

[54] APPARATUS FOR MANIPULATING  
CONTAINERS FOR CIGARETTES OR THE  
LIKE

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abandoned.

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[58] Field of Search ..... 214/301, 302-307,  
214/16.4 C; 198/85

**References Cited**

**UNITED STATES PATENTS**

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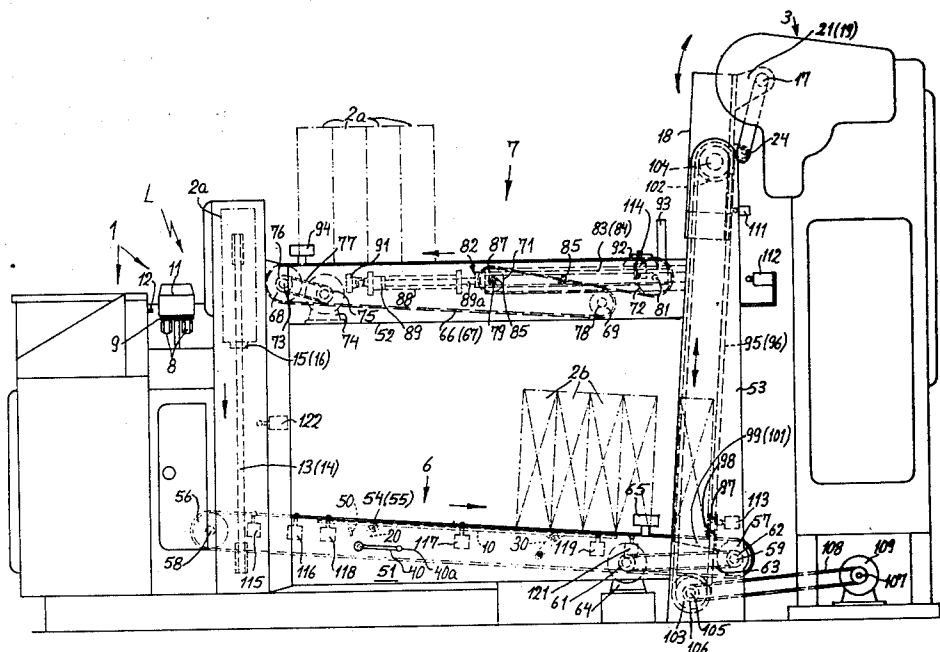
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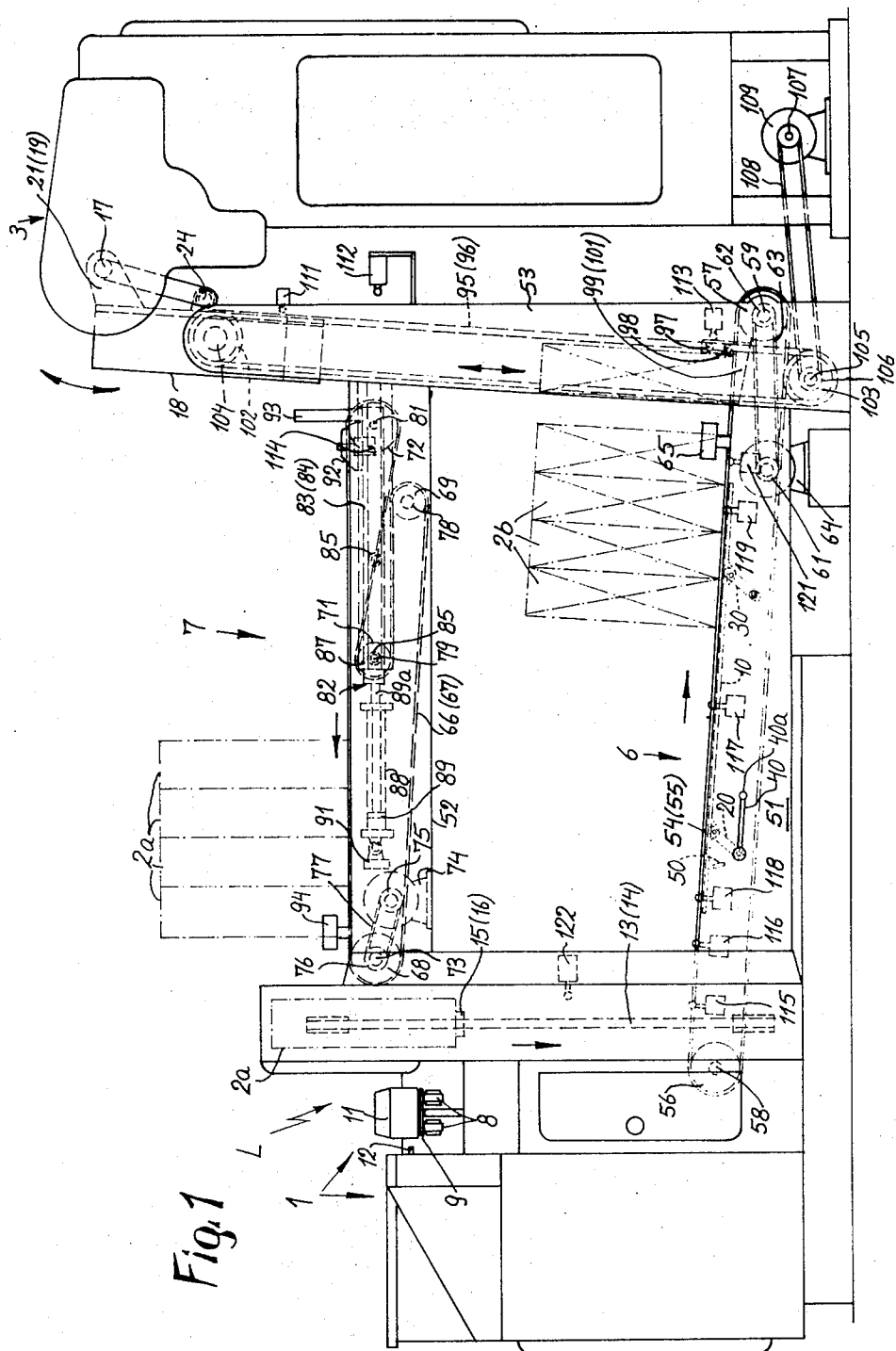
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**ABSTRACT**

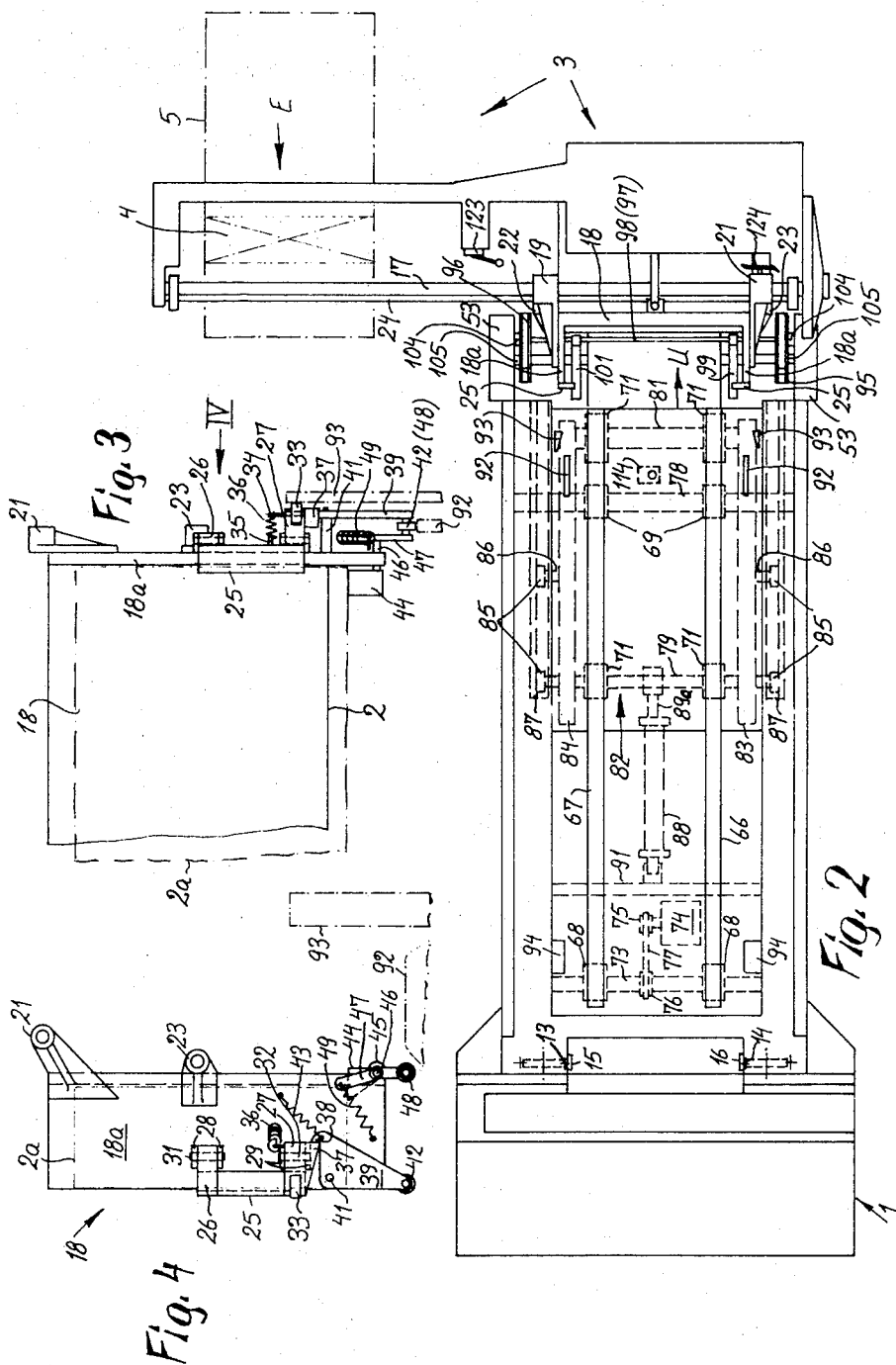
Apparatus for transporting trays between the tray filling unit of a cigarette making machine and an evacuating unit which dumps the contents of filled trays into the magazine of a cigarette packing machine comprises a pair of superimposed storing units and an intermediate conveyor which transports filled trays from the lower storing unit to the evacuating unit. The upper storing unit receives empty trays directly from the evacuating unit and delivers them directly to the filling unit. The filling unit delivers filled trays directly to the lower storing unit.

**11 Claims, 5 Drawing Figures**





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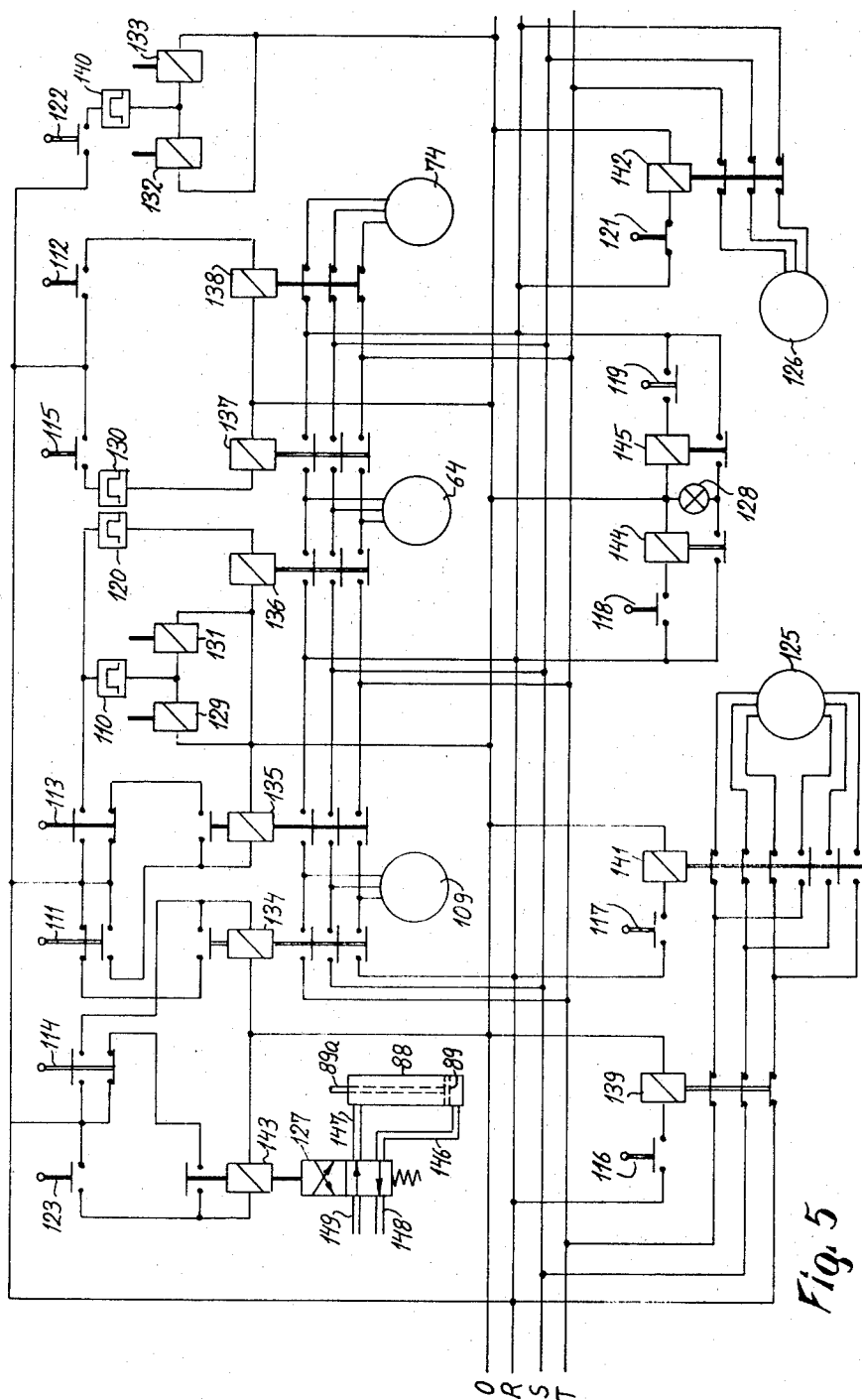


Fig. 5

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# APPARATUS FOR MANIPULATING CONTAINERS FOR CIGARETTES OR THE LIKE

## CROSS-REFERENCE TO RELATED INVENTION

This is a continuation, of application Ser. No. 878,674, filed Nov. 29, 1969 now abandoned.

The apparatus of the present invention constitutes an improvement over and a further development of apparatus which are disclosed in German Utility Model No. 1,938,552 owned by the assignee of the present application and published on Aug. 1, 1966, in the co-pending application Ser. No. 631,504 filed Apr. 17, 1967 now abandoned by Schubert et al. and assigned to the same assignee, and in the co-pending application Ser. No. 737,447 filed June 17, 1968 now abandoned by Bornfleth et al. and assigned to the same assignee.

## BACKGROUND OF THE INVENTION

The present invention relates to apparatus for manipulating cigarettes or analogous rod-shaped articles which are used in the manufacture of or constitute smokers' products. More particularly, the invention relates to improvements in apparatus for manipulating containers for cigarettes or the like (such containers are known as chargers or trays) during their transport between one or more producing machines (e.g., cigarette making machines) and one or more consuming machines (e.g., packing machines). Still more particularly, the invention relates to improvements in apparatus wherein a magazine or hopper which forms part of or is associated with one or more consuming machines is automatically supplied with rod-shaped articles by chargers or trays receiving rod-shaped articles from one or more producing machines.

German Utility Model No. 1,938,552 discloses an apparatus wherein empty and filled trays are stored in separate storing units and wherein a receptacle transports filled trays from the storing unit for filled trays to an evacuating station for admission into the magazine of a packing machine. The same receptacle also serves to transport freshly evacuated trays to the other storing unit. The receptacle is provided with a cover or lid which overlaps a filled tray therein. The introduction of filled trays into and removal of empty trays from the receptacle are normally performed by hand, or the apparatus comprises an endless conveyor system which transports empty trays past the filling unit of a cigarette making machine and thereupon delivers filled trays into the range of the receptacle. In such apparatus, the cigarette making machine is provided with its own storing units for filled and empty trays.

## SUMMARY OF THE INVENTION

An object of the invention is to provide an apparatus which can transport containers between a producing machine and a consuming machine, especially an apparatus which can transport chargers or trays between a cigarette making and a cigarette packing machine, and to construct and assemble the apparatus in such a way that it can accommodate a substantial number of containers in a small area, that the goods stored in such containers are treated gently, and that the apparatus enables one of the machines to remain in operation when the other machine is idle or operates at less than normal speed, and vice versa.

Another object of the invention is to provide the apparatus with a minimal number of storing means for filled and empty containers.

A further object of the invention is to provide an apparatus which establishes short paths for travel of filled containers from the producing to the consuming machine and for travel of empty containers in the opposite direction.

An additional object of the invention is to provide an apparatus which can maintain an adequate supply of filled and empty containers by considering the normally expected periods of idleness of the consuming or producing machine, and which is so constructed that it can continue to satisfy the requirements of one machine when the other machine happens to be idle for extended intervals of time or vice versa.

Still another object of the invention is to provide an apparatus which can be used in combination with existing cigarette making and packing machines.

The improved apparatus is utilized to transport containers for cigarettes or analogous rod-shaped articles between producing and consuming machines and comprises a filling unit arranged to receive articles from at least one producing machine and having loading means (e.g., a suction head and a plunger or the like) for loading such articles into empty containers to thus convert such containers into filled containers, an evacuating unit including a suitable receptacle or analogous receiving means for receiving filled containers and for discharging the contents of such containers into a consuming machine, e.g., into the magazine or hopper of a cigarette packing machine, and transporting means for conveying filled containers from the filling unit to the evacuating unit and for conveying empty containers from the evacuating unit to the filling unit. The transporting means comprises first and second storing means which are common to the filling and evacuating units and are respectively arranged to accommodate supplies of empty and filled containers. Each of the storing means can accommodate a fluctuating supply of containers and at least the second storing means may be provided with auxiliary means which enables the operators to introduce and withdraw filled containers independently of the producing machine.

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 side elevational view of an apparatus which embodies one form of the invention;

FIG. 2 is a plan view of the apparatus;

FIG. 3 is an enlarged fragmentary front elevational view of a receptacle in the apparatus of FIGS. 1 and 2;

FIG. 4 is a side elevational view of the receptacle as seen in the direction of arrow IV in FIG. 3; and

FIG. 5 is a circuit diagram of the electrical control system in the apparatus of FIGS. 1 and 2.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 and 2, there is shown an ap-

paratus which transports containers 2 in the form of chargers or trays between a tray loading station L and a tray evacuating station E. The loading station L accommodates a filling unit 1 which serves to transfer the output of a cigarette machine (not shown in its entirety) into successive empty trays 2a. An evacuating unit 3 is installed at a level above and remote from the filling unit 1 to serve as a means for evacuating or discharging the contents of successively delivered filled trays 2b into the magazine or hopper 4 of a packing machine 5. The evacuating unit 3 delivers empty trays directly to a first storing unit 7 which accommodates a supply of empty trays 2a, and the filling unit 1 delivers filled trays 2b directly to a second storing unit 6 which is located below the storing unit 7 and serves to transport filled trays toward the evacuating unit 3. An intermediate conveyor is provided to transport successive filled trays 2b from the lower storing unit 6 to the evacuating unit 3. The intermediate conveyor and the two storing units 6, 7 together form a transporting means whose function is to convey filled trays 2b from the filling unit 1 to the evacuating unit 3 and to convey empty trays 2a from the evacuating unit 3 to the filling unit 1. Each of the storing units 6, 7 is common to the units 1, 3, i.e., the filling unit 1 need not be provided with separate storing means for empty and/or filled trays.

The exact construction of the filling unit 1 is known, for example, from U.S. Pat. No. 3,190,459 to Kochalski et al. In the illustrated embodiment, the filling unit 1 comprises two parallel conveyor belts 8 which deliver a row of cigarettes 9 from a cigarette making machine, a pneumatic group former or lifter 11 which collects cigarettes in groups or rows containing predetermined numbers of cigarettes, and a transfer member or pusher 12 which delivers such groups or rows into the adjacent empty tray 2a. The parts 11, 12 constitute the tray loading means of the filling unit 1. The feeding unit 1 further comprises a pair of vertical chains or belts 13, 14 which are provided with supporting brackets 15, 16 for empty trays 2a and cause such trays to descend stepwise during intervals between successive working strokes of the pusher 12.

The evacuating unit 3 comprises a horizontal shaft 17 which carries two turnable and axially movable bearing members 19, 21 supporting a receiving means or receptacle 18 for filled trays 2b. The receptacle 18 receives a filled tray 2b at a station U located at a level above the upper storing unit 7 and dumps the contents of such tray at the station E, i.e., into the magazine 4 of the packing machine 5. The entire drive means for moving the receptacle 18 along the shaft 17 is not shown in FIGS. 1 and 2. Such drive means comprises bearing sleeves 22, 23 provided on the receptacle 18 and a shaft 24. The remaining parts of the drive means are fully disclosed in the German Utility Model No. 1,938,552 published Aug. 1, 1966.

The receptacle 18 comprises two holding devices (FIGS. 3 and 4) which can fixedly hold a tray therein. Each of these holding devices is mounted on one of two side walls or panels 18a of the receptacle 18 and includes a holding member or flap 25 secured to two leaves or arms 26, 27 hingedly mounted in eyes 28, 29 of the respective panel 18a by pintles 31, 32. The arm 27 is formed with a recess for a rotatably mounted roll 33 and carries a post 34 for one end of a helical spring 36 which is further connected to a post 35 on the panel 18a. The spring 36 tends to move the holding member

25 to its ineffective or tray-releasing position. Furthermore, the arm 27 comprises a downwardly projecting extension 37 which can enter the notch 38 of a locking lever 39. The locking lever 39 is pivotable on a pin 41 which is mounted on the panel 18a; this lever carries a roll 42. A spring 43 biases the locking lever 39 and is attached to the panel 18a in a manner best shown in FIG. 4.

Each of the panels 18a further carries supporting means for supporting the trays from below. These supporting means are actuated by the trays and includes two blocks 44 each mounted on a shaft 46 extending through a bearing 45 provided on the respective panel 18a. The shafts 46 further carry two-armed levers 47; one arm of each lever 47 is provided with a roll 48 and its other arm is coupled to the respective panel 18a by a spring 49.

The storing units 6, 7 respectively comprise substantially horizontal carriers or beams 51, 52 each of which is attached to the frame of the filling unit 1 at one end and to an upright frame 53 at the other end. The conveyor system of the lower storing unit 6 comprises two parallel conveyor belts 54, 55 (FIG. 1) which are trained over idler rollers 56 and driven rollers 57. The upper stretches of the belts 54, 55 are supported from below by suitable rails or the like (not shown) to prevent sagging under the weight of filled trays 2b. The idler rollers 56 are rotatable on a shaft 58 which is mounted in the frame of the filling unit 1. The rollers 57 are fixedly secured to a shaft 59 which is journaled in the frame 53. The drive means for the shaft 59 includes a gear motor 64 and a transmission including sprocket wheels 61, 62 and a chain 63. A magnetically operated retaining device 65 of known construction is mounted on the carrier 51 at the discharge ends of the belts 54, 55.

In order to facilitate manual insertion or removal of trays from the storing unit 6, the space between the belts 54, 55 accommodates an auxiliary unit including a lifting platform 10 which is articulately secured to two inclined arms 20, 30 pivotable on the carrier 51 by means of a lever 40 having a handle 40a. By pivoting the lever 40 in a counterclockwise direction, as viewed in FIG. 1, an operator can move the arm 20 into abutment with a stop 50 on the carrier 51 whereby the upper surface of the platform 10 extends to a level slightly above the upper surfaces of the upper stretches of the belts 54, 55. The distance between such upper surfaces need not exceed a few millimeters; this suffices to facilitate convenient transfer of loaded trays 2b onto or removal of loaded trays from the raised platform 10. FIG. 1 shows the platform 10 in its lower end position in which the platform cannot interfere with movements of loaded trays 2b in response to movement of the belts 54, 55. A suitable dolly or another wheel-mounted conveyance can be held ready adjacent to the storing units 6, 7 to accommodate a number of filled and/or empty trays.

The upper storing unit 7 comprises two endless belts 66, 67 shown in FIGS. 1 and 2. These belts are trained over driven rollers 68, idler rollers 69 and vertically movable idler rollers 71, 72. The manner in which the belts 66, 67 are trained over these rollers can be clearly seen in FIG. 1. The driven rollers 68 are affixed to a shaft 73 which is journaled in the carrier 52 and is driven by a gear motor 74 through the intermediary of a transmission including sprocket wheels 75, 76 and

chain 77. The rollers 69 are rotatable on a shaft 78 which is fixedly mounted in the carrier 52. The rollers 71, 72 are respectively rotatable on shafts 79, 81; these shafts form part of a carriage 82 and connect the latter's side walls 83, 84 (see FIG. 2). The carriage 82 has four wheels 85 two of which are mounted at the ends of the shaft 79 and the remaining two of which are mounted on stub shafts 86 each mounted on one of the side walls 83, 84 as best shown in FIG. 2. The wheels 85 can travel along U-rails 87 which are mounted on the carrier 52.

The drive means for reciprocating the carriage 82 along the path defined by the rails 87 comprises a pneumatically operated cylinder 88, a piston 89 in the cylinder 88, and a piston rod 89a connected to the piston and extending from the cylinder. The cylinder 88 is articulately connected to a traverse 91 of the carrier 52 and the piston rod 89a is articulately connected to the shaft 79 of the carriage 82. This carriage constitutes a means for changing the effective length and capacity of the storing unit 7.

Each of the side walls 83, 84 is provided with a cam 92 for the rolls 42, 48 on the corresponding panel 18a of the receptacle 18 and a cam or ruler 93 for one of the rolls 33.

That end of the storing unit 7 which is adjacent to the filling unit 1 is provided with a magnetically operated retaining device 94 which is analogous to the aforementioned retaining device 65.

The intermediate conveyor which receives filled trays 2b from the discharge end of the storing unit 7 is mounted in the upright frame 53. This conveyor comprises two spaced endless chains 95, 96 which are coupled to each other by transversely extending bars or rungs 97, 98. These rungs are provided with projecting arms 99, 101 which form a platform for supporting one filled tray 2b at a time. Each of the chains 95, 96 is trained over two sprocket wheels 102, 103. The sprocket wheels 102 are mounted on stub shafts 104 provided in the frame 53. The sprocket wheels 103 are fixed to a shaft 105 which is rotatably journaled in the frame 53 and is driven by a reversible gear motor 109 through the intermediary of a transmission including sprocket wheels 106, 107 and a chain 108.

The motors 64 and 109 drive the belts 54, 55 and the chains 95, 96 intermittently. This is of advantage because the chains 13, 14 can deposit filled trays 2b on the belts 54, 55 while the belts are at a standstill and because the platform including the arms 99, 101 can receive a filled tray while the intermediate conveyor is idle. This prevents overturning of filled trays.

The control system for the apparatus which is shown in FIGS. 1 to 4, for the packing machine 5 and for the cigarette making machine which supplies cigarettes 9 to the filling unit 1 is illustrated in FIG. 5. This control system includes several switches which are located in the path of certain moving parts and include a switch 111 mounted on the upright frame 53 (FIG. 1) and serving to control operation of the reversible gear motor 109 for the chains 95, 96 of the intermediate conveyor; a switch 112 which is also mounted on the frame 53 below the switch 111 (FIG. 1) and controls operation of the gear motor 74 for the belts 66, 67 of the storing unit 7; a switch 113 mounted on the frame 53 above the shaft 59 and serving to control operation of the gear motor 64 for the belts 54, 55 in the storing unit 6, of the motor 109 and of the retaining device 65

(which comprises two parts); a switch 114 mounted at the right-hand end of the storing unit 7 (FIG. 1) and serving to control the motor 109 and the pneumatic cylinder 88; a switch 115 adjacent to the left-hand end of the storing unit 6 (FIG. 1) and serving to control operation of the motor 64; switches 116, 117 mounted on the carrier 51 and serving to control operation of the cigarette making machine; switches 118, 119 mounted on the carrier 51 and serving to control a signal generating device 128 (FIG. 5); a switch 121 (FIG. 1) controlling operation of the packing machine 5; a switch 122 adjacent to the chains 13, 14 of the filling unit 1 and serving to control operation of the upper retaining device 94 (having two parts as shown in FIG. 2); a switch 123 adjacent to the shaft 17 (FIG. 2) and serving to control the pneumatic cylinder 88; and a trip 124 which co-operates with the switch 123 and is mounted on the bearing member 21 for the receptacle 18.

As shown in FIG. 5, the cigarette making machine comprises an electric motor 125 and the packing machine 5 comprises an electric motor 126. The cylinder 88 is directly controlled by an electromagnetic valve 127, the aforementioned signal generating device comprises a lamp 128, the retaining device 65 comprises electromagnets 129, 131 and a trigger 110, and the retaining device 94 comprises electromagnets 132, 133 and a trigger 140. The control system further includes relays 136, 137 with triggers 120, 130, relays 134, 135, 138, 139, 141, 142, and relays 143, 144, 145. Each of the relays 139, 141, 144, 145 is energizable with a predetermined delay. The energy source for the electric motors is a source of polyphase current including leads O, R, S, T. The lead O is the zero lead. The electromagnetic valve 127 is connected with the cylinder 88 by conduits 146, 147. Conduits 148, 149 connect the valve 127 to a suitable source of pressurized fluid, e.g. a blower (not shown). This same source of pressurized fluid can supply fluid to the pneumatic lifter 11 of the filling unit 1.

The operation:

It is assumed that the filling unit 1 is in operation and that the storing units 6, 7 respectively accommodate one or more filled trays 2b and empty trays 2a. An empty tray 2a which is moved into the range of and descends with the inner stretches of the chains 13, 14 advances stepwise past the loading station L and receives successive groups of cigarettes 9. When the descending tray is at least nearly completely filled, it actuates the switch 122 which closes and causes the trigger 140 to energize the electromagnets 132, 133 of the retaining device 94 whereby the latter releases a single empty tray 2a, namely, the foremost tray in the storing unit 7, so that such foremost tray can be transported by belts 66, 67 to enter the loading station L. The descending tray which has actuated the switch 122 is now a filled tray (2b) and reaches the upper stretches of the belts 54, 55 in the lower storing unit 6. The filled tray thereby actuates the switch 115 which is closed and causes the trigger 130 to energize the relay 137. The relay 137 starts the motor 64 for an interval of time which is determined by the trigger 130. The latter constitutes a timer and is adjusted in such a way that the interval during which the motor 64 is running in response to closing of the switch 115 by a descending filled tray 2b suffices to enable the belts 54, 55 to transport the freshly loaded tray 2b all the way into engage-

ment with the parts of the retaining device 65; i.e., if necessary, the belts 54, 55 can transport a freshly filled tray through the entire lower storing unit 6.

The packing machine 5 includes a monitoring device or detector (e.g., a photosensitive cell, not shown) which produces a signal when the level of cigarettes 9 in the hopper 4 decreases below a predetermined level. Such signal causes the receptacle 18 (which is then located in waiting position adjacent to the hopper 4) to evacuate the filled tray 2b therein. Such evacuation of a filled tray 2b at the station E is effected in a known manner in response to sidewise and pivotal movements of the receptacle 18. The receptacle 18 with the freshly evacuated tray (2a) therein is thereupon transported to the upper storing unit 7.

During movement of the receptacle 18 along the shaft 17 from the station E toward the transfer station U, the trip 124 which shares such movement of the receptacle 18 actuates the switch 123 which closes and energizes the relay 143 so that the latter changes the condition of the valve 127. The conduit 146 then admits pressurized fluid to the cylinder 88 to move the piston rod 89a outwardly whereby the piston rod 89a advances the carriage 82 to its receiving position close to the frame 53. The carriage 82 actuates the switch 112 which closes and energizes the relay 138 so that the latter arrests the motor 74 for the belts 66, 67 of the storing unit 7. At this time, the receptacle 18 reaches the unit 7 and is automatically moved from an inclined position (which it assumes during travel along the shaft 17) to an upright position in which the empty tray 2a therein is located directly above the carriage 82. This is described in the co-pending application Ser. No. 737,447 of Bornfleth et al. During pivoting of the receptacle 18 on the shaft 17, the cams 92 on the carriage 82 engage the rolls 48 on the receptacle 18 whereby the supporting blocks 44 move to their idle or inoperative positions against the opposition of springs 49 so that the empty tray 2a is free to descend by gravity and to come to rest on the belts 66, 67. When the empty tray reaches the belts 66, 67, it actuates the switch 114 which changes its position to open the holding circuit of the relay 143 which effects a change in the condition of the electromagnetic valve 127 (under the action of the customary spring which is associated with the valve 127) so that the latter connects the conduit 147 with the source of pressurized fluid (see FIG. 5). The piston rod 89a is withdrawn into the cylinder 88 and moves the carriage 82 away from the switch 122 back to the starting position of the carriage. During the initial stage of such movement, the carriage 82 is disengaged from the switch 112 which opens and deenergizes the relay 138; this starts the motor 74 for the belts 66, 67 of the storing unit 7. At the same time, the cams 92 of the carriage 82 engage the rolls 42 of the holding devices on the receptacle 18 whereby the locking levers 39 are pivoted against the opposition of springs 43 and the extensions 37 of the arms 27 are withdrawn from the notches 38 so that the springs 36 are free to pivot the flaps 25 about the pintles 31, 32 through the intermediary of the arms 26, 27 and the empty tray 2a is free to leave the receptacle 18. The thus released tray 2a is transported by the belts 66, 67 until it reaches the rear-most empty tray 2a in the storing unit 7. During movement of the carriage 82 away from the switch 112, the cams 92 move past the rolls 48 and 42 of the receptacle 18 so that the springs 49 can return the supporting

blocks 44 to their operative positions by way of the levers 47 and the springs 43 can return the locking levers 39 to locking positions. The rulers or cams 93 share the movements of cams 92 and return the flaps 25 to their operative positions by way of the rolls 33 whereby the extensions 37 reenter the corresponding notches 38. As soon as such operations are completed, the aforementioned drive means for the receptacle 18 returns the latter to its inclined position in which the receptacle is ready to receive a fresh filled tray 2b and is also ready to move toward the evacuating station E.

When the switch 114 is moved from the position shown in FIG. 5, it energizes the relay 134 which starts the motor 109 so that the latter drives the chains 95, 96 of the intermediate conveyor in the frame 53 whereby the platform including the arms 99, 101 raises a filled tray 2b and introduces such tray into the receptacle 18 at the station U. The rising filled tray 2b temporarily displaces the supporting blocks 44 but the springs 49 automatically return such blocks to their operative or supporting positions as soon as the filled receptacle 2b is properly accommodated in the receptacle 18. One of the arms 99, 101 (e.g., the arm 99) actuates the electric switch 111 as soon as the filled tray 2b enters the receptacle 18 whereby the switch 111 opens the holding circuit of the relay 134 and energizes the relay 135 to change the direction of rotation of the motor 109. Thus, the arms 99, 101 descend and return to the lower end positions to be ready for reception of the next following filled tray 2b. During downward movement of the arms 99, 101, the filled tray 2b which was introduced into the receptacle 18 also descends until it comes to rest on the blocks 44 and is thus prevented from leaving the receptacle. The drive for the receptacle 18 is then started in a fully automatic way to move to the waiting position adjacent to the hopper 4 of the packing machine 5. The receptacle 18 remains in such waiting position until after the aforementioned monitoring device in the hopper 4 produces a signal indicating that the topmost layer of cigarettes 9 in the hopper has descended to a predetermined level.

When the motor 109 is operated in reverse to lower the arms 99, 101, the arm 99 actuates the switch 113 which opens the holding circuit of the relay 135 which arrests the motor 109. The switch 113 further causes the trigger 110 to energize the electromagnets 129, 131 of the retaining device 65 and the trigger 120 to energize the relay 136 so that the latter starts the motor 64 for the belts 54, 55 of the lower storing unit 6. The retaining device 65 becomes ineffective and the belts 54, 55 are free to advance the foremost filled tray 2b onto the arms 99, 101 of the chains 95, 96. The triggers 110, 120 are timers which are adjusted in such a way that the retaining device 65 can release a single filled tray 2b and that the motor 64 is in operation only for the interval necessary to move the foremost filled tray 2b from the retaining device 65 onto the arms 99, 101 of the intermediate conveyor. This completes one working cycle of the apparatus; the next cycle begins as soon as the aforementioned monitoring device in 4 hopper 5 produces a signal to effect evacuation of the contents of the filled tray 2b in the receptacle 18.

The switches which are mounted in and/or adjacent to the lower storing unit 6 control the operation of the cigarette making machine (motor 125) and of the packing machine 5 (motor 126) in the following manner:

The outputs of the filling unit 1, cigarette making machine and packing machine 5 are selected in such a way that the normal output of the cigarette making machine slightly exceeds the normal requirements of the packing machine, e.g., by 5-20 percent. Also, the elements of the control system normally insure that the storing units 6, 7 are filled with loaded and empty trays to a certain extent, i.e., that the number of trays in each of these storing units normally equals or approaches a predetermined number. Such trays constitute a supply of filled and empty trays which is adequate to permit uninterrupted operation of the cigarette making machine during relatively short periods of idleness of the packing machine 5, or vice versa.

If the packing machine 5 is out of commission for whatever reason or when it is necessary to arrest the packing machine, the number of filled trays 2b in the storing unit 6 increases because the cigarette making machine continues to furnish cigarettes 9 to the belts 8 of the filling unit 1. If the number of filled trays 2b in the storing unit 6 increases to such an extent (e.g. to six) that one of the filled trays 2b maintains the switch 117 in closed position for a period of time which exceeds the delay required to energize the associated time delay relay 141, the latter becomes energized and changes the circuit of the motor 125 in the cigarette making machine so that the latter operates at a reduced speed, for example, at half the normal speed. If the packing machine 5 continues to remain idle, i.e., if the number of filled trays 2b in the storing unit 6 continues to rise, one of the filled trays (e.g., the tenth filled tray) actuates the switch 118 for a period of time which exceeds the time required to energize the time-delay relay 144 so that the relay 144 completes the circuit of the lamp 128. This warns the persons in charge that the number of filled trays 2b in the unit 6 is excessive. If the personnel fails to remove one or more filled trays (with the help of raised platform 10), or if the motor 125 of the cigarette making machine is not arrested by hand, the number of filled trays in the unit 6 increases still further whereby one of the filled trays (e.g., the 12th tray) actuates the switch 116 long enough to cause energization of the time delay relay 139 which automatically opens the circuit of the motor 125. The filling unit 1 comes to a halt in automatic response to stoppage of the motor 125.

If the cigarette making machine is out of commission or is arrested on purpose while the packing machine 5 continues to operate, the number of empty trays 2a in the storing unit 7 increases and the number of filled trays 2b in the storing unit 6 decreases. When the number of filled trays 2b in the storing unit 6 is reduced to such an extent that the switch 119 is not closed by a filled tray, the latter causes energization of the time delay relay 145 which completes the circuit of the lamp 128 to warn the persons in charge that the number of filled trays has been reduced below a predetermined minimum number. If the cigarette making machine continues to remain idle (this is a situation which arises quite infrequently), if the persons in charge fail to supply into the storing unit 6 filled trays 2b from an auxiliary magazine which is provided for such emergencies, and/or if the persons in charge fail to manually arrest the packing machine 5, the retaining device 65 ultimately releases the last filled tray 2b for transfer onto the arms 99, 101 of the intermediate conveyor in the frame 53. This causes opening of the switch 121

(shown in FIG. 1 as being located directly above the sprocket wheel 61) which deenergizes the relay 142 so that the latter arrests the motor 126 of the packing machine 5. Prior to renewed starting of the motor 126, the operators should introduce by hand a certain number of filled trays 2b into the lower storing unit 6 to insure that the number of filled trays in this unit will fluctuate within a desired range.

In the apparatus which is shown in FIGS. 1 to 4, the elements which control the operation of the packing machine 5 and cigarette making machine are shown as being adjacent to the path of filled trays 2b in the lower storing unit 6. However, it is clear that analogous control elements can be provided adjacent to empty trays 2a in the upper storing unit 7 and that the operation of both machines can be regulated as a function of changes in the number of empty trays. For example, the tenth empty tray in the storing unit 7 could cause completion of the circuit of a signal generating device and the 12th empty tray in the unit 7 could cause stoppage of the motor 126 of the packing machine 5. It is further clear that such control elements can be installed adjacent to the path of movement of filled and empty trays. The mode of operation of such modified control systems is analogous or very similar to the mode of operation of the system shown in FIG. 5. It is also within the purview of the present invention to employ a packing machine whose requirements normally exceed the output of the cigarette making machine and which can be operated at several speeds. The relay 142 is then replaced by relays whose function is analogous to that of the relays 139, 141.

An advantage of the improved apparatus is that the length of paths along which the filled trays move is very short; this reduces the likelihood of escape of tobacco particles at the ends of cigarettes. Secondly, the control system is simpler, more compact, less expensive and more reliable than the control systems of presently known apparatus for transport of trays between a cigarette making machine and a packing machine. Furthermore, the apparatus occupies less floor space than presently known apparatus which can accommodate an equal number of trays. It was found that the improved apparatus can establish a direct connection between a modern high-speed cigarette making machine which can produce between 2,400 and 3,000 cigarettes per minute (or even more) and a modern packing machine which can accept the output of such high-speed cigarette making machine, i.e., a packing machine capable of producing 120-150 packs per minute (it being assumed that each pack contains twenty cigarettes in customary distribution).

If the operation of the cigarette making machine is defective, for example, due to the fact that the seam of the wrapper is too weak or that the filler rod contains excessive or insufficient quantities of tobacco shreds, trays containing defective cigarettes can be intercepted in the storing unit 6 before their contents enter the packing machine 5.

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 essential 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

1. Apparatus for transporting discrete containers for cigarettes or analogous rod-shaped articles which containers are movable independently of each other between producing and consuming machines, comprising a filling unit arranged to receive articles from at least one producing machine and having loading means for loading articles into empty containers of polygonal outline to thus convert such containers into filled containers of polygonal outline; an evacuating unit including receiving means for receiving filled containers and for discharging the contents of such containers for delivery into at least one consuming machine; and transporting means for conveying filled containers from said filling unit only to said evacuating unit and for conveying empty containers from said evacuating unit only to said filling unit so that each empty container leaving said evacuating unit is converted into a filled container prior to being returned to said evacuating unit and each filled container leaving said filling unit is converted into an empty container prior to being returned to said filling unit, said containers being separable from said transporting means and said transporting means providing a direct connection between said units and comprising first and second storing means common to said units and respectively arranged to accommodate supplies of empty and filled containers, said first and second storing means respectively comprising a first and second conveyor means movable independently of each other.

2. Apparatus as defined in claim 1, wherein said transporting means further comprises intermediate conveyor means interposed between one of said units and one of said storing means.

3. Apparatus as defined in claim 1, wherein said loading means is located at a first level and said second storing means is located at a second level, said filling unit further comprising conveyor means for transporting successive containers from said first storing means, past said loading means and to said second storing means.

4. Apparatus as defined in claim 3, wherein said evacuating unit is located at a level above said second storing means and said transporting means further comprises intermediate conveyor means for transporting successive filled containers upwardly from said second storing means to said receiving means, said receiving means being movable from a first position in which it is ready to receive a filled container from said intermediate conveyor means, to a second position in which it is ready to discharge the contents of such container, thereupon to a third position in which the thus evacu-

ated container can be accepted by said first storing means, and back to said first position.

5. Apparatus as defined in claim 1, wherein the effective length of at least one of said storing means is adjustable.

6. Apparatus as defined in claim 1, wherein said receiving means comprises supporting means for containers, said supporting means being movable by containers between idle and supporting positions.

7. Apparatus as defined in claim 1, further comprising control means including control elements adjacent to at least one of said storing means and arranged to control the operation of at least one of said machines as a function of the number of containers in the respective storing means.

8. Apparatus as defined in claim 7, wherein said control elements include electric switch means.

9. Apparatus as defined in claim 1, wherein said second storing means is provided with auxiliary means for facilitating manual introduction and withdrawal of containers from said second storing means.

10. Apparatus for transporting discrete containers for cigarettes or analogous rod-shaped articles between producing and consuming machines, comprising a filling unit arranged to receive articles from at least one producing machine and having loading means for loading articles into empty containers to thus convert such containers into filled containers; an evacuating unit including receiving means for receiving filled containers and for discharging the contents of such containers into a consuming machine; transporting means for conveying filled containers from said filling unit to said evacuating unit and for conveying empty containers from said evacuating unit to said filling unit, said transporting means for providing a direct connection between said units and comprising first and second storing means common to said units and respectively arranged to accommodate supplies of empty and filled containers, said second storing means being provided with auxiliary means for facilitating introduction and withdrawal of containers from said second storing means, said auxiliary means comprising lifting means located below the path of movement of containers in said second storing means and means for moving said lifting means up and down whereby said lifting means respectively lifts containers, above and deposits containers in said second storing means.

11. Apparatus as defined in claim 10, wherein said second storing means comprises a pair of endless transporting members operable to advance filled containers away from said filling unit, said lifting means comprising a platform located between said transporting members.

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