

[54] APPARATUS FOR SUPPLYING ROD-SHAPED ARTICLES TO CONSUMING MACHINES

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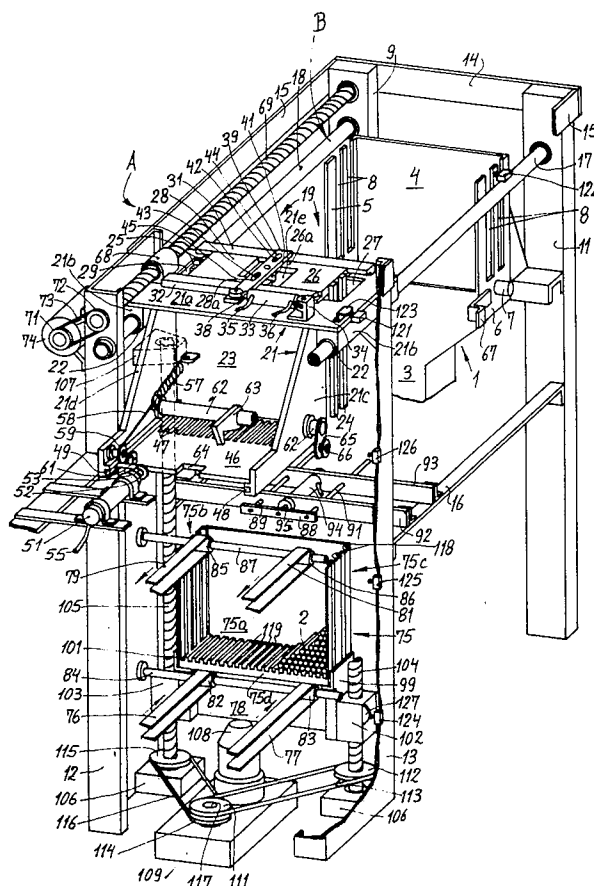
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[57] ABSTRACT

Apparatus which transfers the contents of cigarette trays into the magazine of a packing machine, comprises a carriage movable between a first station above the magazine and a second station above a platform which introduces into the carriage filled trays from below while the bottom of the carriage is held in open position. The bottom is thereupon introduced into the tray below the lowermost layer of cigarettes and the tray is lowered before the carriage advances to the first station where the bottom is returned to open position to permit the cigarettes to descend into the magazine.

21 Claims, 2 Drawing Figures



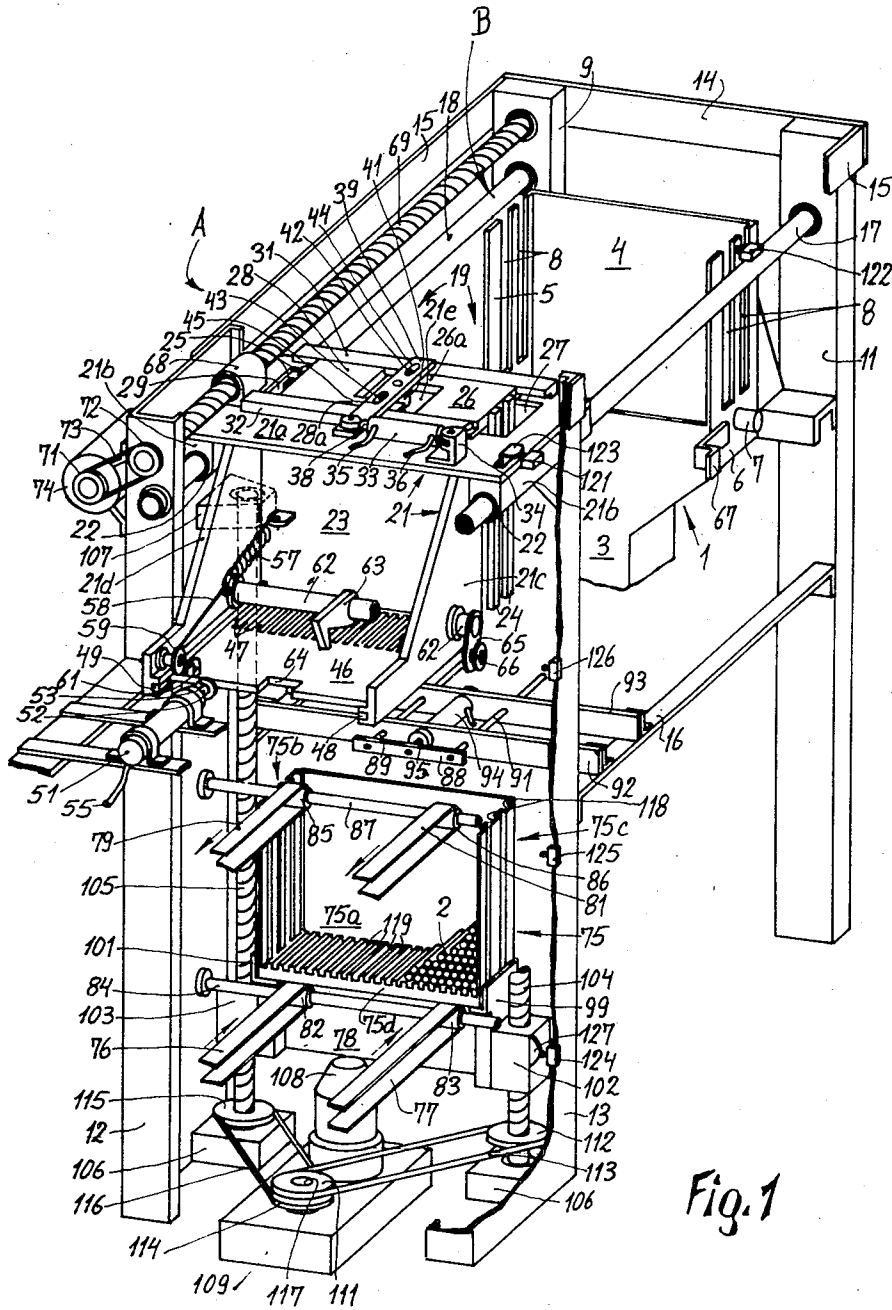


Fig. 1

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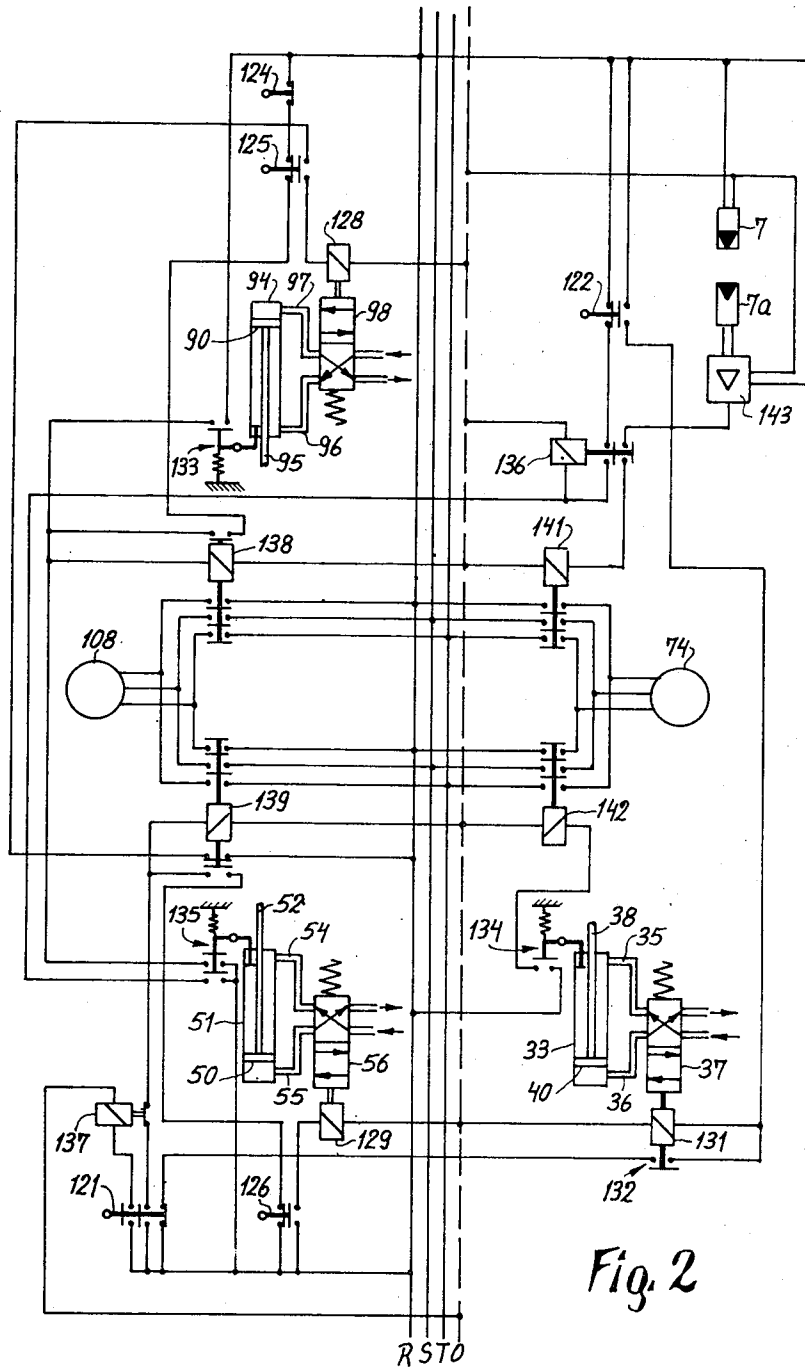


Fig. 2

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APPARATUS FOR SUPPLYING ROD-SHAPED ARTICLES TO CONSUMING MACHINES

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for supplying groups of rod-shaped articles, such as cigarettes, filter rod sections, cigars or cigarillos, to a consuming machine, especially for supplying plain or filter cigarettes to the hopper or magazine of a packing machine.

At the present time, the magazine of a packing machine receives plain or filter cigarettes directly from so-called chargers or trays which are loaded at a filling station and are transported to a position above the open top of of the magazine. Each tray is thereupon inverted to dump its contents into the magazine. As a rule, the traps are not filled to capacity; therefore, the cigarettes are likely to be skewed during inversion of trays which creates problems in connection with evacuation of cigarettes from the magazine.

British patent No. 995,663 disclosed an apparatus wherein the cigarettes are fed from the producing machine or machines directly into a reservoir which feeds cigarettes to the magazine of a packing machine. The volume of the reservoir is variable to account for fluctuations in the delivery of cigarettes from producing machines and/or in requirements of the packing machine. The reservoir is so bulky that it can be employed in newly constructed tobacco processing plants but is much too large for installation in existing factories. Moreover, the cigarettes must cover long distances by traveling with or relative to a host of belts as well as through several compartments; this causes escape to tobacco particles at the ends of wrappers, skewing, drying and other inconveniences.

SUMMARY OF THE INVENTION

An object of the invention is to provide a relatively simple, compact and automatic apparatus which can supply cigarettes or other rod-shaped articles to packing or other consuming machines without skewing, without causing or permitting escape of tobacco or other filler material from the wrappers, and without necessitating inversion of trays, chargers or analogous containers.

Another object of the invention is to provide an apparatus which can transport the contents of filled cigarette trays to the magazine of a packing machine at the rate at which the packing machine consumes or processes the contents of the magazine.

A further object of the invention is to provide an apparatus which can be installed in existing tobacco processing plants.

An additional object of the invention is to provide a novel method and device for removing cigarettes or like articles from filled chargers or trays without deformation, escape of tobacco particles and/or skewing.

The invention is embodied in an apparatus for supplying to a consuming machine groups (preferably stacks) of cigarettes or like rod-shaped articles which are normally stored in trays or analogous containers. The apparatus comprises a hopper or magazine arranged to store a supply of articles at a first station and to feed its contents to the consuming machine, a carriage arranged to shuttle groups of articles between the first station and a second station and to release its con-

tents at the first station for entry into the magazine, and conveyor means including transfer means for delivering filled containers to and for withdrawing empty containers from the carriage at the second station. The carriage includes supporting means which can receive groups of articles from filled container and retains such groups during travel from the second to the first station.

The supporting means includes a portion which is movable between an open position to thereby permit introduction of a filled container into the carriage at the second station and a closed position in which the supporting means retains the contents of the thus introduced container but permits the transfer means to withdraw the container from the carriage.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims.

The improved apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of an apparatus which embodies the invention, with certain parts shown in section and/or broken away; and

FIG. 2 is a diagram of the electric circuit in the apparatus of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus of FIG. 1 comprises essentially a housing or a frame including four uprights or columns 9, 11, 12, 13, a magazine or hopper 1 which forms part of or is combined with a cigarette packing or other cigarette consuming machine, a carriage 19 which shuttles between a receiving station A and a discharging station B, and a conveyor system 76-81 which delivers filled containers in the form of chargers or trays 75 to the station A and removes empty trays subsequent to transfer of their contents into the carriage 19.

The magazine 1 comprises a front wall 3, a rear wall 4 and two side walls 5, 6. The level of cigarettes 2 in the magazine 1 is monitored by a photosensitive detector including a light source 7 mounted on the side wall 6 and a photosensitive receiver 7a (see FIG. 2) on the side wall 5. The side walls 5, 6 are provided with pairs of vertically extending slots 8 of predetermined length and width.

The housing further includes transversely extending braces 14 (only one shown) and longitudinally extending braces 15, 16. The columns 11, 13 and 9, 12 respectively support the ends of two parallel tie rods 17, 18 which serve as guide means for the carriage 19. The latter includes a frame 21 having a top panel 21a and two lateral panels or cheeks 21c, 21d. The end portions of the top panel 21a carry bearing blocks 21b for antifriction bearings 22 which roll along the respective tie rods 17, 18 while the carriage 19 moves from the station A toward the station B or vice versa. The frame 21 serves as a carrier or holder for a supporting device including a first panel 23 which is located in a vertical

plane and is secured to the panels 21a, 21c, 21d. The supporting device further includes two auxiliary panels 24, 25 which are located in vertical planes and whose upper ends are movably supported by the top panel 21a; each of these auxiliary panels comprises a pair of vertical strips which can respectively pass through the slots 8 of the side walls 6, 5 when the carriage 19 dwells at the station B. The upper ends of the strips of the auxiliary panel 24 are secured to a slide 26 and extend downwardly through a rectangular window 27 in the top panel 21a. The slide 26 has an extension or projection 26a which extends toward a second slide 28 supporting the upper end portions of strips which form the auxiliary panel 25. The strips of the panel 25 extend downwardly through a second rectangular window 29 of the top panel 21a, and the slide 28 has an extension or projection 28a which extends toward the slide 26. The area of the window 27 is the same as that of the window 29. The slides 26, 28 are reciprocable toward and away from each other along guide rails 31, 32 provided therefor on the top panel 21a. The plane of each of the auxiliary panels 24, 25 makes an angle of 90° with the plane of the panel 23. The drive means for moving the slides 26, 28 with reference to the panel 21a of the frame 21 comprises a double-acting hydraulic or pneumatic cylinder 33 which is pivotally secured to a bracket 34 on the top panel 21a and is connected with a solenoid-operated valve 37 (FIG. 2) by way of flexible conduits or hoses 35, 36. The valve 37 can connect the one or the other chamber of the cylinder 33 with a source of pressurized fluid, e.g., with a blower or fan for compressed air (not shown). The cylinder 33 accommodates a reciprocable piston 40 (FIG. 2) whose piston rod 38 is articulately connected with a two-armed motion transmitting lever 39 which is fulcrumed on a pivot pin 41 provided therefor on a transversely extending web 21e of the top panel 21a. The web 21e separates the window 27 from the window 29. The two arms of the lever 39 are coupled (with a certain amount of play) to the extensions 26a, 28a of the slides 26, 28. The connections between the arms of the lever 39 and these extensions comprise pins 42, 43 and slots 44, 45.

The supporting device of the carriage 19 further comprises a bottom panel or base panel 46 which can support a group or stack of cigarettes 2 from below and whose marginal portions are reciprocally guided in grooves 48, 49 provided therefor in the lower portions of the lateral panels 21c, 21d. The bottom panel 46 is reciprocable in parallelism with the direction of movement of the carriage 19 between the stations A and B. The rear part of the panel 46 consists of a layer of horizontal prongs 47 of rectangular cross section which are parallel with the tie rods 17, 18 and can enter flutes 119 in the bottom wall 75d of a filled tray 75 when the latter is accommodated at the station A. These prongs constitute that part of the bottom panel 46 which can support the lowermost layer of a group or stack of cigarettes 2 when the tray 75 is removed from the station A and also while the stack is being being transported to the station B. The drive means for moving the bottom panel 46 with reference to the lateral panels 21c, 21d of the frame 21 and with reference to the panels 23, 24, 25 of the supporting device comprises a fluid-operated double-acting (preferably pneumatic

cylinder 51 which is mounted on the housing in front of the station A and accommodates a piston 50 (FIG. 2) whose piston rod 52 can shift the bottom panel 46 in a direction toward the station B against the opposition of a strong prestressed helical spring 57. The outer end of the piston rod 52 carries a disk-shaped pushed 53 which normally abuts against the front edge face of the bottom panel 46. The chambers of the cylinder 51 are connected with a solenoid-operated valve 56 (FIG. 2) by means of two flexible conduits or hoses 54, 55. The valve 56 can connect the conduit 54 or 55 with the aforementioned source of pressurized fluid. The spring 57 is attached to the panel 23 and to a cable 58 which is trained over a pulley 59 on the lateral panel 21d and one end of which is connected to a lug 61 on the front part of the bottom panel 46. The spring 57 tends to maintain the bottom panel 46 in the illustrated retracted or open position in which the prongs 47 are located forwardly of the panel 23 to provide behind the panel 23 a passage for upward movement of a filled tray 75.

The carriage 19 further comprises means for locking the bottom panel 46 of the supporting device in operative or closed position (against the action of the spring 57) and means for disengaging the locking means. The locking means includes a locking member or a hook 63 which is fixed to a transversely extending horizontal shaft 62 journaled in the lateral panels 21c, 21d forwardly of the panel 23, and a notch 64 provided in the front edge of the bottom panel 46. When the pallet of the hook 63 extends into the notch 64 the bottom panel 46 is locked in closed position in which the prongs 47 are located behind the panel 23 and support a group or stack of cigarettes 2 from below. The disengaging means for the hook 63 comprises an arm 65 which is affixed to the shaft 62 outwardly of the lateral panel 21c and carries a roller 66 engaging with a fixed cam 67 on the side wall 6 when the carriage 19 reaches the station B. The cam 67 can turn the shaft 62 in a clockwise direction, as viewed in FIG. 1, so as to withdraw the pallet of the hook 63 from the notch 64 whereby the spring 57 is free to contract and to rapidly propel the bottom panel 46 to the open position so that the stack of cigarettes 2 can descend into the magazine 1.

The panels 23-25 of the supporting device form a U-shaped enclosure which is open from below when the bottom panel 46 is held in open position and which can accommodate and retain a group of stack of cigarettes 2 when the panel 46 is caused to return to closed position. The enclosure then supports and confines the stack from below (panel 46), at the front side (panel 23) and at both lateral sides (panels 24, 25).

The drive means for moving the carriage 19 along the tie rods 17, 18 comprises a spindle nut 68 which is mounted on the top panel 21a of the frame 21, a feed screw or spindle 69 which is rotatably mounted in the columns 9 and 12, a reversible gear motor 74 which is mounted on the column 12, and a transmission including a pulley 71 on the output shaft of the motor 74, a pulley 72 on the spindle 69, and an endless V-belt 73 which is trained over the pulleys 71, 72.

The conveyor system which circulates filled and empty trays along a path which passes through the station A includes a feed conveyor for filled trays, a transfer conveyor or lift which lifts filled trays from the

feed conveyor to the station A, and a withdrawing or evacuating conveyor which removes empty trays and is located at a level between the feed conveyor and the station A. The feed conveyor includes two endless conveyor belts 76, 77 whose upper stretches can transport filled trays 75 to a third station located below the station A and which are trained over idler pulleys 82, 83 mounted on a shaft 84 whose ends are rotatably journaled in the columns 12, 13. The belts 76, 77 are further trained over driven pulleys (not shown) which can move their upper stretches toward the shaft 84. The transfer conveyor comprises a platform or lift 78 which can receive the foremost filled tray 75 from the upper stretches of the belts 76, 77 to thereupon raise the thus received tray into the carriage 19 (while the bottom panel 46 dwells in the inoperative or open position to permit passage of the filled tray behind the panel 23). The evacuating conveyor comprises two endless conveyor belts 79, 81 which can receive empty trays 75 from the platform 78. The belts 79, 81 are trained over idler pulleys 85, 86 on a horizontal shaft 87 whose ends are rotatable in the columns 12 and 13. The belts 79, 81 are further trained over driven pulleys (not shown) which cause their upper stretches to travel forwardly and away from the shaft 87.

The means for transferring empty trays from the platform 78 onto the upper stretches of the evacuating belts 79, 81 comprises a plate-like pusher 88 which is connected to the piston rod 95 of a piston 90 (FIG. 2) in a double-acting cylinder 94 mounted on profiled beams 92, 93 of the housing. The end portions of the pusher 88 are secured to guide rods 89, 91 which are slidable in registering holes provided therefor in the beams 92, 93. A solenoid-operated valve 98 (FIG. 2) can connect a source of pressurized fluid (preferably compressed air) with the chambers of the cylinder 94 by way of flexible conduits or hoses 96, 97. It is preferred to provide a common source of pressurized fluid for the cylinders 33, 51 and 94.

The apparatus further comprises conventional retaining or blocking means (not shown) which normally extends into the path of movement of filled trays 75 on the upper stretches of the belts 76, 77 to hold the foremost filled tray in front of the platform 78. Such blocking means is inactivated in automatic response to return movement of the platform 78 to the illustrated lower end position whereby the continuously driven belts 76, 77 automatically transfer the foremost filled tray 75 onto the platform before the latter begins to ascend toward the station A.

The belts 76, 77 and 79, 81 constitute the output and input elements of the conveyor system which feeds filled trays to the transfer means (platform 78) and receives empty trays for transport back to a loading or filling station (not shown) where the trays are filled with cigarettes. It is clear, however, that these belts can form part of the filling mechanism which receives cigarettes from one or more cigarette making machines and introduces such cigarettes into empty trays for delivery to the platform 78. A cigarette filling mechanism is disclosed, for example, in U.S. Pat. No. 3,190,459 to Kochalski et al. or in the copending application Ser. No. 695,504 of Liedtke which is assigned to the same assignee.

The platform 78 is provided with a pair of upwardly extending brackets 99, 101 which hold a freshly admitted filled tray 75 against lateral movement and insure that the tray can move through the passage behind the panel 23 in open position of the bottom panel 46 when the carriage 19 dwells at the station A. The brackets 99, 101 comprise portions which extend toward each other (i.e., longitudinally of the shaft 84) to arrest the rear wall 75 of a filled tray 75 in an optimum position for transport into the station A.

The drive means for moving the platform 78 up and down comprises two spindles or feed screws 104, 105 which are mounted in bearing blocks 106 and 107 (only one block 107 shown) and extend in parallelism with the columns 13, 12. The platform 78 carries two spindle nuts 102, 103 which respectively mesh with the spindles 104, 105. The means for rotating the spindles 104, 105 comprise a reversible electric motor 108 which drives the output shaft 117 of a transmission 109. The shaft 117 is provided with sprocket wheels 111, 114 for two endless toothed belts 113, 116 which respectively drive sprocket wheels 112, 115 on the spindles 104, 105.

Each tray 75 comprises the aforementioned rear wall 75a, two side walls 75b, 75c, and a bottom wall 75d whose top face is provided with the flutes 119. The walls 75b, 75c are formed with vertically extending slots or channels 118 which can respectively receive the strips of the auxiliary walls 24, 25. These slots 118 extend all the way from the top edges of the walls 75b, 75c to the bottom wall 75d; their dimensions are such that they can receive the strips of the panels 24, 25 with some clearance, i.e., the walls 75b, 75c are slidable up and down with reference to these strips and the strips are movable into and out of the respective slots in response to movement of slides 26, 28 with reference to the rails 31, 32. The flutes 119 extend all the way from the front to the rear edge face of the bottom wall 75d and are dimensioned to receive the respective prongs 47 with a certain small clearance so as to permit unobstructed movements of the bottom panel 46 between open and closed positions when the carriage 19 dwells at the station A. The width of the flutes 119 and of the prongs 47 is such that the lowermost layer of cigarettes 2 in a stack can properly rest on the ribs which separate the flutes 119 from each other as well as on the prongs 47. When the prongs 47 are received in the respective flutes 119, their upper surfaces are flush with the upper surfaces of ribs on the bottom wall 75d.

The apparatus further comprises an automatic control system which regulates the operation of various drive means to insure that the platform 78 automatically receives a filled tray 75 when it reaches the lower end position shown in FIG. 1, that the platform 78 thereupon automatically ascends to enter the station A while the latter accommodates the carriage 19, that the bottom panel 46 thereupon moves to closed position to take over the support of the stack of cigarettes 2 in the tray at the station A, that the platform 78 thereupon descends to move the freshly emptied tray into registry with the evacuating belts 79, 81, that the pusher 88 transfers the empty tray onto the belts 79, 81, and that the carriage 19 automatically advances into registry with the magazine 1 to discharge the stack of cigarettes 2 for admission into the consuming machine. The con-

trol system includes the aforementioned photosensitive detector 7, 7a, additional detectors here shown as electric switches 121, 122, which are mounted in the housing adjacent to the path of movement of the carriage 19, and an actuating cam or trip 123 provided on the top panel 21a and serving to actuate the switches 121, 122. The control system further includes detectors in the form of electric switches 124, 125, 126 which are mounted on the column 13 adjacent to the path of movement of the platform 78 and which can be actuated by a cam or trip 127 on the casing of the spindle nut 102. The switch 121 is in circuit with the motor 74 of the drive for the carriage 19, with the solenoid 131 for the valve 37 which controls the cylinder 33 of the drive for the slides 26, 28, and with the motor 108 of the drive for the platform 78. The switch 122 is in circuit with the solenoid 131 and motor 108, the switch 126 is in circuit with the solenoid 129 for the valve 56 which regulates the flow of fluid to and from the cylinder 51 in the drive for the bottom panel 46 and with the motor 108, the switch 125 is in circuit with the motor 108 and with the solenoid 128 for the valve 98 which controls the flow of fluid to and from the cylinder 94 of the drive for the pusher 88, and the switch 124 is in circuit with the motor 108.

Certain of the just described components of the control system are shown only in FIG. 2 which illustrates the entire electric circuit of the control system. This circuit further includes a relay switch 132 forming part of the solenoid 131, a switch 133 which can be closed by the piston 90 in the cylinder 94, a switch 134 which can be closed by the piston 40 in the cylinder 33, a switch 135 which can be closed by the piston 50 in the cylinder 51 relays 136, 137, 138, 139, 141, 142, an amplifier 143 for signals furnished by the photosensitive receiver 7a, and a source of polyphase current including leads R, S, T, O. The aforementioned source or sources of pressurized fluid which are connected with the valves 37, 56, 98 preferably form part of a central source which supplies pressurized fluid to the cigarette producing machine or machines, to the mechanism which fills the trays 75 with stacks of cigarettes 2, and/or to the consuming machine which receives cigarettes from the magazine 1.

THE OPERATION

It is assumed that the magazine 1 is filled with cigarettes 2, that the carriage 19 dwells at the receiving station A, that the belts 76, 77 and 79, 81 are continuously driven so that the upper stretches of the belts 76, 77 move toward the shaft 84 and that the upper stretches of the belts 79, 81 travel away from the shaft 87, and that the aforementioned blocking means which is associated with the belts 76, 77 has permitted the foremost filled tray 75 to advance onto the platform 78 so that its rear wall 75a and side walls 75b, 75c are engaged and properly located by the brackets 99, 101. The relay 136 is energized and its holding circuit maintains it in energized condition. Therefore, one switch of the relay 136 connects the amplifier 143 with the relay 141. The consuming machine draws cigarettes from the magazine 1 whereby the level of cigarettes in the magazine descends so that the light beam issuing from the source 7 can reach the photosensitive receiver 7a. The latter produces a signal which is amplified by the

amplifier 143; such signal is used to energize the relay 141 which completes the circuit of the motor 74 whereby the belt 73 rotates the feed screw 69 in a direction to transport the carriage 19 from the station A toward the station B. The carriage 19 comes to a halt immediately in front of the rear wall 4 of the magazine 1, i.e., auxiliary panels 24, 25 of its supporting device are inwardly adjacent to the slots 8 in the side walls 6, 5. When the carriage 19 reaches the station B, the trip 123 on the top panel 21a actuates the electric switch 122 and the cam 67 disengages the locking member 63 from the notch 64 so that the spring 57 is free to contract and abruptly propels the bottom panel 46 to open position, i.e., the prongs 47 move away from registry with the bottom layer of cigarettes 2 in the carriage 19 so that the cigarettes can descend into the magazine 1. When the trip 123 actuates the switch 122, the latter opens the holding circuit of the relay 136 which is deenergized and interrupts the electrical connection between the amplifier 143 and relay 141. The relay 141 is deenergized to arrest the motor 74. At the same time, the switch 122 completes the circuit of the solenoid 131 which adjusts the valve 37 and closes its switch 132 to thus complete a holding circuit for the solenoid 131. The valve 37 admits pressurized fluid to the conduit 36 so that the piston 40 moves the piston rod 38 outwardly and pivots the motion transmitting lever 39 on the pin 41. This causes the slides 26, 28 to move away from each other and to move the auxiliary panels 24, 25 apart whereby the strips of the panels 24, 25 respectively pass through the slots 8 of the side walls 6, 5. The lever 39 comes to a stop when the auxiliary panels 24, 25 are outwardly adjacent to the side walls 6, 5. Consequently, the upper layers of the stack of cigarettes 2 are supported or braced by the side walls 5, 6 because it is assumed that only a small part of the freshly delivered stack can enter the space below the upper edge of the front wall 3. Since the bottom panel 46 is already retracted and the auxiliary panels 24, 25 are outwardly adjacent to the side walls 6, 5 the carriage 19 is effectively disengaged from the freshly delivered stack and is ready to return to the station A. Such return movement of the carriage 19 is initiated by the piston 40 in the cylinder 33. When the piston 40 reaches the upper end of its stroke (as viewed in FIG. 2), it closes the switch 134 which completes the circuit of the relay 142. The latter is a time delay relay which is energized after elapse of a predetermined interval of time and thereupon completes the circuit of the motor 74 in such a way that the spindle 69 is rotated in a direction to move the carriage 19 from the station B toward the station A. The trip 123 on the panel 21a of the returning carriage 19 actuates the switch 121 which opens the holding circuit of the solenoid 131 (switch 132) so that the customary spring (shown in FIG. 2) resets the valve 37 in such a way that the source of pressurized fluid is connected with the conduit 35. The piston 40 begins to move toward the position shown in FIG. 2 and permits the switch 134 to open. Such movement of the piston 40 causes the slides 26, 28 to move toward each other (toward the web 21e to the top panel 21a) so as to reduce the distance between the auxiliary panels 24, 25 to that shown in FIG. 1. When the switch 134 opens, the relay 142 is deenergized and causes the motor 74 to arrest the carriage 19 at the station A.

When the trip 123 actuates the switch 121, the latter also completes the circuit of the relay 139 which completes its holding circuit (switch 126) and completes the circuit of the motor 108 whereby the latter rotates the spindles 104, 105 in a direction to move the platform 78 upwardly toward the station A. The switch 121 further completes the circuit of the relay 137 which is energized with a predetermined delay whereby a switch of the relay 137 opens the main circuit of the relay 139 but without causing deenergization of the relay 139 because the latter's holding circuit is completed by way of the switch 126. The ascending platform 78 moves the filled tray 75 into the space behind the panel 23 of the supporting device while the bottom panel 46 remains in open position. During upward movement of the platform 78, the strips of the auxiliary panels 24, 25 behind the panel 23 enter the slots 118 to the side walls 75c, 75b so that the strips can prevent lateral movement of adjacent cigarettes 2 after the tray 75 descends by moving with the platform 78 downwardly and away from the station A. During upward movement of the platform 78, the trip 127 actuates the switch 125 but without effect because, when the relay 139 is energized, it interrupts the electrical connection between the lead R and switch 125. When the platform 78 reaches its upper end position, i.e., when it introduces the filled tray into the supporting device of the carriage 19, the trip 127 on the casing of the spindle nut 102 actuates the switch 126 which opens the holding circuit of the relay 139 whereby the latter opens the circuit of the motor 108 and the platform 78 comes to a halt. The switch 126 also completes the circuit of the solenoid 129 which adjusts the valve 56 so that the source of pressurized fluid is connected with the conduit 55 which causes the piston 50 to move upwardly, as viewed in FIG. 2, and to cause the pusher 53 to move the prongs 47 of the bottom panel 46 into the flutes 119 of the bottom wall 75d. As soon as the bottom panel 46 reaches its closed position (in which the prongs 47 are located behind the panel 23 and extend fully into the flutes 119), the locking member 63 pivots by gravity and its pallet engages the notch 64 to lock the bottom panel 46 in closed position and to maintain the spring 57 in fully stressed condition.

The piston 50 also closes the switch 135 which completes the circuit of the relay 136 whereby the latter completes its holding circuit and reestablishes the electrical connection between the amplifier 143 and relay 141. Thus, the relay 141 is ready to start the motor 74 in a direction to move the loaded carriage 19 toward the station B as soon as the detector 7, 7a produces a signal which indicates that the magazine 1 requires a fresh supply of cigarettes 2. The switch 135 also completes the circuit of the relay 138 which completes the circuit of the motor 108 in such a way that the latter causes the platform 78 to move downwardly toward the piston shown in FIG. 1. The stack of cigarettes 2 remains in the carriage 19 because it is supported by the prongs 47 from below, by the strips of the auxiliary panels 24, 25 at its narrower sides, and abuts against the rear side of the panel 23. The carriage 19 remains in the position of FIG. 1 and awaits the signal from the amplifier 143.

As the platform 78 moves downwardly (together with the freshly emptied tray 75), the trip 127 moves

away from the switch 126 which thereby opens the circuit of the solenoid 129. The spring (shown in FIG. 2) resets the valve 56 so that the latter connects the source of pressurized fluid with the conduit 54 whereby the piston 50 permits the switch 135 to open. This results in opening of the main circuit of the relay 138 but without effect because the holding circuit of the relay 138 remains completed, i.e., the motor 108 continues to move the platform 78 toward the position shown in FIG. 1. When the conduit 54 admits fluid to the cylinder 51 and the piston 50 moves away from the switch 135, the piston rod 52 retracts the pusher 53 from the front edge face of the bottom panel 46 but the latter cannot follow such movement because the pallet of the locking member 63 still extends into the notch 64.

As the platform 78 continues to move downwardly, the trip 127 actuates the switch 125 which opens the holding circuit of the relay 138 so that the motor 108 and the platform 78 come to a halt. The switch 125 also completes the circuit of the solenoid 128 which adjusts the valve 98 so that the latter admits pressurized fluid to the conduit 97 with the result that the piston 90 moves the piston rod 95 forwardly and the pusher 88 transfers the empty tray from the platform 78 onto the upper stretches of the travelling evacuating belts 79, 81. The switch 125 is positioned in such a way that the platform 78 is arrested in an optimum position for transfer of the empty tray onto the belts 79, 81, i.e., the top face of the platform 78 is then flush with the upper sides of the upper stretches of belts 79, 81. As mentioned above, the belts 79, 81 are driven continuously and their upper stretches immediately transport the empty tray away from the shaft 87 as soon as the pusher 88 is moved to extended position. The belts 79, 81 transport the empty tray to storage or directly to the filling station where the tray receives a fresh stack of cigarettes 2.

When the piston 90 in the cylinder 94 reaches its foremost position (i.e., the uppermost position, as viewed in FIG. 2), it actuates the switch 133 which completes the circuit of the relay 138 so that the motor 108 is started again and continues to move the platform 78 toward the lower end position shown in FIG. 1. The trip 127 moves away from the switch 125 which completes the holding circuit of the relay 138 and opens the circuit of the solenoid 128 so that the valve 98 is reset by its spring and admits pressurized fluid to the conduit 96 whereby the piston 90 retracts the pusher 88.

When the platform 78 approaches its lower end position, the trip 127 actuates the switch 127 which opens the holding circuit of the relay 138 whereby the latter arrests the motor 108 at the exact moment when the platform 78 is in an optimum position for reception of a filled tray from the belts 76, 77. Such filled tray is transferred onto the platform 78 (so that it abuts against the brackets 99, 101) in automatic response to inactivation of the aforementioned blocking means because the belts 76, 77 are continuously driven to advance their upper stretches toward the shaft 84. This completes a full cycle and the apparatus is ready to introduce into the magazine 1 a fresh stack of cigarettes 2 as soon as the amplifier 143 receives a signal from the photosensitive receiver of the level detector 7, 7a.

It is clear that the improved apparatus is susceptible of many modifications without departing from the spirit of my invention. For example, the carriage 19 may be provided with wheels or rolls to constitute a dolly or wagen which can move along one or more rails to shuttle between the stations A and B. Also, the auxiliary walls 24, 25 can be rigidly secured to the frame 21. The feature that the auxiliary walls 24, 25 are movable toward and away from each other is desirable because the contents of the supporting means including the panels 23, 24, 25 and 46 can be rapidly disengaged from the carriage 19 so that the latter can immediately return to the station A for reception of a fresh group or stack of cigarettes 2. Thus, since the auxiliary panels 24, 25 can be moved through the slots 8 of the side walls 6, 5 as soon as the carriage 19 enters the station B, the carriage can be returned to the station A after the panels 24, 25 can bypass the magazine 1 at the outer sides of the side walls 6, 5.

An important advantage of the just described apparatus is that the contents of the trays 75 need not be dumped into the magazine 1, i.e., that the trays need not be inverted directly above the open upper end of the magazine. The likelihood of skewing of cigarettes during introduction into the magazine 1 is thereby reduced to a minimum, and the same holds true for transfer of the contents of filled trays 75 into the carriage 19.

Furthermore, the conveyor system including the belts 76, 77, 79, 81 and the platform 78 occupies much less room than the conveyor systems of conventional apparatus wherein the trays must be transported all the way to the receiving station above the magazine for the consuming machine. The distance between the stations A and B is very short so that the carriage 19 can cover such distance within a very short interval of time to insure that the uppermost layer of cigarettes in the magazine cannot sink to a level which is well below the lowermost layer of cigarettes on the prongs 47. Still another advantage of the improved apparatus is that its housing can be readily installed in existing production lines for cigarette packs.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essentially characteristics of the generic and specific aspects of my contribution to the art, and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In an apparatus for supplying to a consuming machine groups of cigarettes or like rod-shaped articles which are normally stored in mobile trays or analogous mobile containers and form therein arrays of parallel articles, a combination comprising a magazine arranged to store a supply of articles at a first station and to feed its contents to the consuming machine; a carriage having a plurality of walls and being arranged to hold arrays of articles, to shuttle such arrays along a predetermined substantially horizontal path between said first station and a remote second station and to discharge its contents at said first station into said

magazine; and conveyor means including transfer means for delivering filled containers to and for withdrawing empty containers from the carriage at said second station, said carriage further having supporting means for receiving arrays of articles from filled containers at said second station while the orientation of such filled containers remains unchanged and for retaining such arrays during transfer to said first station, said supporting means comprising a bottom portion which is movable relative to said walls from a retracted position opening the bottom of the carriage at said second station whereby the container may deliver articles into said carriage through said open bottom to an extended position supporting said articles in said carriage during movement of said carriage to said first station where said bottom portion is again retracted permitting the release of articles for entry into said magazine.

2. A combination as defined in claim 1, further comprising drive means for moving said carriage between said stations.

3. In an apparatus for supplying to a consuming machine groups of cigarettes or like rod-shaped articles which are normally stored in trays or analogous containers, a combination comprising a magazine arranged to store a supply of articles at a first station and to feed its contents to the consuming machine; a carriage arranged to shuttle groups of articles between said first station and a second station and to release its contents at said first station for entry into said magazine; and conveyor means including transfer means for delivering filled containers to and for withdrawing empty containers from the carriage at said second station, said carriage including supporting means for receiving groups of articles from filled containers and for retaining such groups during travel between said stations, said supporting means including a portion which is movable between an open position to thereby permit introduction of a filled container into said carriage at said second station and a closed position in which said supporting means retains the contents of the thus introduced container.

4. A combination as defined in claim 3, further comprising guide means confining said carriage to reciprocatory movement between said stations, said supporting means including a substantially U-shaped enclosure for the contents of a filled container, said enclosure having an open lower end for introduction of the contents of a filled container from below and said movable portion of said supporting means including a bottom member which exposes said lower end in the open position thereof and is located below said open end in the closed position thereof to thus support the contents of a container from below.

5. A combination as defined in claim 4, wherein said carriage further comprises a frame for said supporting means.

6. A combination as defined in claim 4, further comprising drive means for moving said movable portion of said supporting means between said open and closed positions thereof.

7. A combination as defined in claim 6, further comprising locking means for holding said movable portion in closed position during transport of said carriage from said second to said first station and disengaging means for said locking means.

8. A combination as defined in claim 4, wherein the groups of articles are stored in containers of the type having a bottom wall provided with a plurality of flutes and ribs supporting a group of articles from below, said movable portion of said supporting means including prongs arranged to enter into the flutes in the bottom wall of a filled container at said second station in response to movement of said portion from open to closed position whereby the group of articles in such container comes to rest on said prongs.

9. A combination as defined in claim 4, wherein said enclosure includes a first panel and two auxiliary panels flanking said first panel, said panels being located in mutually inclined vertical planes and said carriage further comprising a frame for said supporting means, said auxiliary panels having upper end portions connected with said frame.

10. A combination as defined in claim 9, wherein said auxiliary panels are movable with reference to said frame.

11. A combination as defined in claim 10, further comprising drive means for moving said auxiliary panels toward and away from each other.

12. A combination as defined in claim 11, wherein the groups of articles are stored in containers of the type having a pair of side walls each provided with at least one vertically extending slot and wherein each of said auxiliary panels comprises at least one vertical strip arranged to enter the slot of one side wall of a filled container at said second station in response to movement of said auxiliary panels toward each other.

13. A combination as defined in claim 11, wherein said magazine comprises a pair of side walls each provided with at least one vertical slot and wherein said auxiliary panels are arranged to pass through such slots in response to movement away from each other at said first station.

14. A combination as defined in claim 1, wherein said conveyor means further includes a first conveyor for feeding filled containers to said transfer means and a second conveyor for receiving empty containers from said transfer means.

15. In an apparatus for supplying to a consuming machine groups of cigarettes or like rod-shaped articles which are normally stored in trays or analogous containers and form therein arrays of parallel articles, a combination comprising a magazine arranged to store a supply of articles at a first station and to feed its contents to the consuming machine; a carriage arranged to hold arrays of articles, to shuttle such arrays along a substantially horizontal path between said first station and a remote second station, and to release its contents at said first station for entry into said magazine; and conveyor means including transfer means for delivering filled containers to and for withdrawing empty containers from the carriage at said second station, a first conveyor for feeding filled containers to said transfer means and a second conveyor for receiving empty containers from said transfer means, said transfer means comprising a lift arranged to move filled containers upwardly from said first conveyor to said second station and empty containers downwardly from said second station to said second conveyor, said carriage including supporting means for receiving arrays of articles from filled containers at said second station while the orientation of such filled containers remains unchanged and

for retaining such arrays during transfer to said first station, said supporting means comprising a substantially horizontal bottom portion for supporting the arrays of articles from below.

16. A combination as defined in claim 15, wherein said first and second conveyors are disposed at different levels and further comprising means for moving empty containers from said transfer means onto said second conveyor.

17. A combination as defined in claim 15, further comprising drive means operable to move said lift up and down and control means for operating said drive means, said control means including first detectors adjacent to the path of and actuable by said lift and at least one second detector adjacent to the path of and actuable by said carriage.

18. In an apparatus for supplying to a consuming machine groups of cigarettes or like rod-shaped articles which are normally stored in trays or analogous containers of the type having a bottom wall provided with a plurality of parallel flutes and ribs separating such flutes and supporting the group from below and a pair of vertical side walls each having vertical slot means, a combination comprising a magazine arranged to store a supply of articles at a first station and to feed its contents to the consuming machine; a carriage arranged to shuttle groups of articles between said first station and a second station and to release its contents at said first station for entry into said magazine; and conveyor means including transfer means for delivering filled containers to and for withdrawing empty containers from the carriage at said second station, said carriage including supporting means for receiving groups of articles from filled containers and for retaining such groups during travel between said stations, said supporting means comprising a pair of vertical auxiliary panels each movable through the slot means of one side wall at said second station and a bottom panel movable with reference to said auxiliary panels between an open position and a closed position and having prongs receivable in the flutes of the bottom wall at said second station so that said panels confine a group of articles in a container at said second station from two sides when said auxiliary panels are located in the respective slot means and from below when said prongs extend into the flutes of a bottom wall at said second station in closed position of said bottom panel.

19. A combination as defined in claim 18, further comprising drive means operative to move said carriage between said stations, for moving said bottom panel between open and closed positions and for moving said auxiliary panels, and control means including detector means adjacent to the paths of movement of said carriage and said transfer means for operating said drive means in a predetermined sequence.

20. In an apparatus for supplying to a consuming machine groups of cigarettes or like rod-shaped articles which are normally stored in trays or analogous containers, a combination comprising a magazine arranged to store a supply of articles at a first station and to feed its contents to the consuming machine; a carriage arranged to shuttle groups or articles between said first station and a second station and to release its contents at said first station for entry into said magazine; drive means operable to move said carriage between said sta-

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tions; detector means for monitoring the supply of articles in said magazine and for producing signals when such supply descends below a predetermined level; conveyor means including transfer means to delivering filled containers to and for withdrawing empty containers from the carriage at said second station, said carriage including supporting means for receiving groups of articles from filled containers and for retaining such groups during travel between said stations; and means for operating said drive means in response to signals from said detector means so that said drive means advances said carriage and a group of articles therein from said second to said first station.

21. In an apparatus for supplying to a consuming machine groups of cigarettes or like rod-shaped articles which are normally stored in trays or analogous containers and form therein arrays of parallel articles, a combination comprising a magazine arranged to store a supply of articles at a first station and to feed its contents to the consuming machine; a carriage arranged to

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hold arrays of articles, to shuttle such arrays along a predetermined path between said first station and a remote second station, and to release its contents at said first station for entry into said magazine; a housing; guide means provided in said housing and including a plurality of substantially horizontal parallel tie rods arranged to confine said carriage to reciprocatory movement between said stations; and conveyor means including transfer means for delivering filled containers to and for withdrawing empty containers from the carriage at said second station, said carriage including supporting means for receiving arrays of articles from filled containers at said second station while the orientation of such filled containers remains substantially unchanged and for retaining such arrays during transfer to said first station, said supporting means comprising a substantially horizontal bottom portion for supporting the arrays of articles from below.

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