May 5, 1964 W. S. PEPPLER ETAL 3,131,524

AUTOMATIC CARTON CLOSING APPARATUS

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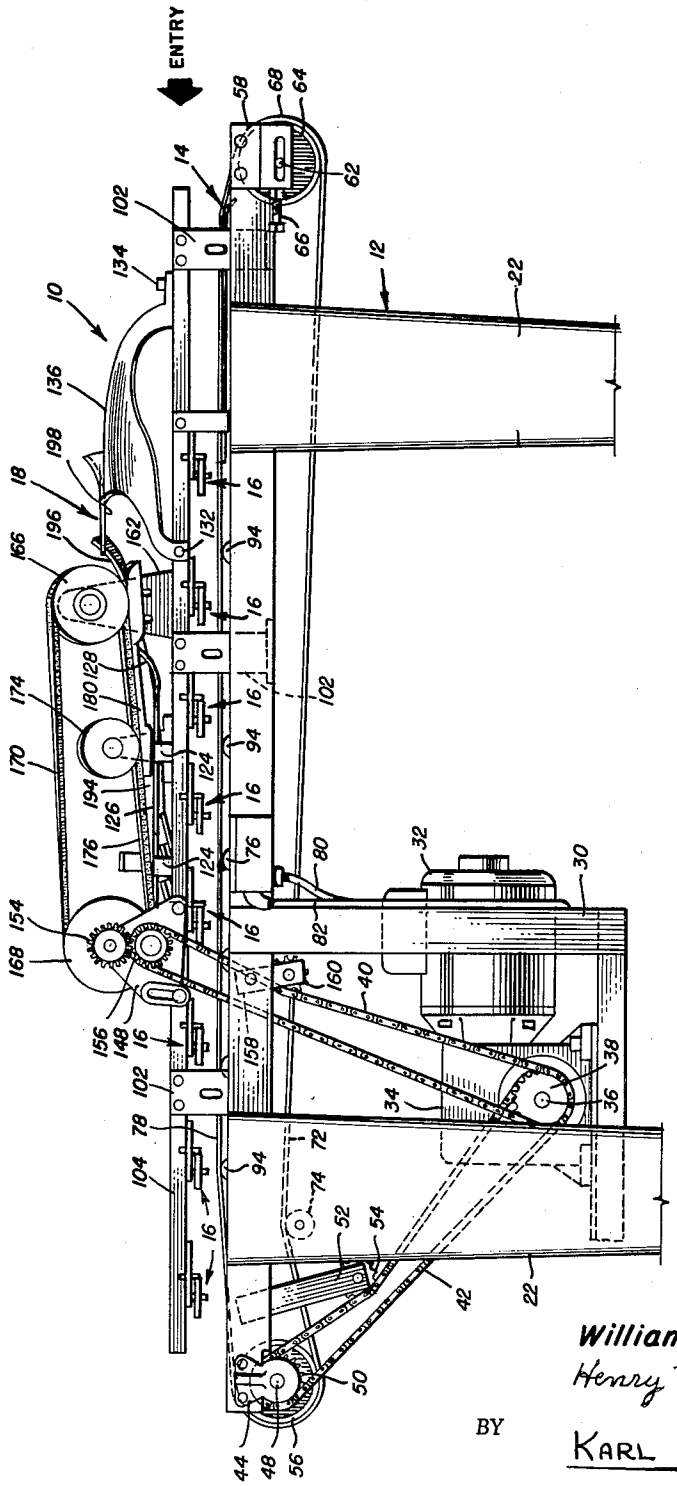


FIG. 1

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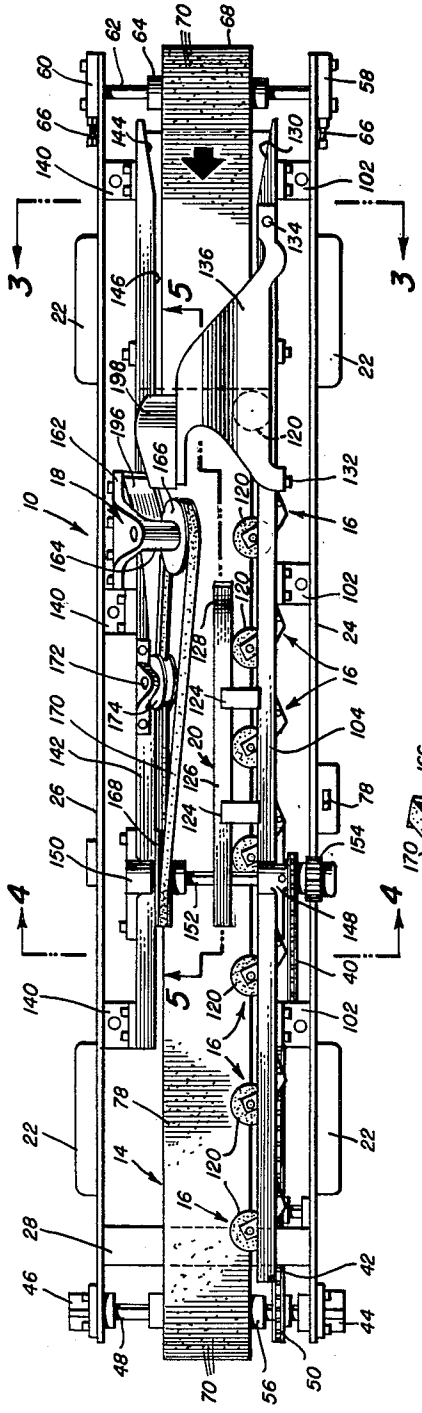


FIG. 2

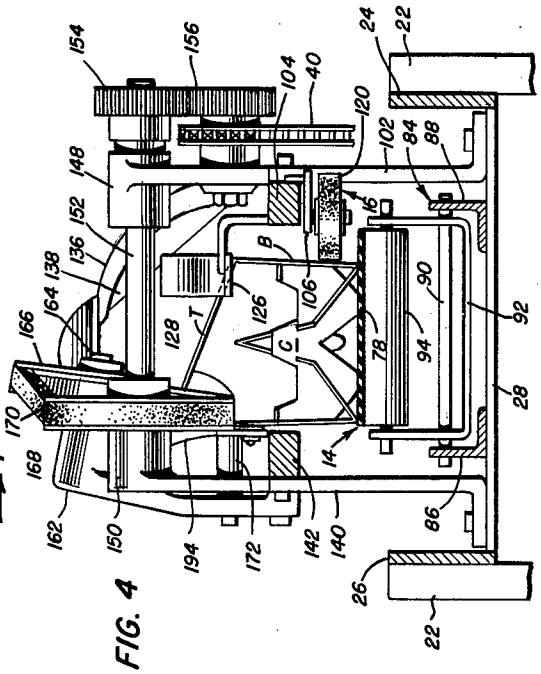


FIG. 4

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AUTOMATIC CARTON CLOSING APPARATUS

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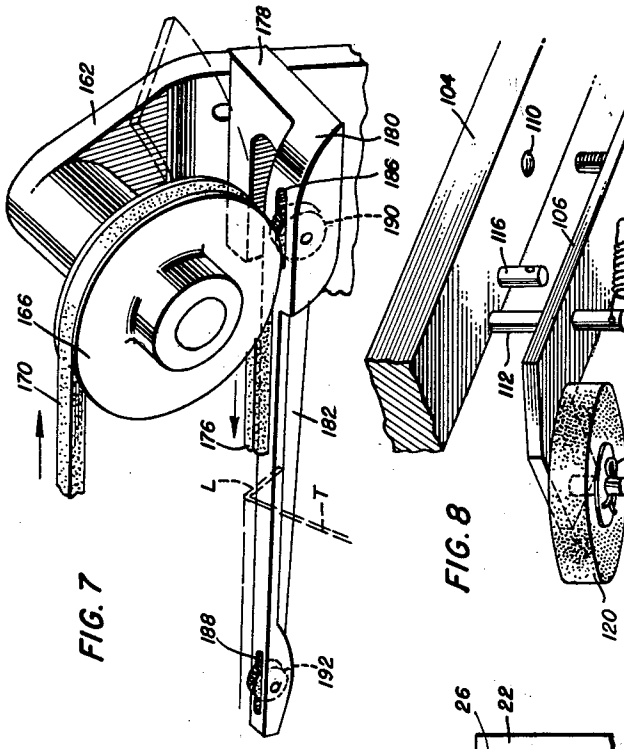


FIG. 7

FIG. 8

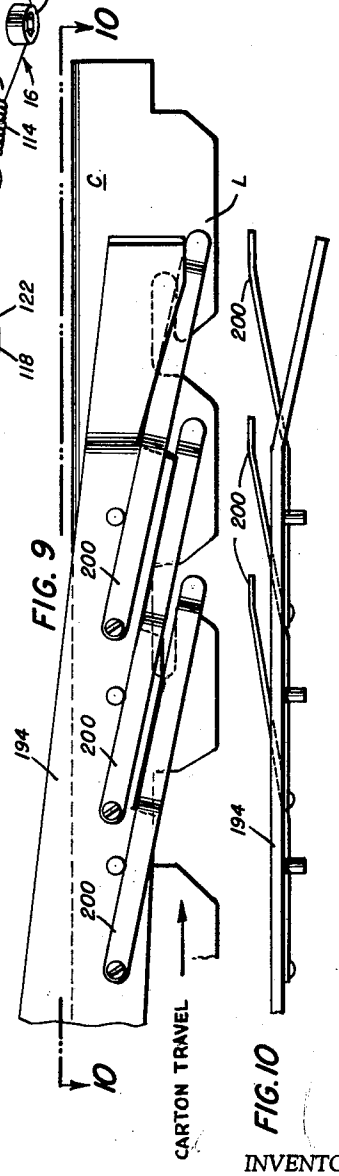


FIG. 9

FIG. 10

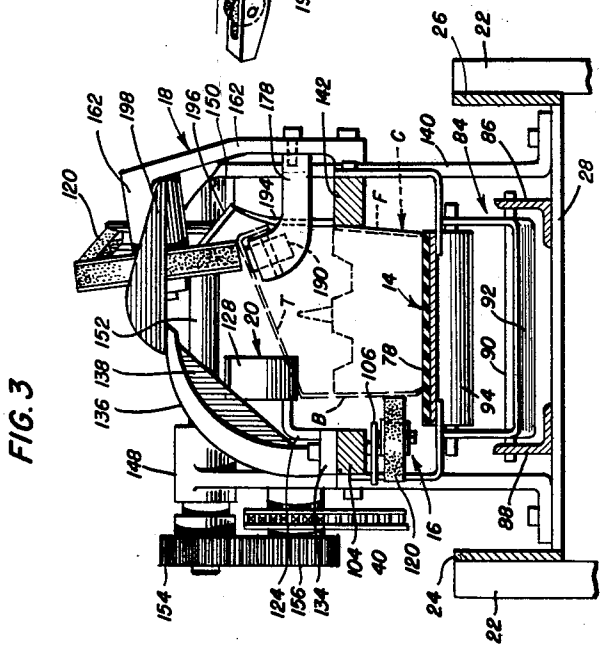


FIG. 3

CARTON TRAVEL

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AUTOMATIC CARTON CLOSING APPARATUS

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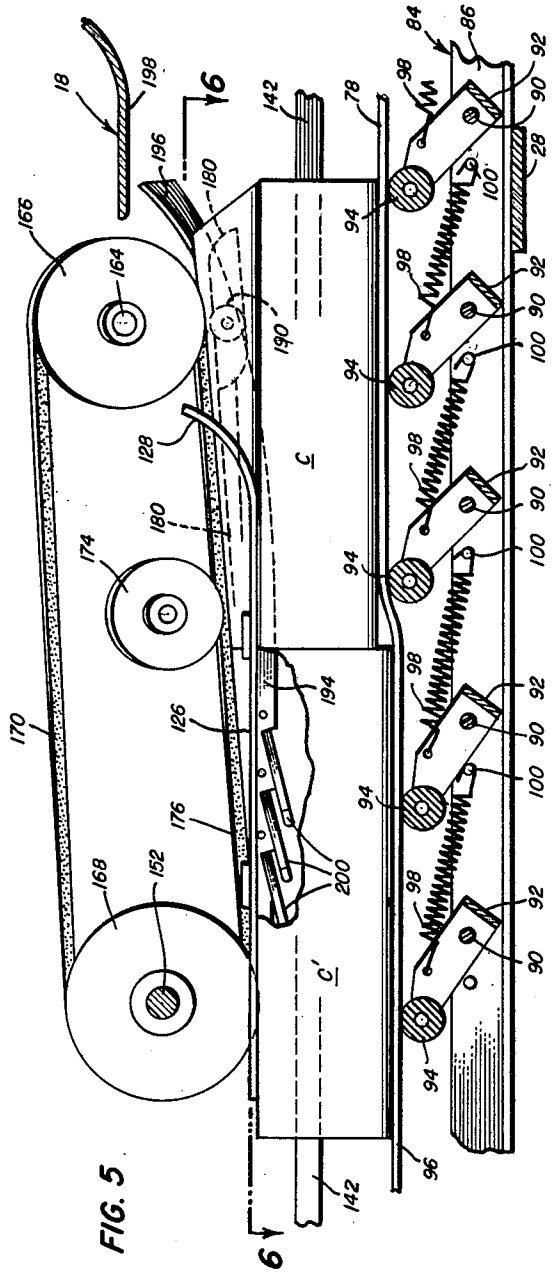


FIG. 5

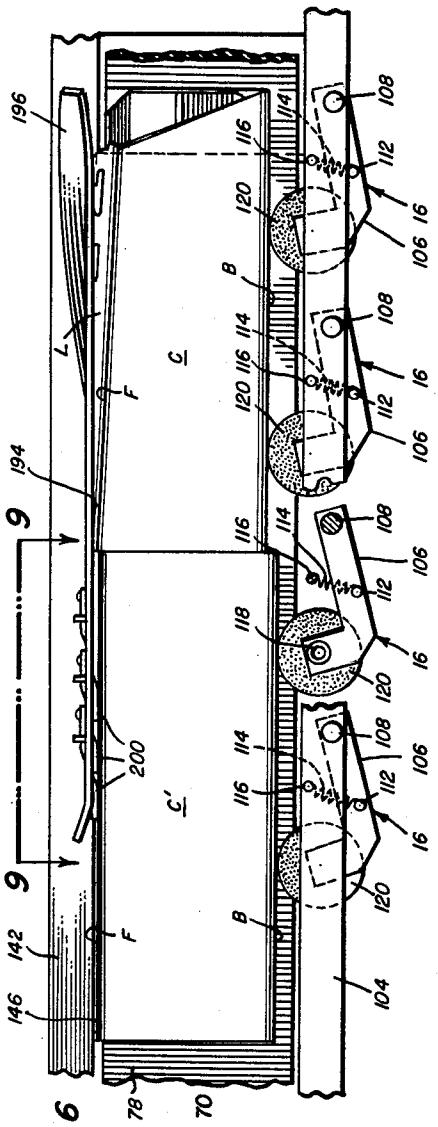


FIG. 6

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3,131,524

AUTOMATIC CARTON CLOSING APPARATUS

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6 Claims. (Cl. 53—376)

The present invention relates to an improved, high speed and continuously operating apparatus for automatically closing lids of conventional cartons, particularly those used for the packaging of eggs.

The type of apparatus involved is generally incorporated in "egg rooms" which are substantially mechanized, and where a considerable number of eggs are graded and packed. Most "egg rooms" have limited floor space and generally pack a number of different grades of eggs; for example, pullet, medium and jumbo sized. After the eggs have been graded and separated and packed in cartons depending upon their size or grade, it is necessary to close the lids of the cartons. There are considerable problems involved in closing the lids of the different cartons, especially those of the paperboard type, which vary in height, width and length.

The egg packing industry has, in the past, used apparatus for mechanically closing egg carton lids. However, due to the dimensional variations between "pullet," "regular," and "giant" sized cartons, it has generally been necessary to utilize three different pieces of apparatus adjusted to accommodate the three different sized egg cartons mentioned above. Not only is valuable floor space occupied by the use of duplicate machinery, but the cost of these duplicate pieces of equipment is economically undesirable.

A primary object of the present invention is to provide novel apparatus for mechanically and automatically closing carton lids wherein random sizes of the cartons, within a given range, will be automatically closed, and the apparatus will automatically compensate for size variations of the carton and the carton lids will always be presented at an optimum closing position with respect to the closing means of the apparatus.

A further object of the present invention is to provide novel carton lid-closing apparatus which eliminates the necessity for duplicate installations of the apparatus and provides means whereby random sized cartons may be automatically closed without previously sorting the cartons according to size.

In the accomplishment of the above described objects, a horizontal conveyor reach will convey cartons end-to-end through a longitudinal path of travel. Carton lid-closing means will extend along the conveyor reach and have a comparatively fixed position along and above the normal height of the conveyor reach. The carton will be urged laterally with respect to its path of travel toward the carton lid-closing means and the conveyor reach will be incrementally supported along its length to permit higher cartons to descend below the normal height of the conveyor reach and thus present the carton lid closure structure of the different dimensioned cartons at the same position with respect to the lid-closing means. The different sized cartons are engaged along the effective length of the carton closing means by orienting means which positions the upper portions of the different sized cartons at same relative position with respect to the carton lid-closing means whereby the lids on all of the cartons, regardless of size, will be closed as they pass through the apparatus.

Once the apparatus is operative, the different sized cartons are closed automatically without any repositioning of any of the apparatus components by an operator.

Packed cartons of eggs are fed onto the conveyor reach, regardless of the size of the cartons, and although the smallest and largest sized cartons may follow end-to-end, they will still be closed without any manual repositioning of the cooperating components of the apparatus.

The foregoing statements are indicative in a general way of the nature of the invention. Other advantages and more specific objects of the invention will be apparent to those skilled in the art from the following description of a preferred embodiment of the invention when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side elevation of the apparatus;

FIG. 2 is a top plan view of FIG. 1;

FIG. 3 is an enlarged vertical section taken substantially on the plane of line 3—3 of FIG. 2, looking into the end from which cartons enter the apparatus;

FIG. 4 is an enlarged vertical section taken substantially on the plane of line 4—4 of FIG. 2, looking into the end from which cartons leave the apparatus;

FIG. 5 is a vertical section taken substantially on the plane of line 5—5 of FIG. 2, showing details of the incremental support afforded by the upper conveyor reach and illustrating the manner in which two different height cartons are accommodated end-to-end in the apparatus, portions being broken away for purposes of clarity;

FIG. 6 is a horizontal section taken substantially on the plane of line 6—6 of FIG. 5, showing the manner in which two different width cartons are accommodated on the apparatus, portions being broken away for purposes of clarity;

FIG. 7 is a fragmentary, enlarged perspective view of one end of the carton lid-manipulating portion of the lid-closing means of the apparatus;

FIG. 8 is an enlarged, exploded, fragmentary perspective view looking below one of the support rails of the apparatus, showing details of the lateral biasing means for urging cartons toward the lid-closing means of the apparatus shown in FIG. 6;

FIG. 9 is an enlarged side elevation of the carton bayonet lock lug-manipulating fingers of the carton closing means of the apparatus, looking substantially from the plane of line 9—9 of FIG. 6; and

FIG. 10 is a plan view looking substantially from the plane of line 10—10 of FIG. 9.

Referring to the drawings in detail, and first considering FIGS. 1–4, the preferred embodiment of the apparatus is indicated generally at 10 and comprises a support frame indicated generally at 12, carton conveying means indicated generally at 14, lateral biasing means indicated generally at 16, carton lid-closing means indicated generally at 18, and carton orienting means indicated generally at 20.

The support frame 12 includes vertical legs 22 which may have caster assemblies (not shown) at the lower ends thereof. Suitably secured to the upper ends of the support legs 22 are spaced parallel, vertically extending side plates 24 and 26 which have extending therebetween, at longitudinally spaced intervals, horizontally disposed straps or plates 28. The support frame 12 includes therebetween a support platform 30 having mounted thereon a power source such as an electrical motor 32 which is coupled to a transmission 34 having a laterally extending power output shaft 36. The shaft 36 has keyed thereon a pair of sprocket wheels 38 (only one being shown) over which are entrained endless link chains 40 and 42.

Secured to the side rails 24 and 26, and depending therefrom, are bearing assemblies 44 and 46, respectively, between which is journaled a transverse support shaft 48 having a sprocket wheel 50 keyed thereon over which the endless chain 42 is entrained. The rail 24 has fixed thereto a depending support strap 52 upon which is

journaled an idler sprocket 54 in engagement with the outer surface of the drive chain 42. Fixed to the central portion of the shaft 48 is a support roller 56. Mounted on bearing assemblies 58 and 60, depending from the other end of the side rails 24 and 26, respectively, is a second transverse support shaft 62 which has mounted on an intermediate portion thereof a support roller 64. The bearing assemblies 58 and 60 include conventional adjusting screws 66 for the purpose of adjusting the shaft 62 longitudinally with respect to the side rails 24 and 26.

Entrained over the support rolls 56 and 64 is an endless flexible conveyor belt 68, constructed from any suitable material and upon which the cartons will be conveyed from right to left as seen in FIGS. 1 and 2. The belt 68 may include on the outer surface thereof a plurality of transverse rib elements 70 to prevent slipping of the cartons thereon. The outer surface of the lower reach 72 of the endless belt 68 may be engaged by a transverse idler roll 74 journaled between the support legs 22 at the left hand of the apparatus, see FIG. 1. The upper reach 78 of the flexible belt defines a horizontal path of travel for cartons passing through the apparatus.

The side rail 24 may have secured thereto a suitable control switch 76 operatively connected through conductors 80 and 82 to the motor means 32.

It will be observed that the endless belt 68 will be rotated from right to left, as viewed in FIGS. 1 and 2, by means of the drive chain 42 secured on the shaft 48 upon which the roller 56 is mounted.

Disposed beneath the upper reach 78 of the endless belt 68 and extending substantially along the effective length of the carton lid-closing means 18 is support means indicated generally at 84, see FIGS. 3–5, for incrementally supporting the flexible upper reach of the endless belt and permitting portions thereof to be downwardly displaced as clearly illustrated in FIG. 5.

The support means 84 comprises a pair of elongated L-shaped angle members 86 and 88 which are suitably secured in overlying relation to the support plates 28. The upper legs of the angle members 86, 88 have extending transversely therebetween, in longitudinally spaced relation, support shafts 90 upon which are pivotally mounted upwardly extending U-shaped support brackets 92. Journaled adjacent the upper ends of the support brackets 92 are transverse rollers 94 which engage the undersurface 96 of the upper reach 78 of the endless belt 68. The brackets 92 are connected to tension springs 98 which are anchored on one of the angle elements 86, for example, as indicated at 100 in FIG. 5. The tension springs 98 will permit portions of the upper reach of the flexible belt to move downwardly as indicated in the left hand portion of FIG. 5 due to engagement of the greater height cartons with the carton orienting means 20 which will subsequently be described in detail.

Disposed inwardly the side plate 24 and secured to the transverse plates 28 are L-shaped support brackets 102 which have secured to the inner surfaces thereof an inwardly projecting, elongated support bar 104. The support bar 104 has pivotally mounted on the undersurface thereof the longitudinally spaced, lateral biasing means 16, the construction of which is most clearly seen in FIGS. 2, 6 and 8. The lateral biasing means 16 comprises a horizontally disposed, substantially L-shaped lever 106 which is transversely apertured for receiving therethrough a pivot scew 108 anchored in a suitably tapped bore 110 opening into the undersurface of the support bar 104, see FIG. 8. The strap 106 includes an intermediate abutment or stop pin 112, the upper end of which is engageable on the outer surface of the support bar 104, see FIG. 6. The lower end of the pin 112 is anchored thereon a tension spring 114 which will be connected to a pin 116 depending from the undersurface of the support bar 104.

The support plate 106 has depending from the undersurface thereof a support shaft 118 upon which is journaled an abutment roller 120 which is retained thereon by means of a suitable washer and cotter pin 122, for example. As clearly seen in FIGS. 3 and 4, the abutment rollers 120 are mounted on axes of rotation substantially normal to the horizontal path of travel defined by the flexible belt reach 78. Additionally, the rollers 120 extend a substantial distance inwardly over the upper belt reach 78 for engaging the back side wall B of an egg carton C. The lateral biasing means may be displaced outwardly as greater width cartons pass through the apparatus on the flexible belt reach 78, as clearly illustrated in FIG. 6. Additionally, the lateral biasing means serves to urge the front wall F of the carton C toward the carton lid-closing means.

Fixed to an intermediate portion of the support bar 104 is a pair of inwardly projecting support brackets 124, see FIGS. 1–4, to which is secured an elongated guide rail 126 having an upwardly turned end 128 to facilitate entry of carton lids therebeneath. The outer surface of the guide rail 126 may be covered with nylon or any other friction reducing material for the purpose of permitting ready passage of cartons therebeneath. Additionally, when the lids of the cartons are engaged in the manner clearly shown in FIG. 5, the lids, and accordingly the bayonet-type lock structure L of the cartons, will be urged downwardly and thus the guide rail or carton orienting means 20 maintains the cartons, regardless of height, in a proper closing position with respect to the carton closing means 18 which will subsequently be described in detail.

The support bar 104 may be formed with a tapered end portion 130 for providing one side of a diverging throat for guidingly receiving cartons therein. Secured on the support bar 104, as indicated at 132 and 134, is an arcuate guide plate 136 which extends inwardly in overlying relationship to flexible belt reach 78 and includes an inner angular surface portion 138. The cartons C will have the tops T thereof disposed in a substantially vertical position in alignment with the back B of the cartons as they move onto the right end of the conveyor reach 78. The angular surface portions 138 of the guide plate will tend to fold the tops T toward the right, as seen in FIG. 3.

Disposed inwardly of the side plate 26, as seen in FIGS. 2–4, are L-shaped support brackets 140 similar to the brackets 102 previously mentioned. The support brackets 140 have suitably secured at the upper ends thereof a second support bar 142 disposed parallel to the support bar 104. The support bar 142 includes a tapered end portion 144, similar to the portion 130 of the support bar 104, to provide the open throat for receiving the cartons therein. The inner surface 146 of the support bar 142 will provide the means for engaging the front F of the egg carton C, and it is toward this surface that the cartons C are being urged by the lateral biasing means 16.

The support bars 104 and 142 have fixed thereon bearing assemblies 148 and 150, respectively, which have journaled therein a transversely disposed support shaft 152 including a terminal pinion gear 154. The gear 154 is in meshed engagement with a drive pinion 156 which has the endless link chain 40 entrained thereover. The side plate 24 has mounted thereon a suitable support strap 158 carrying at the lower end thereof an idler sprocket 160 engaging and controlling the tension on the endless chain 40.

Spaced from the bearing assembly 150 and supported by the support bar 142 is a support bracket 162 which includes an inwardly projecting stub shaft 164 upon which is journaled a belt receiving, angularly disposed pulley 166. The shaft 152 has supported thereon a pulley 168 and a flexible endless belt 170 is entrained over the pulleys 166 and 168. Fixed to the support bar 142 between the pulleys 166 and 168 is a support bracket 172 which has journaled theron an idler pulley 174 engaging an intermediate inner surface portion of the endless belt 170. It

will be noted that the lower reach **176** of the endless belt **170**, see FIG. 1, is in angular relation to the horizontal path of travel defined by the upper reach **78** of the endless conveyor belt **68**. The bracket **162**, upon which the pulley **166** is supported, has secured beneath the pulley **166** an inwardly extending support plate **178** which includes a forward arcuate edge **180**. The support plate **178** includes a downwardly curved support or folding bar **182** which has slots **186** and **188** formed therein which have journaled therein anti-friction rollers **190** and **192**, respectively.

Supported on the inner surface of the bracket **172**, upon which the idler roller **174** is mounted, is an elongated guide plate **194**, see FIGS. 5, 6, 9 and 10, which includes an upwardly twisted and arcuate end **196** which terminates adjacent the arcuate undersurface of an overlying plate **198** of the guide plate **136**. Fixed on the inner surface of the plate **194**, as clearly seen in FIGS. 9 and 10, are a plurality of angularly disposed spring fingers **200** which will progressively engage the bayonet lock structure L of a carton and urge the bayonet locks into conventional cooperating portions of the carton C.

Assuming that cartons C and C′ are respectively pullet and giant size cartons, see FIGS. 5 and 6, and these cartons are filled with eggs and deposited in end-to-end relation on the flexible reach **78** of the conveyor belt **68**, it will be observed that the cartons are urged toward the inner surface **146** of the support bar **144**, i.e., the forward walls of the cartons are urged toward the lock fingers **200**.

The cartons, as previously mentioned, will be placed on the flexible reach **78** with the tops in a substantially vertical position. As they move onto the spring urged rollers **94**, and engage the guide rail or carton orienting means **126**, those rollers beneath the cartons C′ will be depressed to permit the uppermost portion of the carton to be oriented in a proper closing position with respect to the spring fingers **200**. While this is occurring, the lid and lock structure of the carton will have moved beneath the guide plate **136**, and the guide strip **196** and lock portion L will be folded over the folding bar **182**, as seen in FIG. 7.

Continued movement of the conveyor reach **78** and simultaneous movement of the forming or lock flap manipulating belt **170** results in the lock structure L being urged into engagement with the spring fingers **200**, and, at the same time, the forward wall F of the carton is urged toward the inner surface **146** of the support bar **142**. This results in the bayonet lock structure becoming engaged on the cooperating portion of the forward wall F of the carton.

The carton C, the pullet size, which is of a lesser height than the carton C′, will be supported above the lowermost portion of the carton C′, and thus, the lid structure thereof will be in the same relative position as the lid structure of the carton C′. The lock structure of the carton C will be manipulated in the same manner described with respect to the carton C′.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and, therefore, the invention is not to be limited to what is shown in the drawings and described in the specification, but only as defined in the appended claims.

What is claimed is:

1. Apparatus for automatically closing randomly mixed sizes of cartons of differing height and width comprising a longitudinally extending conveyor reach having a normal longitudinal path of travel for moving random sized cartons end-to-end along said longitudinal path of travel, carton lid-closing means disposed longitudinally along and above said conveyor reach and having an effective length over which carton lids will be closed, said carton lid-closing means being fixed relative to said conveyor reach, support means comprising independently-displaceable reach-support portions beneath and incrementally and displaceably supporting said conveyor reach at least along the effective length of said carton lid-closing means for permitting said conveyor reach and cartons thereon to descend below the normal path of travel to present all sized carton lids at the same optimum closing position with respect to said lid-closing means, carton lid-orienting means comprising a guide rail disposed above and overlying the path of said incrementally supported conveyor reach in fixed position with respect to said carton lid-closing means and said normal path of travel and extending along the effective length of said carton lid-closing means for engaging carton lids and orienting all sized carton lids to the same optimum position of engagement by said lid-closing means, and laterally displaceable biasing means opposed to said lid-closing means and spaced along and extending into said longitudinal path of travel for engaging the side wall of different width cartons and urging them toward said lid-closing means.

2. Apparatus as set forth in claim 1; said conveyor comprising a flexible belt, said independently displaceable, reach support portions comprising a plurality of upwardly biased, longitudinally spaced, independent roller elements transversely engaging the undersurface of said conveyor reach.

3. Apparatus as set forth in claim 2; said carton lid-orienting means guide rail overlying said longitudinal path of travel, comprising an upwardly turned end portion for guiding carton therebeneath.

4. Apparatus as set forth in claim 1; said laterally displaceable biasing means comprising a plurality of wheel elements, independently biased toward said lid-closing means from beneath said guide rail.

5. Apparatus as set forth in claim 1; said carton lid-closing means including an endless belt extending longitudinally above said conveyor reach and having a lower reach extending in angular converging relation toward the direction of travel of said conveyor reach.

6. Apparatus as set forth in claim 1 in which said independently-displaceable, reach-support portions comprise an upwardly biased, plurality of longitudinally spaced, independent roller elements transversely engaging the under surface of said conveyor reach, said roller elements each including U-shaped support yokes mounted on a transverse pivot axis beneath said conveyor reach.

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