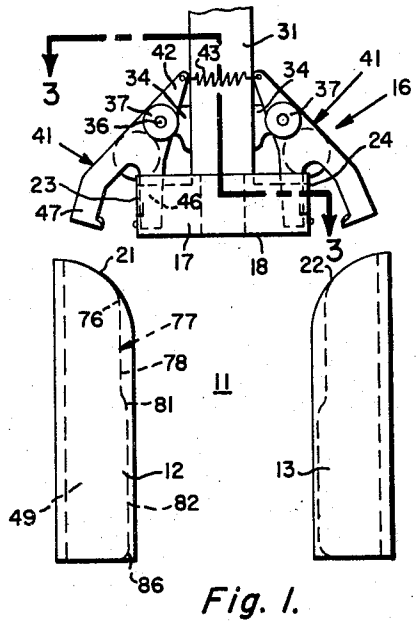


Fig. 1.

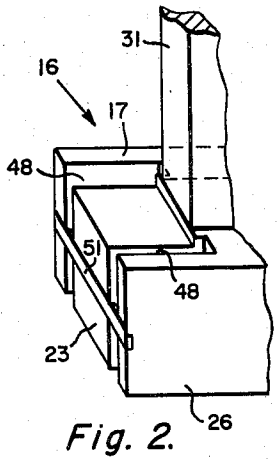


Fig. 2.

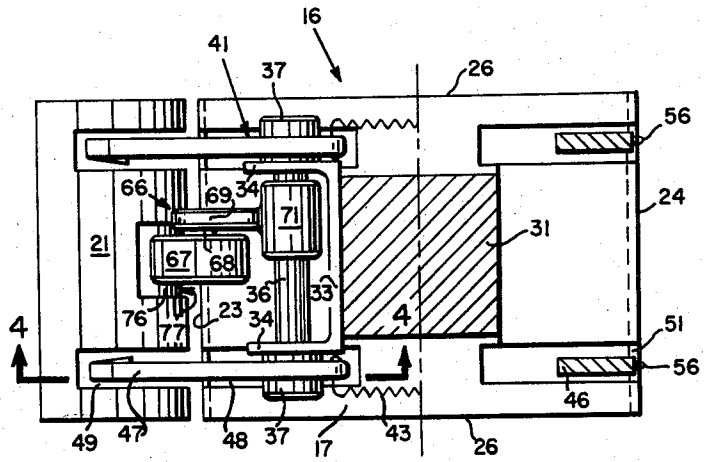


Fig. 3.

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CARTON LOCKING MECHANISM

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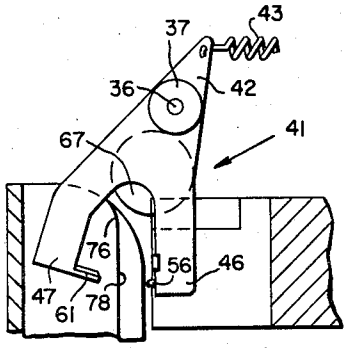


Fig. 4.

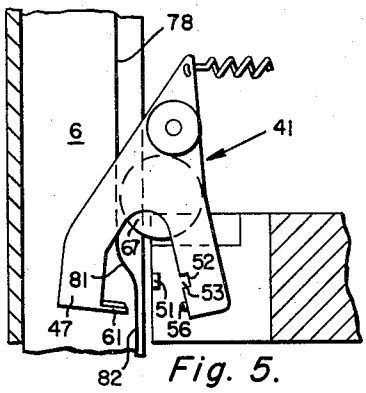


Fig. 5.

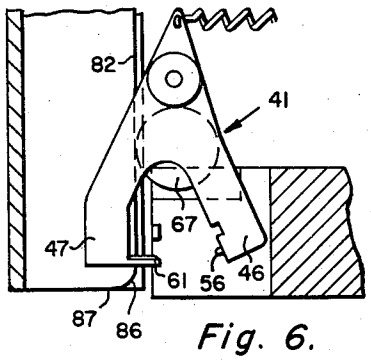


Fig. 6.

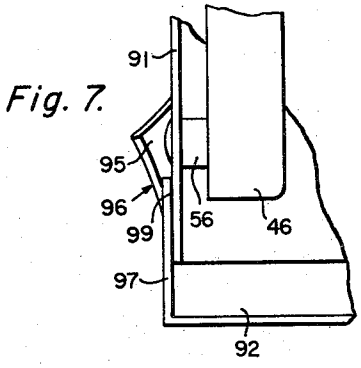


Fig. 7.

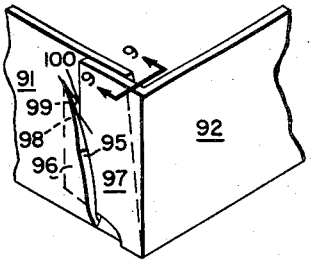


Fig. 8.

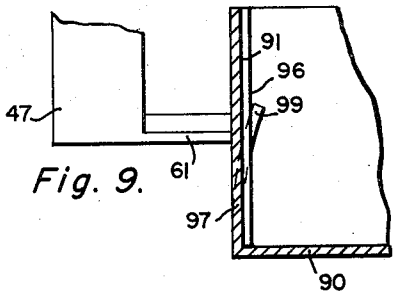


Fig. 9.

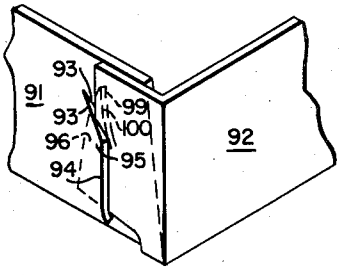


Fig. 10.

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CARTON LOCKING MECHANISM

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Application December 13, 1956, Serial No. 628,190

6 Claims. (Cl. 93—51)

The invention relates to an improvement in machines for folding and locking carton blanks in finished form.

Vast numbers of cartons and trays are daily erected by machines fed with carton blanks provided adjacent each corner with a tongue shaped slot into which is urged an appropriately configured locking flap. Interior fingers are commonly provided in such machines, the fingers pulling inwardly in the flaps and thus effecting locking. Often, however, the deformation given the flaps by the fingers causes the flaps to project inwardly into the carton or tray in an excessive amount and to interfere with the contents packaged therein.

It is therefore an object of the invention to provide a carton locking machine in which the locking flaps are substantially in face to face relation with the adjacent carton wall.

It is another object of the invention to provide a machine in which the flaps are pushed inwardly by the exertion of force on the adjacent carton tongue.

It is yet another object of the invention to provide a machine which is relatively inexpensive to manufacture.

It is a further object of the invention to provide a machine which is durable and has but few moving parts to get out of order.

It is a still further object of the invention to provide a machine which not only opens the carton tongue but which, at an appropriate point in the folding and locking cycle, closes the tongue by imposition of external force thereon.

It is another object of the invention to provide a generally improved carton locking machine.

Other objects, together with the foregoing, are attained in the embodiment described in the following description and shown in the accompanying drawings in which:

Figure 1 is a side elevation of the plunger and die side walls, showing the rockable lever arms in extreme outer location.

Figure 2 is a perspective of the left hand portion of the plunger, the lever arms being removed more clearly to illustrate the plunger construction.

Figure 3 is a section of the locking mechanism, the plane of section being indicated by the line 3—3 in Figure 1.

Figure 4 is a section, the plane of section being indicated by the line 4—4 in Figure 3.

Figure 5 is a view comparable to that of Figure 4 but with the lever displaced angularly inwardly to approximately its mid-position.

Figure 6 is a view comparable to that of Figure 4 but with the lever at its extreme inward position.

Figure 7 is an end view, to an enlarged scale, of the tongue opening button, showing the tongue opened to receive the locking flap.

Figure 8 is a perspective of a corner of a carton with the flap disposed behind the tongue preparatory to being urged inwardly.

Figure 9 is a section of the carton along the plane indicated by the line 9—9 in Figure 8, and showing the disposition to an exaggerated degree of the carton locking members after being urged inwardly by the toe or kicker bar.

Figure 10 is a perspective of a corner of the carton, showing to an exaggerated degree, the disposition of the carton locking flap.

While the carton locking mechanism of our invention is susceptible of numerous physical embodiments depending on the types of cartons or trays to be used, on the environment and on the conditions of use, a substantial number of the herein shown and described devices have been made and sold, and have performed in an outstandingly successful manner.

Movable through a die, generally designated by the numeral 11, including a left hand side wall 12 and a right hand side wall 13, as appears most clearly in Figure 1, is a plunger 16.

The plunger 16 includes, in conventional fashion, a head 17, or block, having a planar bottom surface 18 adapted to engage with the bottom panel of a foldable carton blank (not shown) and to urge the blank downwardly and into engagement with appropriately configured die shoulders, for example left hand shoulder 21 and right hand shoulder 22. The contoured die shoulders effect folding of the carton walls into vertical attitude and shoulders 21 and 22, in particular, cause the carton side walls to fold upwardly into face to face relation with the corresponding side surfaces 23 and 24 of the plunger head 17. Similarly, a pair of contoured die end shoulders (not shown) effects folding of the carton end walls into face to face relation with the corresponding pair of end surfaces 26 of the plunger head. Movement of the plunger head is effected by a plunger rod 31 which is caused to reciprocate at suitable velocity and intervals, and with a force appropriate to the type of carton being erected.

Mounted on the opposite side surfaces of the plunger rod 31 is a pair of brackets 33, each bracket having a pair of outwardly projecting bracket arms 34 having journalled therein a shaft 36 provided at each end with a suitable bushing member 37 adapted to hold the shaft 36 in proper end-wise relation with respect to the bracket arms 34.

Secured adjacent each end of the shaft and rockable therewith is a lever arm, generally characterized by the reference numeral 41. The lever arms assume the shape, roughly, of an inverted Y. Since each of the lever arms on each shaft are in mirror symmetry, and, since the mechanism on each side of the plunger is identical, a description of but one lever arm will serve equally to describe the other, and a description of the mechanism on the left hand side of the plunger will also serve to describe the mechanism on the right hand side thereof.

The lever arm 41 includes a shank portion 42 at the upper end of which is secured resilient means, such as a tension spring 43, likewise affixed to the adjacent lever arm of the mechanism on the opposite side of the plunger. The lower end of the lever arm is thereby urged in an outermost direction, the shaft pivot being located at a position intermediate the spring connection and the lower end of the lever arm.

The bifurcated lower end of the inverted Y-shaped lever arm includes an innermost member 46, termed a finger, and an outermost member 47, called a leg. The finger 46 is adapted to rock inwardly and outwardly in a suitable proportioned recess 48 in the plunger head 17, while the leg 47 moves, in corresponding fashion, in an appropriately dimensioned slot 49 in the die side walls. As can be seen by especial reference to Figures 1–6, the finger 46 although being urged in an outward direction by the spring 43 is prevented from moving outwardly beyond the plane of the plunger side wall 23 owing to the provision of a limit stop bar 51 set in to the outer side

face of the plunger as shown most clearly in Figure 2. The rear or inner wall 52 of a cut out portion 53 in the finger abuts the bar 51 and limits and positions the lever arm, and thus the leg 47, in one extreme location, namely, the outermost location. When in such outermost location the only portion of the finger 46 which projects outwardly beyond the plunger side wall 23 is a button 56 mounted adjacent the lower end of the finger, the button serving, in a fashion later to be described, to open the tongue on the carton side wall and to direct the carton locking flap into proper locking relation.

Adjacent the lower end of the leg 47 and extending inwardly therefrom in a direction generally toward the button 56 is a toe 61, or kicker plate, slightly canted or tilted, as appears most clearly in Figure 9, so as to assume approximately the same angle as the slope of the upper cut of the carton tongue.

From the outermost location shown, for example, in Figure 4 the lever arm 41 is rocked inwardly to a middle or intermediate angular attitude. Rocking is effected by a cam mechanism, generally designated 66, and comprising a roller cam 67 mounted on an anti-friction bearing shaft 68 affixed to a bracket 69 which, in turn, projects outwardly from a hub 71 mounted on the cross-shaft 36.

With particular reference to Figures 3–6 it can be seen that as the plunger is depressed the roller cam 67 approaches and thence engages an arcuately contoured upper cam ramp 76 provided on the die side wall 12, the cam ramp 76 forming the upper portion of a vertically elongated cam track 77. As the plunger continues to move downwardly the upper cam ramp 76 urges or cams the roller 67 inwardly until the vertical track portion 78 is reached. The cam thereupon dwells on the portion 78, the lever arm 41 assuming the intermediate attitude shown in Figure 5, until a middle cam ramp 81 is reached.

As the roller 67 reaches the middle cam ramp 81 and is urged farther inwardly thereby, the lever arm 41, and the attendant finger 46 and leg 47, are urged inwardly so as to assume the innermost position shown in Figure 6. The roller dwells on a lower run portion 82 as the plunger continues to move downwardly, the lever arm 41 continuing in innermost location, until the roller 67 arrives at the lower cam ramp 86. At this juncture the spring urged roller, and attendant lever arm 41, move outwardly so that the lever arm assumes the intermediate position shown in Figure 5. Concurrently, and as the roller 67 reaches the end 87 of the lower cam ramp 86 the plunger stroke is reversed and the plunger head is returned to the starting position shown approximately in Figure 1 and thereby completing the cycle.

While the locking mechanism of the invention is usable with a considerable number of different kinds of cartons and trays (cartons without tops) it has been found that paper box blanks provided with interengaging tongues and locking flaps are erected with great precision, neatness, speed and security. Commonly, a box of this style comprises a bottom panel 90, a side panel 91 and an end panel 92, each foldably hinged to the bottom panel 90. Adjacent the end of the side panel 91 is a compound cut including an inclined or slanted portion 93 and a vertical portion 94, the intersection of the cuts forming a tip 95 and the cuts generally outlining a tongue 96. Foldably hinged to the end panel 92 is a locking flap 97 provided with a forwardly extending portion 98 terminating in a locking tab 99, the upper edge 100 of the tab 99 being cut or inclined at substantially the same angle as the tongue cut 93.

The operation of the carton locking mechanism of the invention in conjunction with the above described blank will now be given.

With the die and plunger elements in the starting position shown in Figure 1 a carton blank is placed, either manually or automatically, on the top of the die shoulders and underlying the plunger. The plunger is thereupon

depressed, the die side shoulder 21 causing the carton side panel 91 to fold upwardly into vertical attitude and into face to face relation with the plunger side wall 23. The button 56 on the lever arm finger 46 extends outwardly beyond the plane of the plunger side wall 23 and is so located behind the tip 95 of the carton tongue 96 that the tongue is deflected into an outward and open position, as appears most clearly in Figure 7, the extent of opening being somewhat exaggerated for clarity.

The tongue opening operation is shortly followed by the movement of the locking flap 97 toward the tongue aperture, upwardly folding of the end panel 92 simultaneously taking place. Shortly after the locking tab 99 enters the opening and is guided into proper location by the rounded end of the button 56, the lever arm 41 is caused to assume its intermediate position, shown in Figure 5, the roller 67 having been acted upon by the upper cam ramp 76 and deflected inwardly to the cam run 78.

Retraction of the button 56 having been effected, the natural resiliency of the tongue 96 tends to urge the locking tab 99 inwardly so that the upper edge 100 of the tab 99 is in edge to edge relation with the overlying edge of the tongue slanted cut portion 93. At this juncture, the carton locking elements are in approximately the positions shown in Figure 8. While this edge to edge relation provides a degree of locking, a more positive locking is brought about by deforming inwardly the tab 99 a distance slightly in excess of the thickness of the side panel 91 and to approximately the attitude shown in Figure 9.

Deformation of the tab 99 in this fashion is effected by pushing inwardly on the portion of the tongue 96 which is in face to face adjacency with the locking tab 99. As the cam roller 67 is deflected inwardly by the middle cam ramp 81 and the kicker plate, or toe 61, on the leg 47 is correspondingly urged inwardly, the inner end of the toe 61 kicks rather sharply against the upper portion of the tongue, as appears in Figure 9, and snapping the tab 99 inwardly as a result of the tongue's pushing inwardly on the tab 99.

The throw of the lever arm is so adjusted, by proper dimensioning of the cam track that, while the tab 99 is deformed inwardly to a secure locking attitude, it is not overbent or deformed to such an extent that the tab unduly interferes with packaging of the contents.

Upon the roller's reaching the bottom cam ramp 86, the lever arm is spring-urged to middle position in which neither the toe nor the button extends into the plane of the box side walls. The box is therefore free to drop off the bottom of the plunger, stripping being assisted by impingement of the upper edges of the box end panels against the adjacent lower ends of the die end walls (not shown) as the plunger commences to retract upwardly. The upper edges, in other words, spring slightly outwardly, owing to their natural resiliency, as the plunger head clears the bottom of the die. Then, as the plunger again moves upwardly the upper edges strike the die lower ends and the carton is stripped from the plunger.

It can therefore be seen that the carton locking mechanism of the invention provides an economical, durable and quick device for converting a carton blank into a securely formed and locked carton.

What is claimed is:

1. A carton erecting and locking machine comprising a die, plunger movable through said die and separated therefrom by a clearance space of predetermined width, said die and said plunger having formed therein in facing relation a slot and a recess, respectively, a leg rockably mounted on said plunger and extending into said slot, a finger rockably mounted on said plunger and extending into said recess, and means for rocking said leg and said finger in dependence upon the location of said plunger in said die between a first position wherein said finger extends into said clearance space and a second

position wherein said leg extends into said clearance space.

2. A carton converting machine comprising a die, a plunger movable through said die, a lever arm rockably mounted on said plunger, said lever arm including a bifurcated lower portion comprising a first member adapted to swing toward and away from said die within a recess in said plunger, and a second member joined to said first member and adapted to swing toward and away from said plunger within a slot in said die, and means for rocking said first member and said second member in dependence upon the location of said plunger in said die.

3. A carton converting machine comprising a die and a plunger vertically movable through said die, said die including a side wall having a vertical slot therein, a vertical cam track mounted on said side wall, said plunger including a rocker shaft pivotally mounted on said plunger adjacent said side wall to rock about a horizontal axis, a roller cam mounted on said shaft and engageable with said cam track, a lever arm mounted on said shaft and rockable therewith, said lever arm including a leg translatable in said vertical slot, and a toe on the bottom of said leg and rockable therewith between a location within said slot and a position in a recess in said plunger, said lever arm further including a finger swingable in said recess, and a button on the bottom of said finger and swingable with said finger between a first position exterior of said plunger and a second position within said recess, and a stop bar mounted on said plunger adapted to limit the swing of said finger toward said die at a predetermined location.

4. A machine for folding and locking a paper carton blank having a tongue and a locking tab substantially coincident with said tongue in folded carton position, said machine comprising a die, a plunger movable through said die, a first member rockably mounted on said plunger and movable toward and away from said die in dependence upon the location of said plunger in said die, and a second member rockably mounted on said plunger and movable toward and away from said plunger in dependence upon the location of said plunger in said die, said first member and said second member being movable in a common plane.

5. In a carton blank folding and locking machine having a die and a plunger movable through said die, the combination of a cam track mounted on said die, and a rocker arm pivotally mounted on said plunger and rockable in dependence upon the location of said plunger in said die, said rocker arm including a cam in engagement with said cam track, said rocker arm further including a finger having a button at one end thereof adapted to urge toward said die a tongue portion cut in a wall of a paper carton blank folded about said plunger, and a leg having a toe at one end thereof adapted to urge toward said plunger a tongue portion of a folded paper carton blank, said toe and said button each facing toward the other.

6. A carton folding and locking mechanism for use in folding and locking a carton blank having a tongue cut in a side panel and a flap adapted to be inserted behind a tongue in locking engagement with a carton side panel, said mechanism comprising a die wall, a plunger movable past said die wall, an inverted Y-shaped member rockably mounted on said plunger, said inverted Y-shaped member including a finger member depending in a recess in said plunger, said finger member including a projection extending outwardly from said plunger in uppermost position of said plunger, said inverted Y-shaped member also including a leg depending in a slot in said die wall, said leg including a toe extending toward said finger projection, and means for consecutively rocking said inverted Y-shaped member as said plunger descends from said uppermost position to a first intermediate position wherein said toe and said finger projection are totally within said slot and said recess, respectively, to a second intermediate position wherein said toe projects exteriorly of the plane of said die wall, to a lowermost position wherein said toe and said finger projection are totally within said slot and said recess, respectively, said finger and said leg being movable in a common plane perpendicular to said die wall and passing through a carton tongue and a carton flap folded into face to face relation.

References Cited in the file of this patent

UNITED STATES PATENTS

2,416,748	Gnoerk	Mar. 4, 1947
2,580,189	Pagendarm	Dec. 25, 1951
2,741,957	Haas	Apr. 17, 1956