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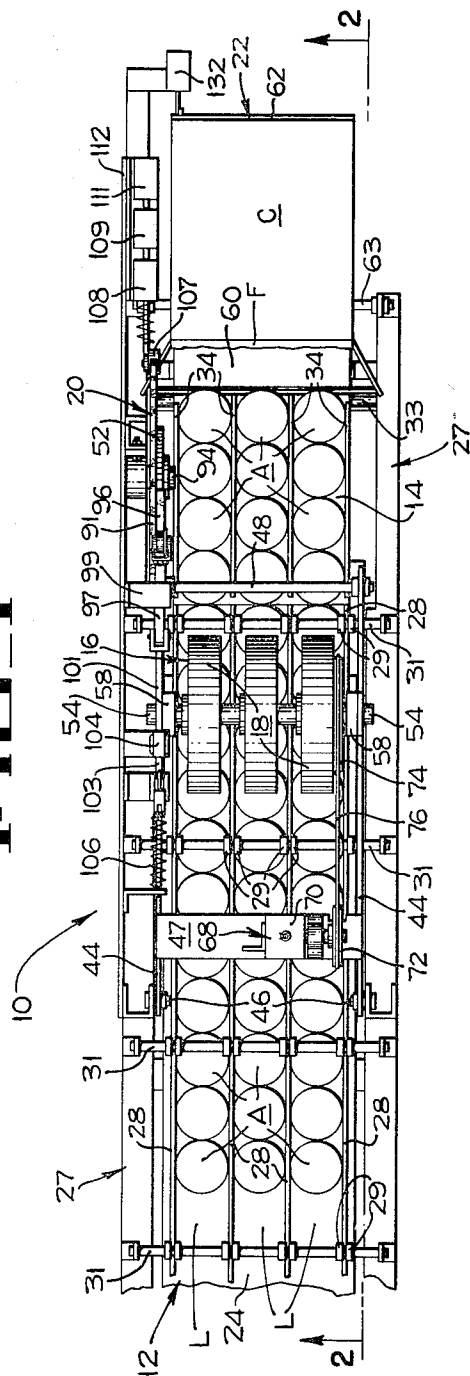
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CASE LOADING MACHINE

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FIG. 1



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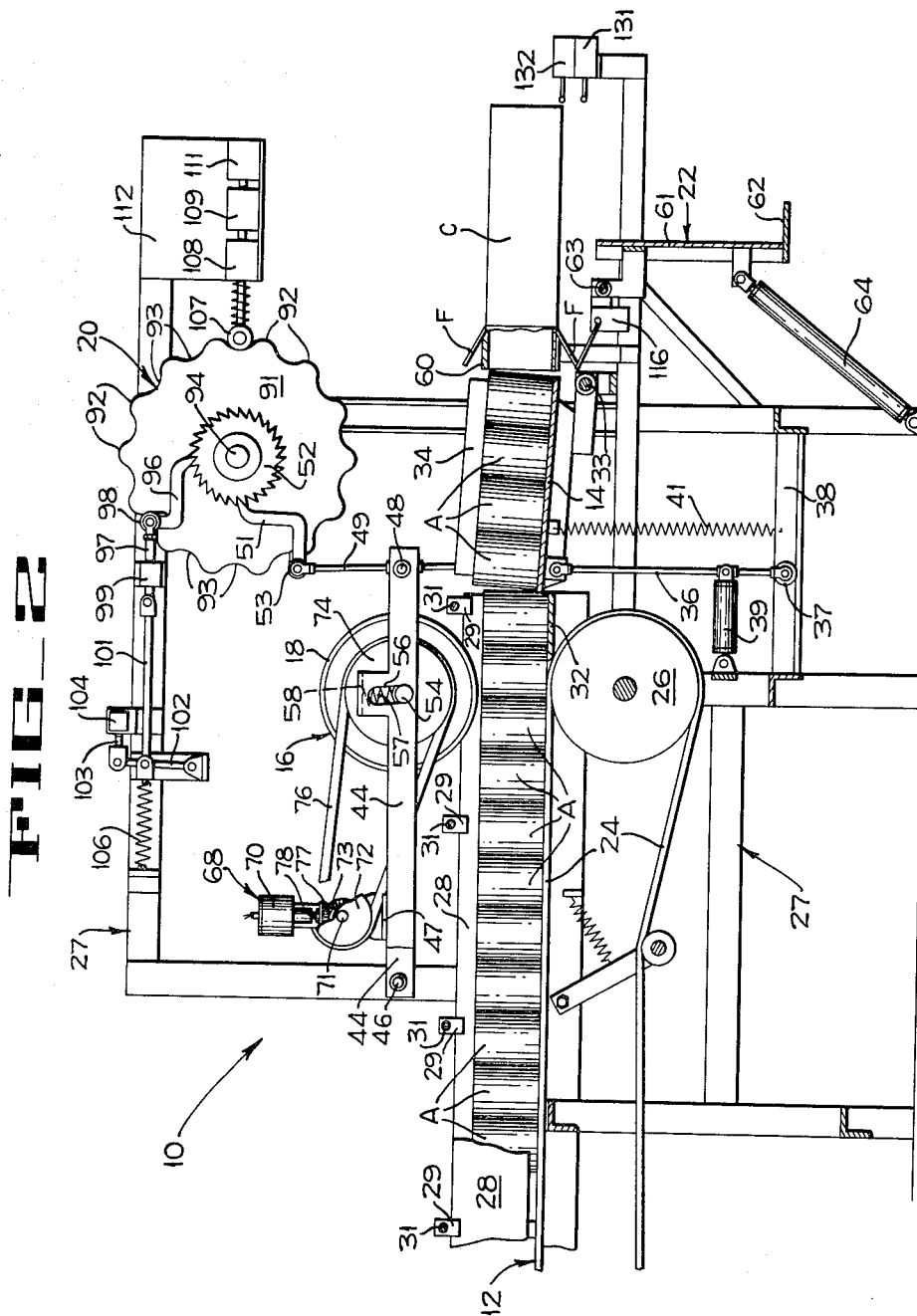
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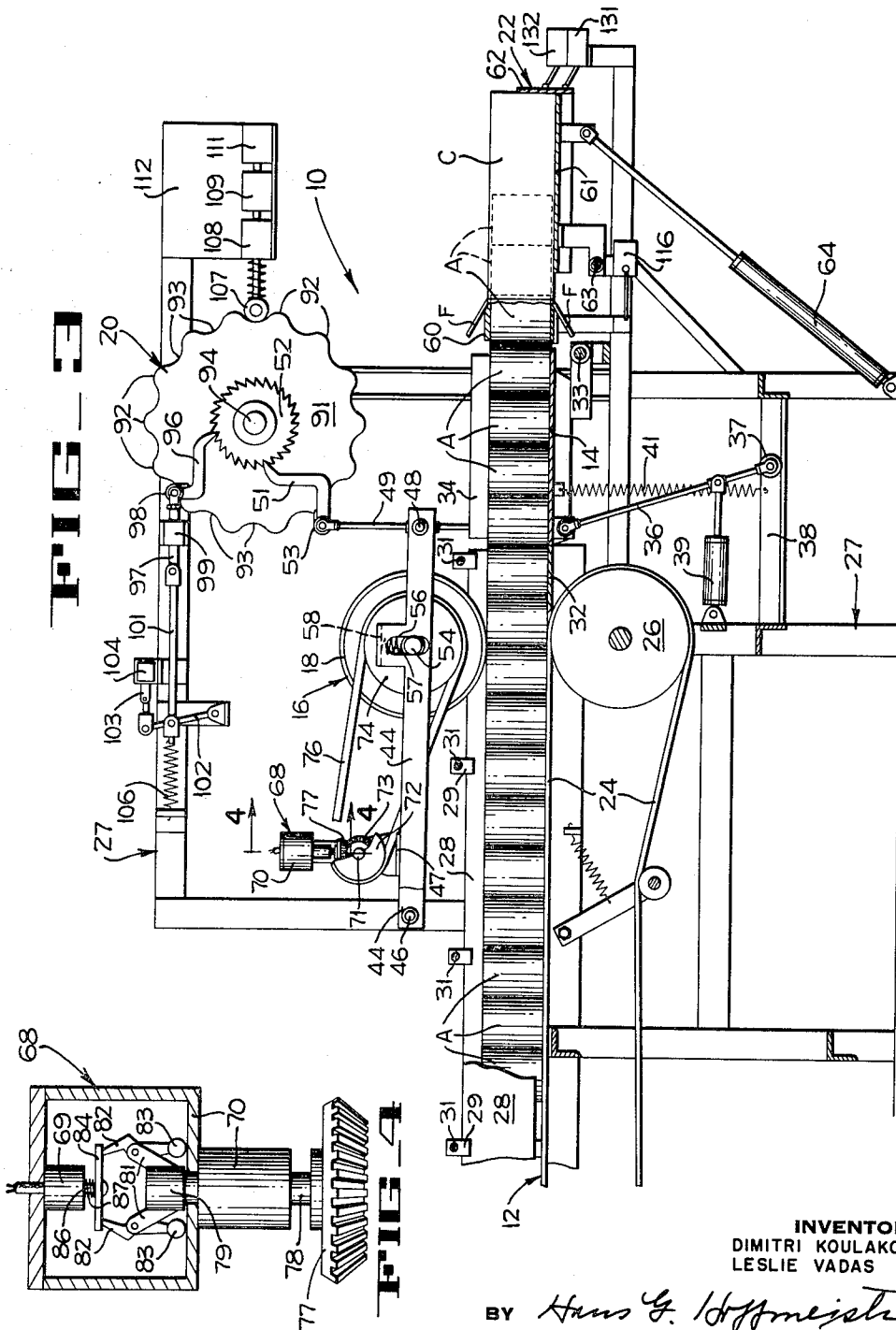
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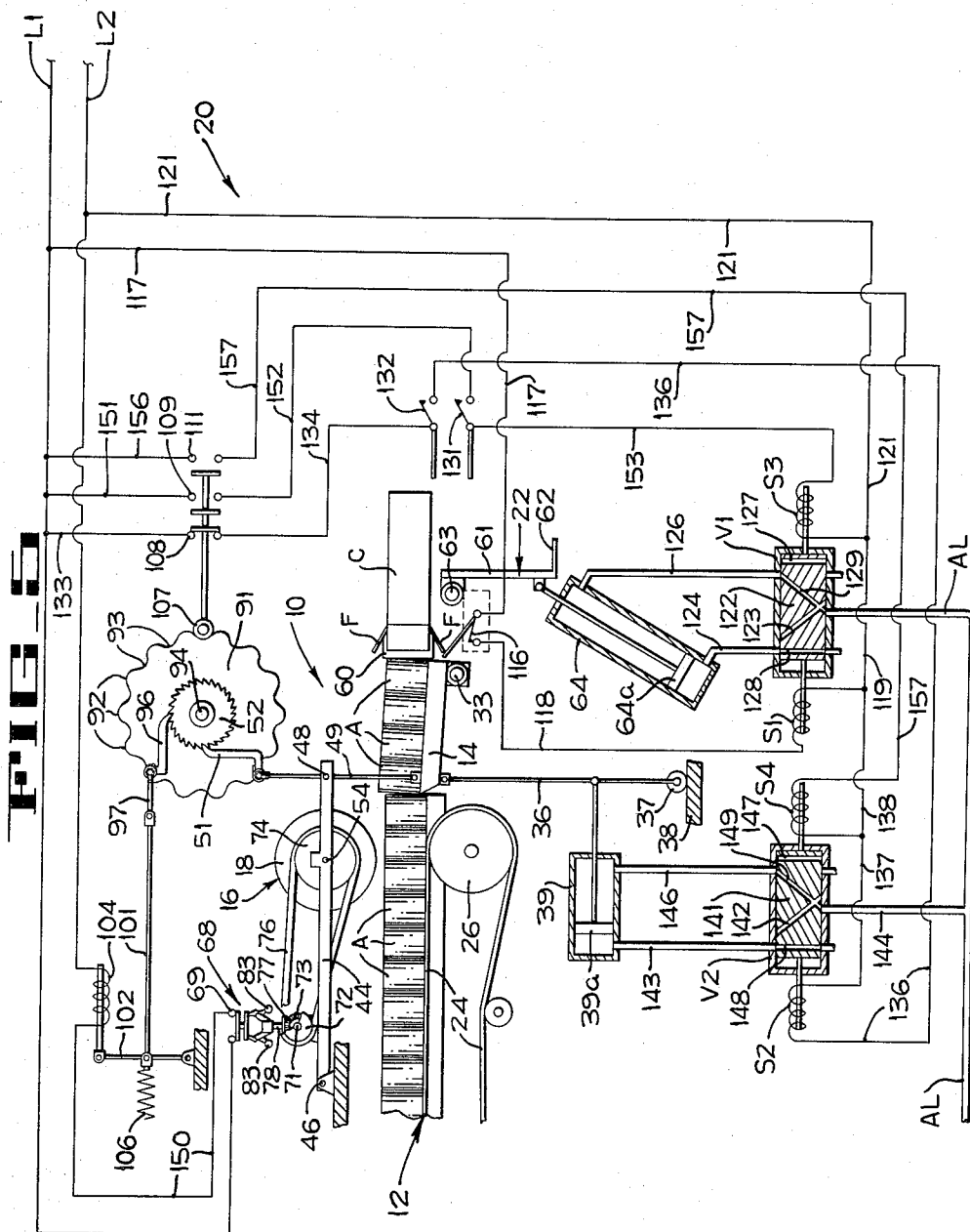


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CASE LOADING MACHINE

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11 Claims. (Cl. 53—55)

The present invention pertains to a machine for loading articles, such as cans, into cases and more particularly relates to a simple, inexpensive in-line machine for loading articles into end-open cases.

Although there are many case loading machines on the market, a great majority of these machines are quite complicated in design and are expensive in initial cost. Accordingly, it is one object of the present invention to provide a simple and inexpensive case-loading machine which is capable of loading end-open cases while the articles are moving along a linear path.

Another object is to provide a caser which utilizes the motive power of the conveyor, which advances the articles to the caser, for moving the articles into the end-open case.

Another object is to provide a control system for a case-loading machine.

These and other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings, in which:

FIGURE 1 is a schematic plan of the case loading machine of the present invention.

FIGURE 2 is a schematic vertical section taken substantially on line 2—2 of FIGURE 1 with certain parts being broken away, the operating mechanisms being in position to positively immobilize the articles.

FIGURE 3 is a schematic vertical section similar to FIGURE 2 but showing the mechanisms in an article advancing position.

FIGURE 4 is an enlarged central vertical section taken along line 4—4 of FIGURE 3 showing a portion of the caser control system which is responsive to the movement of articles toward the case to effect certain changes in the control system.

FIGURE 5 is a diagrammatic elevation showing the control system with the different parts of the case loading machine being in the article arresting position wherein an empty case has been placed into position for receiving articles and has actuated certain parts of the control system to begin actuation of the machine through one case loading cycle.

The embodiment of the case loading machine of the present invention shown in FIGURES 1 to 5 is particularly adapted for loading cases C which are open at one end rather than along a side. In general, the case loading machine 10 comprises a continuously driven feed conveyor 12 which advances articles A, herein shown as cans, along a straight line path toward a tiltable article-arresting plate 14 that assumes the upwardly tilted position of FIGURE 2 at the beginning of a case-filling cycle. During the cycle, the article arresting plate 14 is pivoted downwardly to move its forward end out of the path of movement of the advancing articles. As it swings down, the plate 14 causes the downward movement of rollers 18 of a friction increasing mechanism 16 into engagement with the upper surface of the articles to effect an increase of frictional engagement between the articles and the continuously moving feed conveyor 12. The increased frictional engagement on the articles causes the conveyor to frictionally grip and drive the abutting articles over the arresting plate 14 and into the case C thereby filling the case. When the case is filled, the forward movement of the lines of cases is stopped and, accordingly, the rotation of the rollers 18 stops. The continuously moving con-

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veyor 12 slips under the containers resting thereon. Termination of rotation of the rollers 18 effects the repositioning of certain portions of a control system 20 which causes the friction increasing mechanism 16 and the forward end of the plate 14 to move into the FIGURE 2 position while a pivotally mounted case holder 22 lowers the filled case to a vertical position for subsequent removal from the case loading machine 10.

More particularly, the feed conveyor 12 includes a wide belt 24 trained around a rear roller 26 and a drive roller (not shown), which rollers are journaled on a frame 27. The conveyor 12 is continuously driven by any suitable means (not shown) and advances articles A toward the case C. The articles are maintained in lanes L (FIG. 1) by vertical guide rails 28 which are secured to apertured blocks 29. The blocks 29 are secured to transversely extending shafts 31 that are suitably supported on the frame 27. The lanes of articles are advanced by the conveyor 12 over a dead plate 32 and onto the article arresting plate 14 when the plate 14 is in the depressed position shown in FIGURE 3.

The article arresting plate 14 is pivotally connected to the frame 27 by a transversely extending shaft 33 which is located near the rear end of the plate 14. A plurality of vertically extending rails 34 (FIG. 1) are secured to the upper surface of the plate 14 and are aligned with the guide rails 28 to extend the lanes L past the arresting plate 14. The forward end of the arresting plate 14 is supported by a link 36 which is pivotally connected to the plate 14 and has a roller 37 journaled on its lower end. The roller 37 rides on an angle member 38 of the frame 27. A pneumatic cylinder 39, pivotally connected between the frame 27 and the link 36, is arranged to move the link 36 from a substantially vertical position as shown in FIGURE 2, which holds the arresting plate in its article arresting position, to an inclined position as shown in FIGURE 3 which lowers the leading end of the plate 14 so that articles may be moved over the plate and into the case C. The forward end of the arresting plate 14 is normally urged downwardly by a spring 41 connected between the plate 14 and the angle member 38.

The friction increasing mechanism 16 moves with the plate 14 from a position spaced above the articles A, when the plate 14 is in its arresting position as shown in FIGURE 2, to a position wherein the rollers 18 are in firm engagement with the upper surface of the articles as illustrated in FIGURE 3. The mechanism 16 includes two arms 44 (FIG. 1) which are pivotally connected at their forward ends to the frame 27 by stub shafts 46. A transverse stiffening member 47 is welded to the arms 44 adjacent the stub shafts 46, and a transverse shaft 48 is secured to the rearward ends of the arms 44. One end portion of the shaft 48 is pivotally connected to a link 49 adjacent its midpoint. The lower end of the link 49 is pivotally connected to the forward end of the article arresting plate 14 and the upper end of the link 49 pivotally supports a pawl 51 which is urged against a ratchet 52 by a torsion spring 53. The aforementioned rollers 18, one being provided for each lane L, are secured on a shaft 54 each end of which is journaled in a substantially vertical slot 56 in one of the arms 44. Springs 57 are disposed between the shaft 54 and horizontal flanges 58 (FIG. 2) on the arms 44 and normally urge the shaft 54 downwardly in the slots. It is apparent that upon downward movement of the arms 44 to the position shown in FIGURE 3 the rollers 18 will be urged against the associated articles in the lanes L by the springs 57 to thereby increase the frictional driving force exerted by the belt 24 against the lower surface of the articles A. This increased force causes the belt 24 to advance articles A over the dead plate 32 and over the article arresting plate 14 and into the case C thereby filling the case.

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During the case filling operation, the open end flaps F of the cases C are held open by a tubular chute 60 through which the articles pass. The case C is supported on the case holder 22 which includes a side supporting surface 61 and an end supporting surface 62. The case holder 22 is secured to a shaft 63 which is journaled on the frame 27. The case holder 22 is moved between a horizontal position where a case being filled is supported on the side supporting surface 61 as shown in FIGURE 3 and a vertical position where the filled case is supported on the end surface 62 by a case supporting pneumatic cylinder 64 which is pivotally connected between the case holder 22 and the frame 27.

The control system 20 includes a centrifugal switch mechanism 68 (FIGS. 1, 2 and 4) which opens a switch 69 therein upon rotation of the rollers 18, and which returns to the closed position when the rollers 18 are stationary. The centrifugal switch mechanism 68 is mounted on the stiffening member 47 and includes a body 70 within which is journaled a transversely extending shaft 71 having a sheave 72 keyed on one end and a bevel gear 73 keyed on the other end. The sheave 72 is connected by a belt 76 to a sheave 74 keyed to the shaft 54. The bevel gear 73 meshes with a bevel gear 77 which is keyed on the lower end of a shaft 78 that is journaled in the body 70. A hub 79 (FIG. 4) secured to the upper end of the shaft 78 includes outwardly extending bifurcated ears 81 each of which pivotally supports a switch actuating arm 82 having a counterweight 83 on its lower end. The upper ends of the arms 82 engage a disc 84 secured to the actuating element 86 of the switch 69, which element 86 is urged downwardly by a spring 87 toward the open position. It is apparent that rotation of the shaft 78 will cause the counterweights 83 to swing outwardly thereby permitting the spring 87 to open the switch, and that termination of rotation of the shaft will allow the weight of the counterweights 83 to move to the position shown in FIGURE 4 thereby holding the switch 69 in the closed position.

Also included in the control system 20 is the aforementioned ratchet 52 and pawl 51. The ratchet 52 is secured to a cam 91 having a plurality of equally spaced ridges 92 and valleys 93 spaced around its periphery. The ratchet 52 and cam 91 are journaled on a stub shaft 94 which is secured to the frame 27. A second pawl 96 is pivotally connected to an actuating rod 97 and is urged against the teeth of the ratchet 52 by a torsion spring 98. The actuating rod 97 is guided for reciprocable movement by a block 99 secured to the frame 27 and is pivotally connected to one end of a link 101. The other end of the link 101 is pivotally connected to a lever 102 which is pivoted at one end to the frame 27 and at the other end to the actuating element 103 of a solenoid 104. A spring 106 is connected between the link 101 and the frame 27 and moves the second pawl 96 to the position shown in FIGURE 3 when the solenoid 104 is not energized. As will be described in more detail hereinafter, the pawls 51 and 96 operate alternately to advance the cam 91 so that a cam follower 107 is positioned alternately on a ridge 92 and then in a valley 93 of the cam 91. The cam 91 actuates the cam follower 107 which is connected to the actuating elements of a normally closed switch 108, and two normally open switches 109 and 111. The switches 108, 109 and 111 are mounted on a bracket 112 secured to the frame 27.

Since the operation of the case loading machine 10 is very closely related to its control system 20, the description of the remaining portion of the control system 20 and the operation will be given together.

Having reference to FIGURE 5, the conveyor 12 is continuously driven and the several parts of the case loading machine 10 are shown in the position they assume immediately after a case C has been placed in position to receive the articles A. Even though the conveyor 12 is being driven, the articles are prevented from move-

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ment therewith by the forward end of the arresting plate 14 which is raised into article arresting position.

Placement of the open end of a case over the tubular chute 60 causes the lower flap F to contact and close a normally open flap switch 116 which is mounted on and moves with the case holder 22. Closing of the flap switch 116 completes a circuit which energizes a solenoid S1 of a case holder controlling air valve V1. The circuit is from main line L1, lead 117, flap switch 116, lead 118, solenoid S1, and leads 119 and 121 to main line L2. Energization of the solenoid S1 moves the core 122 of the valve V1 to the left (FIG. 5) so that a main air line AL, connected to a high pressure source of air (not shown), communicates with the lower end of the pneumatic cylinder 64 through a passage 123 in the valve V1 and a conduit 124 connecting the lower end of the cylinder 64 to the valve V1. While in this left position the upper end of the cylinder 64 is vented to the atmosphere through a conduit 126, connecting the cylinder 64 to the valve V1, and through a vent passage 127 in the core 122 of the valve V1. At this time a second vent passage 128 and a second pressure passage 129 of the valve V1 are closed. With the core 122 in its left hand position, the high pressure air enters the lower end of the cylinder 64 and forces the piston 64a upwardly thereby raising the case holder 22 to the case supporting position shown in FIGURE 3. As the case holder moves upwardly, the flap switch 116 becomes spaced from the lower flap and opens the circuit to the solenoid S1.

As the case holder 22 approaches the case supporting position, the end supporting surface 62 of the holder closes a normally open lowering circuit switch 131 and shortly thereafter closes a normally open arresting plate switch 132. Since the cam controlled switch 109 is open, the closing of the lowering circuit switch 131, which is in series with the switch 109, has no immediate effect on the system. Closing of the switch 132, however, energizes a solenoid S2 of an arresting plate control valve V2 through a circuit which includes main line L1, a lead 133, the closed switch 108, a lead 134, the closed switch 132, a lead 136, the solenoid S2, and leads 137, 138, 119 and 121 to the main line L2. Energization of the solenoid S2 moves the core 141 of the valve V2 to the left (FIG. 5) thereby registering a pressure passage 142 of the core 141 with a conduit 143 that is connected to the left end of the pneumatic cylinder 39, and with a conduit 144 that is connected to the main air line AL. High pressure air entering the left end of the cylinder 39 forces the piston 39a to the right (FIG. 5) causing the forward end of the arresting plate 14 to move downwardly to a position which will permit the articles A to move thereover. Air in the right end of the cylinder 39 is vented to the atmosphere through a conduit 146 connected between the cylinder 39 and the valve V2, and through a passage 147 in core 141. A second vent passage 148 and a second pressure passage 149 in the core 141 are closed when the core is in the left hand position.

Lowering of the forward end of the article arresting plate 14 causes the link 49 to lower the rollers 18 into firm rolling engagement with the upper surface of the articles A, and cocks the ratchet pawl 51 which engages another tooth of the ratchet 52. With the rollers 18 forcing the articles into firm engagement against the continuously moving belt 24, the added frictional force between the belt and the articles causes the belt to drive the abutting articles toward the right until the case is filled, at which time the movement of the articles and the rollers 18 is terminated.

When the rollers 18 are rotated in response to movement of articles thereunder, it will be understood that the shaft 78 of the centrifugal switch mechanism 68 is rapidly rotated and the counterweights 83 will swing outwardly thereby opening the switch 69. Opening of the switch 69 opens the circuit to the solenoid 104 which

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is in series with the switch 69 in a circuit which include the main line L1, the switch 69, a lead 150, the solenoid 104, and the main line L2. De-energization of the solenoid 104 permits the spring 106 to move the pawl 96 to the left as shown in FIGURE 3 into cocked engagement behind another tooth of the ratchet 52. When the case C is filled and movement of the articles A and the rollers 18 stops, the switch 69 will again close thereby energizing the solenoid 104. Energization of the solenoid 104 will cause the ratchet pawl 96 to move to the right (FIG. 3) and to rotate the cam 91 to a position wherein the cam follower 107 is resting on one of the ridges 92. When in this position, the switch 108 will be opened and the switches 109 and 111 will be closed.

Closing of the switch 109 completes a circuit to a solenoid S3 of the case holding control valve V1 through a circuit which includes the main line L1, a lead 151, the closed switch 109, a lead 152, the closed switch 131, a lead 153, the solenoid S3, the lead 121 to the main line L2. Energization of the solenoid S3 moves the core 122 of the valve V1 to the position shown in FIGURE 5 wherein the main air line AL communicates with the upper end of the cylinder 64 through the passage 129 and the conduit 126. Air is vented from the lower end of the cylinder 64 through the conduit 124 and the vent passage 128 as the high pressure air entering the upper end of the cylinder 64 forces the piston 64a and the attached case holder 22 downwardly.

Simultaneously, with the above case lowering operation, opening of the switch 108 effects the de-energization of the solenoid S2 while closing of the switch 111 effects the energization of a solenoid S4 of the arresting plate control valve V2 thereby moving the core 141 to the position shown in FIGURE 5. The solenoid S4 is energized through a circuit which includes main line L1, a lead 156, switch 111, a lead 157, solenoid S4, and leads 138, 119 and 121 to the main line L2. With the core 141 in the position shown in FIGURE 5, high pressure air enters the right end of the cylinder 39 through the main air line AL, the conduit 144, the passage 149 and the conduit 146, thereby forcing the piston 39a to the left (FIG. 5). Air is vented from the left end of the cylinder 39 through the conduit 143 and the vent passage 148. Movement of the piston 39a to the left (FIG. 5) raises the forward end of the article arresting plate 14 into arresting position, raises the rollers 18 to a position spaced above the articles A and raises the cocked ratchet pawl 51 thereby rotating the ratchet 52 and the cam 91 to a cycle starting position wherein the cam follower is again positioned within one of the valleys 93. The control system 20 is then prepared for repeating the above cycle of operation upon placement of another case C in loading position with the lower flap closing the switch 116.

From the foregoing description it is apparent that the case loading machine of the present invention is simple in design and in operation since the articles are both collected and advanced into a case while traveling in a straight line. The machine includes an improved control system adapted to effect positive immobilization of the articles in response to the termination of movement of the articles caused by the filling of a case. Also, the control system includes means responsive to the movement of articles by the conveyor for maintaining the article arresting plate in an article bypass position as long as the articles are being moved and wherein termination of movement of the articles will effect the movement of the arresting plate into the article arresting position.

While one embodiment of the present invention has been shown and described, it will be understood that various changes and modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

Having thus described the present invention and the

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manner in which the same is to be used, what is claimed as new and desired to be protected by Letters Patent is:

1. A case loading machine comprising a conveyor for moving articles along a predetermined path, means for supporting a case in position to receive substantially rigid articles moving along said predetermined path, means adjacent the discharge end of said conveyor for impeding the passage of the articles on the conveyor whereby the articles overcome the frictional resistance between the conveyor and the articles and slide thereon, and pressure applying means for forcing the articles downwardly into firm engagement with said conveyor to cause said conveyor to exert a driving force on the articles of sufficient magnitude to advance the articles into the case until the case is filled.

2. A case loading machine comprising a continuously driven conveyor for moving articles along a linear path, means for supporting a case in position for receiving substantially rigid articles moving along said linear path, means adjacent the discharge end of said conveyor for impeding the passage of the articles on the conveyor whereby the articles overcome the frictional resistance between the conveyor and the articles and slide thereon, and pressure applying means for forcing the articles downwardly into firm engagement with said conveyor causing said conveyor to exert a driving force on the articles of sufficient magnitude to advance the articles into the case to fill the case.

3. A case loading machine comprising a continuously driven conveyor for moving articles along a linear path, means for supporting a case in position for receiving articles moving along said linear path, friction increasing means responsive to the presence of a case in position for receiving articles for forcing articles into firm frictional engagement with said conveyor for causing said conveyor to exert a driving force on the article of sufficient strength to advance the articles into the case to fill the case, and means responsive to the termination of movement of the articles on the conveyor upon filling the case for withdrawing said friction increasing means from contact with the articles.

4. A case loading machine comprising a continuously driven conveyor for moving articles along a path, means for supporting a case in position to receive articles moving along said path, article arresting means disposed in said path between said conveyor and said case supporting means and movable between an article arresting position for preventing the movement of articles toward the case and a by-pass position permitting movement of articles therepast, friction increasing means movable between an inoperative position and a position in engagement with the articles for increasing the frictional engagement between the articles and said conveyor tending to move the articles along the path, and control means for simultaneously moving said friction increasing means into engagement with said articles and moving said article arresting means into the by-pass position for causing said conveyor to move articles along said path into the case to fill the case.

5. A case loading machine comprising a continuously driven conveyor for moving articles along a linear path, means for supporting a case in position for receiving articles moving along said linear path, article arresting means disposed between said conveyor and said case supporting means and movable between an arresting position in the path of articles moving toward the case and a by-pass position wherein the articles may be moved past said arresting means, friction increasing means for forcing articles into firm engagement with said conveyor causing said conveyor to exert a driving force on the articles which advances certain ones of the articles into the case to fill the case, and controlling means responsive to the presence of said case supporting means in position to support the case in article receiving position for effecting the movement of said arresting means out of arresting posi-

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tion simultaneously with the movement of said friction increasing means into engagement with the articles.

6. A case loading machine comprising a continuously driven conveyor for moving articles along a linear path, means for supporting a case in position for receiving articles moving along said linear path, article arresting means disposed between said conveyor and said case supporting means and movable between an arresting position in the path of articles moving toward the case and a by-pass position wherein the articles may be moved past said arresting means, friction increasing means for forcing articles into firm engagement against said conveyor causing said conveyor to exert a driving force on the articles which advances certain ones of the articles into the case to fill the case, and controlling means responsive to the presence of said case supporting means being in position to support the case in article receiving position for effecting the movement of said arresting means out of arresting position simultaneously with the movement of said friction increasing means into engagement with the articles, said controlling means being responsive to the termination of movement of the articles with said conveyor due to the filling of the case to simultaneously effect the movement of the arresting means into the arresting position and to move said friction increasing means away from said articles.

7. A case loading machine comprising a continuously driven conveyor having an article supporting surface for moving articles along a linear path, an article arresting plate mounted rearwardly of said conveyor for vertical movement of the forward end thereof between an article arresting position above the plane of the supporting surface of said conveyor to a by-pass position lying in the plane of said supporting surface, a freely journaled roller, means mounting said roller for movement between a position spaced above the articles on said conveyor and a position in firm rolling engagement with the articles moving thereunder so as to increase the frictional engagement of said conveyor with the articles, case supporting means positioned rearwardly of said plate for supporting a case to be filled in said linear path, and actuating means connected to said plate and to said roller mounting means for simultaneously moving said roller into engagement with said article and moving said plate into said by-pass position whereby said conveyor advances articles in said linear path over said plate and into said case to fill the same.

8. A case loading machine comprising a continuously driven conveyor having an article supporting surface for moving articles along a linear path, an article arresting plate mounted rearwardly of said conveyor for vertical movement of the forward end thereof between an article arresting position above the plane of the supporting surface of said conveyor to a by-pass position lying in the plane of said supporting surface, a freely journaled roller, means mounting said roller for movement between a position spaced above the articles on said conveyor and a position in firm rolling engagement with the articles moving thereunder so as to increase the frictional engagement of said conveyor with the articles, case supporting means positioned rearwardly of said plate for supporting a case to be filled in said linear path, actuating means connected to said plate and to said roller mounting means and responsive to the presence of a case support by said case supporting means in said linear path for simultaneously moving said roller into engagement with said article and moving said plate into said by-pass position whereby said conveyor advances articles in said linear path over said plate and into said case to fill the same and to terminate movement of said articles, said actuating means being responsive to the termination of movement of said article and the termination of rolling of said roller to simultaneously move said roller to a position spaced from said articles and to move said forward end of said plate into the arresting position.

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9. A case loading machine comprising a continuously driven conveyor having an article supporting surface for moving articles along a linear path, an article arresting plate mounted rearwardly of said conveyor and having a forward end movable between an article arresting position and an article by-pass position, a freely journaled roller, means mounting said roller for pivotal movement between a position spaced above the articles on said conveyor and a position in firm rolling engagement with the articles moving thereunder so as to increase the frictional engagement of said conveyor with the articles, resilient means carried by said roller mounting means for urging said rollers downwardly, case supporting means mounted for pivotal movement from a position wherein a case is supported in filling position in said linear path to a discharging position wherein the case is moved out of said path, first actuating means connected to said case supporting means and operable to move said case supporting means between said filling and discharging positions, a linkage interconnecting said plate and said roller mounting means and having a ratchet pawl on the upper end thereof, a ratchet mounted for rotation in position to be engaged by said pawl, a cam secured to said ratchet for rotation therewith and having a plurality of equally spaced ridges and valleys on the periphery thereof, a second ratchet pawl disposed in position to engage said ratchet, switch means having an actuating element disposed in position to engage the periphery of said cam, means connected to said second ratchet pawl to actuate the same causing rotation of said cam and causing said switch actuating element to be moved from a valley to a ridge, a centrifugal switch mechanism responsive to the termination of the rotation of said roller for controlling the actuation of said second pawl actuating means, second actuating means connected to said plate for actuating said plate, said roller mounting means and said first pawl in unison, means responsive to the placement of an empty case in loading position to activate said first actuating means to move said case supporting means into position to support said case in the filling position, and means responsive to the movement of said case supporting means into filling position for activating said second actuating means for moving said plate into the by-pass position, for moving the roller into engagement with the articles, and for cocking said first pawl by moving said pawl into engagement with another one of said ratchet teeth, said centrifugal switch mechanism being actuated by termination of movement of said roller and said articles upon filling the case for effecting activation of said second pawl actuating means for rotating said ratchet and cam to a position wherein said switch actuating element is moved from a valley to a ridge thereby activating said switch means, activation of said switch means being effective to actuate said first and second actuating means whereby the filled case and said case supporting means are moved out of the path of movement of the articles, and wherein said plate is moved into arresting position, said roller is moved out of engagement with the articles, and said first pawl is actuated to rotate said ratchet and said cam so as to position said actuating element in a valley of said cam.

10. A case loading machine comprising a conveyor for moving articles along a linear path, means for supporting a case in position for receiving articles moving along said linear path, friction increasing means for causing said conveyor to exert a driving force on the articles to move the articles into the case to fill the case, means responsive to the termination of movement of the articles on the conveyor upon filling the case for withdrawing said friction increasing means from contact with the articles, and control means responsive to the termination of movement of the articles with said conveyor due to the filling of the case to effect the movement of said friction increasing means away from said articles.

11. A case loading machine comprising a conveyor for moving articles along a predetermined path, means for

supporting a case in position to receive articles moving along said predetermined path, a plate adjacent the discharge end of the conveyor wherein articles coming onto said plate will provide sufficient frictional resistance with the plate to halt the advancement of the articles remaining on the conveyor, and pressure applying means for forcing the articles downwardly into firm engagement with said conveyor to overcome the resistance of the articles on the plate thereby advancing the articles into the case.

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