April 30, 1968 LE ROY F. CARKHUFF 3,380,230

LID FORMING AND CLOSING APPARATUS

Filed July 8, 1965 6 Sheets-Sheet 1

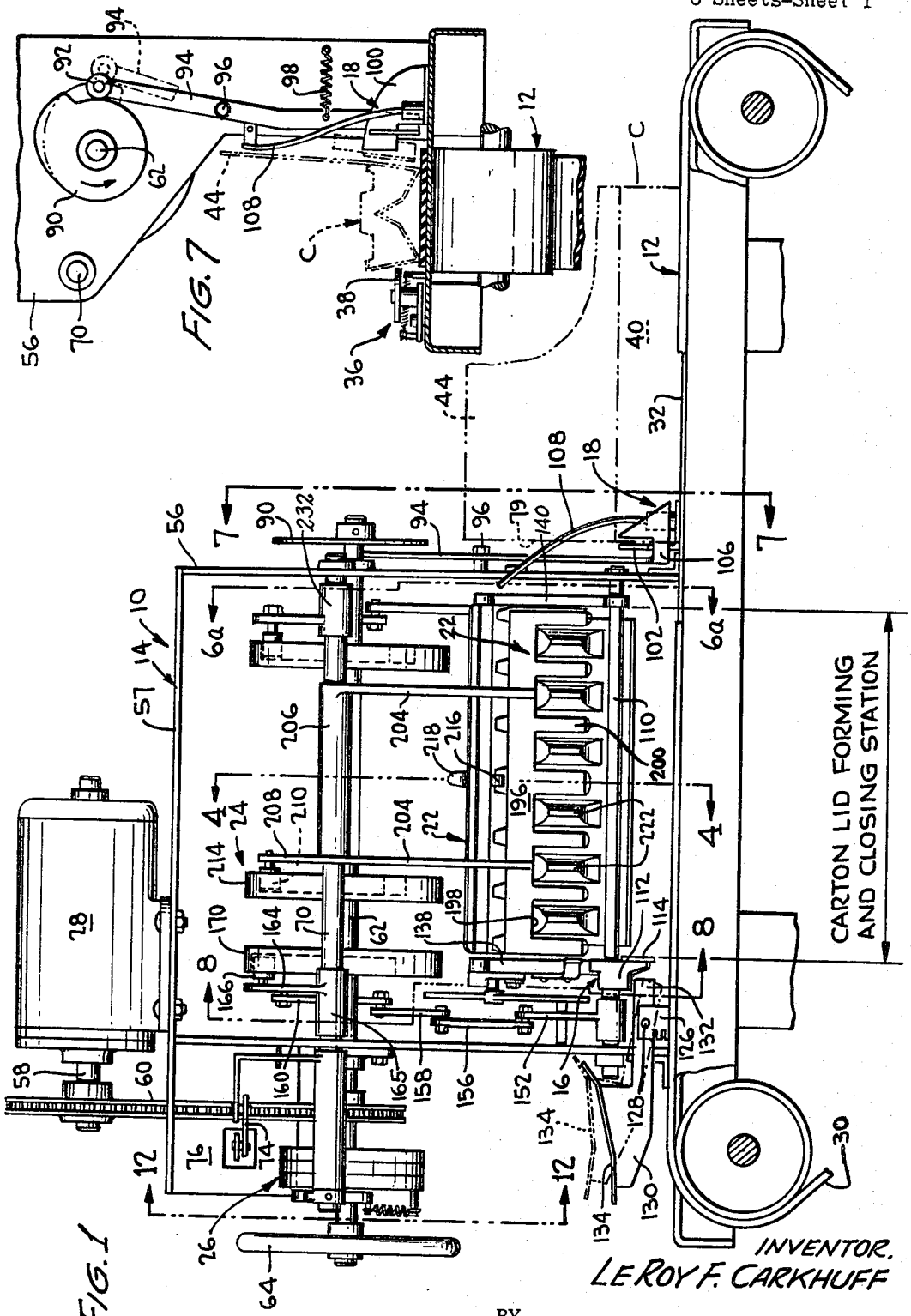


FIG. 7

FIG. 1

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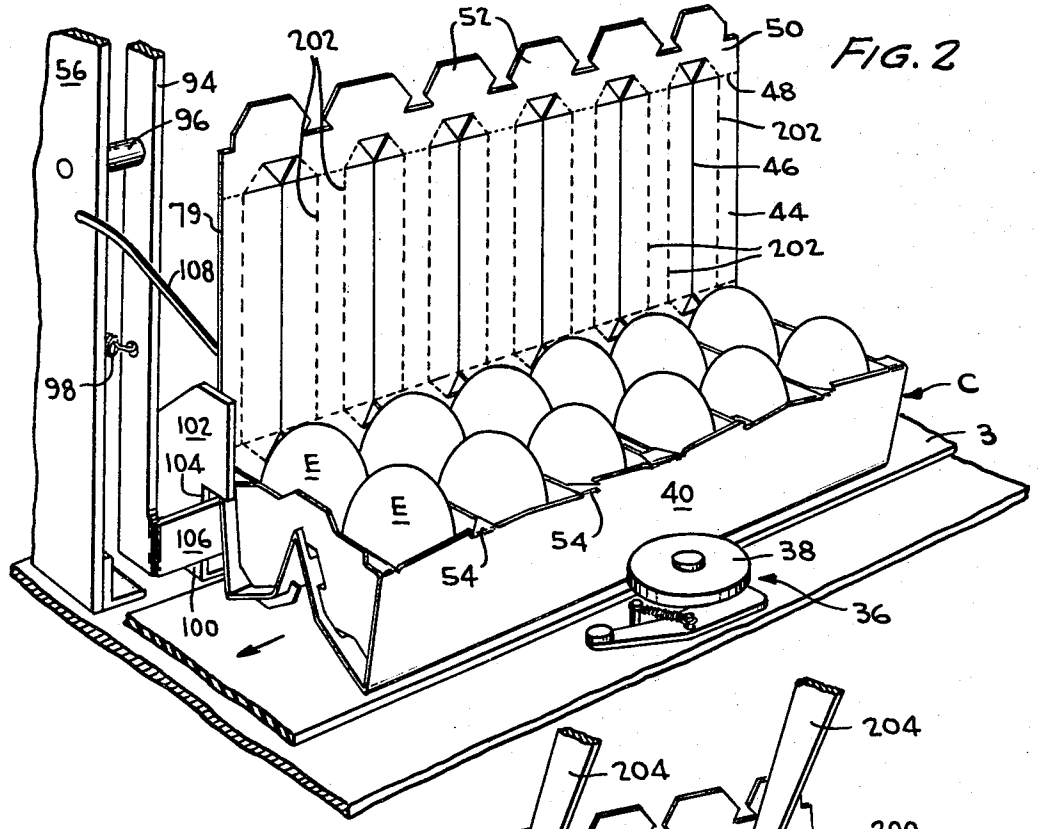
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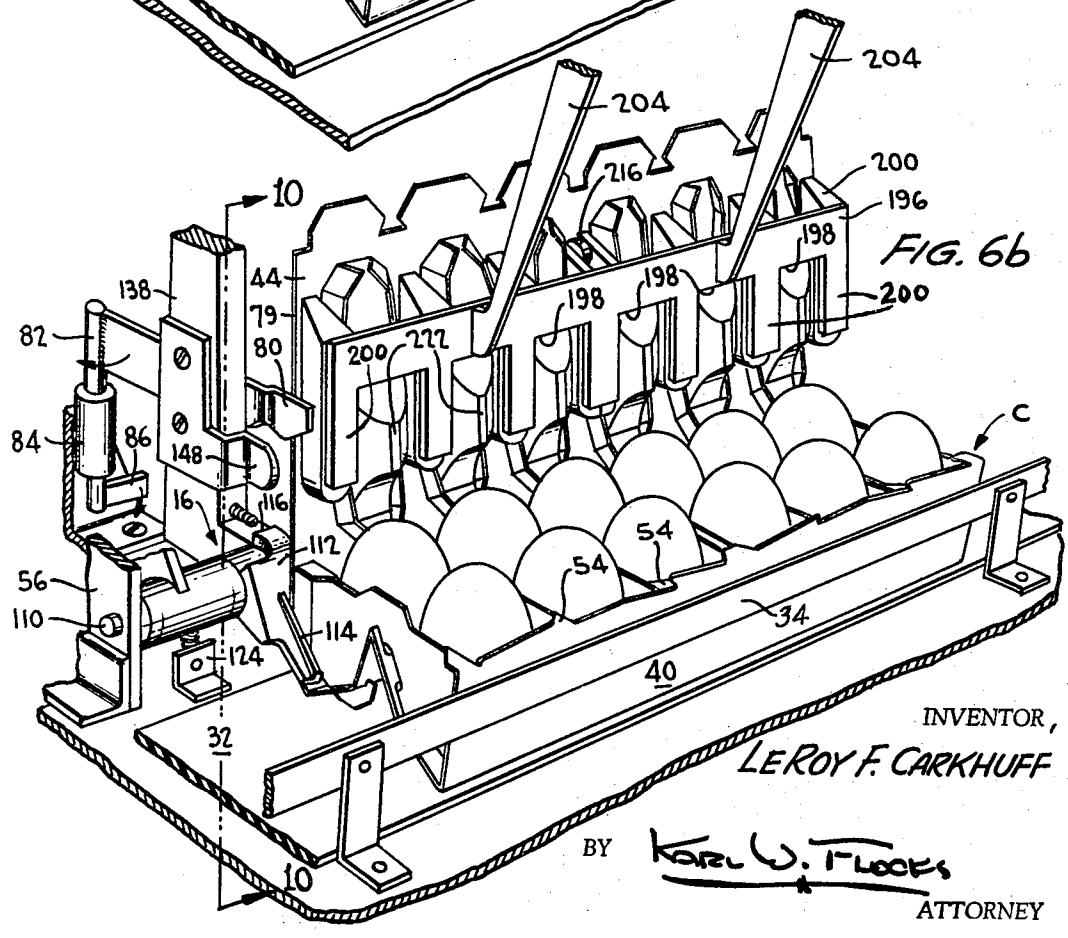
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April 30, 1968 LE ROY F. CARKHUFF 3,380,230

LID FORMING AND CLOSING APPARATUS

Filed July 8, 1965 6 Sheets-Sheet 2





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LID FORMING AND CLOSING APPARATUS

Filed July 8, 1965 6 Sheets-Sheet 3

FIG. 3

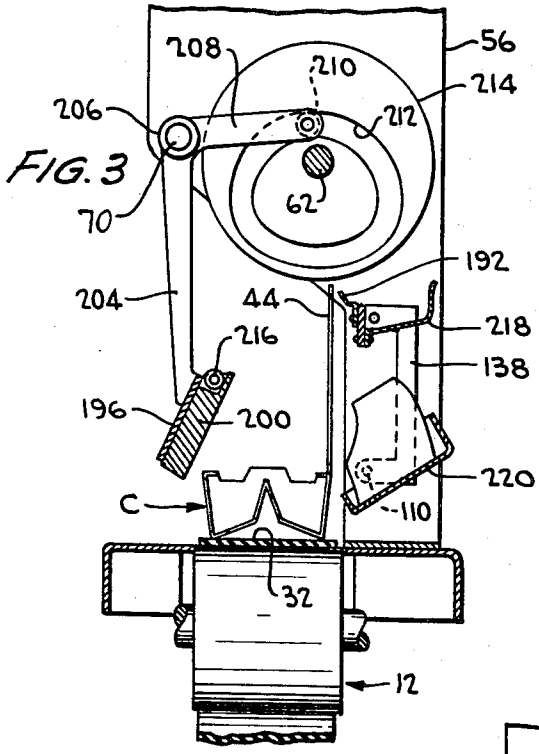


FIG. 4

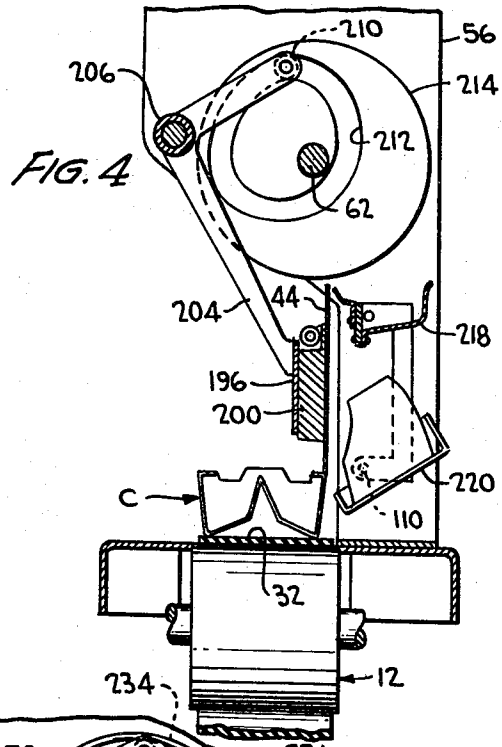


FIG. 5

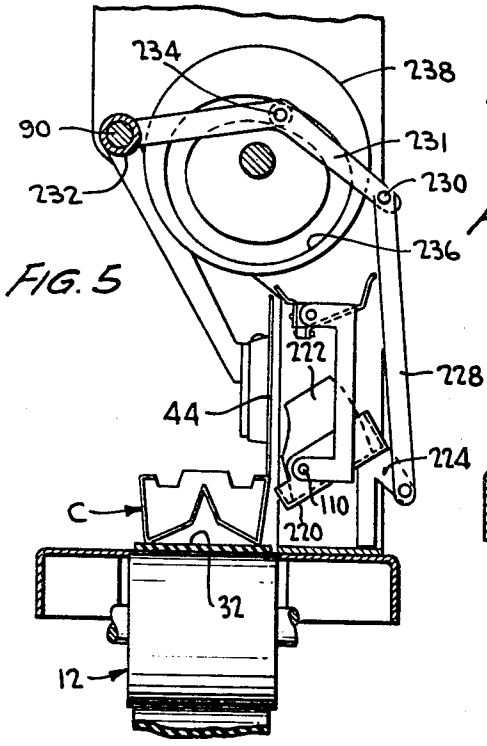
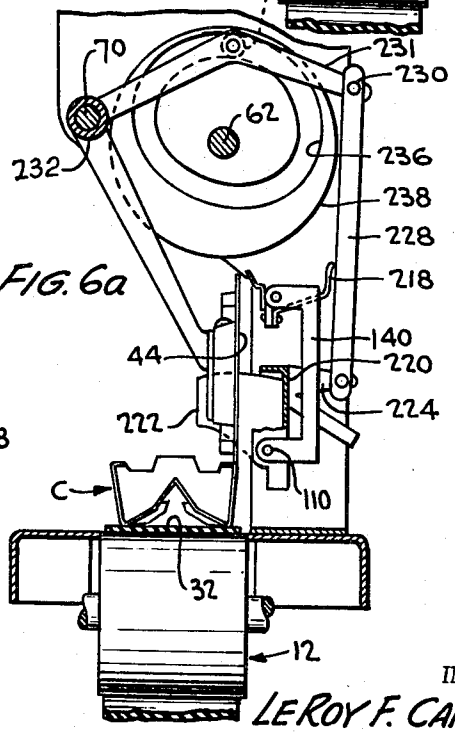


FIG. 6a



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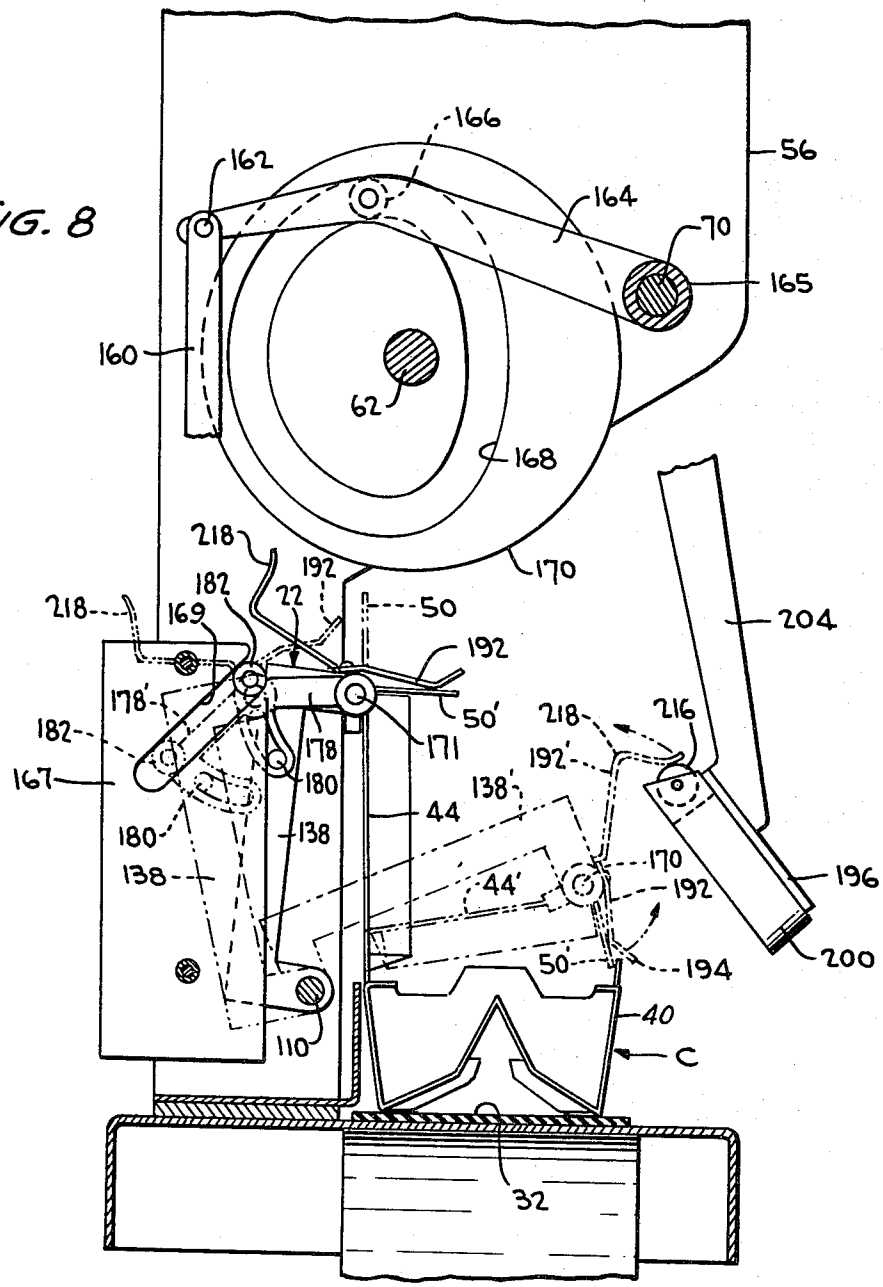
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April 30, 1968 LE ROY F. CARKHUFF 3,380,230

LID FORMING AND CLOSING APPARATUS

Filed July 8, 1965 6 Sheets-Sheet 4

FIG. 8



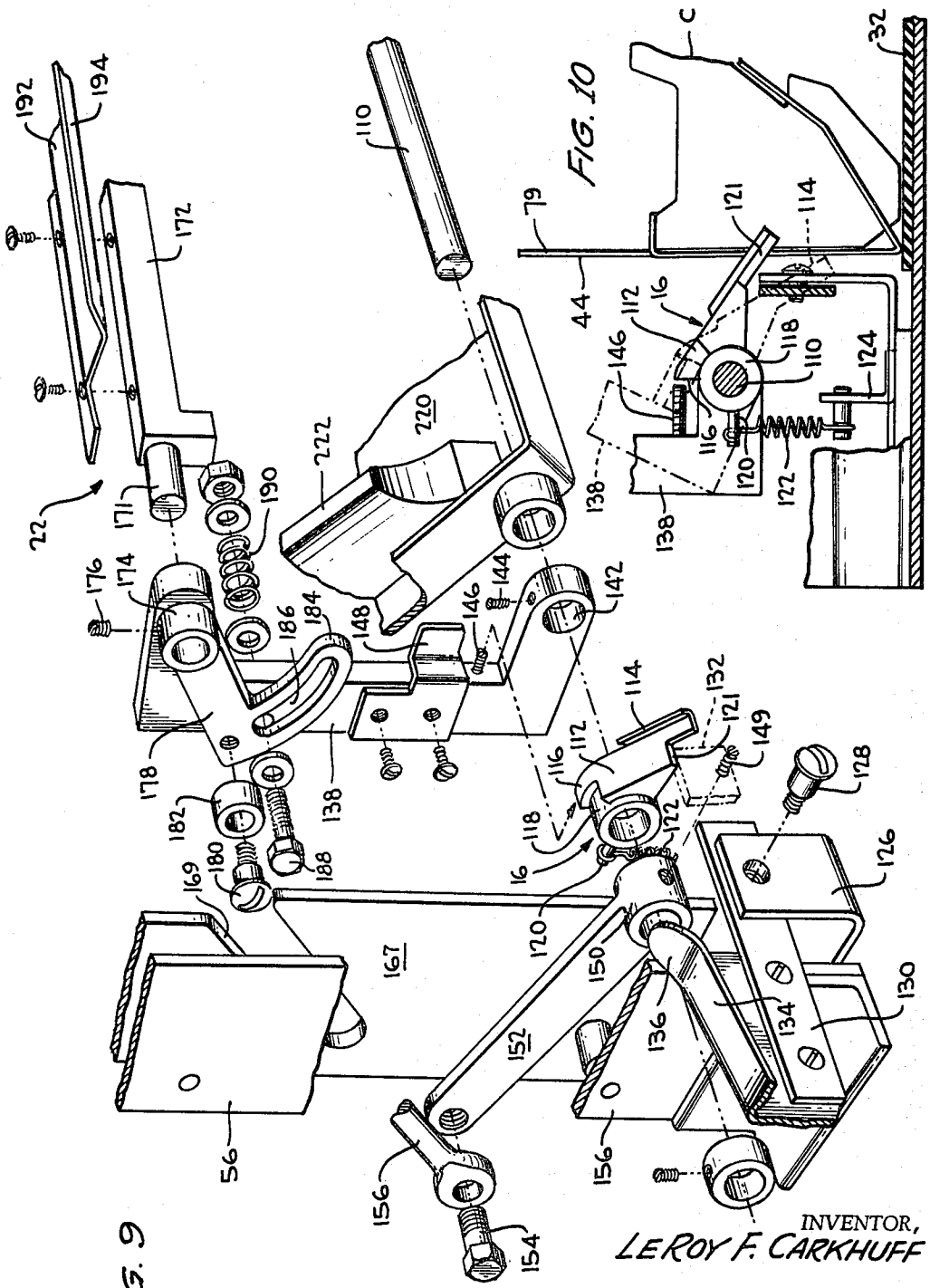
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April 30, 1968 LE ROY F. CARKHUFF 3,380,230

LID FORMING AND CLOSING APPARATUS

Filed July 8, 1965 6 Sheets-Sheet 5



April 30, 1968 LE ROY F. CARKHUFF 3,380,230

LID FORMING AND CLOSING APPARATUS

Filed July 8, 1965 6 Sheets-Sheet 6

FIG. 11

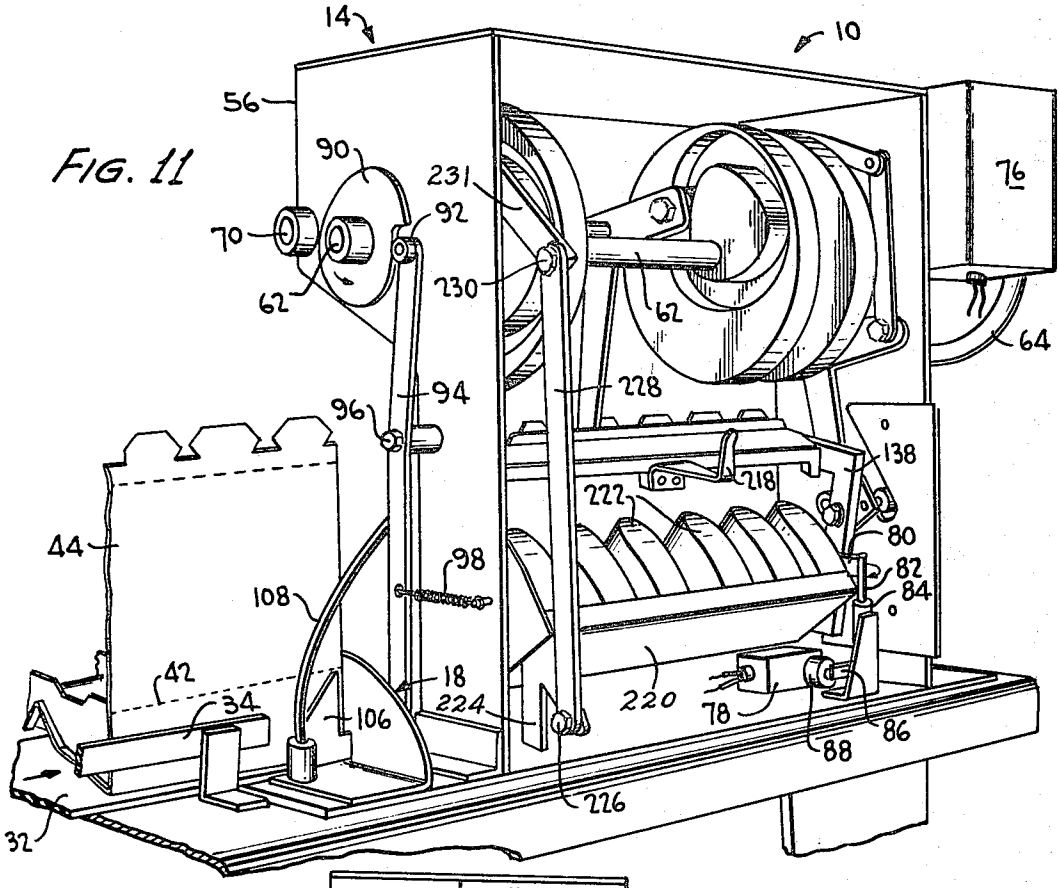
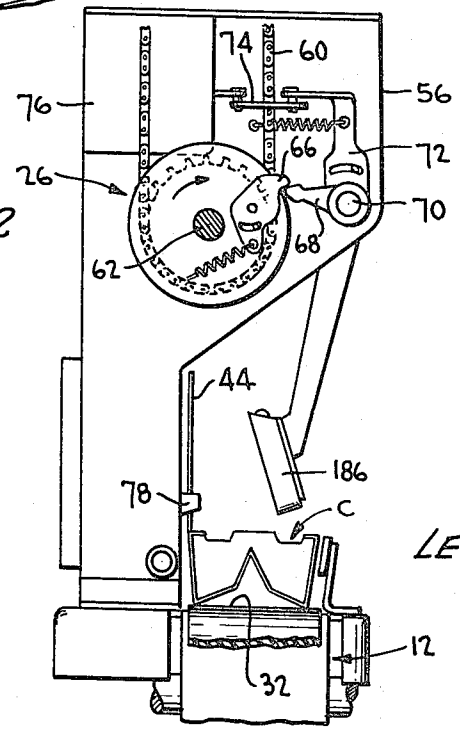


FIG. 12



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United States Patent Office 3,380,230 Patented Apr. 30, 1968

3,380,230

LID FORMING AND CLOSING APPARATUS

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Filed July 8, 1965, Ser. No. 470,475
13 Claims. (Cl. 53—376)

ABSTRACT OF THE DISCLOSURE

Apparatus for continuously orienting filled cartons and forming viewing and ventilation slot portions in the lid for protecting the carton contents, i.e. eggs or the like, which slot portions strengthen the carton and enhance the appearance thereof, and also closing the carton and forming a complete package.

This invention relates generally to package forming apparatus and more particularly to a carton lid closing and/or lid forming and closing machine whereby portions of the carton lid have previously creased and scored portions designed to form viewing slots, and after the viewing slots are formed, the lid is lockingly engaged with and article containing portion of the carton.

The apparatus of the present invention is particularly adapted for use with cartons of the character disclosed in detail in the application of Kenneth D. Bixler and William S. Peppler Ser. No. 407,988, filed Nov. 2, 1964, now United States Letters Patent No. 3,255,947 issued June 14, 1966, assigned to an assignee common to the present application. However, the apparatus could be used, with modifications, to close conventional paper board cartons.

A primary object of the present invention is to provide novel apparatus in which filled egg cartons or the like are conveyed one after the other through a carton lid forming and/or closing station, and are maintained in oriented relationship thereat. The lid is then folded in overlying relationship with respect to the carton and contents while a locking flap portion thereof is also folded into angular relationship with respect to the general plane of the lid and is lockingly engaged with cooperating portions of the article containing portion of the carton.

Another object of the present invention is to provide a novel apparatus which includes novel stop means for orienting a carton along its path of travel through the apparatus of the character mentioned above, and in which positioning of the carton initiates a cycle of operation of the apparatus for operating forming portions for the lid into the configuration for which the lid is designed and for operating the portions for locking the lid in relationship to the article containing portion of the carton.

Another object of the present invention is to provide, in apparatus of the character mentioned above, novel carton lid forming means comprising a backing plate engageable at one side of an oriented carton lid and cooperating with a forming head including dies cooperating in interdigitated relationship with the backing plate.

And still another object of the present invention is to provide in apparatus of the character mentioned above a novel lid closing plate which includes a primary plate having mounted thereon a supplemental forming plate and in which the supplemental forming plate during a portion of the path of travel of the primary forming plate orients the locking flap of a carton lid into a position for lockingly engaging cooperating portions of the article containing portion of the carton.

And yet another object of the present invention is to provide a novel cam control assembly in the apparatus of the character mentioned as above, which controls the sequential operation of the various components of the lid forming and closing assembly which is initiated by one-revolution control means of the apparatus.

These, together with other objects and advantages of the invention, will become apparent from a consideration of the following description when taken in conjunction with the accompanying drawings forming a part thereof, wherein:

FIG. 1 is a front elevation of the novel apparatus with portions broken away for purposes of clarity;

FIG. 2 is an enlarged, fragmentary perspective view of the apparatus, showing details of the stop means upstream of the carton lid forming and closing station in the apparatus;

FIGS. 3–5 are fragmentary vertical sections, substantially diagrammatic, showing the sequence or steps of operation in which the backing plate of the carton lid forming means is oriented into engaging relationship with respect to one side of a vertically extending lid of the carton being formed and taken substantially on the plane of line 4—4 of FIG. 1;

FIG. 6*a* is a fragmentary vertical section taken substantially on the plane of line 6*a*–6*a* of FIG. 1, substantially diagrammatic, and showing the manner in which the lid forming head cooperates with the backing plate during the cycle of operation of the apparatus;

FIG. 6*b* is an enlarged fragmentary perspective view illustrating in detail the manner in which the backing plate cooperates with the forming head, and showing details of the orienting stop for the carton to position it at the lid forming and closing stations;

FIG. 7 is a vertical section taken substantially on the plane of line 7—7 of FIG. 1 and showing details of the control cam for the upstream stop assembly at the entrance to the carton lid forming and closing station;

FIG. 8 is an enlarged vertical section taken substantially on the plane of line 8—8 of FIG. 1 illustrating details of a carton lid closing means of the apparatus;

FIG. 9 is an enlarged, exploded perspective view showing details of construction of the carton lid closing means and the manner in which the components are assembled;

FIG. 10 is an enlarged fragmentary section taken substantially on the plane of line 10—10 of FIG. 6*b*;

FIG. 11 is a perspective view of the apparatus, looking inwardly at the right hand end of FIG. 1 from the side opposite that shown in FIG 1; and

FIG. 12 is a vertical section taken substantially on the plane of line 12—12 of FIG. 1 showing details of the one-revolution control means for the operating shaft of the apparatus.

Referring to the drawings in detail, and first considering FIG. 1, the novel carton lid forming and closing apparatus as indicated generally at 10, generally comprises conveyor means 12 and a carton lid forming and closing assembly indicated generally at 14. Located downstream of the conveyor is an orienting stop assembly indicated generally at 16 for the purpose of defining upstream thereof the carton lid forming and closing station as labeled on FIG. 1. In order to insure that only a single carton to be acted upon is disposed in the forming and closing station, the assembly 14 includes upstream of this station an abutment stop assembly indicated generally at 18.

The lid forming and closing assembly 14 includes lid forming means indicated generally at 20 and includes lid closing means indicated generally at 22. The stop assemblies 16 and 18 as well as the lid forming means 20 and lid closing means 22 are operated in proper sequence by means of drive means indicated generally at 24 and operation thereof is controlled by means of a one-revolution clutch assembly indicated generally at 26.

The one-revolution control or clutch means 26 will be operatively connected to a power source such as an electric motor 28 in a manner to subsequently be described

in detail. Although the power source is illustrated as being mounted on the apparatus of the invention, suitable equivalents may be provided for the purpose of operating the apparatus through a cycle of operation.

The conveyor **12** comprises an endless conveyor belt **30** having an upper run **32** defining a generally horizontal path of travel through the apparatus and the carton lid forming and closing station. Cartons filled with a product, i.e. eggs, for example, will be deposited in end-abutting relationship on the conveyor run **32** in any suitable manner, and are maintained on the conveyor run by means of suitable guide rails or the like, a portion of which are seen in FIG. 11 and indicated at **34**. The filled cartons will be urged toward the guide rail **34** by a suitable spring urged biasing assembly **36** including a friction wheel **38** rollingly engageable with what might be considered the forward wall of the product-receiving compartment of the carton.

The carton indicated generally at C includes a lower product receiving compartment **40** having individual cells to receive the eggs which have been deposited therein prior to the carton being deposited on the conveyor run **32**. The carton C has hingedly connected to the rear edge at a longitudinal fold line **42** (see FIG. 11) a planar lid **44** which includes thereon precut and prescored slot forming portions **46** which will form observation slots as well as cushioning flaps for the eggs as clearly seen in FIG. 6*b*. Hingedly connected to the lid **44** on a transverse fold or score line **48** is a lock flap **50** including bayonet-type lock portions **52** which will lockingly engage with horizontally disposed panel segments **54** of the product receiving, cellular portion **40** of the carton C. As previously mentioned, specific details of the types of cartons manipulated by an apparatus of this invention may be had from United States Letters Patent No. 3,255,947.

Cartons C, which have been previously filled with the product such as eggs, are conveyed in end-to-end abutting relationship on the conveyor run **32**, and the abutment assembly **18** functions to permit only one filled carton at a time to be moved through the apparatus. Further, the orienting stop assembly **16** serves the function of orienting the filled carton that is permitted to pass into the apparatus for subsequent manpiulation by the lid forming means and lid closing means **20** and **22**, respectively, and also serves the function of initiating a cycle of operation of the apparatus.

The structural relationship of the parts will be described, before describing the manner in which cartons are fed along the conveyor run **32**, and the manner in which the lid slots are formed and the lids are manipulated and locked.

The carton lid forming and closing assembly **14** includes a vertical extending, substantially inverted U-shaped support frame **56** having mounted on the upper portion **57** thereof the power source such as the electrically energized motor **28**. The motor **28** includes a laterally projecting power shaft **58** to which is secured a drive gear or sprocket over which is entrained an endless drive belt **60**. The belt **60** constantly rotates a driving portion of the one-revolution control assembly or clutch **26** which is generally conventional and which will not be described in specific details. A power or drive shaft **62** is operatively connected to the one-revolution clutch and includes on the terminal ends thereof a flywheel **64**, permitting the shaft **62** to be rotated manually when initially adjusting the cooperating and subsequentially operated components of the apparatus. Without describing the one-revolution clutch in detail, as seen in FIG. 12, an operating latch **66** is pivotally mounted on one of the parts thereof and a displaceable abutment lever **68** is mounted on a support shaft **70** which is disposed in spaced parallel relationship to the drive or operating shaft **62**. The lever **68** is integrally connected to a vertically extending lever **72** connected by a suitable linkage **74** to a solenoid control or force-transmitting mechanism **76** carried on the frame **56**.

The solenoid controlled mechanism **76** is suitably connected to a power source and as will subsequently be described in detail to a micro switch type control **78**, which will normally be disposed in intersecting relationship to the path of travel of the carton lid edge indicated at **79** (see FIG. 6*b*). The micro switch control **78** includes an operator comprising a lever **80** engageable by the edge **79** which is mounted on a suitable shaft **82** carried by a bearing **84** on the frame of the apparatus. The shaft **82** includes on its lower end a lever portion **86** engageable with the micro switch **88** for activating or closing the same. When the switch **88** is closed, a circuit to the mechanism **76** is closed, and the solenoid control mechanism **76** is activated, resulting in inward movement of the control linkage **74** and movement of the abutment lever **80** out of the path of travel of the control lever **66** of the one-revolution clutch **26**. When this occurs, the shaft **62** will be rotated one revolution, whereafter the abutment **68** will once more be disposed in the position shown in FIG. 12 to prevent continued revolution of the shaft **62** until the abutment edge **79** of the lid of the next preceding carton engages the control lever **80**.

As seen in FIGS. 1, 7 and 11, the shaft **62** has mounted on its upstream end, exteriorly of the frame **56**, a cam element **90** engaged at its peripheral edge by a roller **92** journaled at the upper end of a lever **94** intermediately pivoted at **96** on the frame **56**. A tension spring **98** is terminally secured to the lever **94** below the pivot **96** and is anchored on the frame to urge the lever **94** in a counterclockwise direction as viewed in FIGS. 7, 11 and 12, for example, to urge the roller **92** in engagement with the periphery of the cam **90**.

The support frame of the apparatus has mounted thereon a fixed stop plate **100** which includes an upper portion **102** extending into the path of travel of the edge **79** of the lid **44** of the carton C and normally restrains the cartons from movement into the carton lid forming and closing station. The fixed stop **100** includes a notched out portion **104** and the lever **94** includes at its lower end a lateral projection **106** which will be disposed at the rear side of the cellular lower portion **40** of the carton. An upwardly angled fixed guide bar **108** extends vertically from the fixed abutment plate **100** to a portion of the frame **56** for the purpose of preventing the forward or leading edge **79** of the lid from engaging the lever **94** or frame **56**. As the cam **90**, conveniently described as a carton release cam, rotates through a cycle of revolution, the lever **94** will be biased about the pivot **96** clockwise wherein the lower end, i.e. the abutment portion **106** thereof, engages the rear side of the carton and moves the carton out of intersecting relationship with respect to the fixed stop **102**. When this occurs, the conveyor run **32** will convey the carton, normally stopped by the fixed abutment plate **102**, into the carton lid forming and closing station for engagement by the orienting stop assembly **16** to be presently described.

The support frame **56** has journaled thereon in parallel spaced relationship with respect to the path of travel defined by the run **32** of the conveyor a support shaft **110** (see FIGS. 1, 6*b*, 9 and 10), for example. Journaled on the shaft **110** is a substantially triangular abutment element **112** having an abutment edge **114** engageable with the leading edge of the carton as seen in FIG. 6*b*. The abutment element **112** includes an abutment shoulder **116** engageable by an abutment screw to subsequently be described and comprises a bearing sleeve **118** journaled on the shaft **110** and includes a rearwardly projecting lever portion **120**. The lever portion **120** is connected to a tension spring **122** anchored at its lower end to a bracket **124**, accordingly urging the abutment edge **114** counterclockwise as viewed in FIG. 10.

Mounted downstream of the orienting stop assembly **16** on a bracket **126** and intermediately pivoted at **128** is a lever or shoe **130** which has a portion **132** disposed immediately beneath the abutment element **112** for engage-

ment behind the notch 121 thereof. The lever 130 includes an upper lateral flange 134 terminating in an upwardly angled end portion 136, and when the carton is locked up or closed, the leading end of the carton will engage beneath the flange 134 as it is moved out of the carton lid-forming and closing station when the next preceding carton is moved into the closing station.

The orienting stop assembly 116 is coordinated in its movement with the lid closing means 22, and the description of the operation of the orienting stop assembly and resetting of the same will not be described until the cooperating structure of the lid closing means 22 has been described.

Referring to the details of the lid closing means 22, this portion of the apparatus comprises a pair of C-shaped support elements 138 and 140 (see FIG. 1) which include at the terminal ends of their lower legs transverse apertures 142 received on the shaft 110 and fixedly secured thereto by means of a lock screw 144. The element 138 includes on its vertical leg an adjustable abutment screw 146 which will be disposed immediately behind the abutment shoulder 116 of the orienting stop assembly 16 for normally positioning the abutment portion 114 of the element 112 in the path of travel of the oncoming cartons. In this regard, the abutment screw 146 determines the maximum extent of counterclockwise movement of the abutment element 112 in the manner clearly seen in FIG. 10. Further, as will subsequently be described in detail, when the support element 138 moves from the solid line to the phantom position of FIG. 10, the abutment element 112 will move therewith to the phantom line position shown in FIG. 10, i.e. out of the path of travel of the oncoming cartons C. However, the vertical leg of the support element 138 includes a secondary abutment 148 which will move into position to engage the upper edge of the oncoming carton lids as the abutment elements 112 are moved out of the way, as just mentioned.

When the abutment element 112 moves downwardly or clockwise to the phantom line position shown in FIG. 10, notch portion 21 thereof will engage behind the lever portion 132 of lever 130 which will also be pivoted to the phantom line position shown in FIG. 1, for example. When this occurs, the abutment element 112 is maintained out of the path of travel of oncoming cartons. However, the secondary abutment 148 will engage the leading edge of the oncoming cartons and continue to maintain the cartons in the closing station. After a carton has been properly closed, due to the cycle of operation of the shaft 62 and the means provided thereon for this purpose, as the leading end of the carton moves beneath the flange 134 integral with the lever 130, the portion 136 thereof will be pivoted upwardly causing the lever portion 132 thereof to move downwardly below the notch 121, which will result in the tension spring 122 urging the abutment element 112 back to the solid line position shown in FIG. 10 for the purpose of orienting the next oncoming carton to be operated on at the forming and closing station of the apparatus.

The shaft 110 has fixedly secured thereto, by means of a lock screw 149, a sleeve portion 150 of an operating lever 152. The operating lever 152 is pivotally connected by means of a stub shaft element 154 to an actuating link 156. The link 156 is pivotally connected by a pair of links 158 and 160, the latter of which is pivotally connected at 162 (see FIG. 8) to a lever 164 having journaled thereon an intermediately disposed cam follower element 166 received within a suitably designed cam track 168 on a control cam 170 fixedly connected to the drive shaft 162. The support shaft 70 has journaled thereon the lever 164 which includes a bearing sleeve portion 165 most clearly seen in FIG. 1.

Fixedly secured to the support frame 56, inwardly of the vertical leg thereof, is a cam plate 167 which includes an upwardly angled cam slot 169. The support elements 138, 140 have journaled in the upper arms thereof a terminal stub shaft 171 of a support bar 172. Stub shaft 171 (only one being shown, see FIG. 9) is retained thereon by a sleeve 174 and lock screw 176, the sleeve 174 being integral with a substantially L-shaped lever 178. The lever 178 includes at the lower corner thereof a support shaft 180 upon which is journaled a cam follower element 182 which will be received in the slot 167 when the apparatus is assembled. Included on the lower leg 184 of the lever 178 is an arcuate slot 186 which receives therethrough a screw element 188 having mounted thereon, on the inner surface of the vertical leg of the support 138, a friction increasing assembly indicated at 190.

The support bar 172 has secured to the upper edge thereof a lock flap forming plate 192, which will pivot with the bar 172 in a manner to subsequently be described. Considering FIG. 8, for example, during a cycle of operation of the shaft 62, due to the engagement by the leading edge of a carton and movement of the micro switch control lever 80, etc. during rotation of the cam 170, the shaft 110 will be pivoted clockwise as viewed in FIG. 8. The supports 138 and 140, which are fixed to the shaft 110, will be pivoted from the leftmost position shown in FIG. 8 to the position shown at 138' and therebeyond, resulting in the lid of the carton indicated at 44' being moved into overlying relationship with respect to the cellular article receiving portion 40. During the early part of the pivotal movement of the supports 138 and 140, the angular cam slot 169 of the cam plate 167 which is engaged by the roller 182, causes the layer 178 to move from the position indicated at 178' to that shown by the solid line position at the left hand portion of FIG. 8, accordingly causing the lock flap 150' to be disposed at substantially right angles to the lid 44 of the carton. After the supports 138 and 140 have moved away from the cam plate 166, i.e. the follower 182 moves out of the cam slot 168, the friction means 190 associated with the screw 180 causes the lever 178 to maintain the solid line position shown in FIG. 8. The outwardly turned lip 194 of the plate 192, in conjunction with the bar 172, causes the lock flap 50' of the carton to be folded and to be lockingly engaged with the panel portions 54 of the article receiving portion of the carton portion 40 as they continue beyond the lowermost position shown in FIG. 8, and means will be provided for reorienting the plate 192 to its normal position in opposition to the friction means 190, this being subsequently described in detail.

The structure which has been described will be effective for closing the lids of conventional cartons which do not utilize observation or cushioning slots of the character illustrated in the present application.

The carton lid forming means, indicated generally at 20, comprises a backing plate 196 having a plurality of downwardly opening slot portions 198 (see FIG. 6*b*) flanked by inwardly extending abutment finger portions 200. The abutment finger portions will engage the inner surface of the carton lid adjacent the slots being formed, i.e. engaging along the score lines 202 formed in the lid 44 (see FIG. 2, for example). Connected to the backing plate are a pair of support arms 204 which are fixed at their upper ends to a sleeve 206 journaled by the support shaft 70 (see FIG. 1). The sleeve 206 is connected by an angular lever portion 208 to a cam follower or roller 210 to a cam groove 212 formed on the inner surface of a control cam 214 fixedly connected to the drive shaft 62. The backing plate 196 has mounted on the upper edge thereof an anti friction roller 216, the function of which is to be presently described.

Before describing the function of the backing plate for the purpose of forming the viewing and cushioning slots in the carton lid, it will be observed that the carton lock flap bending plate 192 has extending laterally therefrom an angular abutment tongue 218. Considering FIG. 8, as the support arms 138 and 140 move toward the phantom line position shown in FIG. 8, the abutmenet plate 218 will engage the roller 216 on the backing plate, and will

cause the plate **192** to move back to the normal position shown at the extreme left of FIG. 8, i.e. overcoming the friction imposed by assembly **190**.

The position of the backing plate **196** shown in FIG. 8 or FIG. 3, for example, is the so-called normal position to which the backing plate moves after the viewing and cushioning slots have been formed.

Freely pivoted or journaled on the shaft **110** is a forming head **220** which includes a plurality of inwardly extending forming dies **222** which will be received in interdigitated relationship between the fingers **200** of the backing plate **198**. After the fingers **200** have moved between the fold lines **202** of the respective slots in the carton lid **44** (see FIG. 6*b*), the forming die **220** is pivoted into cooperating relationship. The forming die **220** has projecting rearwardly therefrom a lever portion **224** (see FIG. 11) pivotally connected at **226** to a vertically extending link **228** pivotally connected at **230** to a lever **231** which is journaled at one end on a sleeve **232** mounted on the support shaft **70**. The lever **231** has journaled thereon a roller element **234** engaged in a cam groove **236** formed on the inner surface of a cam **238** fixed to the drive shaft **62**.

Considering FIGS. 3–6*a*, after the carton C has moved along into the carton lid forming and closing station, prior to the carton being closed in the manner previously described, the backing plate **196** and fingers **200** thereof move from the position shown in FIG. 3 to that of FIG. 4, wherein the fingers **200** will engage the inner surface of the lid in flanking relationship with respect to the score or fold lines **202** of the lid. Next, the forming head **220** and the forming dies **222** thereof will move from the position shown in FIGS. 4 and 5 to that of FIG. 6*a*, in which these forming dies will be in interdigitated relationship with respect to the fingers **200** and the arcuate movement thereof will be of such a character to form the inwardly extending flaps or flanges on the carton lid as clearly shown in FIG. 6*b* which is comparable to the positioning of the parts shown in FIG. 6*a*.

Brief résumé of the operation of the apparatus

Cartons which have been loaded with the product eggs, for example in the exemplary embodiment, are conveyed in end-to-end relationship along the run **32** of the conveyor. After the first carton has been disposed in the carton lid forming and closing station and the micro switch **88** has been closed, the apparatus will function automatically. The closing of the micro switch **88** results in activation of the one revolution clutch **26**, causing the cycle of operation of the drive shaft **62**. The backing plate and fingers **200** thereof will move into engagement with the inner surface of a carton lid **44** and thereafter the forming head **220** and dies **222** will move through the slots of the lid and orient them in their final form by moving in interdigitated relationship between the fingers **200** of the backing plate. After this has been accomplished, the carton closing means comprising bar **172** and plate **192** come into operation.

The control cam **170** causes pivotal movement of the supports **138** and **140** about the shaft **110**, and the cam track **169** causes the lid folding plate **192** to fold the lock flap **50** of the carton into substantially right angular relationship with respect to the lid **44**. Continued pivotal movement of the bar **172** and plate **192**, as illustrated in FIG. 8, will result in the carton lid being locked with respect to the article receiving portion **40**.

As the lid is locked into engagement with the article receiving portion **40**, the forming or folding plate **192** is reoriented to its normal position through the expedient of the abutment tongue **218** and roller **216** on the backing plate, and the support arm **138** functions to continue to hold a carton at the forming and closing station by means of the secondary abutment element **148** while it displaces the abutment element **114** into latched or notched relationship with respect to the lever portion **132** of the lever **130**.

As the support **138** moves back to its normal position, the abutment stop assembly **118** functions through the lever **94** and abutment portion **106** thereof urges the carton away from the fixed abutment stop **102** so that it can be conveyed into the forming and closing station. At the same time the orienting stop assembly **116** will no longer restrain cartons from moving out of the forming and closing station and the leading end of the cartons engage the portion **136** of the flange **134** to cause the lever portion **132** to pivot downwardly and out of the path of upward movement of the abutment **114** to accordingly restrain the next oncoming carton at the forming and closing station.

It will be noted that the exemplary embodiment of the invention, as disclosed by way of example, includes means for timing movement of cartons into the apparatus, means to insure that only one carton at a time enters into a forming station, means are provided to sense or detect when a carton has reached a properly oriented position whereby the lid will be formed thereat, and a single-cycle drive means actuates the various functioning components. Although the exemplary and illustrative embodiment of the invention is adapted to accept a random supply of cartons conveyed on a relatively smooth belt conveyor, and includes automatically-operating indexing and positioning means, with respect to the broad concept, as hereinafter claimed, applicant intends that the full range of equivalents of similarly functioning components be applicable with respect to the claims. For example, an intermittently-driven, reciprocating "flighted" conveyor together with automatic positioning of a carton in a "conveyor pocket" could be utilized in apparatus of the character heretofore disclosed, and the cartons could be oriented during a "dwell period" of the conveyor. Further, for example, the apparatus could cycle continuously to eliminate, for example, a single-cycle clutch etc.

Although this apparatus is particularly adapted for forming cushioning and viewing slots in the lid of a carton, as well as closing the same, it also is susceptible for use in closing lids of conventional egg cartons and the like which do not include such viewing slots.

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

What is claimed is:

1. In a carton lid forming and closing apparatus comprising, means for orienting a carton in a predetermined position; lid forming means displaceably supported above said predetermined position and including cooperating portions abuttingly engageable on opposite sides of said predetermined position in a substantially vertical plane for forming viewing and cushioning slots in a carton lid; carton lid closing means displaceably mounted for movement into overlying relation with respect to said predetermined position for folding a lock flap in angular relation to the carton lid and lockingly engaging the lock flap with the carton; and power means operatively connected to said lid forming means and lid closing means for actuating the same.

2. A carton lid forming and closing apparatus comprising, in combination, conveyor means for conveying a carton along a path of travel; lid forming means displaceably supported above said path of travel and including cooperating portions abuttingly engaging from opposite sides of said path of travel in a substantially vertical plane for forming view and cushioning slots in a carton lid; carton lid closing means displaceably mounted for movement into overlying relation with respect to said path of travel for folding a lock flap in angular relation to the carton lid and lockingly engaging the lock flap with the carton; and power means operatively connected to said

lid forming means and lid closing means for actuating the same.

3. A carton lid forming and closing apparatus comprising, in combination, conveyor means for conveying a carton along a path of travel; means operatively associated with said conveyor for orienting a carton at a lid forming and closing station on said machine; lid forming means displaceably supported above said path of travel of said conveyor and including cooperating portions abuttingly engaging from opposite sides of said path of travel in a substantially vertical plane for forming view and cushioning slots in a carton lid; carton lid closing means displaceably mounted for movement into overlying relation with respect to said path of travel for folding a lock flap in angular relation to the carton lid and lockingly engaging the lock flap with the carton; and power means operatively connected to said lid forming means and lid closing means for actuating the same.

4. The structure as claimed in claim 1 in which said lid forming means comprises a backing plate having a plurality of finger portions for engaging one side of planar lid between portions to be formed with slots therethrough, said lid forming means comprising a forming head including a plurality of forming dies, spaced therealong and disposed in interdigitated relation with said backing plate finger portions for engaging therebetween when the slots of a carton lid are produced.

5. The structure as claimed in claim 4 in which said backing plate and die head are suspended on an axis of rotation disposed above said horizontal path of travel, said power means comprising control cam and force transmitting linkages operatively connected to said backing plate and die head.

6. The structure as claimed in claim 3 in which said means operatively associated with said conveyor includes an abutment stop assembly disposed upstream of said lid forming and closing station and includes a mechanical abutment projectable into intersecting relation with respect to said path of travel of said conveyor, and fixed abutment means for normally preventing cartons being conveyed into said lid forming and closing station until the preceding carton lid has been formed and closed.

7. The structure as claimed in claim 3 in which said means operatively associated with said conveyor means includes an orienting stop assembly disposed downstream of said path of travel, said stop assembly including a first pivotal abutment mounted on an axis of rotation spaced parallel from and positionable into said path of travel for engaging the leading end of a carton and orienting the carton in relation to the forming and closing station, and a second pivotal abutment mounted on an axis of rotation downstream of said horizontal path of travel and including a lever portion projecting into intersecting relation to the pivotal path of said first pivotal abutment for movement thereby, said second pivotal abutment including an abutment shoe integral with said lever portion and normally positioned in the path of travel of said cartons, said shoe including a downstream plate portion for engagement by a closed carton for permitting said pivotal abutment into a carton stopping position when the plate portion and lever portion are engaged by a filled carton moved along said path of travel.

8. The structure as claimed in claim 7 in which said means operatively associated with said conveyor means includes an abutment stop assembly disposed upstream of said lid forming and closing station and includes a mechanical abutment projectable into intersecting relation with respect to said path of travel of said conveyor, and fixed abutment means for normally preventing cartons from being conveyed into said lid forming and closing station until the preceding carton lid has been formed and closed.

9. The structure as claimed in claim 1 in which carton lid closing means comprises a primary forming plate pivoted on an axis spaced from and parallel to the path of travel, said primary forming plate including a supplemental forming plate pivotally mounted on the upper edge thereof for folding the lid lock flap in angular relation to the general plane of the lid, and control means disposed adjacent the pivotal path of said primary forming plate and engaged with said supplemental forming plate for pivoting said supplemental forming plate during pivotal movement of said primary forming plate.

10. The structure as claimed in claim 2 in which said power means comprises a power shaft overlying said path of travel, control cams fixed to said drive shaft, lid forming means and lid closing means each being operatively and independently connected to a respective one of said control cams.

11. The structure as claimed in claim 10, including a one revolution control assembly connected to said drive shaft for providing a cycle of rotation for said drive shaft, and control means normally positioned in the path of travel of a carton lid for engagement thereby, and a one-revolution control assembly operatively connected to said control means for initiating a cycle of rotation when engaged by the leading end of a carton lid.

12. A carton closing machine comprising, in combination, conveyor means for conveying a carton along a path of travel, stop means including a portion displaceably supported for movement into intersecting relationship with the path of travel for engaging and orienting a carton at a lid closing station on said machine, carton lid closing means displaceably mounted for movement into overlying relation with respect to said path of travel for folding a lock flap in angular relation to the carton lid and lockingly engaging the lock flap with the carton, and power means operatively connected to said stop means and lid closing means, and including means for actuating the same in a cycle of operation, said stop means including an orienting stop assembly disposed downstream of said path of travel, said stop assembly including a first pivotal abutment mounted on an axis of rotation spaced parallel from and positionable into said path of travel for engaging the leading end of a carton and orienting the carton in relation to the closing station, and a second pivotal abutment mounted on an axis of rotation downstream of said horizontal path of travel and including a lever portion projecting into said intersecting relation to the pivotal path of said first pivotal abutment for movement thereby, said second pivotal abutment including an abutment shoe integral with said lever portion and normally positioned in the path of travel of said cartons, said shoe including a portion engageable by a closed carton for causing said lever to move out of the path of travel of said pivotal abutment to permit it to return to a carton stopping position when the lever portion is pivoted due to movement of a filled carton.

13. The structure as claimed in claim 2 in which said lid forming and lid closing means include a substantially common support frame overlying said path of travel of said conveyor means at a single carton lid and forming station.

References Cited

UNITED STATES PATENTS

2,665,532	1/1954	Wood	53—376
2,734,324	2/1956	Chandler.	
2,782,577	2/1957	Beall.	
2,803,934	8/1957	Lubersky	53—376

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