APPLIANCE FOR FILLING RECEPTACLES WITH CIGARETTES OR THE LIKE

Filed Oct. 13, 1967

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FIG. 16

FIG. 15

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It is well known to employ in a production line for cigarettes so-called chargers or trays which receive stacks of cigarettes and deliver them to a magazine for one or more packing machines. A serious drawback of presently known production lines is that the chargers or trays must be transported by a bulky and expensive conveyor assembly which occupies much room and requires a sophisticated programming system. As a rule, the chargers are circulated between a row forming station where cigarettes coming from one or more makers are arranged in rows and the magazine of a packing machine. The paths along which the chargers travel are quite long and the conveyor assembly interferes with access to other components of the production line.

SUMMARY OF THE INVENTION

It is an object of our present invention to provide a novel and improved apparatus transporting cigarettes or like rod shaped articles between one or more producing machines and a receptacle with little loss in time, without causing damage to or deformation of articles, and with substantial savings in space and equipment.

Another object of the invention is to provide an apparatus wherein articles coming to one or more producing machines can be automatically assembled in rows or other formations during travel toward a receptacle, for example, during travel toward the magazine of a packing machine or toward a charger or tray which thereupon delivers arrayed articles to the magazine.

A further object of the invention is to provide an apparatus wherein the articles need change the direction of their movement in the way between the discharge end of a producing machine and the inlet of a receptacle.

An additional object of the invention is to provide an apparatus wherein the transfer of articles from a producing machine to a receptacle takes place simultaneously with arraying of articles in formations which are best suited for introduction into the receptacle and which can remain intact until the contents of the receptacle are evacuated for further processing, for example, for the application of envelopes to form cigarette packs or the like.

Another object of our invention is to provide the apparatus with a novel feed which can supply articles to a pneumatic conveyor system for delivery to a receptacle.

An ancillary object of the invention is to provide a feed which embodies a novel distributor unit capable of converting one or more files of articles into formations which are ready for delivery into a receptacle.

A concomitant object of the invention is to provide an apparatus which can be converted to deliver articles from one or more producing machines to one or more consuming machines and which can be used with equal advantage to form stacks in the magazine of a packing machine or in successive chargers or trays of a conveyor assembly which circulates stacks of cigarettes between a maker and a packing machine.

The apparatus of our invention is employed for assembly of cigarettes, cigars, cigarillos, filter rods, filter rod sections or like rod shaped articles into arrays which are thereafter destroyed or dispersed during further processing of articles. The apparatus comprises means for pneumatically conveying individual articles lengthwise along a plurality of separate paths which are preferably defined by flexible pneumatic tubes and terminate at a receptacle (e.g., a charger or tray for cigarettes or the magazine of a packing machine) which receives the thus conveyed articles in the form of a first row or group, and for conveying additional articles along such paths to form additional rows or groups which, with the first row or group, form in the receptacle an array of articles, for example, a stack of horizontal layers or rows wherein
the articles of each row are staggered with reference to the articles of the adjoining row or rows.

The articles can be removed from at least one producing station which accommodates a producing machine (e.g., a rod cigarette machine, a filter cigarette machine) and the thus removed articles are thereupon distributed to the separate paths. The just mentioned distributing step may include assembling articles which come from at least one producing station in rows prior to entry of articles into separate paths and delivering successive rows to such paths so that each article of a row travels along a separate path. The assembly of rows can take place on a curved support (for example, in the flutes of a rotary drum) or on a flat support (for example, in flutes provided at the underside of a section head which lifts articles from a belt serving to remove articles from a maker). A fresh row of articles can be assembled during transport of the preceding row into a magazine or tray.

It is also possible to eliminate the row forming step and to convey articles into separate paths directly from a plurality of producing stations so that each such station supplies articles for travel along one of the paths. The groups or rows are formed not later than at the time the articles are conveyed into the respective paths to enter a magazine, a tray or another receptacle or storing device for temporary storage of articles.

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 diagrammatic view of an apparatus wherein the output of a producing machine for rod shaped articles is converted directly into a succession of rows which are pneumatically transported into a receptacle along separate paths;

FIG. 2 is an end elevation view of a distributor unit including three drums which are used in an apparatus for conversion of the output of a single producing machine into a succession of rows;

FIG. 3 is a developed plan view of the drums shown in FIG. 2, further showing the inlets of pneumatic tubes which receive rod shaped articles from the drums and the take-off conveyor of a producing machine which delivers articles to the drums;

FIG. 4 is an axial sectional view as seen in the direction of arrows from the line IV—IV of FIG. 2;

FIG. 5 is a fragmentary partly elevational and partly sectional view of a distributor unit which constitutes a modification of the unit shown in FIG. 2, the section being taken in the direction of arrows as seen from the line V—V of FIG. 4;

FIG. 6 is a partly elevational and partly vertical sectional view of another apparatus wherein the articles coming from one or more producing machines travel side-ways and are accumulated into rows along the underside of a collector in the form of a suction head;

FIG. 7 is a fragmentary top plan view of the structure shown in FIG. 6;

FIG. 8 is a fragmentary schematic plan view of another apparatus wherein a single tubular distributor furnishes the output of one or more producing machines to the inlets of a large number of pneumatic tubes and wherein the operation of the distributor is based on the Coanda effect;

FIG. 9 illustrates the details of a control element in the apparatus of FIG. 8;

FIG. 9b illustrates a modified control element;

FIG. 10 is an enlarged view of the structure within the phantom-line rectangle 165 in FIG. 8;

FIG. 11 illustrates certain details of an apparatus which constitutes a modification of the apparatus shown in FIG. 8;

FIG. 12 is a schematic top plan view of an apparatus wherein each pneumatic tube receives rod shaped articles from a separate producing machine, certain details of this apparatus being shown on a greater scale within phantom-line circle with indications where the details can be found in the overall view of this illustration;

FIG. 13 is a fragmentary perspective view of a receiving unit which accommodates a conveyor for cigarette chargers or trays;

FIG. 14 is a fragmentary perspective view of a magazine in a cigarette packing machine and of a control system which can move the outlets of pneumatic tubes with reference to the magazine;

FIG. 15 illustrates the electric circuit for the structure of FIG. 14;

FIG. 16 is a fragmentary side elevation view of an apparatus which embodies the structure of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a diagram showing certain components of an apparatus which embodies our invention and forms a production line in a tobacco processing plant. The character A denotes one or more producing machines or makers installed at a producing station, for example, a rod cigarette machine, a filter cigarette machine, a cigar machine or a filter machine, whose output is fed to a distributor unit B which serves to supply groups of cigarettes or like rod shaped articles into a plurality of separate paths defined by a series of pneumatic tubes C. During travel from the station which accommodates the distributor unit B to the station which accommodates a receiving unit D, cigarettes advancing lengthwise in the tubes C are automatically retained or assembled in formations or groups of, for example, twenty parallel articles each which form a row so that such rows can be immediately stacked in the receiving unit D. The machine A and the distributor B together form a feed which supplies articles lengthwise to the inlets of the tubes C, and the discharge ends or outlets of the tubes C are grouped in such a way that they can discharge at least one row of articles at a time. The receiving unit D accepts such rows from the outlets of the tubes, the receiving unit may accommodate a customary charger or tray wherein the rows of articles are stacked on top of each other. The stacks formed by rows of articles in the tray of the receiving unit D are destroyed or dispersed when the articles are fed to further processing stations. The receiving unit D may also include the magazine of a packing machine which provides groups of say twenty cigarettes with single or plural envelopes to form packs.

FIGS. 2 to 5 illustrate in greater detail one specific form of apparatus which embodies our invention. FIG. 3 shows an endless take-off belt 109 which forms part of a rod cigarette machine and advances rod shaped articles 105 (hereinafter called cigarettes for short) lengthwise in the direction indicated by an arrow 108. This take-off belt 109 delivers cigarettes 105 into a channel 119 provided in a stationary feed drum 102 adjacent to one axial end of a rotary collecting member or drum 101. The other axial end of the collecting drum 101 is adjacent to a stationary transfer member or drum 103. The collecting drum 101 (hereinafter called collector for short) is provided with axially parallel equidistant peripheral portions having pockets or flutes 104 of substantially semicircular cross-sectional outline which serve to transport cigarettes 105 sideways, namely, from registry with the channel 119 into registry with one of twenty equidistant axially parallel pockets on the drum 114 provided on the transfer drum 103. The bottom region of each flute 104 is provided with an elongated suction slot or duct 106, and each of these flutes tapers gradu-
ly from the feed drum 102 toward the transfer drum 103 (see the mutual inclination of edges 107 bounding the next-to-the-topmost flute 104 of FIG. 3). This ensures an impeded entry of cigarettes into the channel 119 in which successive flutes 104. In FIG. 2, the right-hand part of the feed drum 102 is broken away along the line E–F.

The collector 101 is hollow and accommodates a stationary suction chamber 110 (see FIG. 2 or 4) which communicates with a certain number of suction ducts 106 in each angular position of the collector 101 to ensure that a cigarette 105 which has entered a flute 104 will remain therein until the flute moves into registry with an empty pocket 114 of the transfer drum 103. The suction chamber 110 is connected with a suction conduit 111 whose discharge end is connected to the inlet of a suction pump or another suitable suction generating device, not shown.

The axial end of the transfer drum 103 which is adjacent to the collector 101 is provided with a braking nozzle 112 which can discharge jets of compressed air or other suitable gas into successive flutes 104 of the collector for the purpose of reducing the speed of cigarettes 105 and of ensuring that each cigarette which has been delivered by the take-off belt 109 of the rod cigarette machine comes to a halt in a position substantially midway between the ends of the respective flute 104. The pockets 114 are provided in a portion 113 of the periphery of the drum 103 and they also taper in the same direction as the flutes 104, i.e., away from the collector 101. The lead lines of the numeral 115 shown in FIG. 3 denote the edges of the topmost pocket 114, and it will be seen that these edges converge in a direction to the right so that the passages in which the cigarettes travel axially of the drum 103 become narrower to ensure that the leading end of each cigarette will be accurately aligned with one opening 117 of a stationary guide member or mouthpiece 116 adjacent to the right-hand axial end of the transfer drum 103. Each opening 117 of the guide member 116 registers with the inlet of an elongated pneumatic tube 118, these tubes corresponding to the tubes C shown in FIG. 1. The transfer of cigarettes 105 along the paths defined therefor by the tubes 118 and the transport of cigarettes in the tubes is preferably carried out by means of compressed air.

The feed drum 102 is further provided with a row of orifices 120 each of which registers with the left-hand end of a pocket 114, as viewed in FIG. 3, i.e., with the inlet of one of the tubes 118. The orifices 120 serve to discharge blasts of compressed air at such intervals that they compel a group of twenty cigarettes 105 to leave the adjoining flutes 104 and to advance lengthwise into and beyond the respective pockets 114 of the transfer drum 103. The means for connecting the orifices 120 with a suitable source of compressed air comprises a distributing channel 121 which is machined into the drum 102 and communicates with each orifice, a first supply channel 122 (see FIGS. 2 and 4) which is connected with the channel 121 and comprises two slightly spaced sections separated from each other by an annular portion of a cylindrical valve member 123 axially integral with the collector 101. The annular portion of the valve member 123 is provided with apertures 124 which permit compressed air to flow between the two sections of the supply conduit 122 in order to admit compressed air to the channel 121 and orifices 120. A second supply conduit 125 connects with a first supply conduit 122. The distribution of apertures 124 is such that the orifices 120 receive compressed air only when a group of twenty cigarettes 105 in the flutes 104 registers with the stationary pockets 114. The periphery of the channel 121 and combinations thereof can be in contact with a support for successive groups or rows of twenty cigarettes each. The center of curvature of this support is located on the axis of the collector 101.

Of course, the distributing channel 121 can be connected with a source of compressed air in a number of ways, not only by means of apertures 124 in the rotary valve member 123. A second solution is illustrated in FIG. 5 wherein a supply conduit 122 contains a valve 131 which is associated with a counter 128 serving to count the number of flutes 104 and to open the valve in response to placing of twenty filled flutes 104 into registry with the pockets 114. Alternatively, the counter 128 can determine the angular displacement of the collector 101 and can open the supply conduit 122 whenever this displacement is such that a requisite number of filled flutes 104 register with the pockets 114. The collector 101 carries a gear 126 whose teeth cause an initiator 127 to produce successive output signals which are transmitted to the counter 128. The initiator 127 is of known design; for example, it may be constituted by an apparatus or gap initiator whose exact construction forms no part of the present invention. Its operation is based on the principle that a signal is generated when a ferromagnetic body (i.e., in the present instance a tooth of the gear 126) interferes a high-frequency oscillation. The counter 128 causes the valve 131 to open when it receives a requisite number of signals (for example, a series of twenty signals). The counter 128 then resets itself to zero and starts to count a fresh sequence of signal which are transmitted by the initiator 127. It is clear that the initiator 127 can be replaced by other types of indicators, for example, by a light-sensitive receiver, by an inductive, capacitative or like signal generator or by a generator employing isotopic rays. The valve 131 is installed at the junction of supply conduits 122, 125 or in one of these conduits and opens just long enough to admit into the orifices 120 jets of air which are strong enough to expel a requisite number of cigarettes 105 into and beyond the pockets 114.

An important advantage of the modification shown in FIG. 5 is that the number of cigarettes which are shifted from the collector 101 into the pockets 114 can be varied at will and that no mechanical moving parts are needed to start or to terminate the admission of compressed air. However, it is equally within the purview of our invention to utilize other types of values. For example, the valve 131 could be replaced by a cam-operated valve and the cam for effecting opening and closing of such valve could be mounted on or could rotate in synchronism with the collector 101.

In FIG. 4, the gear 126 is shown for the sole purpose of facilitating the interpretation of FIG. 5. In actual practice, the collector 101 is provided with the valve member 123 or with the gear 126.

The transfer drum 103 of a preferably circularly cylindrical shield 100 of transparent or translucent vitreous or plastic material (e.g., Plexiglas), and such shield preferably extends all the way to the feed drum 103 to surround the entire collector 101.

The width of the intake ends of flutes 104 is such that each flute can receive a cigarette 105 through the channel 119 of the stationary feed drum 102 even if the collector 101 is driven at a relatively high speed. The same applies for the width of intake ends of the pockets 114 in the transfer drum 103.

The drum 103 and the guide member 116 may be omitted if the collector 101 rotates at a relatively low speed or intermittently, i.e., if the discharge ends of flutes 104 can be placed into accurate registry with the inlets of pneumatic tubes 118 at the time the orifices 120 receive compressed air from the distributing channel 121. However, and if the collector 101 turns at a relatively high speed, the tapering pockets 114 of the drum 103 will be capable of receiving groups of cigarettes 105 without any damage to such articles. The blasts or jets of air admitted by the orifice 120 can be strong enough to convey cigarettes 105 from the flutes 104, through the pockets 114, openings 117 and all the way through and beyond the outlets of the pneumatic tubes 118.
In FIGS. 2-4, the take-off belt 109 constitutes a portion of the producing machine A shown in FIG. 1, and the parts 119-125 together form the distributor unit B of FIG. 1. The operation of the apparatus shown in FIGS. 2-4 is as follows:

A producing machine discharges a succession of individual cigarettes 105 which are transported by its take-off belt 109 (arrow 108 in FIG. 2) and travel through the guide channel 119 of the feed drum 102. Each such cigarette enters flute 104 of the rotary collector 101. The means for accelerating the cigarettes 105 on the upper stringer of the take-off belt 109 may comprise one or more eccentrically mounted elastic rollers or one or more nozzles which discharge blasts of compressed air. Such accelerating means is preferably employed to effect lengthwise separation of successive cigarettes 105 by distances which suffice to assure that the collector 101 can turn through a small angle before the leading end of the next-following cigarette advances beyond the channel 119 of the feed drum 102. The aforementioned braking nozzle 112 of the fixed transfer drum 103 discharges jets of compressed air which brake the cigarettes 105 in the flutes 104. The braking action is enhanced by suction produced in the chamber 110, and communicated through the ducts 106. In fact, and if the suction is strong enough, the braking nozzle 112 can be dispensed with. All that counts is to assure that each cigarette 105 comes to a halt somewhat between the ends of the respective flute 104 so that the collector 101 can turn to and place the cigarettes into registry with the pockets 114. The valve member 123 (FIGS. 2 and 4) or the valve 131 (FIG. 5) causes or permits entry of compressed air into the orifices 130 which discharge into the flutes 104 to actuate an escapement 114 registror, whereby the jets of air cause twenty cigarettes 105 to move axially and to travel through the registering pockets and openings 117 and to enter the inlets of corresponding pneumatic tubes 118.

It is clear that the open-sided flutes 104 and pockets 114 can be replaced by tunnels or bores. If the collector 101 and/or the transfer drum 103 is formed with such bores or tunnels, the diameter of each bore preferably diminishes in a direction away from the feed drum 102.

The transfer drum 103 and the guide member 116 can be omitted if the right-hand axial end of the collector 101 (as viewed in FIG. 3) is immediately adjacent to the inlets of the tubes 118. However, the delivery of cigarettes 105 from the flutes 104 of the collector 101 directly into the inlets of tubes 118 is more difficult if the collector 101 is required to move at high speed and to dart on full holt when the orifices 120 discharge jets of air to expel the cigarettes from the flutes 104. Therefore, the use of the drum 103 is advisable to insure accurate transfer of cigarettes from the flutes of a travelling collector, especially since the inlets of pockets 114 preferably diverge in a direction toward the flutes 104.

Referring to FIGS. 6 and 7, there is shown a second apparatus wherein the rotary collector 101 of FIG. 3 is replaced by a collector in the form of a suction head or lifter 137 which is similar to lifters disclosed in U.S. Pat. No. 5,100,455 granted to Kochalski et al. The suction head 137 receives cigarettes 105 which are delivered sideways and are randomly spaced from each other on the upper stringer of a supply belt 136. The underside of the suction head 137 comprises a series of copeolanor portions 138 of the head 137. When each of which 138 receives a cigarette, suction in the chamber 137a is reduced and the vacuum switch 142b completes the circuit of the solenoid 142a through the microswitch 144. The valve 142 then admits compressed air from a conduit 150 which branches from the conduit 150a and such air flows into the chamber 137a of the cylinder 140c so that the piston 141c descendant in a direction to the right and causes the plunger 139 to perform a working stroke whereby the leading edge of the plunger transfers an entire row of cigarettes from

The same procedure is repeated until the suction head 137 accumulates a requisite number of cigarettes 105. The apparatus of FIGS. 6 and 7 further comprises an ejector or transfer member in the form of a plate-like pusher 139 which is reciprocable by a fluid-actuated (preferably pneumatic) single-acting unit including a cylinder 140 and a piston rod 141 reciprocable in directions indicated by arrow 141a. A return spring 143b tends to maintain the piston rod 141 in retracted position. The chamber 140a of the cylinder 140 can receive compressed air through a regulating valve 142 which is a solenoid valve, the solenoid being shown at 142a. The function of the plunger 139 is to expel a row or layer of cigarettes 105 from the flutes 138 of the suction head 137 and to deliver such cigarettes into the inlets of pneumatic tubes 118. The inlets of the tubes 118 are coplanar. The solenoid 142a is connected with a vacuum switch 142b through the intermediary of a microswitch 144. The microswitch 144 can be actuated by a trip 145 of the plunger 139. The vacuum switch 142b will produce a signal when the suction in chamber 137a rises in response to entry of a cigarette into the last or rearmost flute 138. Each of these flutes is connected with the suction chamber 137a. This microswitch 144 can be closed again without, however, completing the circuit of the solenoid 142a. For example, the microswitch 144 and trip 145 can be replaced by a light sensitive receiver or by an initiator of the type described in connection with FIG. 5. A contactless signal generator will be employed when the manufacturer wishes to eliminate the wear which results from repeated engagement between the microswitch 144 and trip 145.

The numeral 146 denotes a guide member which corresponds to the guide member 116 of FIG. 3 and serves to guide direct cigarettes 105 into the inlets of the tubes 118. The guide member 146 can be provided with channels or with open-ended bores or holes.

The plunger 139 is formed with a series of orifices 147 which can be connected to an air compressor 148 or air supply 149. The suction chamber 137a in turn comprises a flexible conduit or hose 150 and a fixed conduit 150a. The conduits 150, 150a are connected to each other by an interrupter valve 149 which is a solenoid valve and is connected with the microswitch 144. The latter effects energization of the solenoid in the valve 149 when the plunger 139 reaches its foremost position (when the trip 145 reaches the microswitch 144) so that the conduits 150, 150a then admit to orifices 147 jets of compressed air which expels cigarettes 105 from the flutes 138 and through the guide member 146 so that such cigarettes enter the inlets of the respective tubes 118.

The operation is as follows:

The belt 136 supplies cigarettes from a producing machine, for example, from a filter cigarette machine, and such cigarettes enter successive flutes 138 of the suction head 137. When each of which 138 receives a cigarette, suction in the chamber 137a rises and the vacuum switch 142b completes the circuit of the solenoid 142a through the microswitch 144. The valve 142 then admits compressed air from a conduit 150 which branches from the conduit 150a, and such air flows into the chamber 137a of the cylinder 140c so that the piston 141c descendant in a direction to the right and causes the plunger 139 to perform a working stroke whereby the leading edge of the plunger transfers an entire row of cigarettes from
the flutes 138 into the guide member 146. When the plunger 139 reaches the forward end of its stroke, the trip 145 strikes against the microswitch 144 and the latter sends a charge of air from the solenoid 142 whereby the valve member of the valve 142 seals the conduit 150g from the chamber 140a and connects this chamber with the atmosphere. The spring 143 is free to return the plunger 139 and the piston rod 141 to starting position. When the microswitch 144 is engaged by the trip 145, it sends a charge of air from the conduit 150g into the conduit 150 whereby the orifices 147 discharge jets of compressed air which transfer cigarettes 105 from the guide member 146 into the inlets of the tubes 118.

The guide member 146 can be assembled of a series of short pipes each of which is connected with one of the tubes 118. In such apparatus, the admission of air which expels cigarettes 105 from the guide member need not take place through orifices in the plunger 139, i.e., air can be admitted directly into the pipes of the guide member. It is equally clear that the transfer of cigarettes 105 from the flutes 138 of the suction head 137 into the inlets of the tubes 118 can be effected by suction. The tubes 118 are then connected with a suction generating device which draws cigarettes from the flutes 138 or from the openings or bores of the guide member 146.

In FIG. 9a, 9b, and 10 illustrate a portion of a further apparatus which can form rows or groups of cigarettes coming from a feed including one or more producing machines or makers 184. The take-off belt 109 of the machine 184 (shown in the lower part of FIG. 6) delivers cigarettes lengthwise and can be made of foraminous metal plates which are placed alongside the suction chamber to advance the cigarettes at a desired speed. The cigarettes are introduced into the intake end of a tubular distributor 150 (hereinafter called pipe) which replaces the parts 101, 102, 103, 116 of FIG. 2. The pipe 150 accommodates a series of novel pneumatic switching devices 151b–151t (hereinafter called switches for short) which can detour cigarettes into the inlets of associated pneumatic tubes 118a–118t. The operation of the pipe 150 and switches 151b–151t is based on the Coanda effect and each of these switches comprises two control nozzles respectively numbered 152b–152r and 153b–153t. The main jet of gas is admitted through one or more main orifices 154 (see also FIG. 11) in such a way that the jet has a tangential component. During travel past the junctions between the distributor pipe 150 and successive pneumatic tubes 118a–118t, the main jet continues to travel along that surface against which it was deflected by a control jet discharged from one of the aforementioned control nozzles. Thus, the direction of the main jet can be changed in a very simple way by admission of a control jet, either through a nozzle 152 or through a nozzle 153. The nozzles 152b–152t and 153b–153t receive compressed air from branches of the first auxiliary line 156 through bistable pneumatic control elements 155b–155t, one of which is illustrated in greater detail in FIG. 7a. The control elements 155b–155t and 155r form part of switches 151b–151r and are respectively provided with outlets 157b–157t and 158b–158r which admit compressed air to control elements 152b–152r and 153b–153t. The connections between these outlets and the corresponding control nozzles are respectively shown at 159b–159r and 160b–160r.

Referring to FIG. 9a in detail, there is shown a bistable pneumatic control element 155 which includes a spherical valve member 155g in a hollow cylindrical body or cylinder 162. The cylinder 162 has two end walls provided with inlets 163, 164 which can admit compressed air from the first auxiliary line 156. Each of the two outlets 157, 158 is adjacent to one end wall and extends radially of the cylinder 162. The effective cross-sectional area of the inlet 163 is greater than that of the outlet 164 because the conduit admitting air to the inlet 164 is throttled considerably at 166. This conduit branches from the first auxiliary line 156, and the latter is also provided with a second branch connected to the inlet 163. A control line 167 communicates with that branch which connects the first auxiliary line 156 with the inlet 163. The control line 167 can be placed in communication with the atmosphere to effect a reduction in air pressure in the right-hand portion of the cylinder 162. Thus, and when the control line 167 is open to the atmosphere, the pressure of air admitted via the inlets 163 and 164 exceed the pressure in the inlet 163 so that the valve member 161 will remain in the position shown in FIG. 9a despite the fact that the flow of air to the inlet 164 is throttled at 166. The valve member 161 then allows air admitted via inlet 164 to enter the outlet 158. If the control line 167 is thereby sealed from the atmosphere, pressure in the right-hand portion of the cylinder 162 rises and the valve member 161 moves against the inlet 164 to permit flow of compressed air from the inlet 163 into the outlet 157 but to seal the outlet 158 from both inlets. The ratio of effective cross-sectional areas of the inlets 163, 164 is greater than that of the valve member 161 continues to seal the inlet 164 from the outlet 158 even if the air pressure in the inlet 164 rises and equals that in the auxiliary line 156. In fact, the valve member 161 continues to seal the inlet 164 even if the control line 167 is thereupon connected with the atmosphere. Therefore, the control element 155 of FIG. 9a is provided with a restoring or resetting line 168 which can admit compressed air into the left-hand end of the cylinder 162 at a pressure necessary to effect return movement of the valve member 161 to the illustrated position.

In FIGS. 8 and 10, the numerals 168a–168b and 167b–167t respectively denote various restoring lines and control lines. The restoring lines 168a–168b receive compressed air from a second auxiliary line 170.

FIG. 9a illustrates a modified bistable pneumatic control element 155g wherein the spherical valve member 161 is replaced by a more rapidly reacting diaphragm 169. Aside from the fact that the valve body or cylinder 162 of FIG. 7b can be made somewhat shorter, the construction of the control elements 155, 155g is otherwise identical. The cylinders 162, 162g can be mass-produced of plastic material. Each of the control lines 167b–167t communicates with one of the tubes 118a–118d.

Referring again to FIG. 8, the second auxiliary line 170 which supplies compressed air to the restoring lines 168a–168b contains an adjustable valve 171 and is connected to a source 172 of compressed air. The valve 171 is a pressure-responsive valve and responds to pressure of air issuing from the outlet 157 of the last control element 155g. When the valve 171 opens, the auxiliary line 170 connects the source 172 with the resting lines 168a–168b so as to restore the valve members 161 or 169 to the positions respectively shown in FIGS. 9a and 9b.

The operation of the just described apparatus will be described with reference to FIG. 10 which illustrates,
on a larger scale, the structure within the phantom-line rectangle 165 shown in the upper part of FIG. 8. This rectangle embraces the switches 151b, 151c and their control elements 155b, 155c as well as the control element 155d. It is assumed that the assembly of a new array of twenty cigarettes 105 is about to begin, i.e., the valve members 161 of all control elements 155b–155d are in positions corresponding to those of the valve member 161 shown in FIG. 9a because the last cigarette 105 of the preceding array has caused the control element 155c to open the valve 171 in the second auxiliary line 170 and to admit compressed air to the resting lines 168b–168d.

The foremost cigarette 105 on the take-off belt 109 enters the inlet of the distributor pipe 150 and advances past all of the switches 151b–151d because the outlets 158b–158d of all control elements receive air from the corresponding branches 156b–156d of the first auxiliary line 156 so that the nozzles 153b–153d admit jets of air which keep the foremost cigarette 105 against entry into the inlet of one of the tubes 118b and 118c. Thus, the foremost cigarette simply continues to pass through the distributor pipe 150 and ultimately enters the inlet of the rightmost tube 118i. The foremost cigarette is conveyed in the main jet of compressed gas which is admitted by the main orifice or orifices 154.

The control line 167b of the control element 155b is in communication with the inlet of the tube 118a and, when the foremost cigarette 105 enters the tube 118a, it seals the open end of the control line 167b whereby the corresponding valve member 161 changes its position and seals the branch 156b of the first auxiliary line 156 from the outlet 155b. At the same time, the valve member 161 of the control element 155a connects the branch 156b with the outlet 157b so that the control nozzle 152b discharges a jet of compressed air which deflects the main jet into the inlet of the second tube 118b. Air which has entered the outlet 157b flows through the connection 159b. The valve member 161 of the control element 155b then remains in the new position for reasons which were explained in connection with FIG. 9a. When the next-following cigarette 105 reaches the junction accommodating the switch 151a, it is caused to enter the inlet of the tube 118b and temporarily seals the open end of the control line 167b to change the position of the valve member 161 in the control element 155c. Thus, the outlet 157c of the control element 155c then admits compressed air to the connection 159c and nozzle 152c at the junction accommodating the switch 151c. The main jet is deflected into the tube 118c which receives the third cigarette 105, such third cigarette causing the control element 155d to admit air to the nozzle 152d, and so forth. When the last one of a series of twenty cigarettes 105 reaches the switch 151a and moves past the control line 167a of the control element 155a on its way into the inlet of the tube 118a, the outlet 157a of the control element 155a admits compressed air to the valve 171 in the second auxiliary line 170 so that the latter admits air from the source 172 into each of the resting lines 168a–168d in order to return the valve members 161 of the control elements 155b–155d to the original positions. The apparatus then begins to assemble a fresh row or group of twenty cigarettes 105 in the just described manner.

In the apparatus of FIG. 8, the parts 184, 150 and 151 constitute a feed which is an equivalent of the producing machine 187b, 187c and 187d comprises a cylinder 173 accommodating an axially reciprocating piston-like valve member 174. The position of the valve member 174 can be changed by an electromagnet 175.

The outlets of the control element 187b are shown at 157b, 158b and a branch of the first auxiliary line 156 admits compressed air substantially in the same way as described in connection with FIGS. 8 to 10. Connections 159b, 160b admit air from outlets 157b, 158b to the control nozzles 153b, 153c of the switch 151b at the junction of the distributor pipe 150 and the inlet of the tube 118b. A return line 167b replaces the control line 168b, i.e., this spring will restore the valve member 174b to a starting or normal position when the respective electromagnet 175b is deenergized.

The electromagnet 175b will be energized in response to a signal produced by a signal generator or detector in the tube 118b. Such signal is initiated by the input 119b of which has entered the inlet of the tube 118a. The signal generator can operate photoelectrically, capacitatively, inductively or with isotopic rays. The signal is received in a storing unit 176b which can transmit the signal to the electromagnet 175b through an amplifier 179b (if necessary). The storing unit 175b has a signal storing input G and a signal erasing input H and has a tendency to erase the signal. Storing units which can store and amplify electric signals are well known in the art. In the embodiment of FIG. 11, the signal generator 119b comprises a light sensitive device 180b including a source 181b of light and a receiver 182b. The inlet of the tube 118a has a section or portion 183a which consists of transparent or translucent material and is disposed between the light source 181b and receiver 182b. The output of the light-sensitive device 180b is connected with the input of the storing unit 175b. The output of the second light-sensitive device 180c in the inlet of the tube 118c is connected with the input of the second storing unit 175c and with the input H of the first storing unit 175b. The remaining reference numerals shown in FIG. 9 denote in part components which were described in connection with FIGS. 8–10 or components which are analogous to the just described components. For example, the second control element 187c comprises a valve member 174c, an electromagnet 175c and two outlets 157c, 158c.

The operation is as follows:

Prior to assembly of a fresh group of twenty cigarettes, the valve members 174 of all control elements 187 stay in their normal positions. Thus, and referring to the control element 187b, its valve member 174b opens the outlet 157b but connects the outlet 157b with the auxiliary line 156 so that the connection 160b admits air to the control nozzle 153b which causes the main jet of air to flow past the inlet of the tube 118b and into the tube 118b. The foremost cigarette 105 of a series of twenty cigarettes 105 enters the inlet of the distributor pipe 150 and enters the inlet of the tube 118a. This cigarette travels through the transparent portion 183a of the tube 118a and causes the light-sensitive device 180b, to produce a signal which is transmitted to the input G of the storing unit 175b. The storing unit 175b sends an output signal via amplifier 179b, and such signal causes energization of the electromagnet 175b which attracts the valve member 174b against the opposition of the return spring 176b so that the valve member 174b seals the auxiliary line 156 from the outlet 157b, and the connection 159b can admit air to the control nozzle 152b which deflects the main jet into the inlet of the tube 118b. The next cigarette enters the inlet of the tube 118b and passes through the transparent portion 183b of this tube whereby the light-sensitive device 180c is actuated by the input G of the storing unit 175c as well as to the erasing input H of the storing unit 175b. The output signal of the storing unit 175c causes the valve member 174c to admit air from the auxiliary line 156 into the control nozzle 152c so that the main jet of air is deflected into the inlet of the tube 118c. The signal transmitted from the receiver 182c to the input H of the storing unit 175b erases the signal at the input G of the unit 175b so that the electromagnet 175b is deenergized and the valve member 174b returns to the position of FIG. 11, i.e., the con-
Control nozzle 153b discharges air but such air cannot affect the flow of the main jet because the latter is deflected at the jet nozzle 153c. The flow of the main jet from the tube 180 is rotated stepwise by a conventional indexing assembly including an electric motor 194. Thus, the tray 190 can descend stepwise so as to provide room for successively delivered rows of cigarettes 105. The rows which are introduced into the mouth of the tray 190 and each other to form a stack of predetermined height. A horizontal removing conveyor including an endless belt 195 is installed at level below the descending tray 190 and serves to remove successively filled trays 190 to a packing machine or to another destination. The outlets 196 of pneumatic tubes 118 or 119 are connected to each other and discharge successive cigarettes 105 through the open front side of the tray 190. The outlets 196 are held together by a strap 197 or another suitable clamping and aligning device. Whenever the motor 194 of the indexing assembly receives an impulse, it turns the shaft 193a through an angle of predetermined magnitude to lower the tray 190 by a distance which approximates the thickness of a row or layer of cigarettes in the outlets 196 or in the tray 190. The tray is lowered through the intermediary of the platform 191.

The control circuit for the motor 194 of the indexing assembly receives and transmits signals when the pneumatic tubes 118 receive fresh cigarettes 105, i.e., before such cigarettes reach the outlets 196. For example, the control circuit for the motor 194 may include the microswitch 144 of FIGS. 6 and 7 or a pressure-responsive switch (not shown) which is adapted to check the pressure delivered to the outlets 120. A pressure switch 120 discharges jets of compressed air to transfer cigarettes 105 from the flutes 104 of the collector 101 into the pockets 114 of the transfer drum 103 shown in FIGS. 2–5. The microswitch 144 and/or the just mentioned pressure-responsive switch can produce signals with requisite delay. It is equally clear that the motor 194 can be energized in response to signals transmitted by the control element (155, 155' or 187) associated with the last switch in the apparatus shown in FIG. 8, 9b or 11. The control circuit for the motor 194 may include the microswitch 144 and/or the pressure-responsive switch which produces signals with requisite delay. The indexing assembly is transmitted to a conventional flip-flop circuit or another suitable bistable multivibrator which changes its output signal in response to each input signal. The conductors at the output side of the multivibrator are connected with the winding of a staggering or shifting electromagnet 199 and with the winding of a resetting electromagnet 200. The electromagnet 199 operates against the bias of a helical return spring 201 and the stroke of its armature 202 approximates the radius of a cigarette 105. The armature 202 has a bore 203 which receives a detent pin 204 biased by a spring 205. The pin 204 constitutes the armature of the resetting electromagnet 200 and is retracted from the bore 203 against the opposition of the spring 205 when the spring 201 should move the outlets 196 sideways in order to effect (in cooperation with the electromagnet 199) staggering of successively deposited rows of cigarettes 105 with reference to each other. In other words, the electromagnet 199 and the spring 201 insure that the cigarettes of a second row are deposited into gaps or grooves between the cigarettes of the preceding row.

When an empty tray 190 is introduced into the receiving unit of FIG. 13, the platform 191 assumes its upper end position so that the first row of cigarettes 105 is deposited on the bottom wall of the empty tray. The motor 194 then receives an impulse to lower the platform 191 by a step, together with the tray 190 which latter than already accommodates a first row of cigarettes 105. At the same time, the multivibrator 198 receives an impulse and its output signal energies (if necessary through a suitable amplifier circuit) one of the electromagnets 199 and 200, namely, that electromagnet which was not energized in response to the previous output signal. For example, the multivibrator 198 will energize the electromagnet 199 upon entry of the first row of cigarettes 105. The electromagnet 199 attracts its armature 202 against the opposition of the spring 201 and shifts the outlets 196 of all
twenty tubes 118 in a direction to the right, as viewed in FIG. 13, by a distance corresponding substantially to the radius of a cigarette 105. It is to be noted that the strap 197 is connected with the armature 202. The cigarettes of the second row are then deposited into the gaps between the cigarettes of the first row and the motor 194 thereupon energized. Simultaneously approximating the diameter of a cigarette 105, before the multivibrator 198 energizes the electromagnet 200 which retracts the detent pin 204 against the opposition of the spring 205 so that the spring 201 is free to expand and to move the strap 197 in the direction to the left, as viewed in FIG. 13, again by a distance approximating the radius of a cigarette 105. Thus, the cigarettes of the third row are in vertical alignment with the cigarettes of the first row and enter the gaps between the cigarettes of the second row. When the electromagnet 199 is energized again, the pin 204 snaps into the bore 203 of the armature 202 under the bias of the spring 205 and remains in locking position until the multivibrator 198 sends a signal which energizes the electromagnet 200. When a loaded tray 190 reaches the upper stringer of the belt 195, it is automatically removed from the platform 191 and a fresh (empty) tray moves to receiving position. Such fresh tray is lowered by a second platform (not shown) which is attached to the chains 192. Details of the transfer or movement between trays which can be used in the receiving unit of FIG. 13 are disclosed, for example, in German Pat. No. 1,194,303.

FIG. 14 illustrates a receiving unit which includes the magazine 210 of FIG. 12, i.e., a magazine which forms part of a cigarette packing machine. The magazine 210 can store cigarettes for delivery to one, two or more packing machines. This magazine comprises a series of partitions 212 which define a series of vertical ducts 211, for example, six ducts the lower ends of which are adjacent to a reciprocating transfer member or pusher which can expel two cigarettes from each duct 211 to form an array of twelve cigarettes in a formation ready to be introduced into an empty pack consisting of one or more envelopes. The side walls 213 at the upper end of the magazine 210 are provided with windows 214 which can be constituted by open vertical slots or by slots containing transparent or translucent panels of glass or plastic. The outlets 196 of the pneumatic tubes 118 are arranged in a horizontal row and extend into the space between or terminate in front of the side walls 213. A strap 197 or a like clamp for the outlets 196' has its ends connected with carriers 211 and outwardly protrudes against the side walls 213. The carrier 215 supports two vertically spaced light sources 217, 218 and the carrier 216 supports two vertically spaced photosensitive receivers 219, 220, e.g., a pair of photodiodes. The conductors which are connected with the sources 217, 218 and receivers 219, 220 are flexible and long enough to establish satisfactory connections between these components and the signal receiving and transmitting elements of the control circuit in the receiving unit of FIG. 14. The strap 197' is connected with a vertically movable toothed rack 221 which meshes with a pinion 222. A pin of the output shaft of a reversible electric motor 223. The transmission including the pinion 222 and rack 221 is of the self-locking type and the rack 221 is guided in bearings 224. The pneumatic tubes 118' consist at least in part of flexible or elastic material and their inlets are fixed to a stationary support or guide (not shown in FIG. 14) so that they may receive cigarette 105 from the takeoff belts 109 of individual rod cigarette machines 184 (see FIG. 12) or from one of the structures shown in FIGS. 2 to 11. The curvature of flexible portions of tubes 118' is selected in such a way that they cannot damage or deform the cigarettes 105 during travel toward the outlets 196' and while the outlets 196' move up and down between the upper level 226 and lower level 225. The tubes 118' preferably consist of suitable synthetic plastic material.

FIG. 15 illustrates a control circuit for the motor 223 of FIG. 14. The output lines of the receivers 219, 220 contain suitable impulse generating stages 227, 228 (for example, Schmitt triggers) which can produce and amplify signals and transmit such signals to the energizing circuits of switching elements 229, 230. The switching element 229 is energizable to connect the motor 223 with a source 231 of electrical energy in a sense to raise the strap 197' through the intermediary of the pinion 222 and rack 221. The strap 197' is of this polarity type. When energized, the switching element 230 connects the motor 223 with the source 231 in such a way that the motor lowers the strap 197'. The stage 227 is of such design that it transmits a signal which results in energization of the switching element 229 only at a time when it receives no input signal from the receiver 219. When the signal from the receiver 219 disappears, the stage 227 produces an output signal to energize the switching element 229 and to cause the strap 197' to move upwardly to raise the outlets 196' from the tubes 118' up to the upper level 226. The connection between the receiver 219 and stage 227 includes a conventional delay circuit 232. The circuit of the stage 228 is such that it produces an output signal for energization of the switching element 230 only at a time when it receives a signal from the photosensitive receiver 220.

The operation of the control circuit of FIG. 15 is as follows:

The magazine 210 receives successively formed rows of twenty cigarettes 105 each. Such rows may be formed by the assemblies which were described in connection with any of FIGS. 1 to 12, for example, in a manner as shown in FIG. 12 wherein each of twenty individual makers 184a-184l supplies cigarettes to one of twenty pneumatic tubes 118a-118l. At the same time, the aforementioned pusher or transfer members expels arrays of twelve cigarettes 105 each from the lower ends of ducts 211 whereby such arrays advance into the packing machine proper and are provided with envelopes to form customary cigarette packs. When the operation of the feed which delivers cigarettes into the inlets of tubes 118' and the operation of the packing machine or machines which receive cigarettes from the ducts 211 are normal, the rate at which the outlets 196' deliver rows of cigarettes equals or closely approximates the rate at which the pusher expels cigarettes from the ducts 211. Thus, the level of cigarettes which is stacked in the magazine 210 remains substantially unchanged and is located somewhere between the levels 225, 226 shown in FIG. 14. If the packing machine slows down or is shut off, the supply of cigarettes in the magazine 210 rises and approaches and ultimately reaches the level 226. On the other hand, faulty operation or stoppage of mechanism which feeds cigarettes to the tubes 118' (while the packing machine continues to operate at normal speed) causes the level of the supply of cigarettes in the magazine to descend toward and to ultimately reach the level 225. The outlets 196' must follow the level of the supply of cigarettes in the magazine 210 to prevent pileup or to prevent cigarettes from dropping through an excessive distance (when the upper level of the cigarette stack in the magazine is low) so that the cigarettes would undergo deformation and would be deposited in the magazine in random distribution. Such movements of outlets 196' are regulated by the light-sensitive devices including the light sources 217, 218 and receivers 219, 220. If the topmost layer of cigarettes in the magazine 210 is located between the levels 225, 226, the motor 223 is idle because neither of the receivers 219, 220 produces a signal. If the uppermost layer of cigarette in the magazine 210 descends to the level 225, the lower receiver 220 receives light from the lower source 218. The signal produced by receiver 220 energizes the switching element 230 which connects the motor 223 with the energy source 231.
in a sense to move the rack 221 and strap 197 downwardly until the uppermost layer of cigarettes in the magazine 210 again interrupts the beam of light between the lower light source 218 and the lower receiver 220. The latter ceases to transmit a signal and the switching element 225 is deenergized in automatic response to termination of such signal.

If the top layer of cigarettes 105 in the magazine 210 moves to the level 226 of FIG. 14, this layer interrupts the light beam between the upper light source 217 and the upper receiver 219 whereby the stage 227 produces an output which deenergizes the switching element 225. The latter connects the motor 223 with the energy source 231 in such a way that the motor moves the rack 221 and strap 197 upwardly until the uppermost layer of cigarettes again enters the space between the light source 217 and receiver 219. The just described control circuit compensates for substantial fluctuations in the level of stacked cigarettes 105 in the magazine 210 by causing the outlets 196 of the tubes 118 to move upwardly or downwardly.

It is clear that the photosensitive signal generating devices 217–225 can be replaced by other contactless signal generators, for example, by signal generators which operate with ultrasonics or with isotope rays. Furthermore, the position of the top layer of cigarettes in the magazine 210 can be sensed by a mechanical detecting device of any known design. Also, the structure of FIG. 14 can be provided with a detection which may constitute limit switches and respectively arrest the packaging machine when the top layer of stacked cigarettes reaches the level 225 or the makers 184 of FIG. 12 when the top layer reaches the upper level 226. Such detectors can arrest the makers or packers and the packaging machine or machines so that the operators will know that the production line is defective or requires adjustment.

FIG. 16 illustrates, by way of example, one of the pneumatic tubes 118 in the structure shown in FIG. 12 or 14. This tube 118 extends from a fixed guide or support 233 to the strap 197 on the upper end of the rack 221. The median portion 234 of the tube 118 is flexible and forms a loop whose radius of curvature is such that cigarettes 105 travelling through the median portion of the tube cannot become stuck and are not damaged when the rack 221 moves the strap 197 and the outlet 196 between the levels 225, 226.

If the tubes are sufficiently flexible, one or more makers may be coupled directly with one or more packing or like consuming machines. Furthermore, the outlets of tubes 118 or 118' can be readily detached from one receiving unit and attached to another receiving unit or vice versa. Also, the inlets of tubes 118 or 118' can be detached from one distributor unit and attached to another distributor unit or vice versa. Moreover, the outlets of tubes can be connected to a single packing or other consuming machine or to two or more packing machines. As a rule, the consuming machine will be a packing machine.

In each of the aforementioned embodiments of our apparatus, the articles are preferably braked prior to reaching the outlets of pneumatic tubes. Such braking can be effected by suction, by means of compressed air, by electrostatic forces or by mechanical means. The braking prevents escape of laboratory dusting particles at the ends of wrappers, deformation of or damage to wrappers of cigarettes, and facilitates accurate stacking of articles in magazines, trays or other types of receptacles. A braking system which combines suction with the action of compressed air (for example, as described in connection with delivery of cigarettes from the channel 119 into the flutes 104 of the collector 101 shown in FIGS. 2–5) was found to be particularly suited in connection with transport of cigarettes or like articles. Electrostatic braking forces can be employed when the articles can be electrostatically charged. For example, such forces can be produced in pneumatic tubes consisting of synthetic plastic material in that the tubes are charged during passage of articles toward their outlets. The braking action can be enhanced by generation of electrostatic charges in addition to those which develop during passage of articles.

The method and apparatus of our invention bring about a number of important advantages. The delivery of rod-shaped articles from a producing machine or maker directly into a tray or magazine with attendant formation of rows or other orderly groups reduces the outlay for equipment and saves space. Moreover, the formation of stacks consumes less time because the customary step of assembly randomly supplied articles into rows prior to delivery into a magazine or tray can be dispensed with in most instances. The paths for transportation of trays are shorter and the equipment necessary for transportation of trays is simpler because the tubes 118 or 118' can be of any desired practical length so that they can convey articles from one or more producing machines to a remote magazine or to a remote system of circulating trays. Furthermore, the articles are treated gently so that the percentage of rejects is low and the articles undergo less deformation.

Another important advantage of the improved apparatus is that it can employ a relatively simple and hence less expensive control or programming system. This is particularly the case when the pneumatic tubes receive rows or groups of articles from a rotary drum shaped member, such as the collector 101 of FIGS. 2–5. The controls for the collector 101 can operate slowly even if the articles are transported at a high speed. The assembly of members 101, 103 can be installed in an attachment which applies filters to cigarettes issuing from one or more rod cigarette machines. In such attachments, the articles are conveyed by fluted drums so that the delivery of articles into the flutes 104 of the collector 101 presents no problems.

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 our contribution to the art.

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

We claim:

1. Apparatus for assembling cigarettes or other rod shaped articles into arrays which are thereupon dispersed during further processing, comprising a plurality of elongated pneumatic tubes each having an article receiving inlet and an article discharging outlet, said outlets being so positioned with reference to each other that articles issuing therefrom form a group consisting of at least one row of closely adjacent articles; a feed for supplying articles to said inlets; and a receptacle for receiving successive groups from said outlets so that the groups received in said receptacle form an array of superimposed rows, said outlets and said receptacle being so arranged that the outlets deposit said row of articles directly into the receptacle at the level which the row is to occupy.

2. Apparatus as defined in claim 1, wherein said feed includes at least one article producing machine and at least one distributor unit which transfers articles from said machine to the inlets of said tubes.

3. Apparatus as defined in claim 2, wherein said distributor unit comprises a rotary drum arranged to receive articles from said producing machine and means for transferring articles from said drum into said feeding intake.

4. Apparatus as defined in claim 3, wherein said drum is provided with peripheral article-receiving flutes.

5. Apparatus as defined in claim 3, further comprising means for braking the articles during transfer from said producing machine onto said drum.

6. Apparatus as defined in claim 5, wherein said braking means comprises combined suction and air pressure generator means.
7. Apparatus as defined in claim 3, wherein the means for transferring articles from said rotary drum to said inlets comprises a stationary transfer drum having flutes registering with said inlets.

8. Apparatus as defined in claim 1, wherein said feed comprises collector means having a row of coplanar article receiving flutes each of which registers with one of said inlets.

9. Apparatus as defined in claim 8, wherein said feed further comprises a supply conveyor for delivering articles sideways to the flutes of said collector means.

10. Apparatus as defined in claim 8, wherein said collector means comprises a suction head.

11. Apparatus as defined in claim 10, wherein said feed further comprises transfer means for moving articles lengthwise from said flutes into the respective inlets.

12. Apparatus as defined in claim 1, further comprising means for admitting jets of air to said inlets to transport the articles through said tubes, and valve means for controlling the admission of air to said inlets.

13. Apparatus as defined in claim 1, wherein said feed comprises at least one article producing machine, a distributor pipe communicating with said inlets and arranged to receive successive articles from said producing machine, and switching devices for distributing articles from said pipe to said inlets.

14. Apparatus as defined in claim 13, wherein the operation of said switching devices is based on the Coanda effect.

15. Apparatus as defined in claim 1, wherein said feed comprises a plurality of article producing machines each arranged to supply articles directly to one of said inlets.

16. Apparatus as defined in claim 1, wherein said receptacle is a magazine.

17. Apparatus as defined in claim 1, wherein said receptacle is a tray.

18. Apparatus as defined in claim 1, further comprising control means for effecting relative movement between said outlets and said receptacle.

19. Apparatus as defined in claim 1, wherein at least a portion of each tube consists of flexible material.

20. Apparatus for assembling cigarettes or other rod shaped articles into arrays which are thereupon dispersed during further processing, comprising a plurality of elongated pneumatic tubes each having an article receiving inlet and an article discharging outlet, said outlets being so positioned with reference to each other that articles issuing therefrom form a group wherein the articles are in a predetermined spatial relationship relative to each other; a feed for supplying articles to said inlets; a receptacle for receiving successive groups from said outlets so that the groups received in said receptacle form an array; and control means for effecting relative movement between said outlets and said receptacle, comprising means for moving the outlets up and down with reference to the receptacle.

21. Apparatus as defined in claim 20, further comprising means for withdrawing articles from said receptacle, said control means comprising means for changing the position of said outlets in dependency on the level of articles in said receptacle.

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U.S. Cl. X.R.

53—236; 131—25; 302—2