Dec. 8, 1959 B. G. COPPING 2,915,868

FOUR FLAP CASE OPENER

Filed Dec. 30, 1957 4 Sheets-Sheet 1

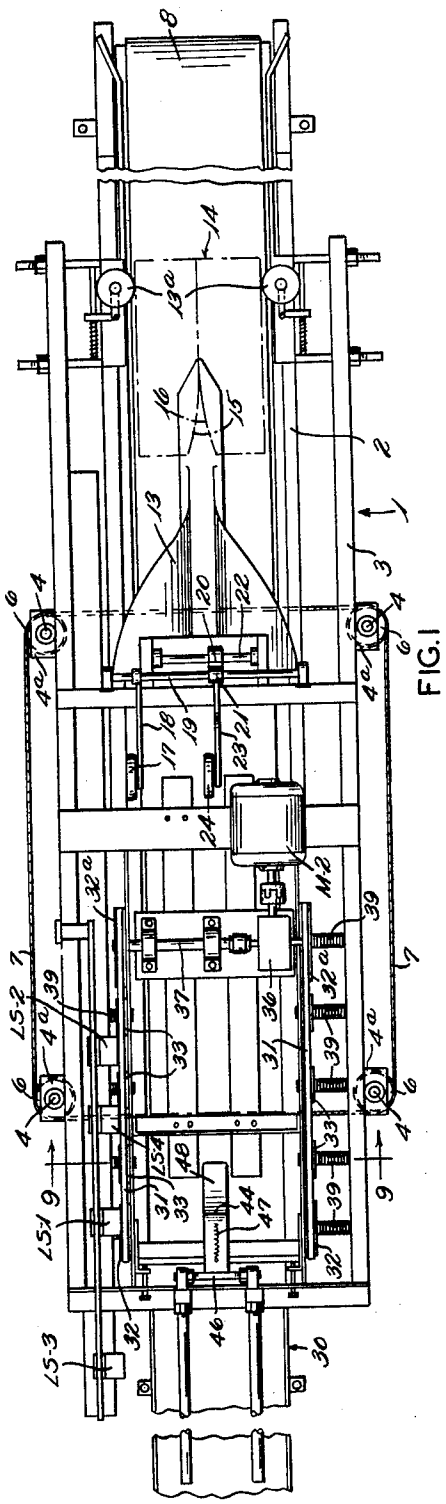

FIG. 1

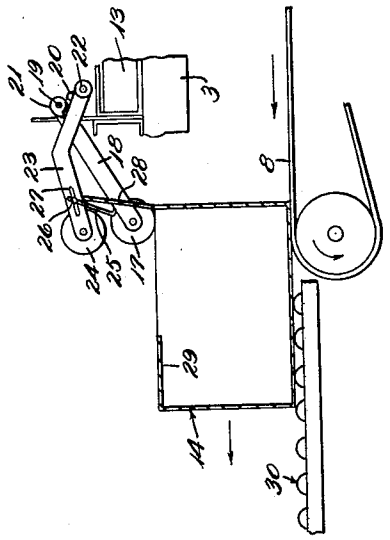

FIG. 6

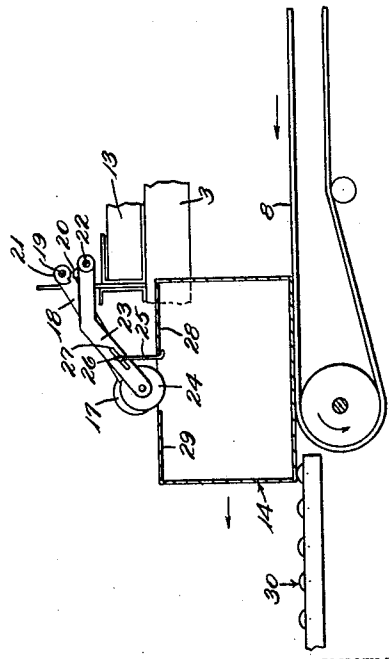

FIG. 5

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FOUR FLAP CASE OPENER

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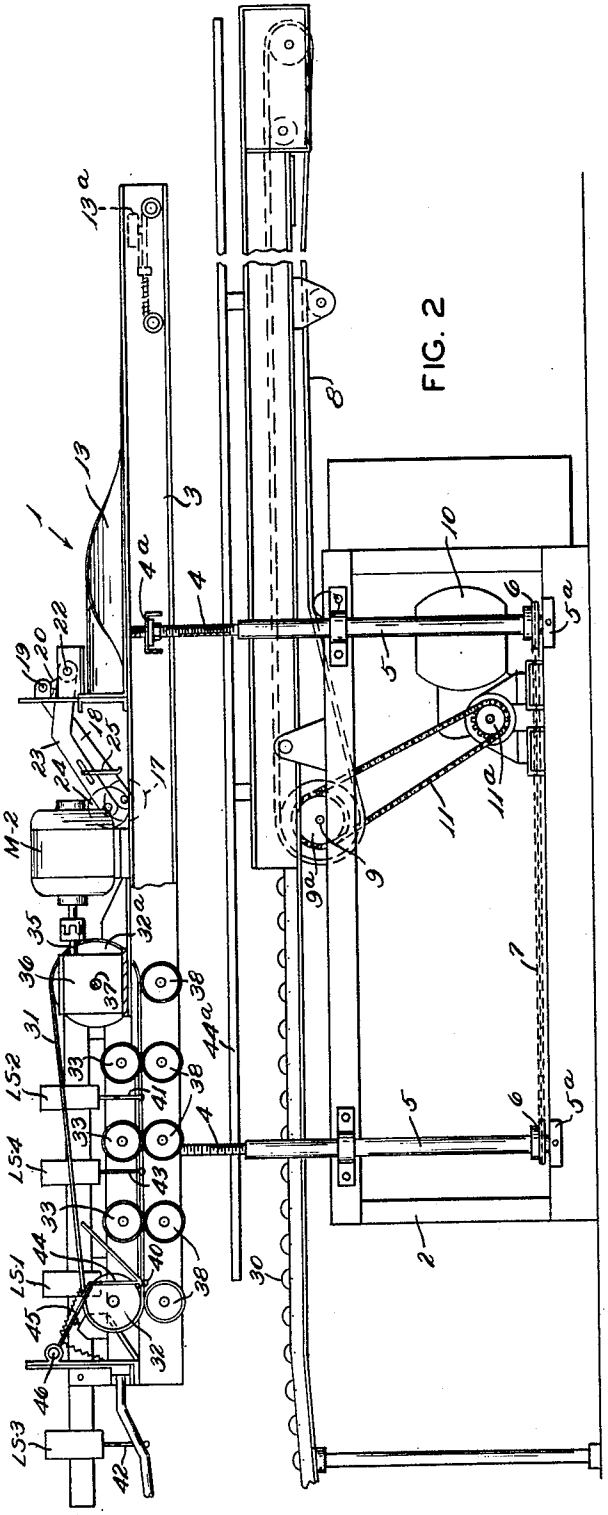

FIG. 2

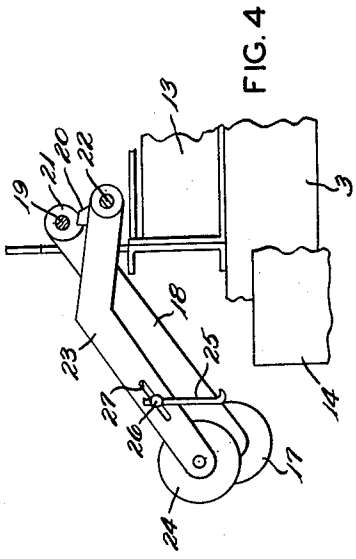

FIG. 4

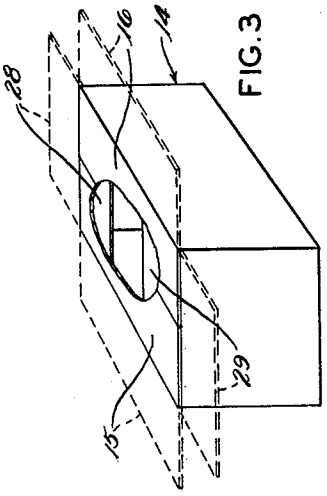

FIG. 3

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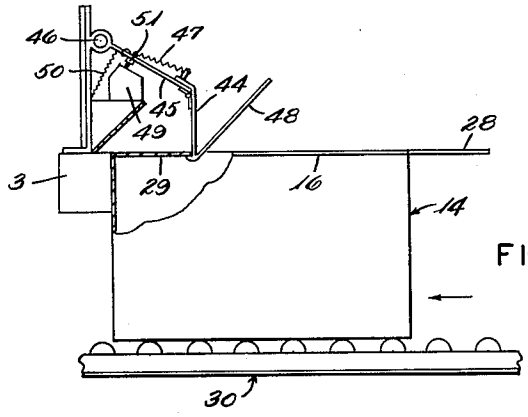

FIG.7

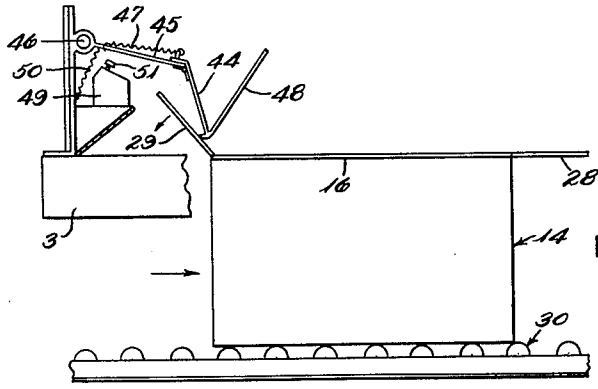

FIG. 8

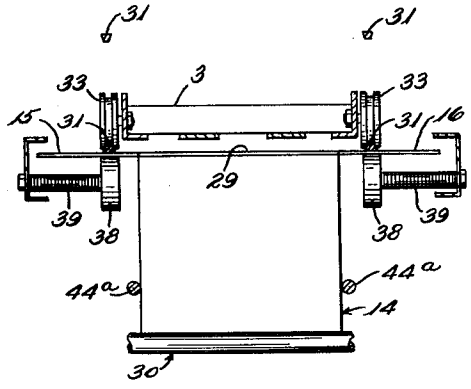

FIG. 9

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FOUR FLAP CASE OPENER

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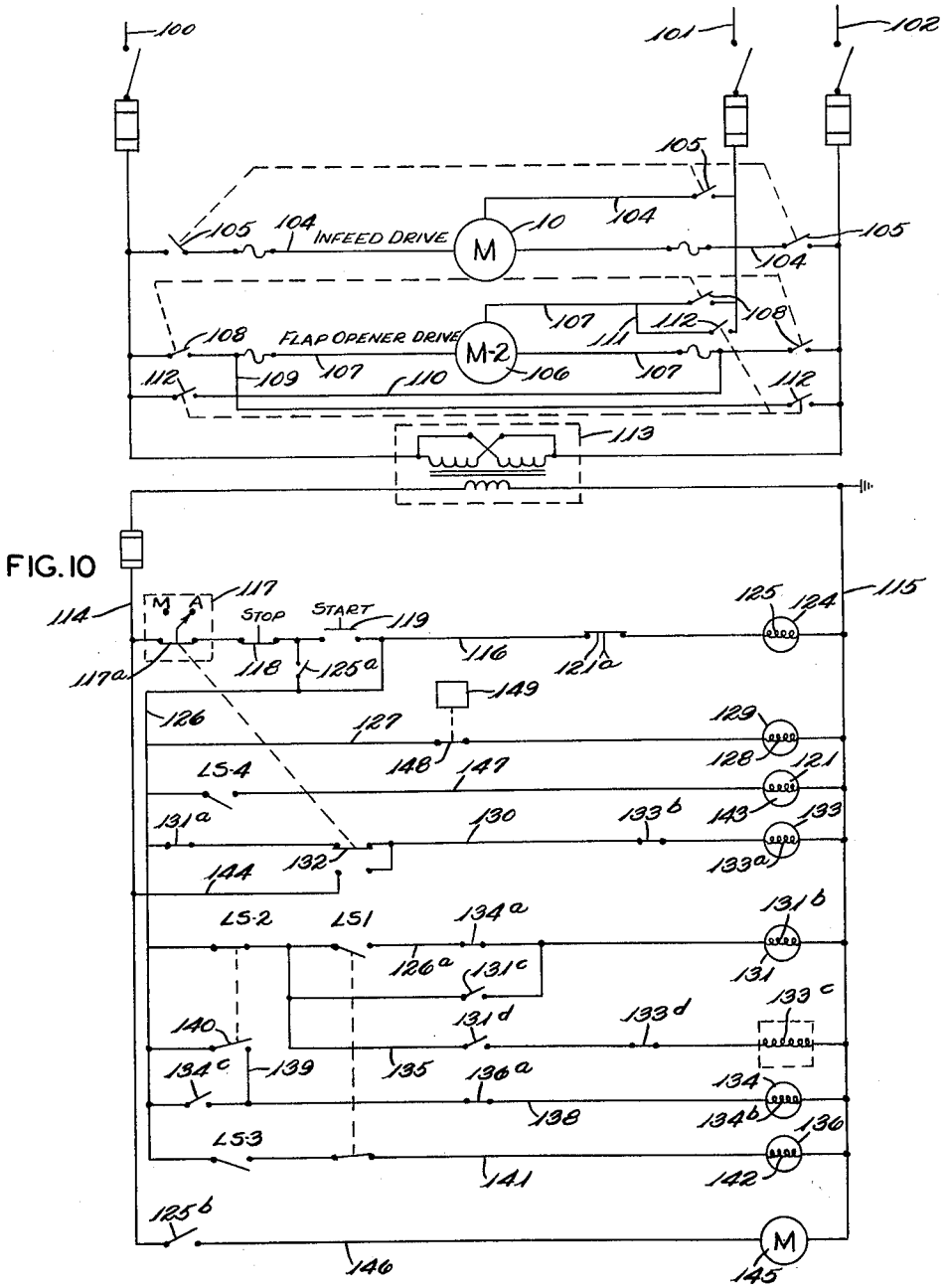

FIG. 10

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United States Patent Office 2,915,868 Patented Dec. 8, 1959

2,915,868

FOUR FLAP CASE OPENER

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Application December 30, 1957, Serial No. 706,154

18 Claims. (Cl. 53—381)

This invention relates to box or case flap opening apparatus and especially to apparatus for opening the four top flaps on a case or box of conventional construction having two end flaps and two side flaps for closing the top or bottom of a case, such as one made from cardboard, corrugated board, or the like.

Many different industries today purchase a large number of empty containers from manufacturing concerns and then fill such containers with merchandise for commercial sale of a packaged product. When these empty containers, such as bottles, boxes or cans are shipped from the manufacturing concern to the filling concern, such as a brewery, a refinery, a canning factory, or the like, these empty containers are usually shipped in cardboard cases having four flaps on opposite ends and sides thereof for closing action. When the cases are received by the cannery or other manufacturer, the cases are usually opened in such a manner that the cardboard cases can be reused for shipping the filled containers. Usually some type of a plow member is provided for opening the slide flaps as the cases move along through a given path, and various types of apparatus have also been provided heretofore for opening at least a trailing end flap of the filled cases. Thereafter the partially opened cases may be inverted to let the containers tumble therefrom for further alignment, processing, etc. However, in some instances, it is very desirable that all four flaps of the case be opened before removing the containers therefrom. Thus, removal fingers or other means can be inserted into the cases for engaging and removing the empty containers while keeping them in desired alignment for transfer to a different apparatus, or the open cases may be otherwise processed to remove the containers.

The general object of the present invention is to provide a novel and improved type of apparatus for opening the flaps on boxes, cases or the like characterized by the ability of the apparatus to effectively and positively open all four flaps without any injury or damage thereto.

Another object of the apparatus is to provide a compact apparatus with certain control or limit switches therein engaged by a case being processed to operate the apparatus in such a manner to have all four flaps on the case opened as it is processed.

Another object of the invention is to provide apparatus for moving a case forwardly through a flap opening portion of the apparatus to open some of the flaps of the case, and to reverse movement of the case temporarily for opening the then trailing end flap on the case, and then to again reverse the case and move it out of the apparatus in the same direction as the case was originally being moved.

A further object of the invention is to provide a novel hook means for engaging a closed trailing end flap on a case being processed through a given path to automatically open such end flap on the case as it is being moved through the apparatus.

Further objects of the invention are to provide novel and improved electrical control means for moving a case forwardly and then backwardly of given flap opening apparatus and to move the case out of the apparatus after all flaps thereon are opened; to provide special roller and belt members for engaging opened side flaps of a case to control the movement of the case through the apparatus by the side flaps; to provide a special control arm assembly on the apparatus to position a hook member in proper relationship to a processed case for opening the trailing end flap thereon; and to provide a double hinged hook member resiliently positioned in the apparatus for engaging a trailing end flap of a case for opening it as the case is moved through the apparatus.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

Attention now is particularly directed to the accompanying drawings wherein apparatus embodying the principles of the invention is shown, and wherein:

Fig. 1 is a plan view of a four flap case opener apparatus of the invention;

Fig. 2 is a side elevation of the apparatus of Fig. 1;

Fig. 3 is a perspective view of a case shown with its four flaps in their opened position;

Fig. 4 is an enlarged fragmentary side elevation of the initial trailing flap opening arm assembly of the apparatus of the invention;

Fig. 5 is a fragmentary vertical section of the trailing end flap arm assembly of Fig. 4 showing it operatively associated with a case being processed;

Fig. 6 is a figure, like Fig. 5, only showing the case as further moved through the apparatus of the invention and with the end flap being opened;

Fig. 7 is a fragmentary vertical section showing the second trailing end flap opening hook means apparatus of the invention when initially engaged with an end flap;

Fig. 8 is a view, similar to Fig. 7, but with the direction of movement of the box being processed being reversed and with the end flap being shown swinging to its opened position;

Fig. 9 is a fragmentary vertical section taken on line 9—9 of Fig. 1 to show the means engaging a case that is being processed in the apparatus to control movement thereof; and

Fig. 10 is a diagrammatic wiring diagram of the electrical circuit means used in the apparatus of the invention.

When referring to corresponding parts shown in the drawings and referred to in the specification, corresponding numerals are used to facilitate comparison therebetween.

The present invention, in general, relates to a case opening apparatus including means such as a conveyor for supporting a case or box having closed side and end flaps thereon and which conveyor moves the case forwardly, means for opening both the side flaps and the trailing end flap of the case as it is moved forwardly, means for moving the case to the rear after the said trailing end flap is opened, means for opening the then trailing or second end flap as the case is moved rearwardly in the apparatus, and means for again moving the case forwardly after the trailing flap has been opened.

Attention now is particularly directed to the details of the construction shown in the drawings, and a case opening apparatus of the invention is indicated as a whole by the numeral 1. This case opening apparatus 1 includes a frame 2 having an upper frame section 3 vertically adjustably secured thereto, as by means of a plurality of support rods 4. These support rods 4 are threaded at their upper ends only and engage with suitable tapped

sockets 4*a* on the upper frame section. The rods 4 are rotatably positioned by brackets 5 secured to the frame 2 and by suitable thrust bearing means 5*a*. The rods 4 are coupled together for unitary control thereof, as by means of sprockets 6 secured to the rods 4 and engaging an endless chain 7. The chain 7 extends around all four rods provided for supporting the upper frame section 3 so that rotation of any one of the rods 4, as by means of a bar (not shown) engaging a hole in a rod 4, will provide unitary rotation of all rods 4 to vary the relationship of the upper frame section to the remainder of the apparatus. This adapts the apparatus to handle a variety of vertical height cases for flap opening action.

The frame 2 has a conveyor belt 8 suitably journalled thereon at the input end of the frame. Such conveyor usually has a positioning shaft 9 provided at one end thereof carrying a drive sprocket 9*a* thereon. A drive motor 10 is provided in the apparatus and connects to the drive sprocket 9*a* by an endless chain 11 that connects to a driven sprocket 11*a* operatively connected to the drive motor 10.

A plow 13 is positioned on the upper frame section 3 and extends towards the input end of the frame for engaging the side flaps of a case or corrugated box 14 being processed by the apparatus of the invention. Initially all four flaps, the pair of opposed side flaps and the pair of opposed end flaps on the case 14 are closed when the case is fed into the apparatus. Normally the case has a plurality of empty containers, such as cans, bottles or boxes therein. With forward movement of the conveyor belt 8, the side flaps 15 and 16 on the box or case 14 are opened as the plow 13 is positioned to extend in under these side flaps and fold them back, to open the flaps, with relative movement between the plow and the case being processed. Squeeze rolls 13*a* engage the sides of the case 14 and facilitate the flap opening action of the plow 13.

After the case 14 has passed under the plow 13, a roller 17, journalled on a control arm 18, is positioned to contact the opened side flap 15. This control arm 18 is secured to a shaft 19 extending transversely of and journalled in the upper frame section 3 so that the roller 17 will have rolling engagement with the opened side flap of a case being processed and its position is determined by such side flap. A second shaft 22 is journalled on the upper frame section parallel to and immediately below the shaft 19. Interengaging means are provided to couple the shafts 19 and 22 together and comprise a cam 21 secured to the shaft 19 and engaging a finger or lug 20 on a support arm 23 secured to the shaft 22. The support arm 23 extends in the same general direction as the control arm 18 which extends in the direction of forward movement of cases through the apparatus 1. A roller 24 is journalled on the support arm 23 and is positioned by the action of the control arm 18 engaging the side flap 15 to roll on the closed end flap of the case. When not engaging a case, the control arm 18 hangs down to lift the support arm 23 up out of case engaging position. The arm 23 has a flap engaging hook 25 carried thereby and extending downwardly therefrom. Such hook 25, as shown in Fig. 4, is adjustably secured to the arm 23 by means of a lock bolt 26 received in a slot 27 extending longitudinally of the arm 23. Thus the hook can be vertically as well as longitudinally adjusted with relation to the arm 23 for engaging a trailing end flap 28 of the case 14 as the case is moved through the apparatus. The opposite end flap 29 remains in its closed position while the case is being so processed. The rollers 17 and 24 and arms 18 and 23 are arranged to prevent the hook 25 from gouging into the leading end of the case, or from catching in the contents of the case. Figs. 5 and 6 best show this initial engagement of the roller 24 and hook 25 with the end flap 28 for opening action thereon. As the roller 24 drops off the end flap 29, the hook 25 is positioned to engage the trailing end flap 28 but has been held above the open tops of containers in the case 14.

Box moving means

Fig. 2 of the apparatus clearly shows that a conventional roller conveyor 30 is journalled on or otherwise positioned by the frame 2 at the discharge end of the belt conveyor 8. Such belt conveyor terminates after it has moved the processed case 14 past the trailing end flap opening hook 25. At such time, the side flaps 15 and 16 of the case 14 are opened as is the end flap 28. The apparatus then provides a means for engaging these open side flaps 15 and 16 for moving the case 14 through the apparatus and controlling the position thereof. To this end, a pair of endless belts 31 are positioned by sheaves 32 and 32*a* to extend along the upper frame section 3 adjacent the lateral margins thereof and to have horizontal courses immediately above the side flaps 15 and 16. These endless belts 31 are partially positioned by backup rolls, or pulleys 33, that reenforce the endless belts 31 and prevent any undesired upward vertical movement thereof. A drive motor M–2 is provided to control the movement of the case 14 and such motor, hereinafter described in more detail, is suitably coupled to a shaft 35 of a gear box 36, or the like. This gear box 36 drives a shaft 37 on which the drive sheaves 32*a* for the endless belt 31 are positioned so that the motor M–2 will drive the belt 31 whenever energized.

Fig. 9 of the drawings best shows that back-up rolls 38 are resiliently positioned on the upper frame section 3, as by means of flexible coil springs 39 so that such rolls 38 will be urged up against the under surfaces of the side flaps 15 and 16 to force them into good driving engagement with the endless belts 31 that are backed up against undesired vertical movement by the positioning rolls 33.

Electric control circuit for case movement

Fig. 2 of the drawings best shows that a plurality of limit or control switches LS–1, LS–2, LS–3 and LS–4 are positioned at longitudinally spaced portions of the upper frame section 3 and that a trip or actuation arm 40, 41, 42 and 43, respectively, extends downwardly from each one of these limit switches for actuation or closing action thereon. These limit switches are provided for controlling the drive circuit or energization of the control motor M–2 and effect the energization circuits for such motor in accordance with the control means referred to hereinafter in more detail. In all events, as the partially opened case 14 is moved forwardly through the apparatus 1, the side flap 15 will contact the actuation arm 40 of LS–1 and this will effect a reversal of drive of the motor M–2. In such forward movement, the case 14, or a side flap has contacted and moved the actuation arm 41 but does not trip or effect limit switch LS–2 as it is actuated only by rearward movement of a case in the apparatus. During the forward movement of the case 14 through the case opening apparatus 1, the second end flap 29 has been moved forwardly past a second end flap engaging hook 44. The hook 44 is pivotally carried by a carrier bar or arm 45. This carrier arm 45 is secured to a shaft 46 journalled on the upper frame section 3. Figs. 7 and 8 of the drawings best show that a spring 47 is connected between the hook 44 and the carrier arm 45 to urge the hook 44 up towards a position substantially in alignment with the carrier arm 45. Also, the hook 44 has a slide bar 48 either secured thereto, or formed therewith and extending therefrom for initial sliding engagement with the leading end of the case 14 as it is moved forwardly through the apparatus. A support bar 49 on the upper frame section 3 limits the downward movement of the carrier arm 45 which is resiliently drawn against such support bar 49 by a spring 50. An adjustable stop 51 positioned below the carrier arm 45 controls the normal position of the carrier arm 45 with relation to the support bar 49. As the case moves under the slide bar 48, the hook 44 is brought into operative association with the case 14. After this case has been moved so that the trailing end flap 29 has moved beyond the hook 44, then the case 14 strikes the

actuating arm 40 and the reversing action on the drive of the motor M–2 is effected. The case thus starts to move rearwardly in the apparatus, as indicated in Fig. 8. Thus the hook 44 moves or catches in under the trailing end flap 29 and it effects a gradual lifting action thereon with continued reverse movement of the case 14. That movement of the case 14 then brings the leading end of the case 14, or else one side flap 15 thereof into engagement with the actuating arm 41 for the second reversing switch LS–2 of the apparatus. At such time, as hereinafter described, the drive of the motor M–2 is reversed again and the case 14 will be moved in a forward direction through the case opening apparatus 1 and out of the apparatus for other processing action as desired. However, by this time all four flaps on the case 14 will have been opened to expose the contents thereof for either being lifted out of the case 14, or for the case 14 to be dumped or to be otherwise processed to permit use of the containers within the case.

In passing out of the apparatus 1, the case 14 or side flap thereon will contact actuation arm 42 for LS–3 and this effects a resetting of the control switches LS–1 and LS–2 of the apparatus, as hereinafter described.

Each time a case 14 is moved into the center portions of the belts 31, the actuation arm 43 of limit switch LS–4 is actuated and this provides a safety control in the apparatus to turn off all motors in the case opening apparatus, should such safety switch LS–4 be actuated longer than a predetermined time interval.

Suitable guide bars 44*a* are adjustably positioned by the frame 2 to engage the sides of the case 14 and hold it centrally of the apparatus 1 while being processed therein.

Electric circuit—details

The control circuits involved and utilizing the limit switches LS–1, LS–2, LS–3 and LS–4, referred to hereinbefore and shown in the drawings, is detailed in Fig. 10 of the drawings. Thus a plurality of power supply leads 100, 101 and 102 are provided and they connect to the infeed drive motor 10 by a plurality of leads 104 connecting the individual power supply leads to the motor 10. Each of these leads 104 has a control switch 105 provided therein. These three control switches 105 are operated as a unit by a suitable motor starter referred to hereinafter.

Power to a flap opener drive motor 106 (M–2) for forward drive thereof is supplied by a plurality of leads 107 connecting the individual power supply leads to the motor 106 through a plurality of individual line control switches 108. The control switches 108 are adapted to be operated as a unit by a suitable motor started member hereinafter described. When the motor 106 is to be reversed, power then is supplied to the motor 106 by leads 109, 110 and 111 with each of such lines having a switch 112 provided therein. Thus each switch 112 is controlled by the motor starter provided for the motor 106 and the three switches 112 are adapted to be operated as a unit in alternate closing relationship to the switches 108.

The actual regulation or control means for use with the apparatus of the invention is provided with power by a transformer 113 that is connected to the leads 100 and 102. The transformer secondary supplies power to leads 114 and 115 connected for operating the control means of the invention. A lead 116 connects between the leads 114 and 115 for supply of operating power to the control circuit. This lead 116 has a selector switch 117 comprising a double pole double throw switch, for example, therein. When such switch 117 is placed on the position indicated at A in the drawings, this sets up automatic operation of the apparatus and closes the power circuit through a contact 117*a* to a normally closed stop switch 118. A normally open start switch 119 is also connected in the lead 116 and starts the apparatus when temporarily closed manually for start of operation of the apparatus. The lead 116 has a normally closed switch, or contact 121*a* of a time delay relay 121 connected therein. The time delay relay 121 thus controls flow of current through the lead 116 to an operating coil 124 for a first control relay 125 connected therein, so as to actuate such relay 125 when the starter switch 119 is closed. The relay 125 controls two switches indicated at 125*a* and 125*b* in the drawings. These switches normally are open but are closed by actuation of the relay 125 by the starter switch 119. The switch 125*a* shorts around the starter switch 119 to maintain the apparatus in operation after the operational circuit is once energized by temporarily closing the switch 119. A second power supply lead 126 extends from the lead 116 past the starter switch 119 for connection to the remainder of the apparatus of the invention to supply power thereto, and with power being supplied to such lead 126 as long as control relay 125 remains closed. The lead 126 has a power supply lead 127 extending therefrom and extending through an energization coil 128 for an infeed relay-type motor starter 129 over to the opposite power circuit lead 115. Thus, power is supplied to the motor starter 129 which controls the three switches 105 and supply of power to the infeed drive motor 10 so that such motor will run continually as long as the control relay 125 remains closed.

A second power transmitting lead 130 connects to the lead 126 to couple it to the opposite power lead 115 and with such lead 130 transmitting power to an operating coil 133*a* of a reversible motor starter 133. The lead 130 connects through a normally closed switch 131*a* of a second control relay 131. A switch 132 is also closed in this lead 130 by the selector switch 117 so that power supplied to the lead 130 flows through an interlocked normally closed contact 133*b*, controlled by the reversible starter 133 and opened when the coil 133*c* is energized, to the operating coil 133*a* therefor which is thereby actuated and closes the power supply to the motor 106 for forward movement thereof. Hence, the motor 106 will be driven to move cases forwardly through the apparatus of the invention until a side flap of a box being opened trips and temporarily closes LS–1, which is the first reversing switch in the control.

Closing of LS–1 energizes coil 131*b* of the second control relay 131 through normally closed LS–2, a normally closed contact 134*a* controlled by a third control relay 134 to be hereinafter described, and a lead 126*a* extending from the lead 126. The energization of the second control relay 131 will close an energization circuit for such relay through normally open switch 131*c* to close a circuit around LS–1 and the contact 134*a*. The energization of the control relay 131 also closes a switch 131*d* in lead 135 which energizes a reversing coil 133*c* of the reversible motor control starter 133. Energization of the coil 133*c* effects the continuous reverse drive of the motor 106 by opening the switches 108 and closing switches 112. A normally closed switch 133*d*, opened by actuation of the forward drive coil of the motor starter 133, is connected in the lead 135 that connects to power lead 126*a*. Hence, the tripping of LS–1 effects a reversal of the motor 106 and moves the processed box back into contact with LS–2 and temporarily trips such switch from its normally closed position to an open position. During such reverse movement of the case, the then trailing end flap will be opened as previously described.

As the next operation, controlled by LS–2, the control relay 131 and the circuit for the reversing coil 133*c* will be opened and the further, or third control relay 134 will be energized. Such circuit for an energization coil 134*b* of the control relay 134 is controlled by a normally closed switch 136*a* operated by a fourth control relay 136 connected in the circuit means of the invention. A lead 138 connects to the control relay 134 and

connects through a lead 139 to the power supply lead 126 by a switch 140 temporarily closed when LS–2 is actuated. The third control relay 134 maintains itself energized by means of a normally open switch 134*c* controlled and closed by the relay 134 in the lead 138 and connecting it to the power supply lead 126. The de-energization of the reverse coil 133*c* of the motor starter 133 permits the forward drive operating coil 133*a* thereof to be energized through normally closed switches or contacts 131*a* and 132 so that the motor 106 will now be driven forwardly.

The case being processed is now ready to be moved out of the flap opening apparatus with all four flaps thereof open. As the case moves out of the processing apparatus, it contacts and trips LS–3 to close a power supply circuit through a lead 141 that connects lead 126 to the operating coil 142 for the fourth control relay 136. By such movement, the case has previously passed and tripped LS–1 but does not close any circuit because normally closed switch 134*a* is held open by energization of the third control relay 134, at such time. This energization of the fourth control relay 136 opens switch 136*a* and thus opens the circuit to the third control relay 134, and the operating mechanism is ready for entry of a new case thereinto for forward and reverse movement through the flap opening portion of the apparatus.

LS–4 is a safety limit switch in the apparatus and when it is closed by a case in the forward-reverse portion of the apparatus 1, it energizes a coil 143 of the time delay relay 121. The switch 121*a* is normally closed and only opened after a predetermined time delay after the energization of the coil 143 controlling the time delay relay 121. Such relay 121 requires continued energization for its switch or contact opening action. The time delay relay 121 is of the instantaneous reset type when de-energized. Each time a case moves into the forward-reverse portion of the apparatus, the coil 143 is energized and maintained energized as long as the case is in that portion of the apparatus. Lead 147 connects to LS–4 and power lead 126. Should a case stay in the forward-reverse portion of the apparatus too long and LS–4 remain closed for an excessive time, the coil 143 will effect opening of the relay 125 and stop both motors 101 and 106 by opening the switch 121*a*.

If for any reason it be desired to eliminate the automatic functioning of the apparatus and merely move cases forwardly through the apparatus, the switch 117 can be set to position M and in such position it will close contact 132 through a lead 144 to the power lead 114 so that the flap opener drive motor 106 is continuously driven forwardly.

If it is necessary to have a cooling action on the motor 106 or other portions of the apparatus, a motor 145 is provided for driving a suitable blower. This motor 145 is connected between the power leads 114 and 115 by a lead 146 having a normally open switch 125*b* in such circuit, which switch is closed when control relay 125 is energized.

Any conventional fusing means is provided in the power supply circuit and the transformer 113 is grounded.

A normally closed demand control switch 148 is provided in the lead 127 and may be operated by a remote control unit usually positioned at the apparatus to which the cases 14 are passed by the apparatus 1. Thus if cases are improperly accumulated in such open case receiving unit, such cases could actuate an electric photo-cell control, a time delay switch, or other conventional control 149 to open the demand control switch 148 and prevent the motor starter 129 for the infeed motor 10 from being energized and no cases will move into the apparatus until the switch 148 is closed by the opened cases moving on for further processing.

In some instances, it may be desired to move the cases by a second driven conveyor, for example, in the forward-reverse part of the apparatus on which the cases would be supported. Or, arms on a driven endless belt could engage the cases 14 to move them over the roller conveyor 30.

From the foregoing, it will be seen that a positive type of a four flap case opening apparatus has been provided by the invention. The apparatus is adapted to function automatically and with the conveyor belt 8 being adapted to be driven at a speed that it will feed cases 14 into the forward-reverse section of the apparatus at such a rate as to permit them to be fully opened or processed therein before admitting a new case to this section of the apparatus for opening the fourth or remaining end flap of the case being processed. The apparatus is relatively uncomplicated to construct and can be easily adjusted to operate upon a different size case, as desired. The movement of the cases being processed is positively controlled in the apparatus and cases will not be harmed in any manner while being opened in the apparatus of the invention. Thus it is believed that the objects of the invention have been achieved.

While one complete embodiment of the invention has been disclosed herein, it will be appreciated that modification of this particular embodiment of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. In a flap opening apparatus for corrugated boxes, cases or the like, means to support the processed cases, means to open the side and trailing end flaps of the cases, means to engage the side flaps of the cases and control the movement of the cases on said support means, electric means to drive said engaging means, electric circuit means to control said electric means to drive said engaging means forwardly normally, switch and control means in the path of the cases to be contacted thereby to reverse the drive of said engaging means by said electric circuit means, and means for opening the remaining and then trailing end flap of the case when moving in the reverse direction.

2. In a flap opening apparatus for corrugated boxes, cases or the like, means to support the processed cases, the side and trailing end flaps of the cases being open, means to engage the side flaps of the cases and control the movement of the cases on said support means, electric means to drive said engaging means, electric circuit means to control said electric means to drive said engaging means forwardly, switch and control means in the path of the cases to be contacted thereby to reverse the drive of said engaging means by said electric circuit means, means for opening the remaining and then trailing end flap of the case when moving in the reverse direction, and a control switch in the path of movement of the case when moving rearwardly for actuation thereby and connected to said electric circuit means to again move the case forwardly.

3. In a flap opening apparatus for corrugated boxes, cases or the like, means to support the processed cases which have open side and trailing end flaps and to move them through the apparatus, electric means to drive said case moving means, electric circuit means to control said electric means to drive said case moving means forwardly, switch and control means in the path of the boxes to be contacted thereby to reverse the drive of said case moving means by said electric circuit means, means for opening the remaining and then trailing end flap of the case when moving in the reverse direction, and safety means to terminate actuation of said case moving means if a case remains in the apparatus beyond a predetermined time.

4. In a flap opening apparatus for corrugated boxes, cases or the like, means to support and move the processed cases, means to open the side and trailing end flaps of the cases, electric means to drive said case moving means, electric circuit means to control said electric means to drive said case moving means forwardly, switch

means in the path of the cases to be contacted thereby and connected to said electric circuit means to reverse the drive of said case moving means by said electric circuit means, and means for opening the remaining and then trailing end flap of the case when moving in the reverse direction.

5. A case opening apparatus comprising a conveyor for support of a case having closed side and end flaps thereon for moving the case forwardly, means for opening both the side and trailing end flap on the case as it is moving forwardly, means for moving the case to the rear after said trailing end flap is opened, means for opening the then trailing end flap as the case is moved to the rear, and means for again moving the case forwardly after the second trailing end flap has been opened.

6. A case opening apparatus comprising a conveyor for support of a case having closed side and end flaps thereon for moving the case forwardly, means for opening both the side and trailing end flap on the case as it is moving forwardly, means for moving the case to the rear after said trailing flap is opened, and means for opening the trailing end flap as the case is moved to the rear.

7. A case opening apparatus comprising a conveyor for support of a case having closed end flaps thereon for moving the case forwardly, means for opening the trailing end flap on the case as it is moving forwardly, a limit switch actuated by a processed case after the trailing end flap is opened, means for moving the case to the rear after said limit switch is actuated, means for opening the remaining and now trailing end flap as the case is moved to the rear, and means including a control switch actuated by a processed case for again moving the case forwardly after the second trailing end flap has been opened.

8. In a flap opening apparatus for corrugated boxes, cases and the like, means to support the cases and move them forwardly, the cases having the side flaps thereon open, and means for opening the trailing end flap on the cases as they are moved forwardly, said end flap opening means comprising a pivotally positioned support arm, a hook carried by said support arm to engage an end flap and hold it against forward movement to open such flap, a control arm pivotally positioned adjacent said support arm, roller means on said control arm to contact any cases being processed and to be moved up thereby, and means connecting said control arm to said support arm to move said support arm oppositely to said control arm and position said hook for engaging an end flap of a case engaged by said roller means.

9. In a flap opening apparatus for corrugated boxes, cases and the like, means to support the boxes and move them forwardly, the boxes having the side flaps thereon open, and means for opening the trailing end flap on the cases as they are moved forwardly, said end flap opening means comprising a pivotally positioned support arm, hook means on said support arm to engage an end flap of a case and open it on forward movement of the case, a control arm pivotally positioned adjacent said support arm, means on said control arm to contact any cases being processed and be moved up thereby, and means connecting said control arm to said support arm to move said support arm oppositely to said control arm and position said hook means for engaging an end flap of a case engaged by said control arm means.

10. In a case opening apparatus, a frame, a pair of driven endless belts operatively journalled on said frame for individually engaging corresponding surfaces of each of the pair of side flaps of a case when opened, back-up rolls carried by said frame for said side flaps and engaging the opposite surfaces of said side flaps when opened, resilient means positioning said back-up rolls on said frame to hold such side flaps against said belts, a plurality of pulleys journalled on said frame and engaging said belts intermediate the journal means to retain portions of said belts in case engaging positions, and conveyor means adjacent said frame and extending parallel to said endless belts to support the case for movement by said driven belts.

11. In a flap opening apparatus for corrugated boxes, cases and the like, means to support the cases, means to move the cases forwardly and then in a reverse direction, the cases having the side flaps thereon open, and means for opening an end flap on the cases as they are moved forwardly and then in a reverse direction, said end flap opening means comprising a pivotally positioned carrier arm, a hook pivotally carried by said carrier arm to engage an end flap and hold it against movement to open such flap, spring means connecting said hook to said carrier arm to lift said hook and facilitate upward movement of said hook, and a slide bar extending forwardly from said hook to engage a case as it is moved forwardly into engagement with such slide bar, said slide bar positioning said hook for engaging the end flap of a case when the case is moved rearwardly after being brought into engagement with said slide bar by forward movement.

12. In a flap opening apparatus for corrugated boxes, cases and the like, means to support the cases, means to move the cases forwardly and then in a reverse direction, the cases having the side flaps thereon open, and means for opening an end flap on the cases as they are moved forwardly and then in a reverse direction, said end flap opening means comprising a pivotally positioned carrier arm, a hook pivotally carried by said carrier arm to engage an end flap and hold it against movement to open such flap on relative movement of the case and hook, and a slide bar extending forwardly from said hook to engage a case as it is moved forwardly into engagement with such slide bar, said slide bar positioning said hook for engaging the end flap of a case when the case is moved rearwardly after being brought into engagement with said slide bar by forward movement of the case.

13. In a flap opening apparatus for corrugated boxes, cases and the like, means to support the cases, electrically controlled means to move the cases forwardly, the cases having the side flaps thereon open, and means for opening the initially leading end flap on the cases as they are moved forwardly and then in a reverse direction in the apparatus, said end flap opening means comprising a pivotally positioned carrier arm, a hook pivotally carried by said carrier arm to engage an end flap and hold it against movement to open such flap, a slide bar extending forwardly from said hook to engage a case as it is moved forwardly into engagement with such slide bar, said slide bar positioning said hook for engaging the end flap of a case when the case is moved rearwardly after being brought into engagement with said slide bar by forward movement, and electric control switch means for actuation by a case as moved into engagement with said slide bar for engagement by said hook and connected to said electrically controlled case movement means to move such cases rearwardly.

14. In a flap opening apparatus for corrugated boxes, cases and the like, means to support the cases, means to move the cases forwardly and then in a reverse direction, the cases having the side flaps thereon open, and means for opening an end flap on the cases as they are moved forwardly and then in a reverse direction, said end flap opening means comprising a pivotally positioned carrier arm, a hook pivotally carried by said carrier arm to engage an end flap and hold it against movement to open such flap on relative movement of the case and hook, a slide bar extending forwardly from said hook to engage a case as it is moved forwardly into engagement with such slide bar, said slide bar positioning said hook for engaging the end flap of a case when the case is moved rearwardly after being brought into engagement with said slide bar by forward movement of the case, a support bar limiting the inoperative position of said carrier

arm, and spring means urging said carrier arm towards said support bar.

15. In a flap opening apparatus for corrugated boxes, cases and the like, means to support the cases and move them forwardly, the cases having the side flaps thereon open, and means for opening the trailing end flap on the cases as they are moved forwardly, said end flap opening means comprising a pivotally positioned support arm, a hook carried by said support arm to engage an end flap and hold it against forward movement to open such flap, a control arm pivotally positioned adjacent said support arm, roller means on said control arm to contact an opened side flap of a case being processed and to be moved up thereby, and means connecting said control arm to said support arm to move said support arm oppositely to said control arm and position said hook for engaging a trailing end flap of a case engaged by said roller means, said control arm retaining said support arm in a position to avoid said hook gouging into a processed case, said support arm being free to pivot upwardly as a trailing end flap is opened.

16. In a flap opening apparatus for corrugated boxes, cases or the like, means to support the processed cases, means adjacent said support means to open the side and trailing end flaps of the cases, means operatively associated with said second-named means engaging the cases and controlling the movement of the cases on said support means, electric means to drive said engaging means, electric circuit means connected to said electrical means to control said electric means to drive said engaging means forwardly normally, switch and control means in the path of the cases to be contacted thereby to reverse the drive of said engaging means by said electric circuit means, and means operatively associated with said support means for opening the remaining and then trailing end flap of the case when moving in the reverse direction.

17. In a flap opening apparatus for corrugated boxes, cases or the like, means to support the processed cases,

the side and trailing end flaps of the cases being open, means to engage the cases and control the movement of the cases along said support means, electric means connected to said engaging means to control the operation thereof, electric circuit means connected to said electric means to control said electric means to drive said engaging means forwardly, switch and control means in the path of the cases to be contacted thereby as moved forwardly on said support means to reverse the drive of said engaging means by said electric circuit means, means for opening the remaining and then trailing end flap of the case when moving in the reverse direction, and a control switch in the path of movement of the case when moving rearwardly on said support means for actuation thereby and connected to said electric circuit means to again move the case forwardly, said control switch being actuated only upon rearward movement of said case on said support means.

18. A case opening apparatus comprising a conveyor for support of a case having closed side and end flaps thereon, means engaging a case for moving the case forwardly, means engaging the case for opening both the side and trailing end flap on the case as it is moving forwardly, means operatively controlling said engaging means for moving the case to the rear after said trailing end flap is opened, means engaging the case for opening the then trailing end flap as the case is moved to the rear, and means operatively controlling said engaging means and actuated by contact with a rearwardly moving case on said conveyor for again moving the case forwardly after the second trailing end flap has been opened.

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