

March 22, 1966

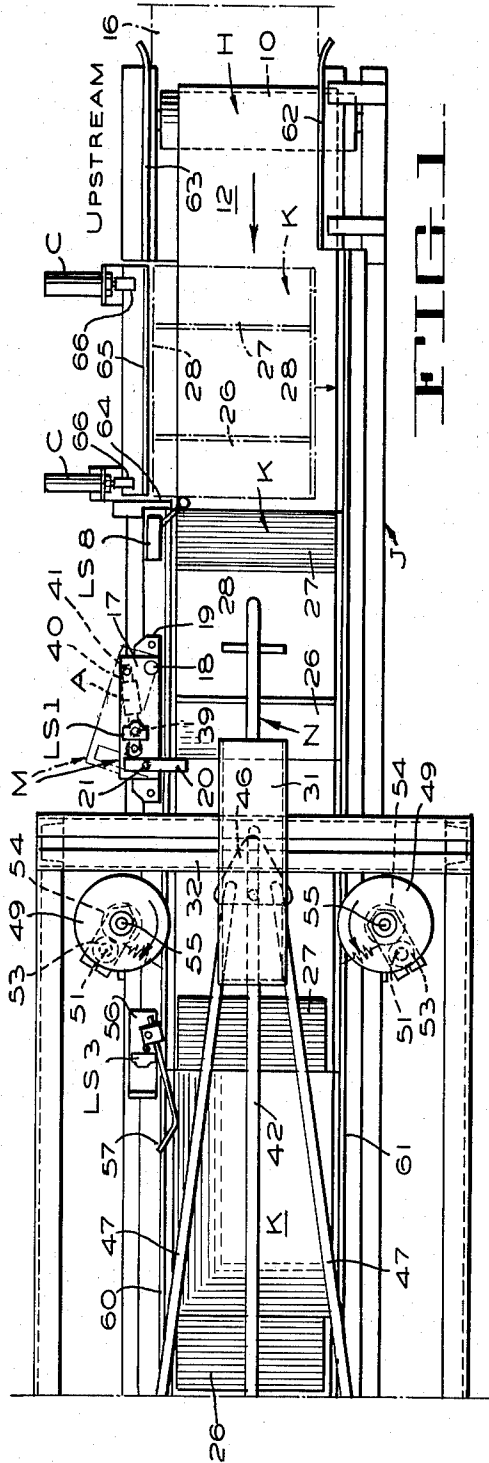
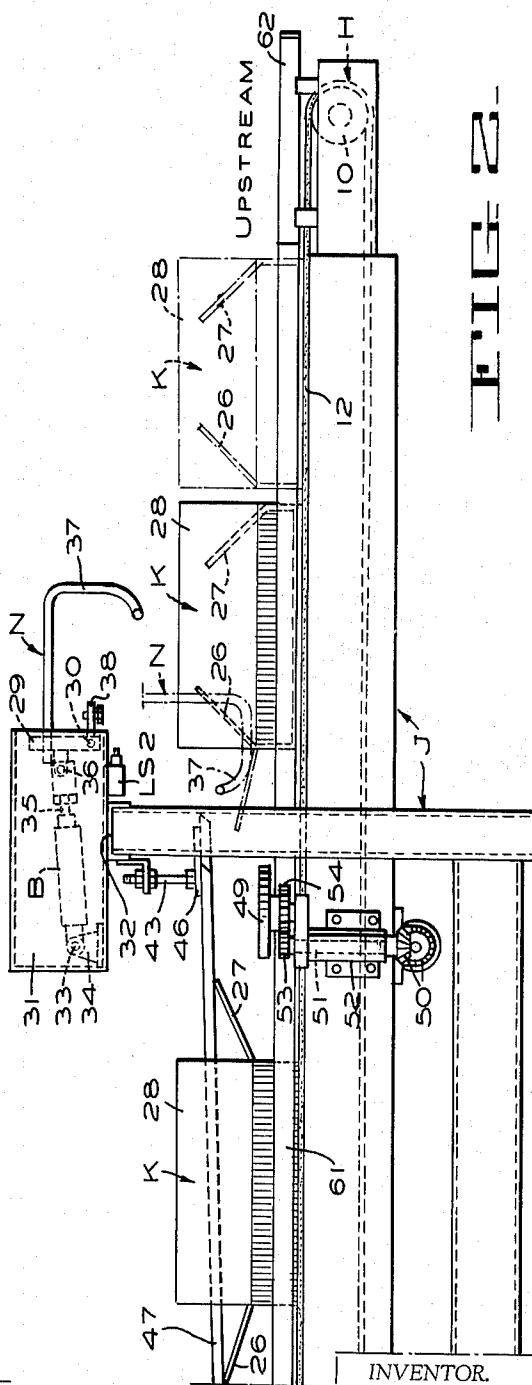
J. C. BERNEY

3,241,292

CASE OPENING MACHINE

Filed Sept. 4, 1962

4 Sheets-Sheet 1



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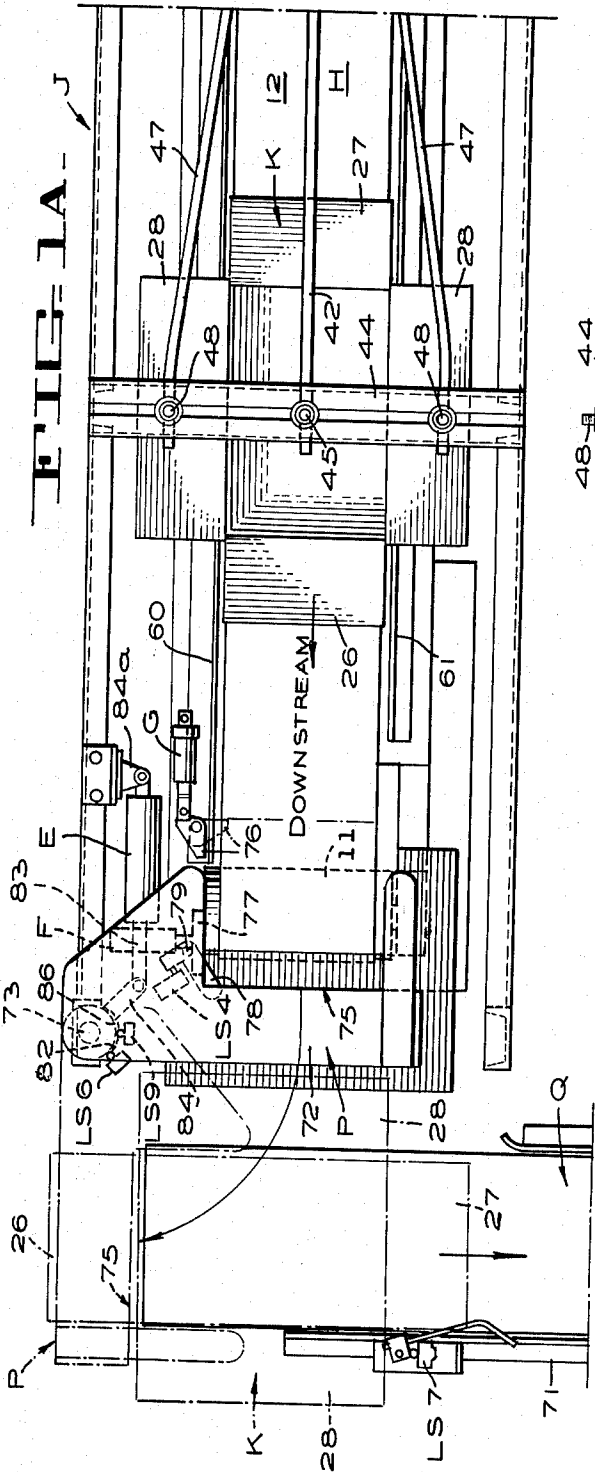
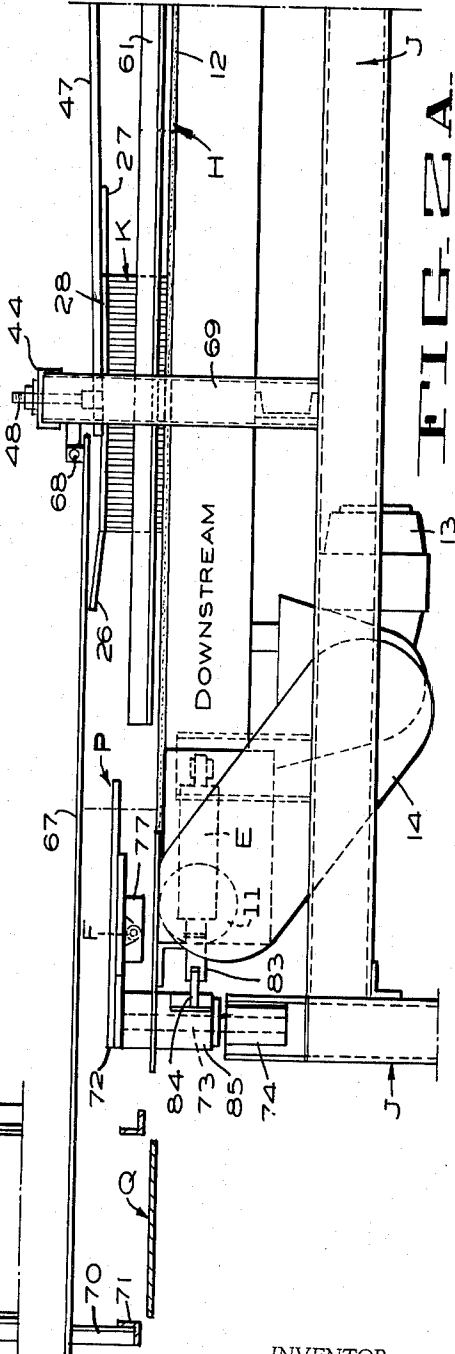
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4 Sheets-Sheet 2



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CASE OPENING MACHINE

Filed Sept. 4, 1962

4 Sheets-Sheet 3

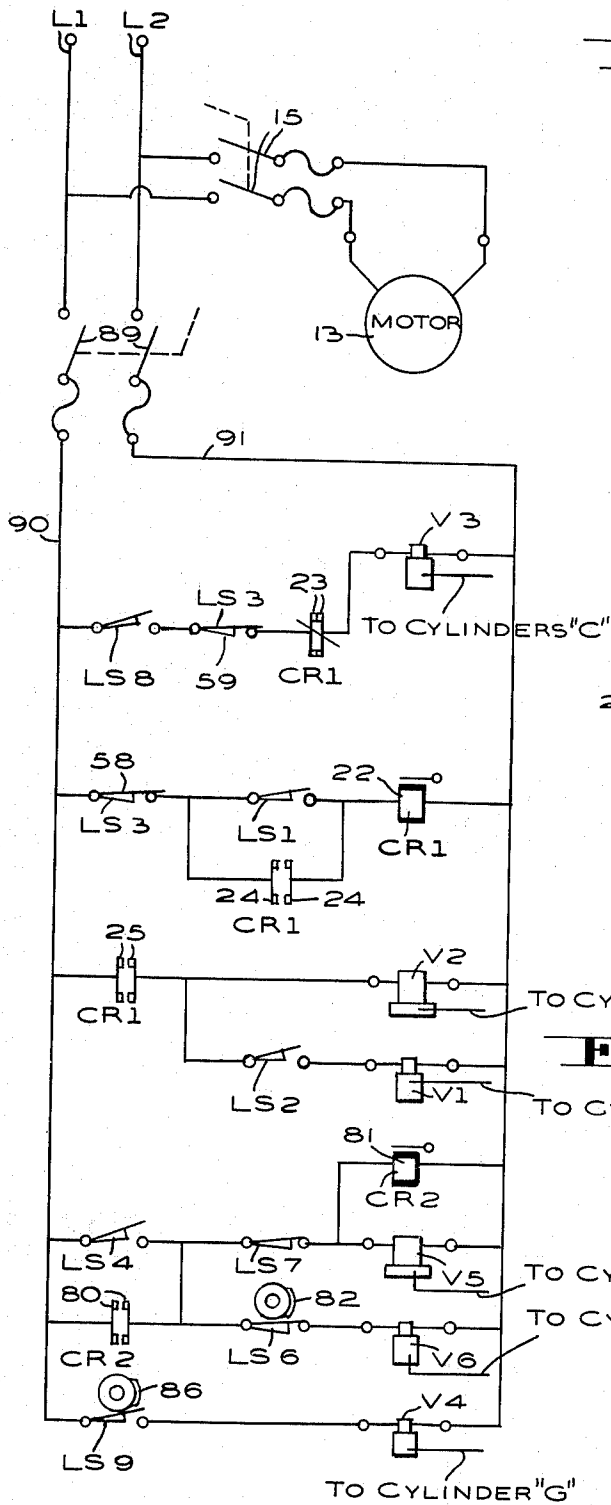


FIG. 3

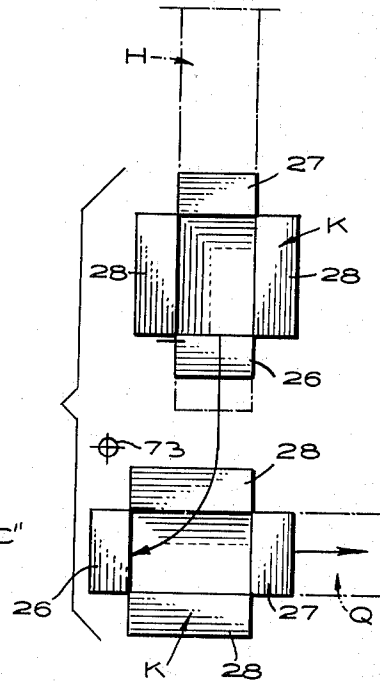


FIG. 4

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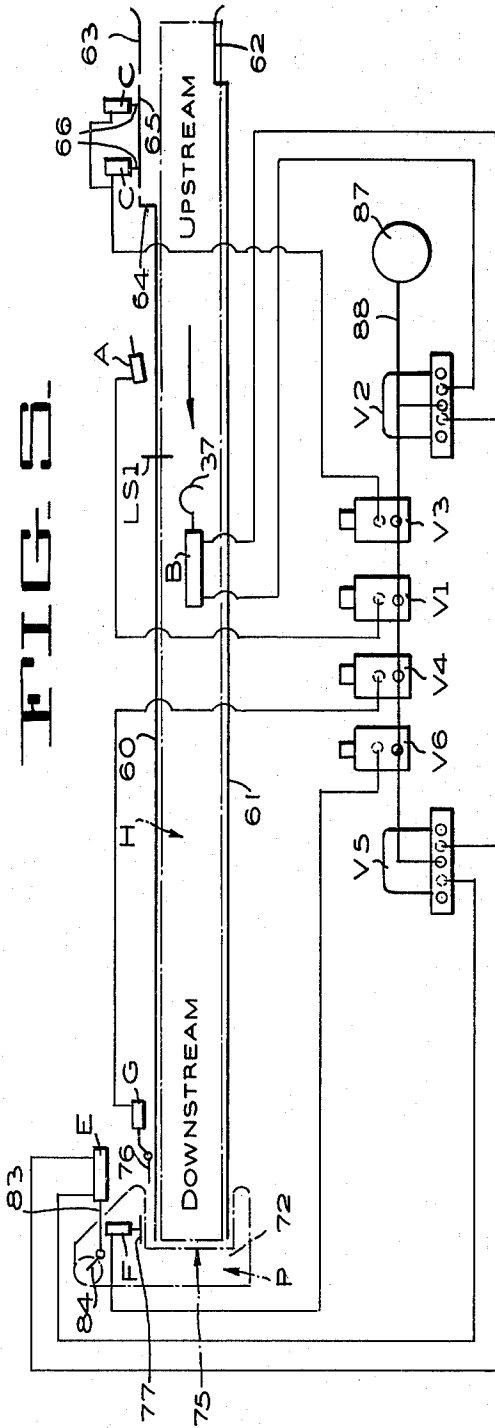
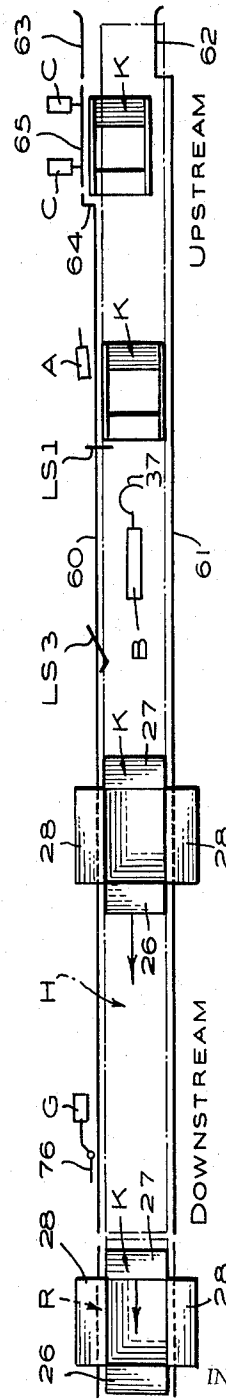
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4 Sheets-Sheet 4



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CASE OPENING MACHINE

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Filed Sept. 4, 1962, Ser. No. 221,187
10 Claims. (Cl. 53—382)

It is proposed in this invention to provide a case opening machine in which a conveyor has a reach disposed to receive cases at the upstream end thereof in processional relation, this reach being operable continuously for advancing the cases downstream, and the machine being actuated to fold flaps of each case outwardly and to deliver the opened cases to successive equipment on a packaging line in accordance to requirements of the latter. Unless the packaging line is ready to receive an opened case, the latter will be retained by the case opening machine, even though the conveyor reach is being operated continuously.

Moreover, it is proposed to provide a case opening machine wherein a stop mechanism is disposed in the path of each case being advanced by the reach for temporarily arresting forward movement of the case, with a flap-opening swing arm being operable to fold a leading end flap of the arrested case outwardly, with this swing arm capable of remaining in a position to fold a trailing end flap outwardly, when the case is released and advanced downstream. Also, means are provided to engage with side flaps of the case to fold them outwardly as the partially opened released case is advanced downstream.

It is also proposed to provide a case opening machine in which the cases are positively advanced downstream during the outwardly folding of their side flaps. As the opened cases are advanced downstream, all of their flaps are maintained in opened position so that the cases will be delivered in this condition to the successive equipment on the packaging line. Moreover, after an appropriate interval as each opened case is moved forwardly, the next succeeding case in the row will be automatically released for downstream movement where its flaps will be folded outwardly.

Furthermore, it is proposed to utilize a stop-lock disposed in the path of each succeeding case arriving at the downstream end of the conveyor reach for temporarily holding the next case back, while the case thereahead is being transformed from the reach to the packaging line.

It is further proposed to provide various embodiments of the case opening machine in which: (1) the opened cases may be turned in orientation and delivered to the packaging line in a new downstream direction extending at an angle, such as 90°, relative to the length of the conveyor reach; and (2) the opened cases may be delivered to the packaging line in a straight path of advancement, without changing the orientation of the cases.

Other objects and advantages will appear as the specification proceeds. The novel features of the invention will be set forth in the appended claims.

Drawings

For a better understanding of the invention, reference should be had to the accompanying drawings, forming part of this specification, in which:

FIGURE 1 is a top plan view of the upstream end of one embodiment of the case opening machine, this embodiment being adapted to turn the opened cases in orien-

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tation and deliver them to a packaging line in a new downstream direction extending at an angle;

FIGURE 2 is a side elevational view of FIGURE 1;

FIGURE 1A is a top plan view of the downstream end of the embodiment of the case opening machine shown in FIGURE 1, it being noted that FIGURE 1 and FIGURE 1A may be joined together to form a complete plan view of the case opening machine;

FIGURE 2A is a side elevational view of FIGURE 1A, it being noted that FIGURES 2 and 2A provide a complete side elevational view of the case opening machine;

FIGURE 3 is a schematic view showing the transfer of an opened case from the case opening machine of FIGURES 1 and 1A to successive equipment of a packaging line;

FIGURE 4 is a wiring diagram for the case opening machine shown in FIGURES 1 and 1A;

FIGURE 5 is a schematic view of the air circuitry for the case opening machine of FIGURES 1 and 1A;

FIGURE 6 shows a schematic plan view of another embodiment of the case opening machine in which the opened cases may be delivered to the packaging line in a straight path of advancement, without changing the orientation of the cases.

While I have shown only the preferred embodiments of the invention, it should be understood that various changes, or modifications, may be made within the scope of the annexed claims without departing from the spirit thereof.

Detailed description

Referring now to the first embodiment of the case opening machine, as illustrated in FIGURES 1, 1A, 2, 2A, 3, 4 and 5, there is provided an endless conveyor designated generally at H. This conveyor is mounted in a supporting frame J, and passes around a head roller 10 (see FIGURES 1 and 2) and a tail roller 11 (see FIGURES 1A and 2A).

For the purpose of continuously advancing an upper reach 12 of this conveyor from the "Upstream" end thereof (see FIGURES 1 and 2) to the "Downstream" end of the conveyor (see FIGURES 1A and 2A), a motor 13 is provided. This motor actuates the conveyor H through a drive mechanism 14 (see FIGURE 2A).

As disclosed in the wiring diagram contained in FIGURE 4, electric power may be supplied to the motor 13 from lines L1 and L2 by closing a double-pole switch 15.

The reach 12 of the conveyor H is disposed to receive a plurality of cases K in processional relation one behind the other in a row from an infed conveyor 16, or from a suitable descending conveyor line, arranged upstream of the endless conveyor H (FIGURE 1).

It will be noted that a stop mechanism designated generally at M in FIGURE 1 is disposed in the path of the cases K being advanced downstream by the reach 12 for temporarily arresting forward movement of each case. This stop mechanism has a swingable plate 17 that is secured by a pivot pin 18 to a fixed plate 19 anchored to the supporting frame J. A stop lever 20 is attached by a journal pin 21 to the swingable plate 17, and the latter has a limit switch LS1 anchored thereto. When a case K strikes the stop lever 20, the latter rotates slightly around its journal pin 21, closing the limit switch LS1 and the latter activates relay CR1 (see FIGURE 4).

In FIGURE 4 it will be observed that the coil of the relay CR1 is designated at 22, and this relay has back contacts 23 which are closed when the relay is in its normally opened position. Also, the relay CR1 has pairs of normally opened contacts 24 and 25 that are closed when the coil 22 is energized. These portions of the electrical circuits will become apparent as the specification continues.

In its structural features, each case K is provided with leading and trailing end flaps 26 and 27, respectively, and a pair of side flaps 28. The leading and trailing flaps may be inside or outside of the side flaps, as the cases are advanced onto the conveyor reach 12.

For the purpose of folding the leading and trailing end flaps 26 and 27, respectively, in directions outwardly to their respective case K, a flap-opening swing arm N is mounted above the reach 12 for swinging between raised and lowered positions (see FIGURE 2). This swing arm is secured to a lever 29 which is attached by a pivot pin 30 to a housing 31. The latter is mounted on a cross-beam 32 of the supporting frame J (see FIGURES 1 and 2).

It will be noted that an air cylinder B is provided in the housing 31, and this cylinder is swingably anchored by a pivot pin 33 to a bracket 34 fixed to the housing 31. The piston rod 35 of this air cylinder is connected by a journal pin 36 to the lever 29. When the piston rod 35 is extended relative to the air cylinder B, the swing-arm N will be moved from its raised position, as shown by full lines in FIGURE 2 into its lowered position, as disclosed by dot-dash lines in this same view. A solenoid valve V2 controlling air cylinder B is operated through the contacts 25 of the relay CR1 (see FIGURE 4).

The flap-opening swing arm N has a hook 37 disposed to fold the leading end flap 26 on an arrested case K outwardly with respect to this case, when the swing arm is swung about its pivot 30 into lowered position. The stop lever 20 is so positioned in relation to the flap-opening arm N as to enable the hook 37 to open the leading end flap 26 of an arrested case, when this flap is tilted rearwardly at approximately 45°.

Upon completion of the down stroke of the swing arm N, a trip lever 38 projecting from the lever 29 closes a limit switch LS2 (see FIGURES 2 and 4). This operates a solenoid valve V1 (see FIGURES 4 and 5) which in turn actuates an air cylinder A (see FIGURE 1). When this air cylinder is thus actuated, the swingable plate 17 is swung into its dot-dash line position shown in FIGURE 1, and swings the stop lever 20 until the latter is completely out of the path of the case K, the front or leading end flap 26 of which has just been folded outwardly.

The air cylinder A is swingably anchored by a journal pin 39 to the fixed plate 19, and its piston rod 40 is secured by a pivot pin 41 to the swingable plate 17 (see FIGURE 1).

The flap-opening swing arm N maintains its downward position, holding the leading end flap 26 of the case K in an outwardly folded position until this flap passes underneath a center plow 42 that extends lengthwise relative to the reach 12 and is spaced thereabove.

The center plow 42 is provided by a rod, the upstream end of which is supported from the cross-beam 32 by a vertically adjustable bolt 43 (see FIGURE 2). As illustrated in FIGURE 1A, the downstream end of this center plow is adjustably supported from a second cross-beam 44 by a bolt 45. The center plow is inclined downwardly toward the reach 12 in a downstream direction to thus fold the leading end flap 26 of the case K into a substantially horizontal position as the case is advanced (see FIGURE 2A).

The hook 37 remains in its lowered position so that the back of this hook will fold the trailing end flap 27 outwardly relative to the released case K, as the latter is advanced downstream by the reach 12.

As the partially opened case K moves forward beneath the cross-beam 32, its side flaps 28 are plowed open by a triangular plate 46 mounted at the upstream end of the center plow 42. During further advancement of this case, the side flaps 28 are folded outwardly relative to the released case by side plows 47 (see FIGURES 1, 1A, 2 and 2A). These side plows are in the form of rods having their upstream ends secured to the triangular plate 46, while their downstream ends are adjustably supported by bolts 48 from the cross-beam 44 (see FIGURES 1A and 2A). The side plows 47 diverge relative to one another in a downstream direction.

The triangular plate 46 is secured to the lower end of the bolt 43, and adjustment of the latter will raise or lower the upstream ends of the center plow 42 and the side plows 47. The latter are inclined downwardly toward the reach 12 in a downstream direction (see FIGURES 2 and 2A) so that the side flaps 28 will be moved to substantially horizontal positions as they pass beneath the cross-beam 44.

It will be noted from FIGURES 1 and 2 that a pair of rollers 49 are disposed along opposite lateral sides of the reach 12 so that their peripheries will engage with the sides of the released case K to positively move the latter downstream during the outwardly folding of the side flaps 28 by the diverging plows 47. The rollers 49 are located downstream of the swing arm N in a position to engage the sides of the case K before the trailing end flap 27 is opened by the back of the hook 37, with these rollers continuing to move the case downstream as the trailing end flap 27 is opened, even though the reach 12 should slip under the case.

The rollers 49 may be driven continuously or intermittently and they may be replaced by belts, if desired. In FIGURES 1 and 2, the bevel gears 50 have been shown for transmitting power from a suitable source to vertical shafts 51 mounted in bearings 52. These shafts have spur gears 53 fixed thereto that mesh with spur gears 54 fixed to stub shafts 55 on which the rollers 49 are fixed to thus drive the rollers in opposite directions. These rollers may be spring loaded and rubber coated and may be adjusted toward and away from one another. It will be apparent that one of the rollers 49 may be driven, while the other is an idler, if desired. The same would be true, if the rollers are replaced by belts.

The provision of the rollers 49 is sometimes necessary when dealing with a case K that has exceptionally stiff flaps, or where the flaps may not have been bent back in an earlier operation. Also, these rollers can assist in pushing the case past a sensing arm 57 of a limit switch LS3 (see FIGURE 1).

As illustrated in FIGURE 1, a return switch plate 56 is mounted downstream of the rollers 49, and carries the limit switch LS3 and the spring-loaded sensing arm 57. The latter projects into the path of the advancing case. When the case strikes the sensing arm, the limit switch LS3 is actuated. As shown by the conventional symbol in FIGURE 4, the limit switch LS3 will break a circuit when operated. The limit switch LS3 has a pair of poles 58 and 59, and for this reason it is duplicated in the wiring diagram (see FIGURE 4).

Referring to the wiring diagram (FIGURE 4) and the air circuitry (FIGURE 5), the lower pole 58 of the limit switch LS3 opens the circuit to relay CR1, which in turn, through a pair of contacts 25, breaks the circuit to solenoid valves V1 and V2 controlling air cylinders A and B, respectively. Cylinder A returns the stop mechanism M to its operating position to halt and hold back the next case K in the row; and the cylinder B returns the flap-opening swing arm N to its up position, as disclosed by full lines in FIGURE 2. The closing of the upper pole 59 of the limit switch LS3 activates a solenoid valve V3 that controls a pair of air cylinders C for the purpose mentioned later.

As shown in FIGURES 1, 1A, 2, 2A and 5, a pair of

side guides 60 and 61 extend lengthwise of the conveyor H along the opposite lateral sides of the reach 12, and between which the cases K may be advanced. An offset guide bar 62 is mounted adjacent to the side guide 61 to push each case K in succession towards the opposite side guide 60, as the cases are advanced upon entering the machine. The side guide 60 is provided with a guide section 63 which is offset laterally relative to this side guide and away from the reach 12 to provide a space into which each case K may be pushed by the offset guide bar 62, as the cases are advanced downstream.

The side guide 60 has a stop 64 disposed to abut and temporarily retain that case K which has been pushed into the space by the offset guide bar 62, and thereby hold this case in a waiting position. For the purpose of pushing this waiting case back onto the reach 12 in a position to clear the stop 64, a push bar 65 is slidably mounted between the guide section 63 and the stop 64. The cylinders C, previously mentioned, are fixed relative to the supporting frame J and have their piston rods 66 connected to the push bar 65 to move the waiting case into a position to clear the stop 64, whereby this case may be moved downstream by the reach 12.

In FIGURES 1 and 5, the stop 64 and the push bar 65 are shown as being disposed downstream relative to the offset guide bar 62 so as to provide space downstream of the latter into which the waiting case may be pushed. It will be clear that the next succeeding case is retained by the stop 64 against moving downstream, while the hook 37 is disposed in its lowered position, as shown by dot-dash lines in FIGURE 2. As each case is released from the stop 64, it moves forward until it is arrested by the stop mechanism M.

When the case K which was previously opened by the flap-opening swing arm N passes the sensing arm 57, this sensing arm is actuated. Upon releasing the limit switch LS3, the cylinders C will bring the push bar 65 to its normal "in" position, and the leading end of the waiting case moves forward to rest against the stop 64, where it stays until the next operation of the cylinders C. The release of the limit switch LS3 by the case passing the sensing arm 57 closes the circuit to coil relay CR1, so that a new cycle occurs when the next case strikes the stop lever 20 of the stop mechanism M.

Thus far it has been assumed that a case K is disposed beneath the flap-opening swing arm N at the start of the case opening operation. However, there will be times when a case is not arranged in this position, for example, when the machine is initially started, or when there are voids in the row of cases being delivered to the reach 12. Therefore, a limit switch LS8 is provided (see FIGURES 1 and 4).

This feature will now be described in detail. As a case K moves through the machine and comes to rest against the stop 64, it will close the limit switch LS8 that is positioned adjacent to this stop. The limit switch LS8 has been shown in FIGURE 4 by the conventional symbol as being of the type that will make a circuit when actuated.

The solenoid valve V3 is actuated through the limit switch LS3 and back contacts 23 of relay CR1. The cylinders C are operated by solenoid valve V3, and push the waiting case onto the reach 12 so that it moves downstream against the stop lever 20. If a case is in position at this stop lever, then the arriving case will remain pressing limit switch LS8 closed, but will not operate because relay CR1 is closed. Also, if a case is holding limit switch LS8 open, again the new case will wait until the case thereahead clears this limit switch.

After passing the sensing arm 57, the opened case K will proceed downstream until it arrives at a case-transfer swing mechanism designated generally at P in FIGURES 1A, 2A and 5. The leading and trailing end flaps 26 and 27, respectively, as well as the side flaps 28 are maintained in open position by the center and side plows

42 and 47, respectively, as the cases advance downstream toward the swing mechanism P, and are held in open position by a hold-down plate 67 as the cases are moved in a new downstream direction by the case-transfer mechanism P (see FIGURE 2A).

This hold-down plate 67 is attached by a pivot pin 68 to rear uprights 69 of the supporting frame J, and rests upon outboard supports 70 of a cross-frame 71 of a transverse conveyor Q (see FIGURES 1A, 2A and 3). This transverse conveyor may form part of a packaging line equipment, and may extend at a suitable angle, for instance 90°, relative to the reach 12.

With particular reference to FIGURES 1A and 2A, it will be observed that the case-transfer mechanism P has a swing plate 72 which is mounted on a vertical shaft 73 for movement from a position adjacent to the downstream end of the reach 12 into an angular position relative thereto, such as 90°. The lower end of this shaft is secured in a suitable support 74 (see FIGURE 2A).

The swing plate 72 defines a recess 75 that is dimensioned to receive at least the forward portion of a case K that has been pushed therein by the reach 12. However, a stop-lock 76 is disposed near the downstream end of the reach 12 in the path of each succeeding case for temporarily holding the next case back while the case thereahead is being transferred from the reach 12 to the receiving conveyor Q.

Assuming that the stop-lock 76 has been retracted by operating an air cylinder G, a case K will be pushed into the recess 75 of the case-transfer swing mechanism P. As this occurs, an air clamping cylinder F is automatically actuated by this case to move a clamp 77 into engagement with the case entering the recess 75 for securing the case to the swing plate 72 (see FIGURES 1A, 2A and 5). This is accomplished by a sensing arm 78 which is swingably attached by a pivot pin 79 to the swing plate 72.

When the sensing arm 78 is moved by the case entering the recess 75, it will actuate a limit switch LS4. As shown by the conventional symbol in FIGURE 4, the limit LS4 is normally opened and will make a circuit when operated. This limit switch actuates a relay CR2, which remains actuated through its own contacts 80 and a limit switch LS7. The coil for relay CR2 is designated at 81 in the wiring diagram (FIGURE 4).

It will be noted from FIGURES 4 and 5 that a solenoid valve V6 operates clamping cylinder F through a limit switch LS6, clamping the case K in place in the case-transfer swing mechanism P. The limit switch LS6 is mounted in fixed relation to the supporting frame J, and is normally closed as shown by the conventional symbol in FIGURE 4. The limit switch LS6 is opened by a cam 82 that moves with the swing plate (see FIGURES 1A and 4).

The swing plate 72 is operated by an air cylinder E, which has its piston rod 83 pivotally attached to an arm 84 fixed to a hub 85 on the underside of this swing plate (see FIGURES 1A and 2A). The cylinder E is swingably anchored to a bracket 84a that is fastened to the supporting frame J (see FIGURE 1A). A solenoid valve V5 actuates the air cylinder E (see FIGURES 4 and 5), causing the swing plate to move through an arc of 90°. Of course, the swing plate 72 may be moved away from the downstream end of the reach and subsequently returned to a position adjacent to this reach.

The limit switch LS6 is opened at the end of the outward movement of the case-transfer mechanism P, thereby releasing the clamping cylinder F and permitting the released case K to move freely onto the transverse conveyor Q of the packaging line equipment.

From FIGURES 1A and 3, it will be observed that the transferred case K is turned in orientation and moved in a new downstream direction extending at a desired angle relative to the reach 12. FIGURE 3 diagrammatically disclosed the movement of the case in its new downstream direction.

When the clamping cylinder F releases the case K, the latter moves in its new downstream direction until the back end of the case is outside of the path of the case-transfer swing mechanism P. The front end of the case on the transverse conveyor Q then strikes a limit switch LS7, which is in series with the relay CR2 (see FIGURE 4). The conventional symbol for the limit switch shows that it is normally closed, but may be opened by a case to break a circuit to relay CR2. When this happens, the solenoid valve V5 controlling the cylinder E will be deactivated. Swing plate 72 will return to its normal position adjacent to the downstream end of the reach 12 and will be ready to receive the next case for transfer.

In its normal position, the swing plate 72 is disposed in the full line position shown in FIGURE 1A, and a limit switch LS9 is open. This limit switch is fixed to a suitable part of the supporting frame J, and a cam 86 that moves with the swing plate 72 closes the limit switch LS9, actuating a solenoid valve V4, which operates the air cylinder G previously mentioned. At this time, the cylinder G pushes the stop-lock 76 into the path of the succeeding case K on the reach 12, holding the next case back until the swing plate 72 returns to its normal position, opening the limit switch LS9 and retracting the stop-lock from its position in front of the next case.

The case-transfer swing mechanism P was permitted to return when the discharged case cleared the arc of movement of the swing plate 72. When the discharged case releases limit switch LS7, the circuit to relay CR2 is again closed, and the case-transfer swing mechanism can then be actuated.

The air circuitry diagram contained in FIGURE 5 discloses a suitable source 87 for compressed air, which will supply air to the solenoid valves V1 to V6, inclusive, through a manifold line 88. Of course, a hydraulic system could be used in place of the compressed air, if desired.

In FIGURE 4, a double-pole throw switch 89 has been shown for connecting the electric lines L1 and L2 to wires 90 and 91, respectively of the wiring diagram.

Turning now to the second embodiment of the invention, as illustrated in FIGURE 6, the upstream end is the same as that shown in FIGURES 1 and 2 of the first embodiment. However, the case-transfer swing mechanism P and its associated parts contained in FIGURES 1A and 2A are omitted in FIGURE 6. Here the cases K may be delivered from the conveyor H in a straight line delivery to a receiving conveyor R of a packaging line equipment, without changing the orientation of the cases, as diagrammatically shown in FIGURE 6.

It will be noted that like reference characters have been applied to corresponding parts of the first and second embodiments of the invention.

It will be understood that the wiring diagram in its entirety, as contained in FIGURE 4, applies only to the first embodiment. Portions of this wiring diagram apply to the second embodiment (FIGURE 6).

I claim:

1. In a case opening machine:
 - (a) a conveyor having a reach disposed to receive a case, the latter being provided with leading and trailing end flaps and a pair of side flaps;
 - (b) means operable for advancing the reach continuously during operation of the machine;
 - (c) a stop mechanism disposed in the path of the case being advanced by the reach for temporarily arresting forward movement of the case;
 - (d) a flap-opening swing arm pivotally mounted above the reach for swinging between raised and lowered positions, and having a hook disposed to fold the leading end flap of the arrested case outwardly relative to the case, when this swing arm is swung about its pivot into lowered position;
 - (e) means operable to free the arrested case from the

- stop mechanism, whereby the case will be free to be advanced by the reach, while the hook remains in its lowered position so that the back of the hook will fold the trailing end flap outwardly relative to the released case as the latter is advanced;
- (f) and means operable to raise and lower the flap-opening swing arm and its hook relative to the reach.
2. The case opening machine, as set forth in claim 1;
- (g) and in which means are provided to engage with the side flaps to fold them outwardly relative to the released case, as the latter is advanced downstream by the reach;
- (h) and means engaging with the released case, and being operable to move the case downstream during the outwardly folding of the side flaps.
3. The case opening machine, as set forth in claim 1;
- (g) and in which means are provided to engage with the side flaps to fold them outwardly relative to the released case, as the latter is advanced downstream by the reach;
- (h) means provided to engage with the outwardly folded leading and trailing end flaps to maintain them opened as the case is advanced downstream;
- (i) and means engaging with the released case, and being operable to move the case downstream as the side flaps are being folded outwardly, with the latter means continuing to move the case downstream as the trailing end flap is opened.
4. In a case opening machine:
 - (a) a conveyor having a reach defining upstream and downstream ends, with the upstream end being arranged to receive a plurality of cases in processional relation one behind the other in a row, each case having leading and trailing end flaps;
 - (b) means operable for advancing the reach downstream during operation of the machine;
 - (c) a stop mechanism disposed in the path of a case being advanced downstream by the reach for engaging with the case and temporarily arresting forward movement of this case;
 - (d) a flap-opening swing arm pivotally mounted above the reach for swinging between raised and lowered positions, and having a hook disposed to fold the leading end flap of the arrested case outwardly relative to this case, when the swing arm is swung about its pivot into lowered position;
 - (e) means operable to free the arrested case from the stop mechanism, whereby this case will be free to be advanced by the reach, while the hook may remain in its lowered position so that the back of the hook will fold the trailing end flap outwardly of the released case as the latter is advanced downstream;
 - (f) means operable to raise and lower the flap-opening arm and its hook relative to the reach;
 - (g) means engaging with the next succeeding case upstream to retain this case against moving downstream, while the hook is disposed in its lowered position;
 - (h) and means operable as the opened case moves forwardly to release the next succeeding case in the row for downstream movement.
5. The case opening machine, as set forth in claim 4;
 - (i) and in which a sensing arm is disposed downstream from the flap-opening swing arm in a position to be actuated by the opened case as the latter moves downstream;
 - (j) this sensing arm being operatively connected to the means for raising the flap-opening swing arm and its hook into raised position, whereby the next succeeding case in the row may be moved under the raised hook;
 - (k) and the sensing arm being further operatively connected to said stop mechanism for returning the latter into a position to halt and hold back the next suc-

ceeding case in the row, when the latter arrives under the raised flap-opening swing arm.

6. In a case opening machine:
 - (a) a conveyor having a reach defining upstream and downstream ends, with the upstream end being arranged to receive a plurality of cases in processional relation one behind the other in a row;
 - (b) means operable for advancing the reach downstream during operation of the machine;
 - (c) a pair of side guides extending lengthwise of the conveyor along opposite lateral edges of the reach, and between which the cases may be advanced;
 - (d) an offset guide bar mounted adjacent to one of the side guides in a position to push each case in succession towards the opposite side guide, as the cases are advanced;
 - (e) said opposite side guide being provided with a guide section which is offset laterally relative to this side guide and away from the reach to provide a space into which each case may be pushed by the offset guide bar, as the cases are advanced downstream;
 - (f) said opposite side guide having a stop disposed to abut and temporarily retain that case which has been pushed into the space, and thereby retain this case in waiting position;
 - (g) means operable to push the waiting case back onto the reach in a position to clear the stop, whereby this case may be moved downstream by the reach;
 - (h) a stop mechanism located downstream from said stop for temporarily arresting forward movement of the case previously released from said stop;
 - (i) a flap-opening swing arm disposed and being operable to open flaps of the case temporarily arrested against forward movement by the stop mechanism;
 - (j) and means disposed adjacent to said stop, and being actuated by a case arriving at the stop, for operating the means for pushing this case back onto the reach to clear said stop, even though a case is not disposed against the stop mechanism at this time.
7. In a case opening machine:
 - (a) a conveyor having a reach defining upstream and downstream ends;
 - (b) the upstream end of the reach being arranged to receive a case, the latter being provided with leading and trailing end flaps;
 - (c) means operable for advancing the reach continuously during operation of the machine;
 - (d) a stop mechanism disposed in the path of the case being advanced by the reach to abut and temporarily arrest forward movement of the case;
 - (e) a flap-opening swing arm pivotally mounted above the reach for swinging between raised and lowered positions, and having a hook disposed to fold the leading end flap of the arrested case outwardly of this case, when this swing arm is swung into lowered position;
 - (f) means operable to retract the stop mechanism from engagement with the arrested case, whereby this case will be free to be advanced downstream by the reach, while the hook remains in its lowered position so that the back of the hook will fold the trailing end flap outwardly relative to the released case as the latter is advanced downstream;
 - (g) means operable to raise and lower the flap-opening swing arm and its hook relative to the reach;
 - (h) and a stop-lock disposed at the downstream end of the reach in the path of a case arriving thereat for abutting and temporarily holding this case against further downstream movement.
8. In a case opening machine:
 - (a) a conveyor having a reach defining upstream and downstream ends, with the upstream end being arranged to receive a plurality of cases in processional relation one behind the other in a row, and each case

- being provided with leading and trailing end flaps and a pair of side flaps;
 - (b) means operable for advancing the reach downstream during operation of the machine;
 - (c) means operable to fold all of the flaps of each case outwardly relative to their respective case;
 - (d) a case-transfer swing mechanism arranged at the downstream end of the reach to receive the opened cases, one at a time;
 - (e) the case-transfer swing mechanism having a swing plate which is mounted for movement from a position adjacent to the downstream end of the reach into an angular position relative to the reach, whereby the case received thereby will be moved into a new downstream direction;
 - (f) means operable for moving the swing plate away from the downstream end of the reach and for subsequently returning the swing plate;
 - (g) clamping means engaging with the case being transferred from the reach by the case-transfer swing mechanism for securing this case to the swing plate;
 - (h) means operable to release the clamping means from the case after the case has been transferred to the new downstream direction;
 - (i) and means actuated by the released transferred case, when this case is outside of the path of movement of the swing arm, for actuating the means to return the swing plate to a position adjacent to the downstream end of the reach for receiving another case.
9. In a case opening machine:
 - (a) a conveyor having a reach defining upstream and downstream ends, with the upstream end being arranged to receive a plurality of cases in processional relation one behind the other in a row, and each case being provided with leading and trailing end flaps and a pair of side flaps;
 - (b) means operable for advancing the reach downstream during operation of the machine;
 - (c) means operable to fold all of the flaps of each case outwardly relative to their respective case;
 - (d) a case-transfer swing mechanism having a swing plate which is mounted for movement from a position adjacent to the downstream end of the reach into an angular position relative to the reach, whereby the case received thereby will be moved into a new downstream direction;
 - (f) clamping means engaging with the case being transferred by the swing mechanism for securing the case to the swing plate; and
 - (g) means operable to engage with the flaps of the case being transferred from the reach for holding these flaps in their outwardly folded positions relative to the case.
 10. In a case opening machine:
 - (a) a conveyor having a reach defining upstream and downstream ends, with the upstream end being arranged to receive a plurality of cases in processional relation one behind the other in a row, and each case being provided with leading and trailing end flaps and a pair of side flaps;
 - (b) means operable for advancing the reach downstream during operation of the machine;
 - (c) means operable to fold all of the flaps of each case outwardly relative to their respective case;
 - (d) a case-transfer swing mechanism arranged at the downstream end of the reach to receive an opened case;
 - (e) the case-transfer swing mechanism having a swing plate which is mounted for movement from a position adjacent to the downstream end of the reach into an angular position relative to the reach, whereby the cases received thereby will be moved into a new downstream direction;

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- (f) clamping means engaging with the case being transferred by the swing mechanism for securing the case to the swing plate; and
- (g) a sensing arm mounted on the swing plate in a position to be actuated by the case when the latter is received by the swing plate; 5
- (h) this sensing arm being operatively connected to the clamping means for actuating the latter and thereby securing the case in place on the swing plate.

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