

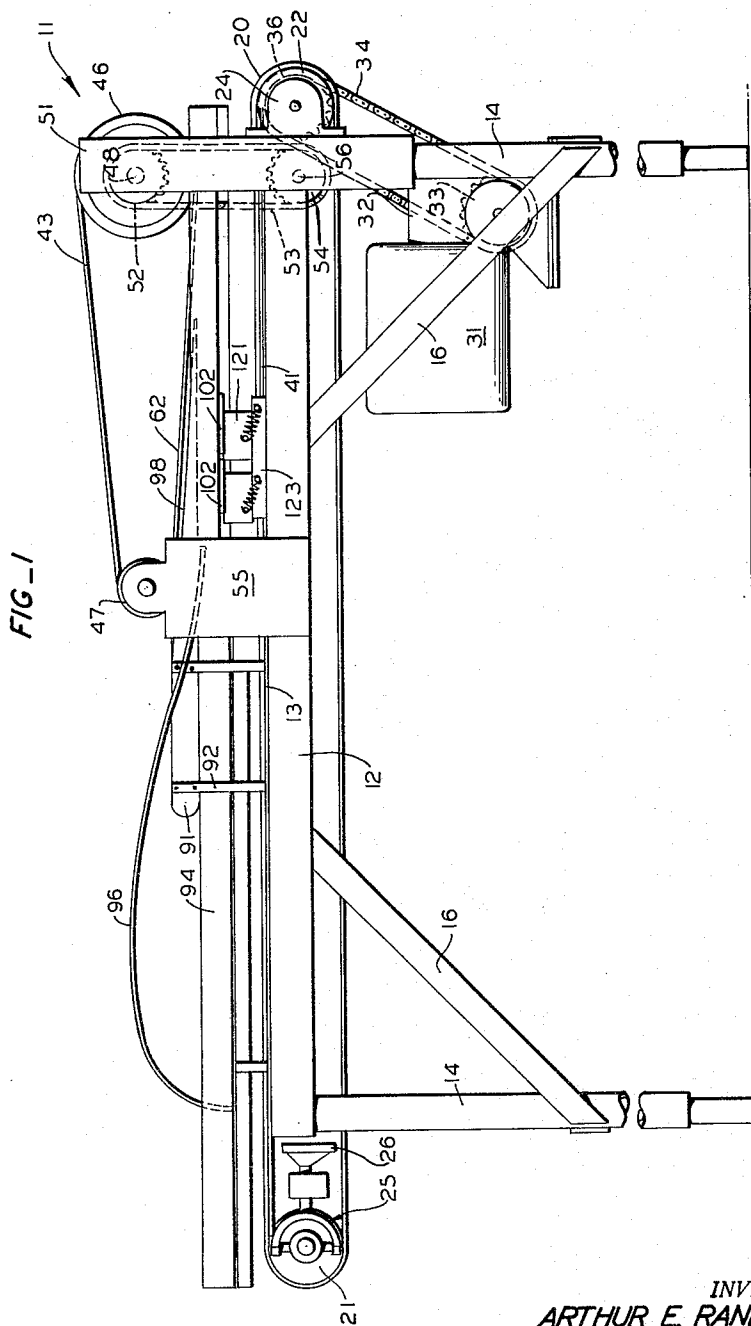
Sept. 5, 1961

A. E. RANGLES, JR
EGG CARTON CLOSING MACHINE

2,998,688

Filed Sept. 11, 1958

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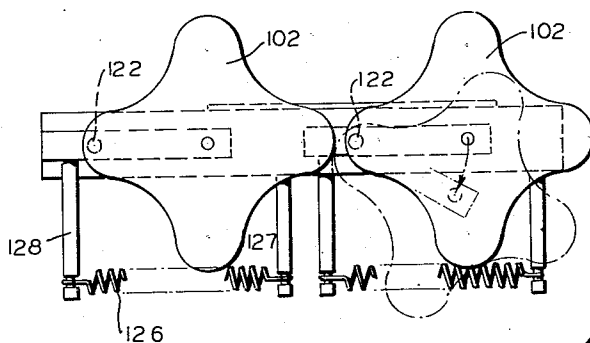
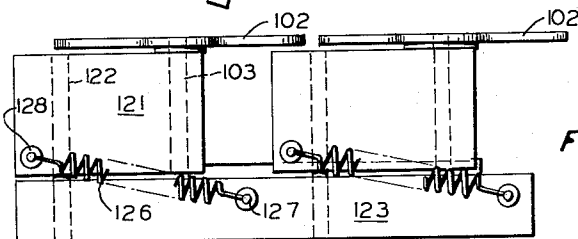
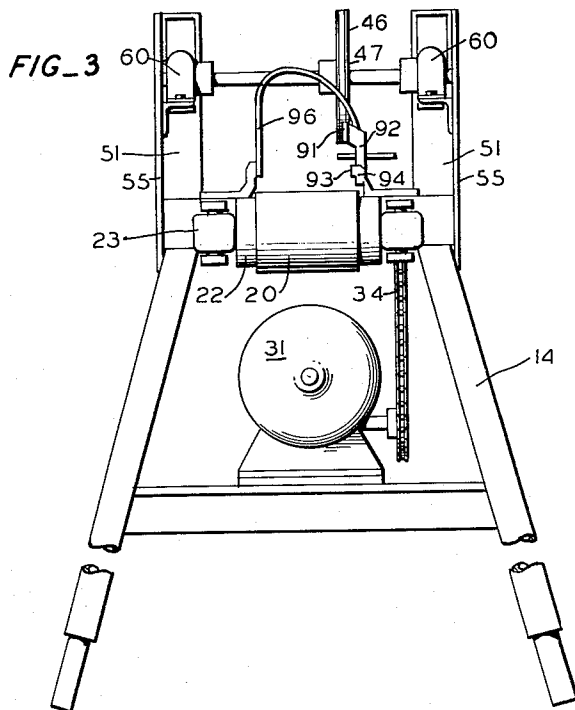


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4 Sheets-Sheet 3



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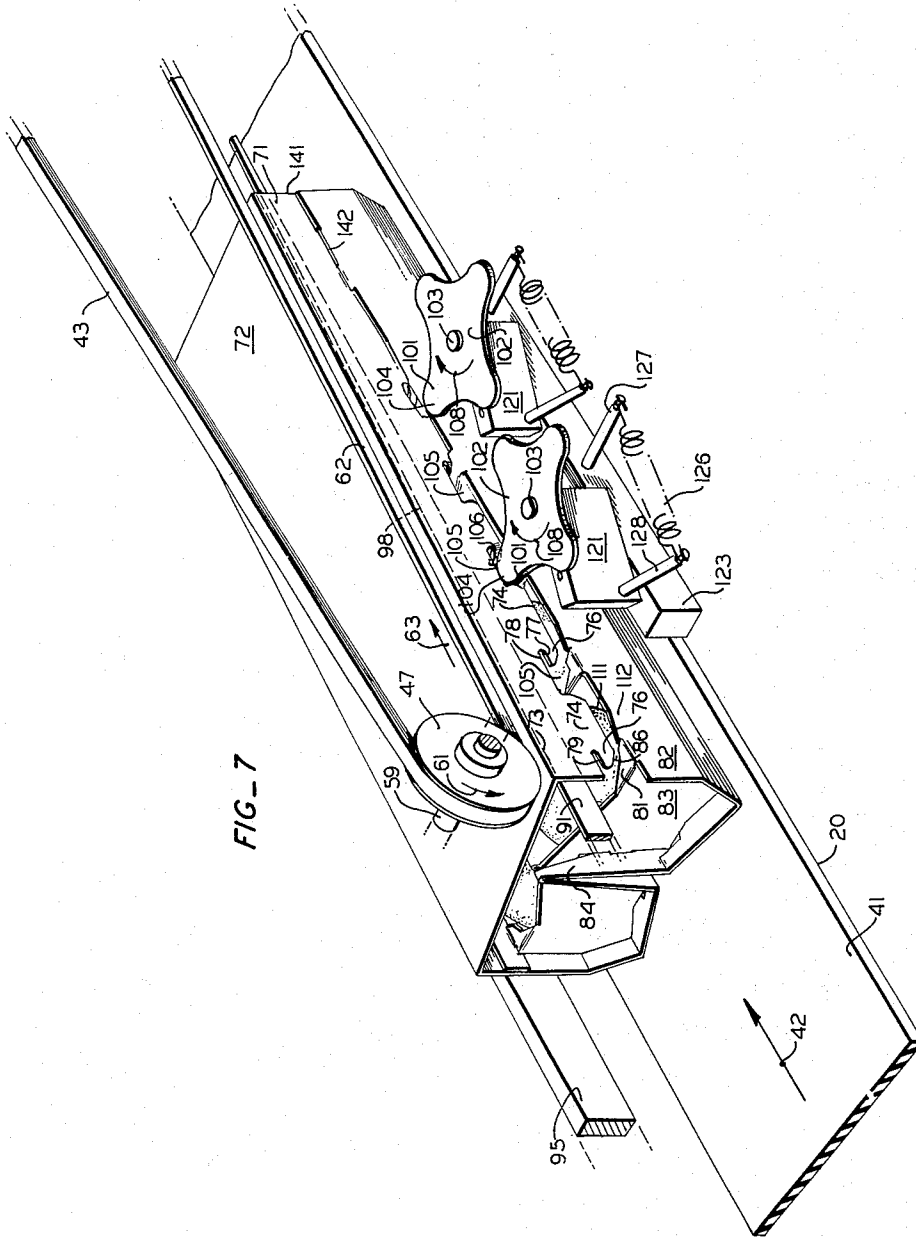
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EGG CARTON CLOSING MACHINE

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4 Sheets-Sheet 4



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EGG CARTON CLOSING MACHINE
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1 Claim. (Cl. 53-376)

The invention relates to carton closing machines and, more particularly, to an improved machine for closing and locking the cover of a carton having eggs packaged therein.

Egg carton closing machines have long been known and used. Such machines frequently include a conveyor belt and a roll-over or cover-closing bar adapted to urge the conventional locking tabs on the cover into locking engagement with the corresponding locking gussets adjacent the upper margin of the carton side wall as the carton is moved along by the conveyor belt.

While such machines have operated in a generally satisfactory manner, occasional misalignment of the carton elements or dimensional inaccuracies of the interlocking members result in jamming, and consequent improper or inadequate closure. On other occasions, the presence of oversize eggs leads to interference between the interengaging members and even to the breakage of such eggs and a resulting need for re-packaging.

It is therefore an object of the invention to provide an egg carton closing machine which effects a maximum of fully interlocked closures.

It is another object of the invention to provide an egg carton closer which is extremely reliable in operation.

It is still another object of the invention to provide a carton closer which is relatively inexpensive to construct but which produces a high yield of carton closures.

It is yet another object of the invention to provide an egg carton closer which reduces egg breakage to a minimum.

It is a further object of the invention to provide a carton closer which has but relatively few moving parts and which, therefore, is durable and requires but a minimum of down-time for upkeep and repairs.

It is another object of the invention to provide a generally improved egg carton closing 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 egg carton closing machine of the invention;

FIGURE 2 is a plan;

FIGURE 3 is an end view from the left-hand end of the device shown in FIGURE 1;

FIGURE 4 is a side view, to an enlarged scale, of the lock tab tucking mechanism;

FIGURE 5 is a plan of the tucking mechanism shown in FIGURE 4;

FIGURE 6 is a fragmentary section, to an enlarged scale, of the tucking mechanism illustrating its mode of operation on an egg carton, the plane of section being indicated by the line 6-6 in FIGURE 2; and

FIGURE 7 is a fragmentary perspective showing the structure and mode of operation of the tucking mechanism and its cooperation with the conveyor belt, friction belt and support bar in effecting progressive, full interlocking closure of the carton cover.

While the egg carton closing machine of the invention is susceptible of numerous physical embodiments, depending on the environment and requirements of use, substantial numbers of the herein shown and described embodiments have been made and used in closing many hundreds of thousands of cartons and all have performed in an eminently satisfactory manner.

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The egg carton closer, generally designated by the numeral 11, in common with many presently used machines, comprises an elongated table 12 provided with a horizontal planar top 13 supported by a plurality of legs 14 and braces 16.

Substantially bisecting the table longitudinally is an endless conveyor belt 20 reaved at opposite ends of the table about a dead or idler roller 21 and a live roller 22, the rollers being suitably journaled in a pair of bearings 23 and 24, respectively, mounted adjacent the opposite ends of the table 12. A belt tensioning mechanism, generally designated by the numeral 25, including a handwheel 26 and a threaded stem 27 adapted to urge the journal bearing either in a tension-producing or tension-reducing direction, serves to effect the desired degree of tension on the conveyor belt 20.

Belt motion is obtained by rotating the right-hand or live roller 22, as appears most clearly in FIGURES 1 and 2, rotation being effected by an electric motor 31 acting through a speed reducing unit 32, a drive gear 33, a chain 34 and a sprocket gear 36 mounted coaxially on the live roller 22. The direction of rotation is such that the upper run 41 of the conveyor belt 20 travels in a right-hand direction, when viewed in FIGURES 1, 2 and 7, and indicated by the arrow 42 in FIGURES 2 and 7.

In addition to the conveyor belt 20 there is provided a friction belt 43 reaved at one end about a drive pulley 46 and at the other end about a driven or idler pulley 47. The drive pulley 46 is mounted on a cross-shaft 48 appropriately journaled in a pair of bearings 49 mounted on a pair of vertical angles 51 secured to the table. The cross-shaft 48 is rotated by a sprocket 52 having reaved thereon a chain 53 driven by a sprocket 54 appropriately mounted on a transverse shaft 56 having coaxially secured thereto a spur gear 57 in meshing engagement with a spur gear 58 on the shaft of the live roller 22. The gear train elements are so arranged that the idler pulley 47, or sheave, which is mounted on a cross-shaft 59 journaled in a pair of bearings 60 on a pair of posts 55, is rotated in the counter-clockwise direction indicated by the arrow 61 in FIGURE 7, the lower run 62 of the friction belt 43 being thereby moved in the direction shown by the arrow 63 in FIGURE 7.

It will be noted, as appears most clearly in FIGURE 1, that the driven pulley 47 is smaller than the drive pulley 46 and is so located with respect thereto that the lower run 62 of the friction belt is inclined at a predetermined angle with respect to the horizontal upper run 41 of the conveyor belt 20, the right-hand end of the lower friction belt run 62 being closer to the conveyor belt than the left-hand end of the run 62, as appears most clearly in FIGURE 1.

The packaged egg carton 66, as shown most clearly in FIGURE 2, is introduced at the left-hand end of the machine. The carton itself is preferably of the kind shown in my copending application, Serial No. 659,044, filed May 14, 1957, now U.S. Patent No. 2,946,497, but the machine's use is not limited thereto. In the carton shown, the carton cover locking elements are comparable to those used in a wide variety of present-day cartons and include a locking flap 71 hingedly mounted on the carton cover 72, as shown most clearly in FIGURES 6 and 7, a score line 73 defining the hinge. Adjacent the lower margin of the locking flap is a plurality of spaced members 74 each having a left-hand extending projection 76, or tab. The upper edge 77 of each of the tabs is separated from the adjacent overlying edge 78 of the flap by a horizontal slot 79. Locking is effected by inserting each of the tabs 76 under the corresponding one of a plurality of triangular-shaped gussets 81, each of the gussets being hingedly attached to the outer side wall 82 of the carton

and to the adjacent one of the transverse partitions 83 which, in combination with a longitudinal rib 84, form the customary egg receiving compartments.

Each of the locking tabs 76 is provided with a lower inclined edge 86 which acts in the nature of a cam and which serves, to a degree, to deflect inwardly the tip of the tab as the tab is urged downwardly into engagement with the hypotenuse edge of the triangular gusset. The theory is that the tab is deflected resiliently inwardly until it clears the gusset and at this location it resiliently snaps back to underlie the gusset and thus is in locking relation therewith, the gusset extending into the slot 79. Unfortunately, in practice, dimensional inaccuracies and other causes occasionally prevent locking from taking place in this manner. I have therefore provided mechanism for effecting locking in a highly reliable manner.

The improved locking mechanism includes a longitudinally disposed cover support bar 91 mounted on a pair of upstanding brackets 92 secured to the table. The upper portions of the brackets 92 are off-set inwardly from the adjacent margin of the conveyor belt, as appears most clearly in FIGURES 2 and 3, and in fact serve to hold the support bar inwardly from the inner face 93 of the customary carton front guide wall 94. Thus, when the filled egg carton is introduced at the beginning or front end of the conveyor belt, as appears in FIGURE 2, and moves along so that its cover and its locking flap are progressively bent downwardly by the conventional roll-over or curling bar 96 in the direction indicated by the arrow 97 in FIGURE 6, the leading portion of the locking flap 71 is urged over the top of the support bar 91 and into the position shown most clearly, in full line, in FIGURE 6. As the carton continues to move, the roll-over bar 96 progressively urges the remaining portion of the lock flap 71 into the position appearing in FIGURE 6.

Cooperating with the front guide wall 94 is a back guide wall 95, the two guide walls carefully directing the carton in its advance through the cover closing station and the cover locking station.

As the leading portion of the carton assumes approximately the status shown in FIGURE 6, the upper surface of the carton cover is engaged by the lower run 62 of the friction belt 43 at a location adjacent the small pulley 47. Owing to the downward inclination of the belt run 62 as it proceeds in the direction 63 toward the end of the machine, the carton cover 72 is urged progressively downwardly, the locking tabs 76 being correspondingly urged downwardly toward the locking gussets 81.

The support bar 91, as appears most clearly in FIGURES 1 and 7, is tapered beginning approximately below the small pulley 47, with the upper tapered edge 98 of the support bar assuming substantially the same angle of inclination as the lower friction belt run 62. The interposed carton cover and the depending locking tabs are consequently smoothly and progressively urged downwardly toward the underlying gussets, as is indicated most clearly in FIGURE 7.

It has been found that for many environments and requirements of use, improved closure is effected by running the friction belt at a somewhat different relative speed from that of the conveyor belt. For example, by running the friction belt at a speed somewhat slower than the conveyor belt, a slight drag effect is exerted on the carton lid and producing in the case of some cartons a superior closure owing to the slight longitudinal backward displacement of the lid with respect to the gussets. In the case of other carton locks, a forward displacement is to be preferred, this being effected by running the friction belt at a somewhat greater speed than the conveyor belt.

In either event, as the carton moves from its lid closing station toward its locking station, and as the locking tabs 76 are progressively urged into close juxtaposition to the underlying gussets, the tabs are resiliently bent inwardly under urgency of a plurality of fingers 101, or

arms, projecting radially outwardly on a star wheel 102, there being provided a pair of such star wheels in tandem arrangement for maximum efficiency. Each of the star wheels 102 is mounted on a vertical pin 103 for free rotation about a vertical axis. The tips 104 of the fingers 101 are arcuately rounded and are so proportioned that as the carton is urged past the wheels, the tips project inwardly into the gaps 105 between the adjacent locking members 74 and bend slightly inwardly the locking tabs as at 106 in FIGURE 7.

Obviously, since the tips 104 project inwardly to fill the gaps 105, a kind of meshing occurs, as in the case of gear teeth, and the wheels are accordingly rotated in the direction indicated by the arrows 108 in FIGURE 7. The wheel fingers are so spaced, peripherally, as to fill, seriatim, the gaps 105 in the particular carton being closed.

It is especially important to note that the point of contact between the adjacent one of the eggs 111 and wall 82 of the carton is approximately at the location indicated by the numeral 112 in FIGURE 7, this location being displaced forwardly from the position of the corresponding locking tab. Thus, by bending inwardly the tab, as at 106, the curve of the tab follows rather closely the curvature of the adjacent egg wall, although spaced therefrom.

Consequently, for the great majority of eggs, the slight inward bend of the tab does not interfere with the egg but it does enable the tab to clear the gusset as the tab is progressively urged downwardly into fully closed position. Then, as the carton moves on and the wheel finger is disengaged, the tab resiliently returns to its original fore and aft alignment but underlies the gusset for full locking effect.

Occasionally an oversize egg is inserted in the carton, producing interference with the locking tab's being bent inwardly. Relief mechanism is therefore provided. As appears most clearly in FIGURES 4, 5 and 7, each of the wheel pins 103 is mounted in a block 121 pivotally mounted on a pin 122 secured to a base 123, or plate, affixed to the table. A tension spring 126 fastened at one end of a projection 127 from the base and at the other end to a rod 128 extending outwardly from the pivot block tends to urge the rotating wheel 102 inwardly toward the carton. Where interference occurs, however, the force exerted by the egg shell, acting through the tab 76, is sufficient to overcome the spring tension and to pivot the block about the pin 122 so that the wheel assumes the position shown in outline, to an exaggerated extent, in FIGURE 5. However, even though the wheel is rocked somewhat out of the way to accommodate to the occasional oversize egg, sufficient bending of the tab is obtained to effect full locking with the gusset. The spring tension is selected, furthermore, so that the shell of any egg is sufficiently strong to displace the wheel.

As previously mentioned, it has been found that a pair of wheels is much to be preferred over a single wheel even though the wheels are both self-registering; that is to say, are so proportioned with respect to the distance between the leading edge 141 of the carton locking flap 71 and the first or leading gap 142 as to register or position the wheels so as to effect meshing. While the right-hand one of the wheels in FIGURE 7 is not shown as being in meshing engagement, for purposes of clarity, it is to be realized that both of the wheels effect bending of the tabs and at the high speed at which the cartons are sent through the machine the twin effort of the two wheels assures a highly reliable operation.

It can therefore be seen that I have provided an extremely efficient machine capable of high speed operation and one which results in a minimum of product breakage.

What is claimed is:

A machine for closing and locking the cover of an egg carton having a locking flap provided with a plurality of depending coplanar members and formed with a plu-

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rality of spaced locking tabs interspersed between said members and adapted to engage with a corresponding plurality of spaced locking gussets, said machine comprising: a conveyor belt adapted to advance an egg carton; a closing bar adapted to fold over said cover and said locking flap; means for progressively urging said locking tabs downwardly toward the underlying corresponding ones of said gussets; a block pivotally mounted on a vertical axis at a location adjacent said conveyor belt; resilient means attached to said block for urging one portion of said block toward said conveyor belt; and a star wheel pivotally mounted on said one portion of said block for rotation about a vertical axis, said star

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wheel including a plurality of radially projecting arms angularly spaced to clear said members and successively to engage and tuck inwardly said locking tabs out of the plane of said depending coplanar members.

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