

[72]	Inventor	Timothy Wallace Andover, England
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[73]	Assignee	AMF Incorporated New York, N.Y.
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[33]		Great Britain
[31]		23106/68

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Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Robert J. Spar
Attorneys—George W. Price, Esq. and Eli Weiss, Esq.

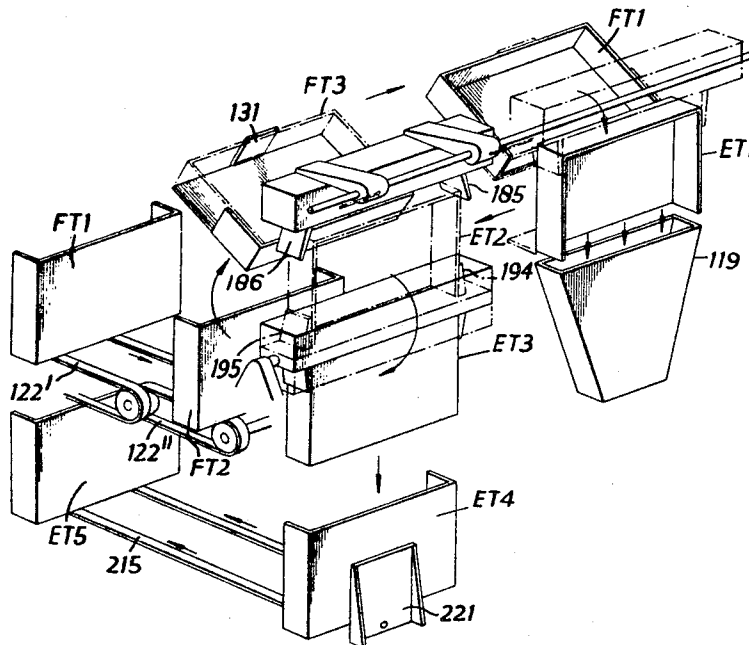
[54] ARTICLE CONVEYING AND LOADING MACHINE
17 Claims, 15 Drawing Figs.

[52] **U.S. Cl.**..... 214/306,
214/307, 214/314
[51] **Int. Cl.**..... **B65g 65/34**
[50] **Field of Search**..... 214/300,
301, 302, 307, 314, 315, 306

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ABSTRACT: The machine is a loader for a cigarette packer in which a pivoted container conveyor is capable of swinging down to a loading position and swinging up to an inclined position and thereafter to a ready position adjacent a discharge position. A clamp arrangement is provided for holding a container at the discharge position while it is emptying and for conveying an empty tray from the discharge position to a take away path. Turning mechanism is provided so that the tray in the ready position is pivoted into the discharge position as soon as the empty tray has cleared the discharge position on removal therefrom.



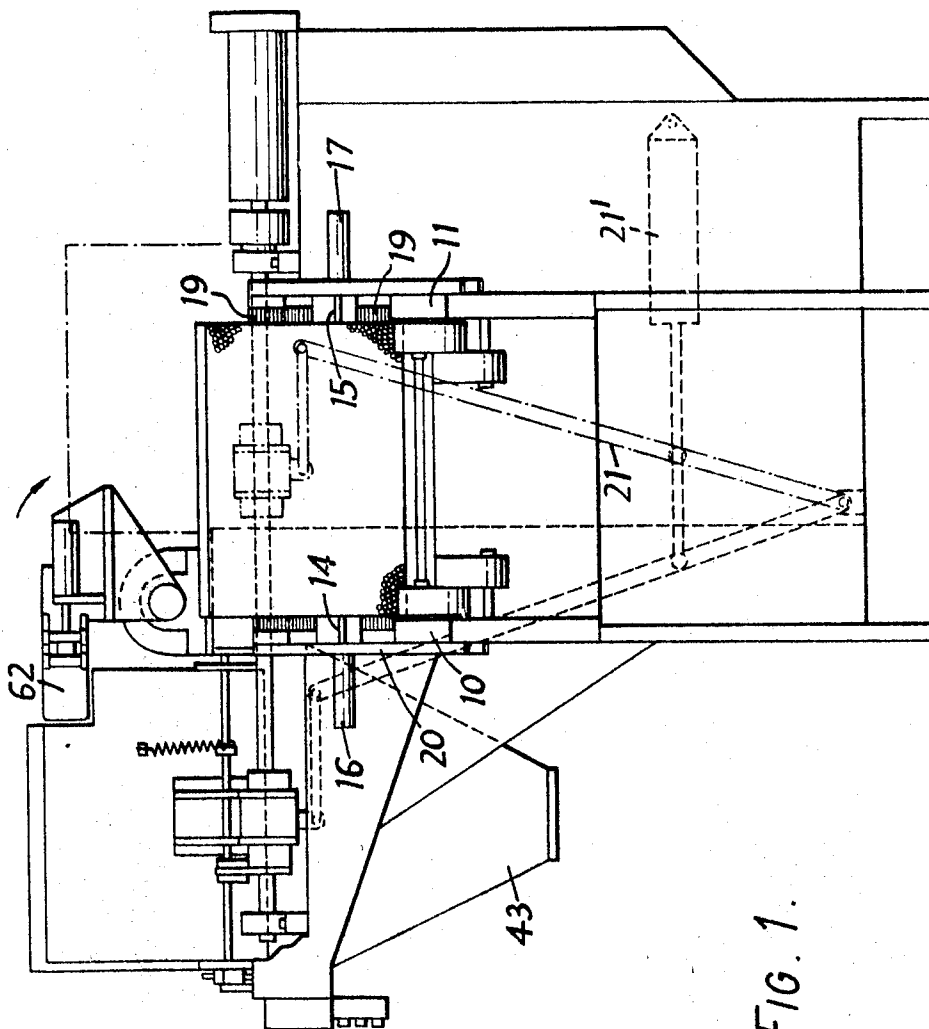


FIG. 1.

INVENTOR
TIMOTHY WALLACE
BY *Timothy Wallace*
ATTORNEY

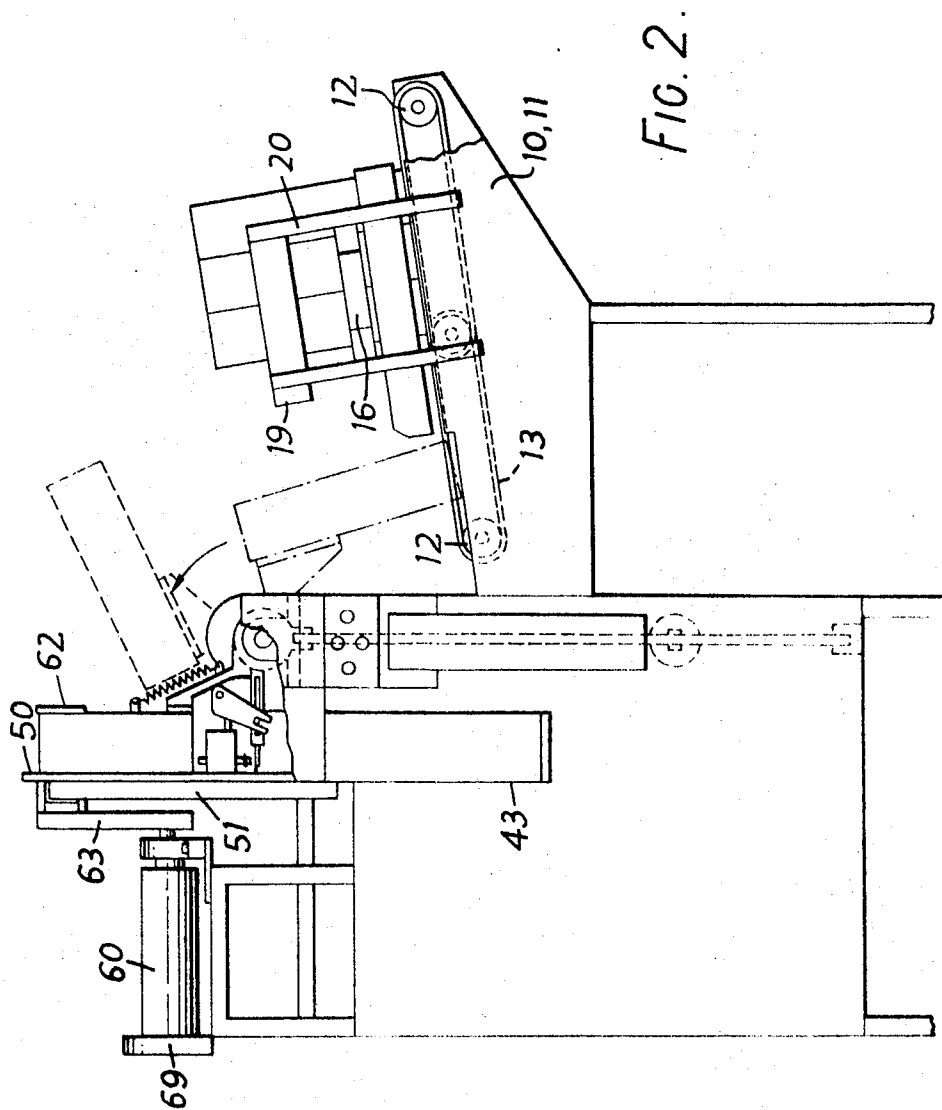


FIG. 2.

INVENTOR
TIMOTHY WALLACE
BY *Murray Schaff*
ATTORNEY

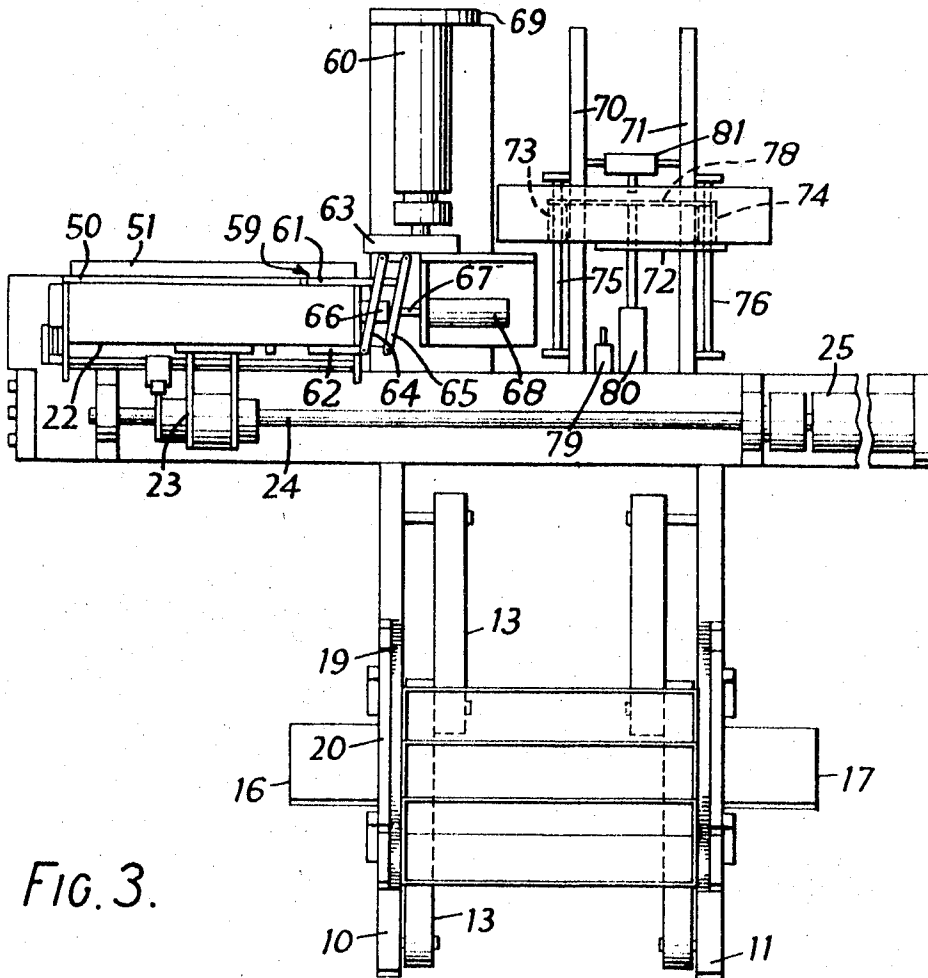


FIG. 3.

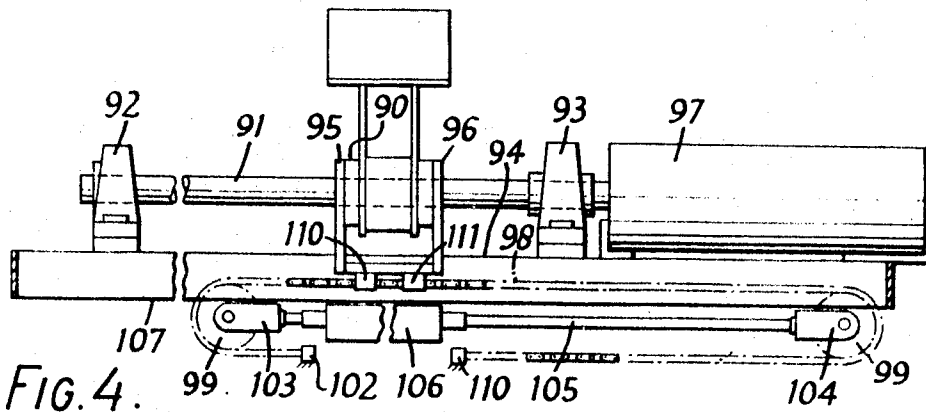


FIG. 4.

INVENTOR
TIMOTHY WALLACE

BY

Harry DeLoe
ATTORNEY

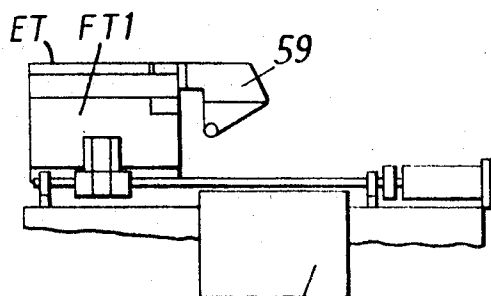


FIG. 7A.

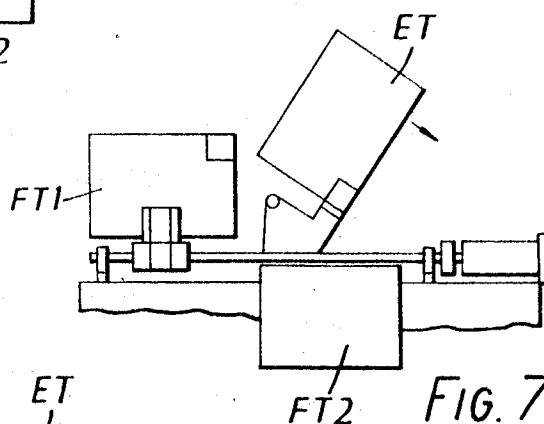


FIG. 7B.

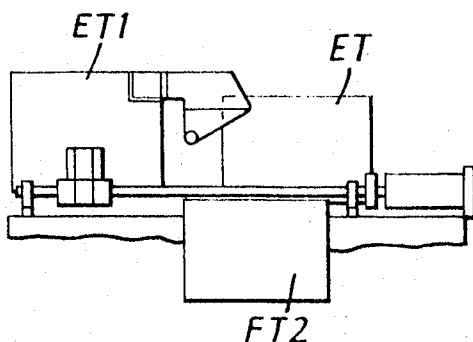


FIG. 7C.

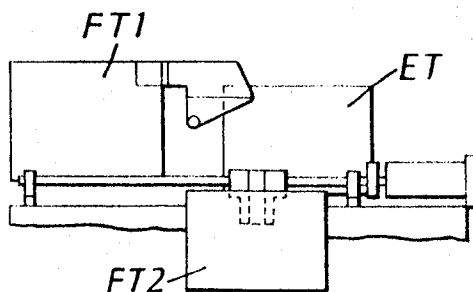


FIG. 7D.

INVENTOR
TIMOTHY WALLACE
BY *Harry Schuff*
ATTORNEY

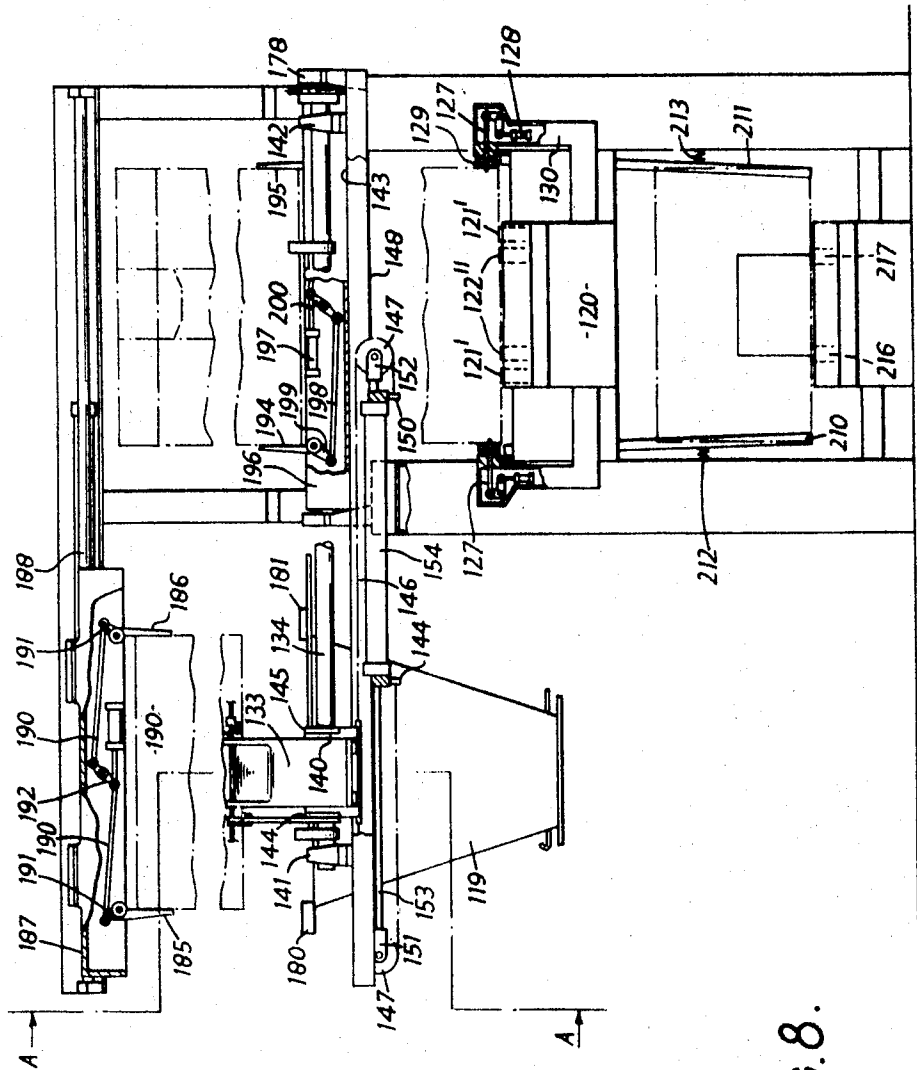
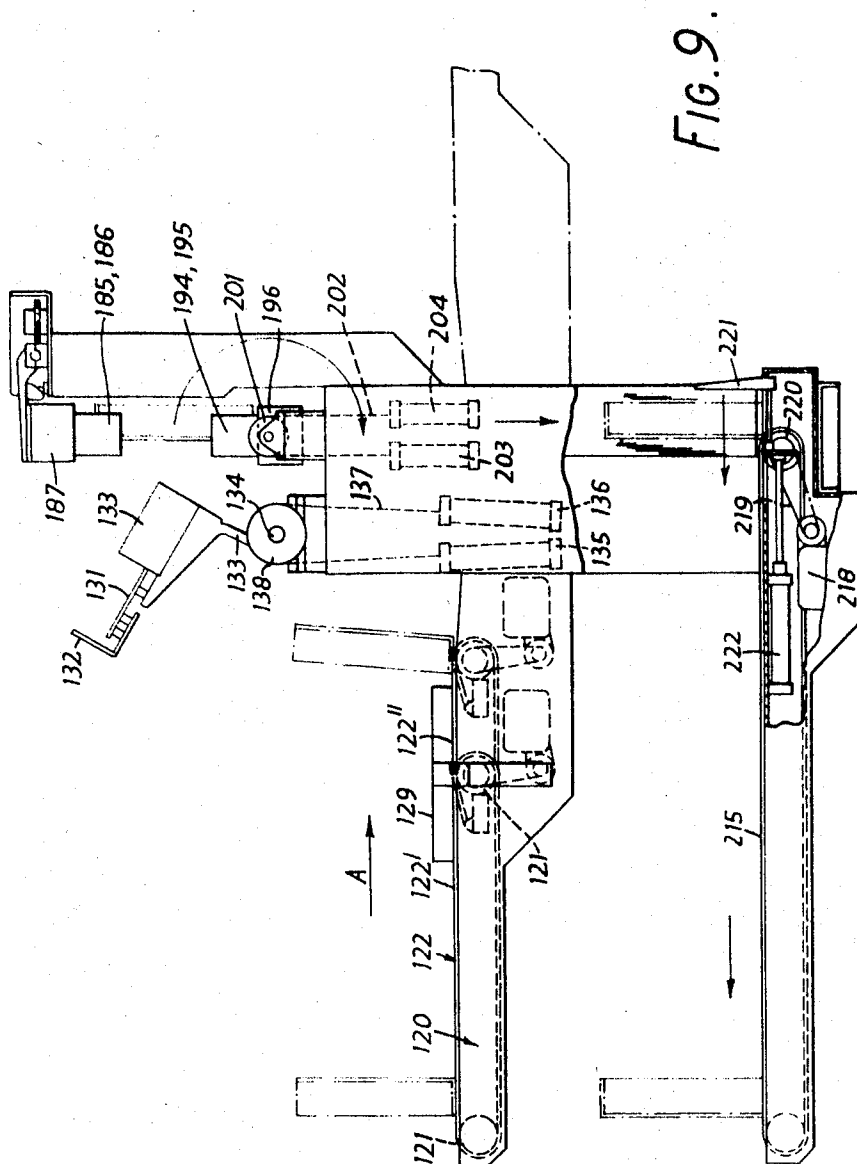
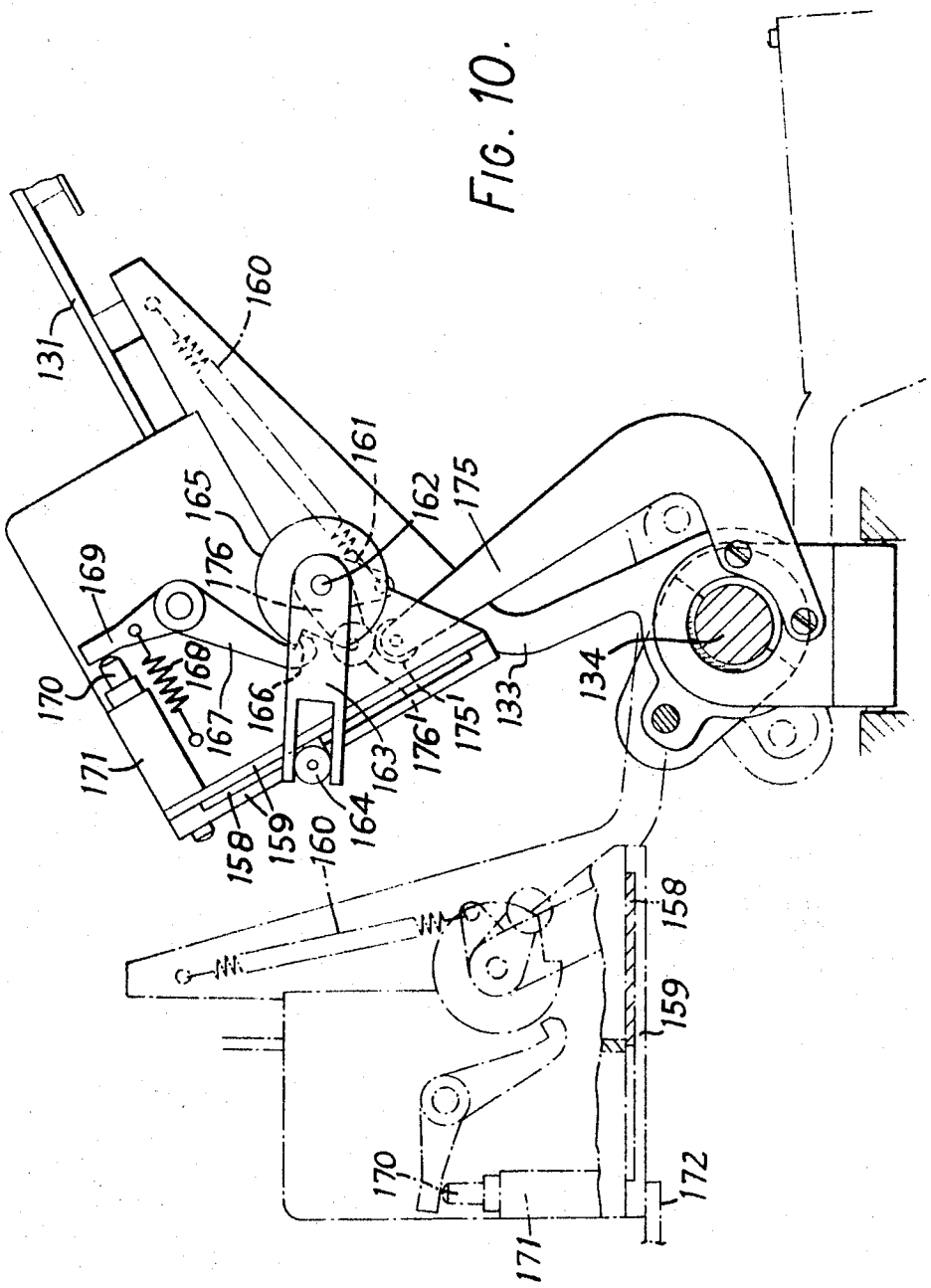


FIG. 8.

INVENTOR
TIMOTHY WALLACE
BY *Henry Schaff*
ATTORNEY



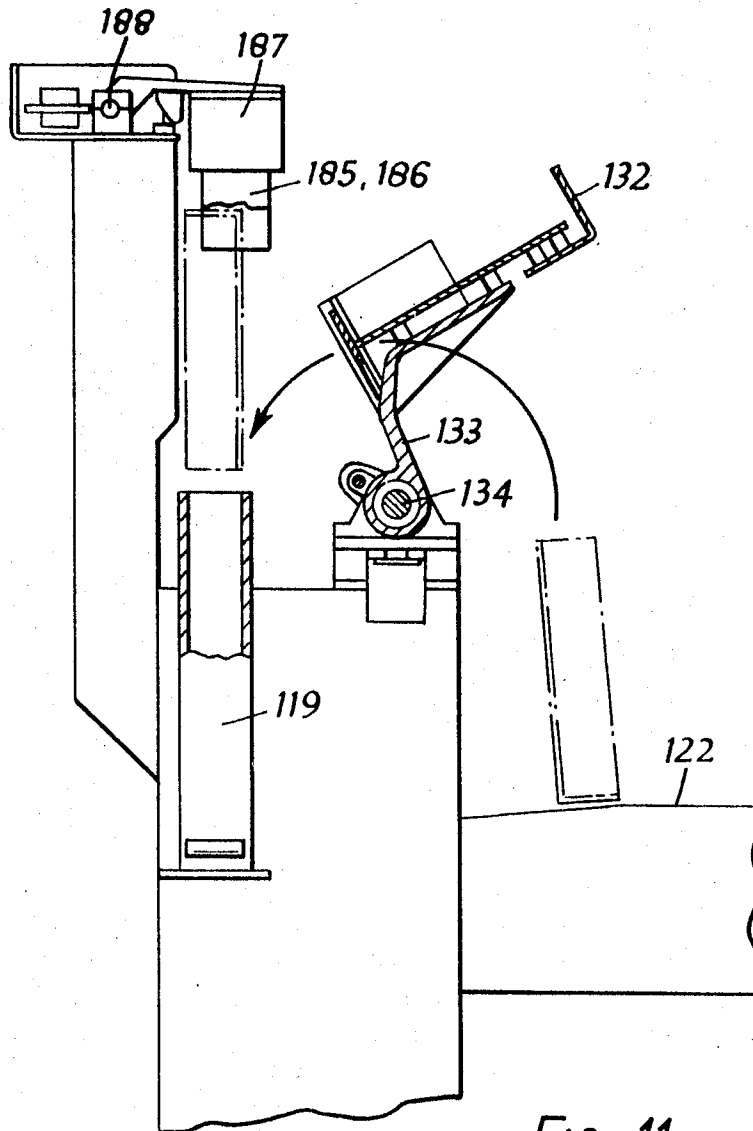
INVENTOR
TIMOTHY WALLACE
BY *Wm. Schaff*
ATTORNEY



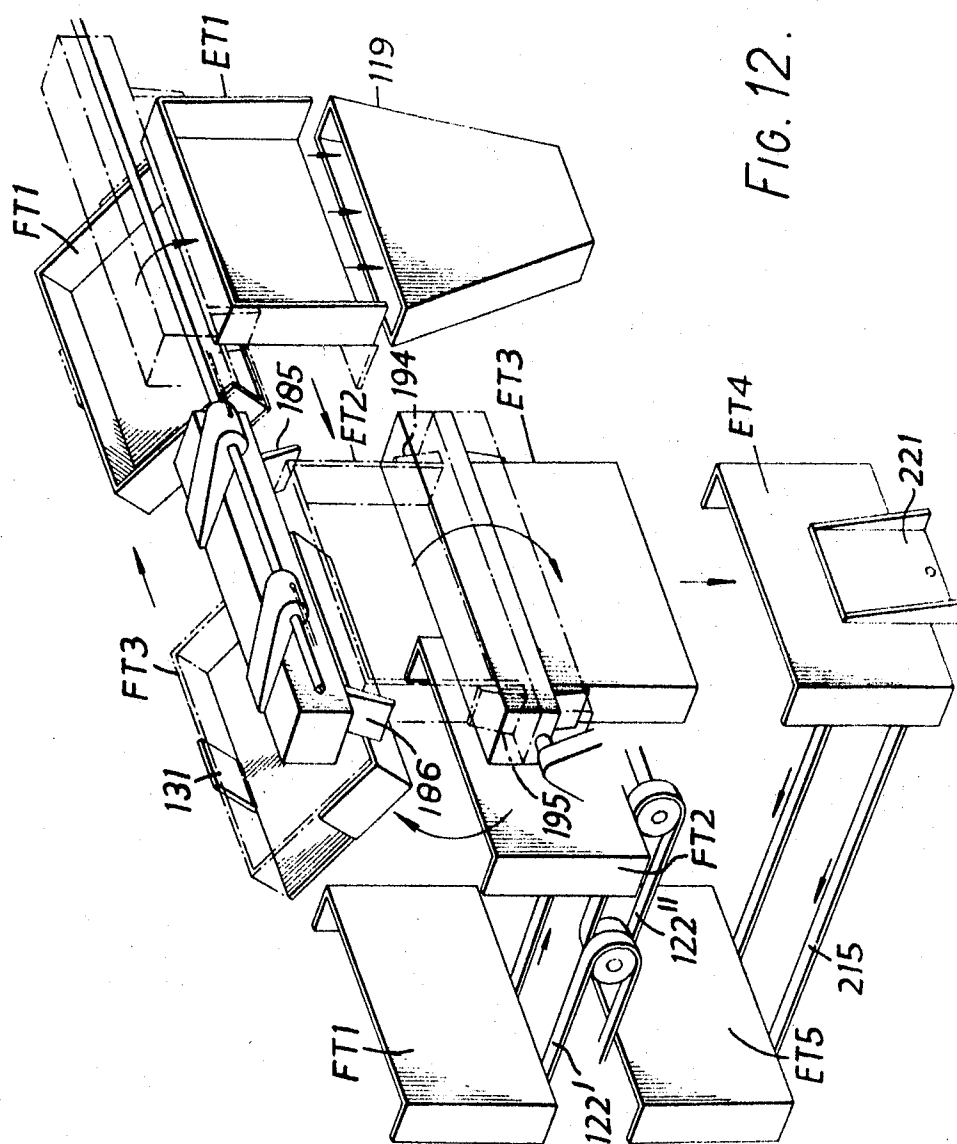
INVENTOR
TIMOTHY WALLACE

BY

Harvey Schaff
ATTORNEY



INVENTOR
TIMOTHY WALLACE
BY *Harry Schuff*
ATTORNEY



INVENTOR
TIMOTHY WALLACE

BY


 ATTORNEY

ARTICLE CONVEYING AND LOADING MACHINE

BACKGROUND TO THE INVENTION

This invention relates to a loader for the sequential feeding of batches of articles in a series of containers. The loader is particularly suitable for the sequential loading of batches of loose cigarettes contained in trays where it is necessary to feed the cigarettes into a packing machine hopper on instruction by a demand signal.

In known loading devices of this kind there has been provided a pickup device which takes a tray from a line of trays to a discharge position and after discharge conveys the empty tray take away conveyor. The device then returns to the line of trays and picks up the next tray. This has the disadvantage that there is a long time delay as the pickup device moves from the discharge position to the take away conveyor where it releases the empty tray, and subsequently collects the next tray and returns to the discharge position.

An object of the invention is to minimize the time between the removal of a tray from the discharge position and the arrival of the next tray at said position.

SUMMARY OF INVENTION

According to the invention we provide a machine for the sequential conveying of a series of containers to and away from a discharge position, comprising a first device for receiving a container and conveying said container laterally from a tray-receiving position to a ready position adjacent said discharge position, and a second device for conveying a discharge container from the discharge position to an outlet path for the empty containers, and means for moving said first device from the ready position to the discharge position on removal of a discharged container from the discharge position.

BRIEF DESCRIPTION OF DRAWINGS

Constructional forms of the invention will now be described with reference to the accompanying photographs and drawings, in which:

FIG. 1 is a front elevation of the packing machine loader of the invention,

FIG. 2 is a side elevation of the machine shown in FIG. 1;

FIG. 3 is a plan view of the machine shown in FIGS. 1 and 2;

FIG. 4 is a part front elevation of an alternative form of tray conveyor traversing mechanism, (tray conveyor not shown) with the casing removed for clarity;

FIG. 5 is a perspective view of the tray conveyor and mechanism for actuating the slidable bottom of the tray conveyor;

FIG. 6 shows a greater detail of the actuating mechanism for said slidable bottom;

FIGS. 7A-7D show a sequence of movement of cigarette trays being conveyed by the machine;

FIG. 8 shows a second example of a packing machine loader of the present invention in front elevation;

FIG. 9 is a side elevation of the machine shown in FIG. 8;

FIG. 10 is an enlarged part elevational and part sectional view showing the tray conveyor and actuating mechanism for the sliding bottom to the tray conveyor;

FIG. 11 is a part section taken along the line A-A in FIG. 8 showing the path of movement of the tray conveyor into the ready position of the charged cigarette container; and

FIG. 12 is a perspective view of essential parts of the machine sufficient to show the path of movement of the container from the ready position to a discharge path.

DESCRIPTION OF PREFERRED EMBODIMENTS

CONSTRUCTION OF EXAMPLE 1

Tray Conveyor. The loading machine has a framework supporting the various working parts. At the front of the machine

there extend two arms 10, 11 serving as the base portion of a tray conveyor shown particularly in FIGS. 1, 2 and 3. The arms carry pulleys 12 over which belts 13 pass and convey the trays rearwardly. The belts are arranged in two pairs, the front pair conveying the trays from the front to a position midway along the arms and a second pair extending from said midway position to a tray carrier to be described.

The pairs of belts are driven by two pneumatic motors (not shown) coupled by a rack and segment device (not shown) to the pulleys. The front pulleys may be caused to urge the trays continuously against stop pins 14, 15 arranged by said midway position and supported and operated by pneumatic rams 16, 17. The stop pins 16, 17 in the unoperated position extend into the path of travel of the trays and completely clear the path when actuated.

The rear belts cause a tray on its release to effect an intermittent rearward movement until the tray reaches and enters the tray carrier.

The trays are guided on the belts by means of brushes 19 disposed at each side of the tray conveyor on upright members 20 which serve also to carry the pneumatic rams 16, 17.

The trays are formed with a base and three sidewalls and in the position shown the cigarettes are horizontally stacked. The open side of the tray faces the front of the machine and the side with no sidewall is uppermost.

The pairs of belts may alternatively be driven by electric motors to give a unidirectional and continuous movement during operation.

Tray Carrier. This part of the apparatus takes the tray that it receives from the tray conveyor and brings it to the packer hopper in a manner to be described. The carrier comprises a plate 22 having three sidewalls; one of which has an opening by which the presence of a tray can be detected by a microswitch (not shown). The carrier is attached to a pair of brackets 23 pivotally mounted on a shaft 24 to which they are keyed or splined, so as to rotate therewith and to slide axially thereon. The shaft 24 is rotated by a rotary actuator 25 which in this example is a piston and cylinder device.

The carrier is moved axially on the shaft, i.e., laterally of the machine, by means of a lever 21 arrangement (see FIG. 1) driven by a ram 21'.

The tray carrier is provided with a removable bottom wall 28 (see FIG. 6) slidable in guides 29. The movement of the wall 28 is effected by means of a spring 30 (FIGS. 5 and 6) which is connected between the tray carrier and a lever 31 rigidly attached to a rod 32 passing through openings in the brackets 23. The ends of the rod extend beyond the carrier width and carry forked members 33 which engage pins 34 extending from the ends of the wall 28.

At one end of the carrier only a further lever 35 (see FIG. 6) is rigidly connected to a slider 36 axially movable within a block 37. The slider has a recess 36' which is engaged by a nose 40' formed in a release member 40 which is urged by a spring 41 into an engagement position. The release member is slidable within the block at right angles to the movement of the slider.

The release member 40 is engageable with an adjustable stop 42 so that as the carrier comes into the discharge position over the hopper 43 the release member is moved in relation to the block 37 whereupon the spring 30 causes rapid rotation of the shaft 32 and forked members 33 whereby the wall slides in its guides to permit discharge of the cigarettes into the hopper.

The wall is returned into its closed position by means of a fixed cam 46 and a follower 47 rigidly attached to the shaft 32. As the carrier moves out of the discharge position the follower engages the cam so that the follower rotates. The shaft also rotates and the forked members 33 slide the wall back into its closed position. The slider 36 also slides into a position where its recess 36' is once more engaged by the nose 40' of the release member 40.

A cover 48 houses a number of control microswitches (not shown) operated by an arm (not shown) connected transversely to the end of the shaft 24. Microswitches (not shown) are

also provided at the ends of the stroke of the lever 21 effecting movement of the carrier. These and other switches (not shown) effect the sequence of operation to be later described.

Discharge Position. At the discharge position (see FIG. 2) above the hopper 43 there is provided a plate 50 (which may be transparent for demonstration purposes) against which the tray is held during discharge. Mounted on the supporting framework 51 for the plate 50 there is provided a lamp (not shown) arranged to provide a horizontal beam through the upper region of the hopper. The lamp is aligned with a photoelectric cell (not shown) mounted at the opposite side of the framework. The photoelectric cell is arranged to emit a demand signal when the level of the cigarettes in the hopper has fallen so as to expose the cell to the lamp.

The framework carries the adjustable stop member 42 which is enclosed together with the cell within a guard 54.

Clamp. The tray T is held in position against the plate 50 by means of a clamp 59 (see FIG. 3). The clamp serves also to convey the tray from the discharge position to a take away conveyor. A rotary actuator 60 serves as a mounting for the clamp 59 which is provided with a pair of jaws 61, 62. Jaw 61 is slidable on an arm 63 attached rigidly to the end of the shaft of the rotary actuator 60. Parallel pairs of links 64, 65 are pivotally connected to the two jaws and a link 64 is pivotally mounted on a block 66 attached to the piston rod 67 of a ram 68. Controlling microswitches (not shown) are provided within the housing 69 which also contains an operating arm for said microswitches, transversely attached to the rear end of the shaft of the rotary actuator 60.

Actuation of the ram 68 causes the block 66, the links and jaws to move towards the tray. As the jaws approach, jaw 61 moves behind the tray until the jaw 61 is prevented from further movement by a stop (not shown). As the jaw 61 is arrested and the block continues its movement the links cause the jaw 62 to move in front of the tray and at the same time to swing rearwardly so as to grip the tray.

The clamp and operating mechanism can swing through 180° to a take away position.

Empty tray magazine. This is shown in FIG. 3 and comprises a pair of strips 70, 71 along which the tray is pushed by a pusher arm 72 carried by two tubular mountings 73, 74 which slide on rods 75, 76 fixed to the machine framework. The mountings 73, 74 are connected together by a crossmember 78. A microswitch 79 detects the presence of an empty tray and provides a signal at the appropriate moment to a solenoid valve controlling the rearward movement of a ram 80 mounted on the framework of the machine. The piston rod of the ram 80 is connected to the crossmember 78. A microswitch 81 mounted between the strips 70, 71 is provided at the end of the stroke of the pusher arm whereby the system is set ready for a return signal to effect the forward movement of the pusher arm.

Alternative drive for tray carrier. In FIG. 4 there is shown a cross-slide 90 keyed on a shaft 91 mounted in bearings 92, 93 fixed to a plate 94 and supported by two plates 95, 96. The shaft is rotatable as before by a rotatory actuator 97 arranged on the plate 94. The plates 95, 96 have axially aligned bores which engage annular shoulders on the cross-slide 90.

Beneath the plate 94 there is a driving chain 98 which passes over pulleys or sprockets 99. The ends of the chain are secured to a bottom plate 100 by pins at 101, 102. The chain is also attached to the plates 95, 96 by downwardly extending tube 110, 111. The pulleys 99 are mounted on bearings 103, 104 attached to the ends respectively of the piston rod 105 of a two-way acting ram 106 mounted on a plate 107.

On actuation of the ram 106 the rod moves axially. The chain moves in a two to one ratio to the rod movement and consequently the cross-slide is moved over a lateral stroke twice that of the piston rod of ram 106.

Operation of the loader.

The operation of the machine will now be described from the point at which a demand signal is emitted from the photoelectric cell in the discharge position. The various relays

and solenoid operated valves are enclosed within the casing surrounding the framework of the machine. The whole system is operated by electrical and pneumatic devices commonly used and accordingly not described.

In FIG. 7A the machine, shown schematically, is in the position awaiting a demand signal. Here the empty tray ET is held in the discharge position by the clamp 59 while the first full tray FT1 is poised at a position ready for movement into the discharge position. A second full tray FT2 is shown on the tray conveyor.

When the cigarettes at the discharge position fall below the level of the photoelectric cell the latter is exposed to the lamp. This causes a demand signal to actuate a relay which effects energization of the solenoid valve controlling the rotary actuator for the clamp.

The clamp 59 rotates to move the empty tray out of the discharge position (see FIG. 7B). A microswitch within the casing 69 is closed after 60° so that rotary actuator 25 operates by way of a relay and solenoid valve to bring a loaded tray into the discharge position (see FIG. 7B). The release member 40 now engages the adjustable stop 42 so that the movable wall 28 rapidly retracts under the influence of the spring 30. The cigarettes fall into the hopper and the fresh tray FT1 partially empties. At the discharge position of the tray carrier a microswitch in casing 48 operates to shut off the pneumatic supply to the rotary actuator 25.

Completion of 180° rotary movement of the clamp causes the microswitch 79 to be closed by the empty tray arriving on the take away conveyor. The clamp ram 68 opens and withdraws thereby releasing the empty tray ET. On completion of withdrawal a further microswitch operated by the ram switches a solenoid valve to feed the ram 80 to move the pusher arm rearwardly to take the empty tray away from the arrival position on the empty tray magazine. At the end of the rearward stroke of the pusher arm the microswitch 81 is operated and this causes the ram 80 to return the pusher arm to its forwardmost position and to cause the rotary actuator 60 to move with reverse direction whereby the clamp commences its return movement. The clamp now arrives back in its clamping position adjacent the fresh tray on arrival at this position a microswitch in casing 69 is closed whereby the clamp ram 68 operates to effect clamping of the fresh tray FT1 (see FIG. 70).

On closure of the clamp jaws on the fresh tray causing operation of another microswitch, the rotary actuator 25 operates in the reverse direction bringing the carrier away from the discharge position and into a position about 60° from vertical in which position lateral movement of the carrier takes place. On arrival at the inclined position a microswitch in casing 48 causes a relay and solenoid valve to actuate and supply pneumatic pressure to the ram driving the carrier laterally. Lateral movement therefore takes place until the end of the lateral stroke is reached at which point another microswitch closes to initiate actuation once again of the rotary actuator 25. The carrier swings down and comes to rest in a tray-receiving position (see FIG. 7D) at which point it has travelled through an angular distance of 168° from vertical.

On reaching the tray-receiving position a microswitch is casing 48 and operated by the rotary shaft 24, closes thereby causing a solenoid valve to operate so that pneumatic rams 16, 17 withdraw the stop pins from the path of the trays. Simultaneously with the withdrawal of the stop pins the front and rear pairs of belts are driven so that a loaded tray is conveyed of the stop pins the front and rear pairs of belts are driven so that a loaded tray is conveyed rearwardly onto the rear pair of belts. Timing means (not shown) cause the pins to extend once again after the loaded tray arrives on the rear belts so that movement of the remaining loaded trays is prevented.

The fresh tray FT2 progresses rearwardly until it enters the tray carrier in which position the bottom of the fresh tray engages the arm of a microswitch, which arm extends through an opening in the removable wall of the carrier.

Actuation of this latter microswitch causes the pneumatic motors to cease their drive of the front and rear belts and at the same time to activate the rotary activator 25 so that the tray is swung up and is lifted to the inclined position shown in FIG. 5.

A microswitch in casing 48 operates to terminate upward movement of the carrier and to initiate operation of the ram driving the cross-slide of the carrier 22. The carrier is therefore moved laterally until it reaches the end of its stroke when it remains poised with its fresh load of cigarettes in a steady state until a further demand signal is emitted by the photoelectric cell. The machine is therefore back in the position shown in FIG. 7A.

CONSTRUCTION OF EXAMPLE II

The second example shown in FIGS. 8 to 12 provides actual means for removing the empty tray from the discharge position.

CONSTRUCTION

Tray conveyor As before, the loading machine has a framework supporting the various working parts. At the front of the machine there extends tray conveyor 120. The conveyor comprises pulleys 121 over which belts 122 pass and convey the trays rearwardly in the direction of arrow A. The belts are arranged in two pairs, the front pair 122' conveying the trays from the front to a position midway along the arms and a second pair 122'' extending from said midway position to a tray carrier to be described.

The pairs of belts are driven by two pneumatic motors 123, 124 coupled by pulleys 125, 126 to the pulleys 121. The front pulleys 122'' may be caused to urge the trays continuously against stop pins 127 arranged at said midway position and supported and operated by pneumatic rams 128. The stop pins in the unoperated position extend into the path of travel of the trays and completely clear the path when actuated.

The rear belts 122'' cause a tray on its release to effect a rearward movement until the tray reaches and enters the tray carrier.

The trays are guided on the belts by means of brushes 129 disposed at each side of the tray conveyor on upright casing members 130 which serve also to carry the pneumatic rams 128.

The trays are formed with a base and three sidewalls and in the position shown the cigarettes are horizontally stacked. The open side of the tray faces the front of the machine and the side with no sidewall is uppermost.

Tray carrier. This part of the apparatus takes a tray that it receives from the tray conveyor and brings it to a discharge position over the packer hopper 119 in a manner to be described. The carrier comprises a plate 131 having an upset portion 132, and sidewalls 133. The carrier is attached to a bracket 133 pivotally mounted on a shaft 134 to which it is keyed or splined, so as to rotate therewith and to slide axially thereon. The shaft 134 is rotated by an actuator comprising a pair of pistons and cylinder device 135, 136 and a chain 137 passing over a pulley or sprocket 138.

The carrier is moved axially on the shaft 134, laterally of the machine, by means of a lever ram 139.

A cross-slide 140 is keyed on the shaft 134 which is mounted in bearings 141, 142 fixed to a plate 143 and is supported by two plates 144, 145. The plates 144, 145 have axially aligned bores which engage annular shoulders on the cross-slide 140.

Beneath the plate 147 there is a driving chain 146 which passes over pulleys or sprockets 147. The ends of the chains are secured to lugs 149, 150. The chain is also attached to the cross-slide 140. The pulleys 147 are mounted on bearings 151, 152 attached to the ends respectively of the piston rod 153 of the ram 154, which is two-way acting, mounted on the plate 148.

On actuation of the ram 154 the rod moves axially. The chain moves in a 2 to 1 ratio to the rod movement and consequently the cross-slide 140 is moved over a lateral stroke twice that of the piston rod of ram 154.

The tray carrier is provided with a removable bottom wall 158 (see FIG. 10) slidable in guides 159. The movement of the wall 158 is effected by means of a spring 160 which is connected between the tray carrier and a lever 161 rigidly attached to a rod 162 passing through openings in the brackets 133. The ends of the rod extend beyond the carrier width and carry forked members 163 which engage rollers 164 extending from the ends of the bottom wall 158.

At one end of the carrier only a disc 165 is rigidly connected to the rod 162. The disc has a recess 165 which is engaged by a detent 167 pivotally mounted on the tray carrier which is urged by a spring 168 attached to a lever 169 rigidly connected to the detent 167 into engagement with said recess. A release member 170 is slidable within a block 171.

The release member 171 is engageable with a stop 172 so that as the carrier comes into the discharge position over the hopper the release member 170 is moved in relation to the block 171 whereupon the disc 162 is released so that the spring 160 causes rapid rotation of the rod 162 and forked members 163 whereby the bottom wall 158 slides in its guides 159 to permit discharge of the cigarettes into the hopper.

The wall is returned into its closed position by means of a fixed cam 175 and a follower 176 rigidly attached to rod 167. The follower 176 and cam 175 have rollers 176', 177 at their ends. As the carrier moves out of the discharge position the follower engages the cam so that the follower swings about the axis of the rod 162. The rod 162 also rotates and the forked members 163 slide the wall 158 back into its closed position. The detent 167 returns into engagement with the recess 166.

A cover 178 (FIG. 8) houses a number of control microswitches operated by an arm connected transversely to the end of the shaft 134. Microswitches are also provided at the ends of the stroke of the carrier effecting movement of the carrier. These and other switches, (not shown), effect the sequence of operation to be later described.

Discharge Position. At the discharge position above the hopper 119 there is provided a plate as described in the first embodiment (not shown but which may be transparent for demonstration purposes) against which the tray is held during discharge. Mounted on the supporting framework for the hopper there is provided a lamp 180 aligned with a photoelectric cell 181 arranged on the opposite side of the hopper. The photoelectric cell is arranged to emit a demand signal when the level of the cigarettes in the hopper has fallen so as to expose the cell to the lamp.

Sliding Clamp. The tray is held in the discharge position against the transparent plate by means of clamp jaws 185, 186 pivotally mounted on a casing 187 slidable on a rod 188. The clamp jaws serve also to convey the tray from the discharge position to a take away conveyor. A ram 189 actuates the jaws by means of rods 190 and levers 191, 192.

The casing 187 and clamp jaws are slidable laterally on the shaft 188 between the discharge position and an empty tray take away position by means of a piston and cylinder device substantially the same as is described for effecting the lateral movement of the tray carrier and accordingly further description thereof is unnecessary.

Rotatable Clamp. At the take away position a further pair of clamp jaws 194, 195 are provided which are pivotally mounted in a casing 196 and operable by means of a ram 197 and rods 198 and levers 199, 200 in a similar manner as described in relation to the slidable clamp above. The casing 196 together with the clamp-actuating mechanism are rotatable through 180° by means of a pulley 261 and chain 202 actuated by a pair of pistons and cylinder devices 203, 204.

Empty Tray Magazine. Beneath the rotatable clamp there is provided a chute having movable sides 210, 211 urged towards each other by springs 212, 213. These sides retard the speed of descent of the empty trays when released by the rotatable clamp.

A take away conveyor 215, comprises a pair of belts 216, 217 driven by a motor 218 and belt 219 and pulleys 220. In order to move the tray arriving between the sides 210, 211 onto the conveyor 215 a pusher arm 221 is provided which is actuated by a ram 222.

A microswitch (not shown) detects the presence of an empty tray between the sides and provides a signal at the appropriate moment to a solenoid valve controlling the forward movement of the ram 222. A microswitch (not shown) is provided at the end of the stroke of the pusher arm whereby the system is set ready for a return signal to effect the rear movement of the pusher arm.

Operation of the Loader. The operation of the machine will now be described from the point at which a demand signal is emitted from the photoelectric cell in the discharge position. The various relays and solenoid operated valves are enclosed within the casing surrounding the framework of the machine. The whole system is operated by electrical and pneumatic devices.

In FIG. 12 the full cigarette tray FT4 is shown poised in he ready position.

When the cigarettes at the discharge position fall below the level of the photoelectric cell 181 the latter is exposed to the lamp 180. This causes a demand signal to actuate a relay which effects energization of the solenoid valve controlling the ram 188 for the clamp 185, 186.

The clamp 185, 186 slides laterally to move the empty tray ET1 out of the discharge position. A microswitch (not shown) is closed at the end of the stroke of movement of the clamp 185, 186 so that the rams 134, 136 operate by way of a relay and solenoid valve to bring a loaded tray FT4 into the discharge position just vacated by tray ET1.

FIG. 11 shows the path of movement of the full tray from its position on the conveyor into an inclined position from which after a lateral movement of the carrier has taken place it will swing into the discharge position above the hopper. The release member 170 now engages the stop 172 so that the movable wall 158 rapidly retracts under the influence of the spring 160. The cigarettes fall into the hopper 119 and the fresh tray FT1 partially empties. At the discharge position of the tray carrier a microswitch operates to shut off the pneumatic supply to the rams 135, 136.

Completion of lateral movement of the clamp 185, 186 causes a microswitch to be closed whereby clamp jaws 194, 195 close. The clamp jaws 194, 195 are now rotated by the rams 203, 204 through 180° until the empty tray shown at ET3 is depending from the clamp 194, 195. The clamp jaws 194, 195 on arriving at the end of its downward swing release the tray ET3 on actuation of a switch (not shown) controlling the ram 197. The empty trays ET2 falls into the chute between the spring loader sides 210, 211. The pusher arm forwardly then operates on arrival of the empty tray at ET4 to take the empty tray away from the arrival position on the empty tray magazine. At the end of the forward stroke of the pusher arm with the tray at ET5 a microswitch is operated and this causes the ram 222 to return the pusher arm to its rearwardmost position and to cause the rams 203, 204 to move with reverse direction whereby the clamp 194, 195 commences its return movement through 180°. The clamp 185, 186 also returns laterally to the discharge position at which point its jaws close to effect clamping of the fresh tray.

On closure of the clamp jaws 185, 186 on the fresh tray causing operation of another microswitch, the rams 135, 136 operate in the reverse direction bringing the carrier away from the discharge position and into a position about 60° from vertical in which position lateral movement of the carrier takes place. On arrival at the inclined position a microswitch in casing 178 causes a relay and solenoid valve to actuate and supply pneumatic pressure to the ram 154 driving the carrier laterally. Lateral movement therefore takes place until the end of the lateral stroke is reached at which point another microswitch closes to initiate actuation once again of the rams 135, 136. The carrier swings down and comes to rest in a tray-receiving position at which point it has travelled through an angular distance of 168° from vertical.

On reaching the tray-receiving position a microswitch in casing 178 and operated by the rotary shaft 134 closes thereby causing a solenoid valve to operate so that pneumatic rams 128 withdraw the stop pins 127 from the path of the trays. Simultaneously with the withdrawal of the stop pins the front and rear pairs of belts 122' are driven so that a loaded tray FT1 is conveyed rearwardly onto the rear pair of belts 122' at a position shown at FT2. Timing means (not shown) cause the pins to extend once again after the loaded tray arrives on the rear belts so that movement of the remaining loaded trays is prevented.

The fresh tray progresses rearwardly until it enters the tray carrier in which position the bottom of the fresh tray engages the arm of a microswitch, which arm extends through an opening in the removal wall of the carrier 131.

Actuation of this latter microswitch causes the motors to cease their drive of the front and rear belts and at the same time to activate the rams 135, 136 so that the tray if swung up and is lifted to the inclined position shown at FT3.

A microswitch in casing 178 operates to terminate upward movement of the carrier and to initiate operation of the ram 154 driving the cross-slide of the carrier. The carrier is therefore moved laterally until it reaches the end of its stroke (see position FT4) when it remains poised with its fresh load of cigarettes in a ready state until a further demand signal is emitted by the photoelectric cell.

It will be seen that the tray on its passage through the machine has rotated in one direction through 360°. Furthermore, the empty trays are brought out just beneath the entry position of the full trays. This means that one operator may stack the full trays onto the tray conveyor and remove the empty trays from the take away conveyor at one operating position.

If desired the empty trays may be brought out at the rear of the machine on a conveyor (see the conveyor RTC shown in chain lines in FIG. 9) in which case it would not be necessary to provide clamps for effecting the 180° angle of rotation. The laterally sliding clamp would release the empty tray and a rearwardly moving pusher arm would move the tray onto the take away conveyor in a similar manner to that described in the previous example. Therefore the second embodiment permits the empty tray magazine to be on the opposite side to the full tray magazine or on the same side underneath the full tray magazine.

The former arrangement has the advantage with normal loading of trays to and from the magazine that the empty tray magazine can be at the same convenient level as the full tray magazine. The Mark 1 swiveling empty tray removal left the empty trays inconveniently high.

The latter arrangement has the advantages when the loader is used with automatic handling of trays to and from the cigarette making department by overhead conveyor in that with superimposed magazines the same tray handling means can be used for transferring both empty and full trays between the conveyor and loader and the empty and full trays face the same way so that empty trays can be placed on the hanger vacated by full trays.

The machines described are particularly suitable for maintaining the supply of cigarettes to the hopper of a packing machine. It can be seen that by having the tray carrier with its loaded tray in a ready position adjacent the discharge position only a short length of movement is necessary to bring it into the discharge. The clamp and the rotary actuator controlling the carrier can be timed so that the carrier comes into the discharge position when the empty tray gripped by the clamp has just cleared the discharge position.

I claim:

1. A machine for the sequential conveying of a series of containers to and away from a discharge position, comprising a carrier adapted to receive a container pivotally mounted on a shaft and axially slidable thereon and conveying said container laterally from a tray receiving position to a ready position adjacent said discharge position, a second device for conveying a discharged container from the discharge position to an outlet

path for the empty containers, a sprocket and chain arrangement coupled to rotate said shaft and driven by a pair of rams to move said carrier from the ready position to the discharge position on removal of the discharged container from the discharge position and a container conveyor provided for moving the containers towards the tray receiving position, wherein said carrier is pivotable into a lowered position which is the tray-receiving position, above one end of the container conveyor, into a raised inclined position at which lateral movement takes place into the ready position; and into an upright position which is the discharge position.

2. A machine as claimed in claim 1 wherein means are provided for moving said carrier laterally along the shaft comprising a lever pivotally connected at one end to a fixed part of the machine and to the carrier by means of a link, and a ram interposed between the machine and said lever.

3. A machine as claimed in claim 2 wherein means are provided for moving said carrier laterally along the shaft comprising a two-way acting ram mounted on the machine beneath the shaft on which the carrier is mounted, said ram having a double-ended piston rod carrying at each end a pulley, and a chain passing over the pulleys, the ends of the chain extending towards each other and being connected to a fixed part of the machine, said chain being connected between its ends to a bearing member for said carrier.

4. A machine as claimed in claim 3 wherein said second device comprises a clamp pivotally mounted on a shaft of a rotary actuator, said clamp being adapted to grip the tray at the discharge position for retaining said tray in said discharge position and for moving the tray from said discharge position to the outlet path by swinging through an angle of 180° on actuation of said rotary actuator.

5. A machine as claimed in claim 4, including switching mechanism whereby the carrier shaft is rotated to move the carrier into the discharge position at the moment the rotary actuator has swung an empty tray out of the discharge position.

6. A machine as claimed in claim 5 where the carrier is provided with a slidable bottom wall and mechanism for effecting sliding of said bottom wall at the moment the carrier arrives in the discharge position.

7. A machine as claimed in claim 6, wherein said mechanism for effecting sliding comprises a pair of forked arms pivotally mounted on the carrier and engaging pins extending from the ends of the bottom wall, a spring for urging said forked arms in a direction tending to slide said bottom wall into an open position, and release mechanism for preventing pivoting of said forked arms until the carrier arrives in the discharge position.

8. A machine as claimed in claim 7 wherein said outlet path comprises a take away conveyor extending rearwardly of the machine and comprising a pusher arm capable of reciprocation by means of a ram arranged to operate after release of the empty tray by the clamp to move the empty tray on the take

away conveyor.

9. A machine as claimed in claim 3 wherein the second device is a clamp slidably mounted on a shaft between the discharge position and the outlet path.

10. A machine as claimed in claim 9, wherein said clamp comprises a casing slidable on said shaft, clamp jaws pivotally mounted on said casing and extending downwardly from said casing in the clamping position on the tray, and a ram connected by levers and links to said clamp jaws.

11. A machine as claimed in claim 10 wherein switching mechanism is provided whereby the carrier shaft is rotated to move the carrier into the discharge position at the moment driving mechanism for said clamp has moved the latter and the tray held thereby out of the discharge position.

12. A machine as claimed in claim 11 wherein the carrier is provided with a slidable bottom wall and mechanism for effecting sliding thereof comprising a pair of forked arms pivotally mounted at the corner and engaging pins extending from the ends of the bottom wall, a spring for urging said forked arms in a direction tending to slide said bottom wall into an open position, and release mechanism for preventing pivoting of said forked arms until the carrier arrives at the discharge position, said release mechanism including a notched disc arranged to rotate with the forked arms and a detent engageable with the notch and releasable by a release member when the latter comes into contact with a stop on arrival of the carrier into the discharge position.

13. A machine as claimed in claim 12, wherein a cam is provided fixed to the machine which cam is engageable by a follower rigidly attached to said disc to return it to a position at which it is held by the detent as the carrier moves away from the discharge position.

14. A machine as claimed in claim 13 wherein the outlet path comprises a further clamp which is rotatable through 180°, the clamp jaws thereof extending upwardly when gripping the empty tray conveyed to the outlet path by the laterally sliding clamp and downwardly when the rotatable clamp has rotated through 180°.

15. A machine as claimed in claim 14, wherein said outlet path further comprises a chute with spring-loaded sides for retarding the fall of the empty tray after release by the rotatable clamp.

16. A machine as claimed in claim 15, wherein a take away conveyor is provided beneath the full tray conveyor, and a pusher device operated by a ram is provided to move the empty tray from the bottom of the chute onto the take away conveyor which conveys the tray forwards for removal.

16. A machine as claimed in claim 16 wherein said outlet path comprises a take away conveyor extending rearwardly of the machine and comprising a pusher arm capable of reciprocation by a ram arranged to operate after release of an empty tray by the laterally slidable clamp, to move the empty tray onto the take away conveyor.

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