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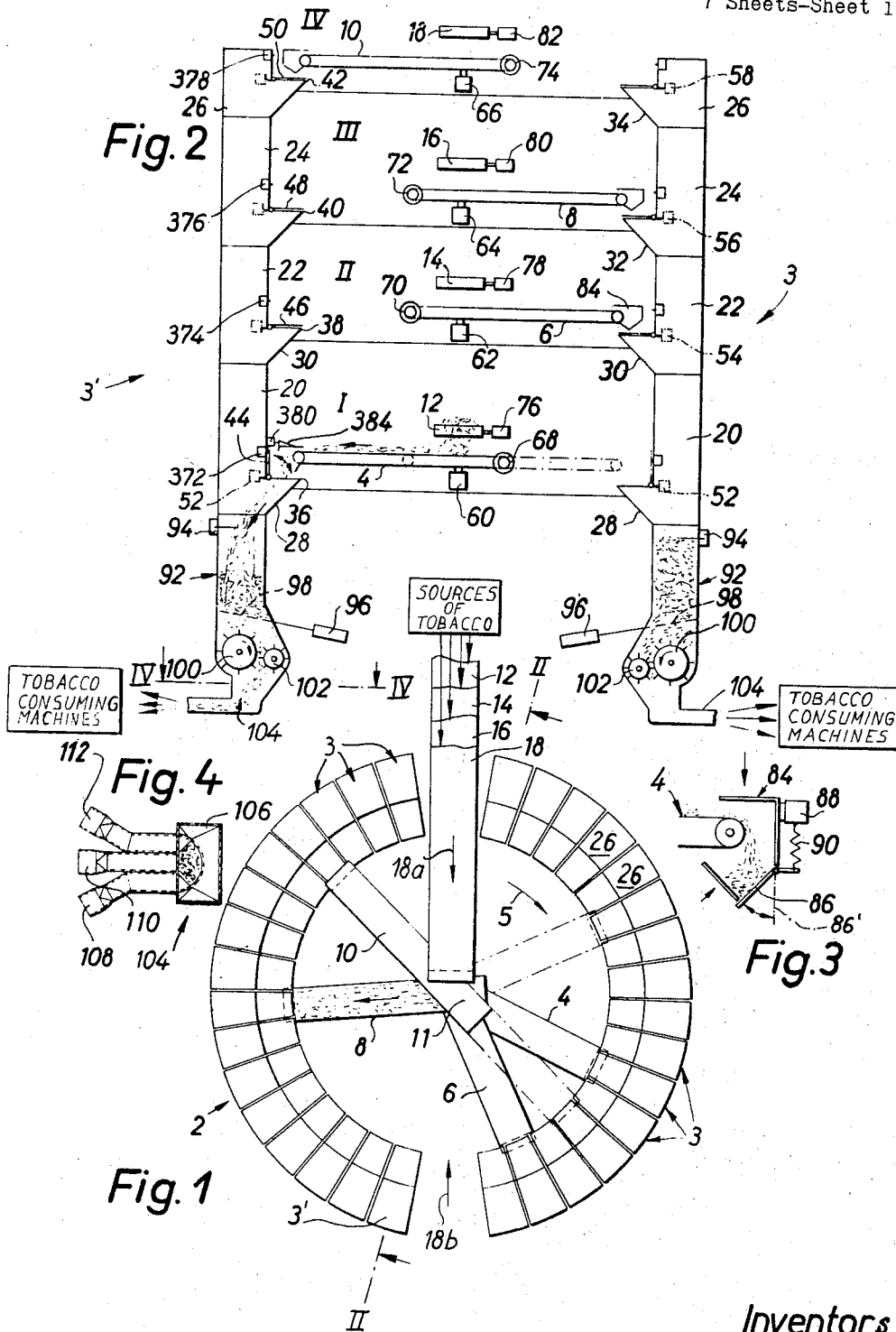
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METHOD AND APPARATUS FOR FEEDING TOBACCO

Filed July 12, 1965

7 Sheets-Sheet 1



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METHOD AND APPARATUS FOR FEEDING TOBACCO

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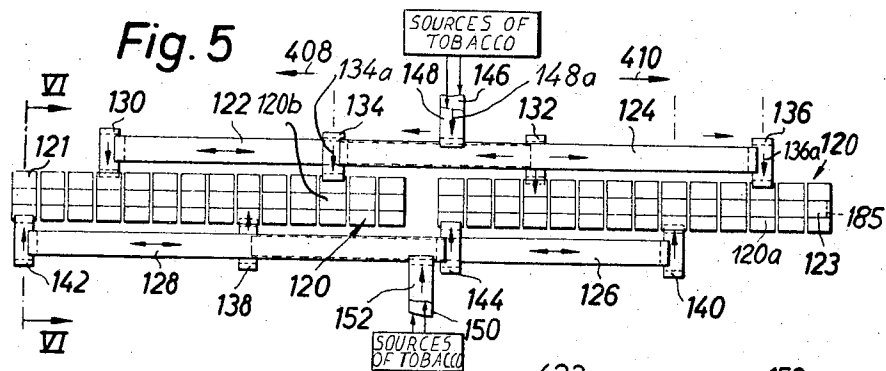


Fig. 17

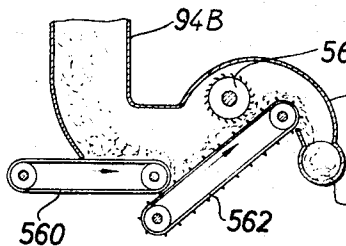


Fig. 7

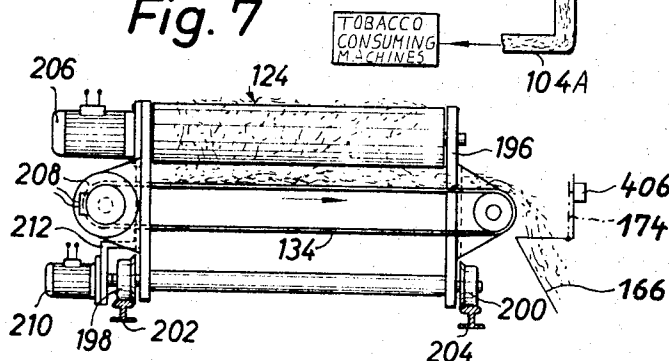
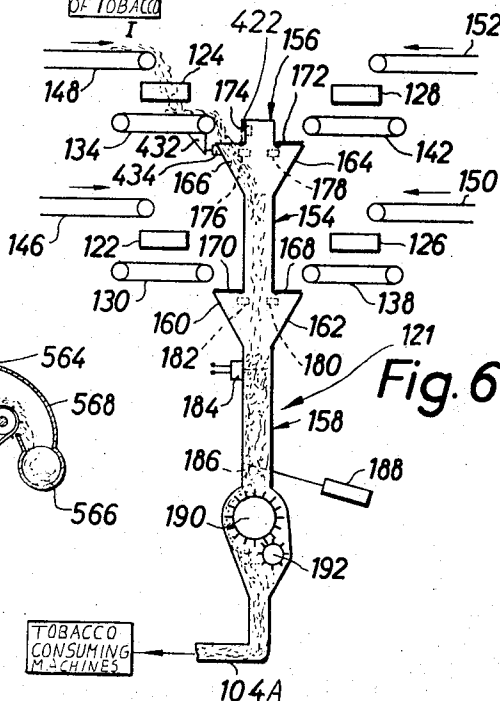


Fig. 6



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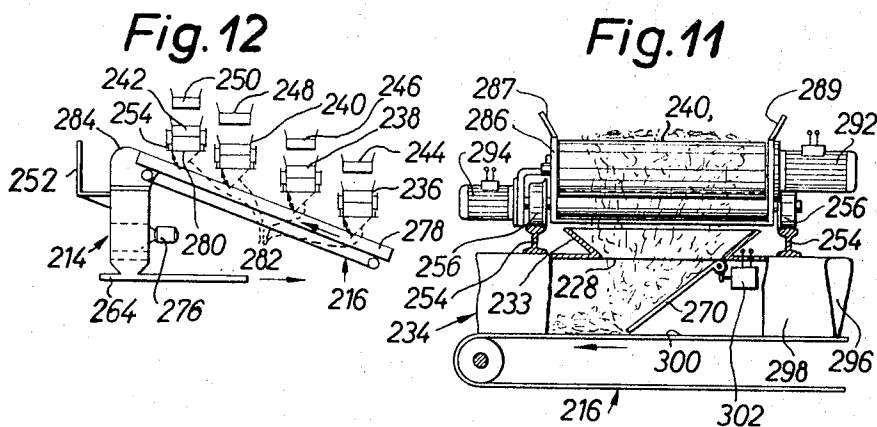
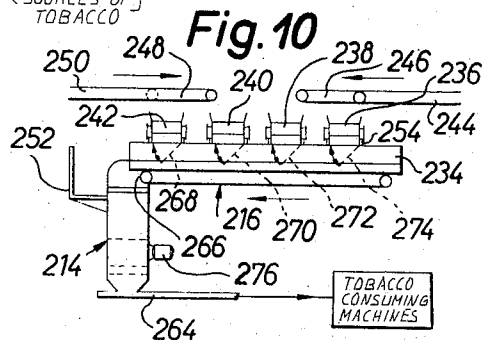
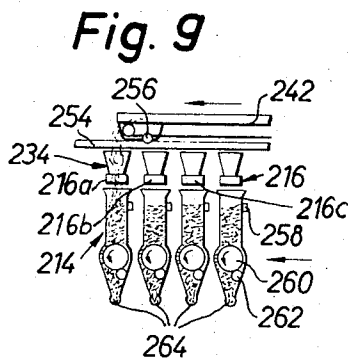
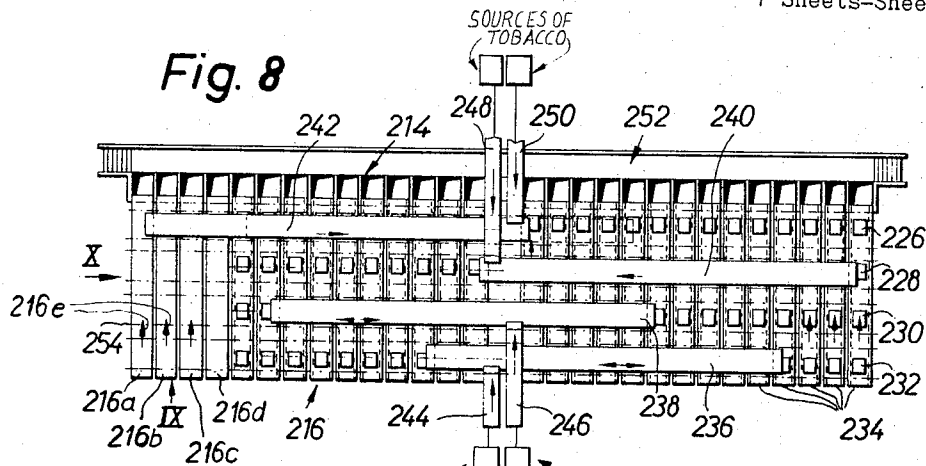
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METHOD AND APPARATUS FOR FEEDING TOBACCO

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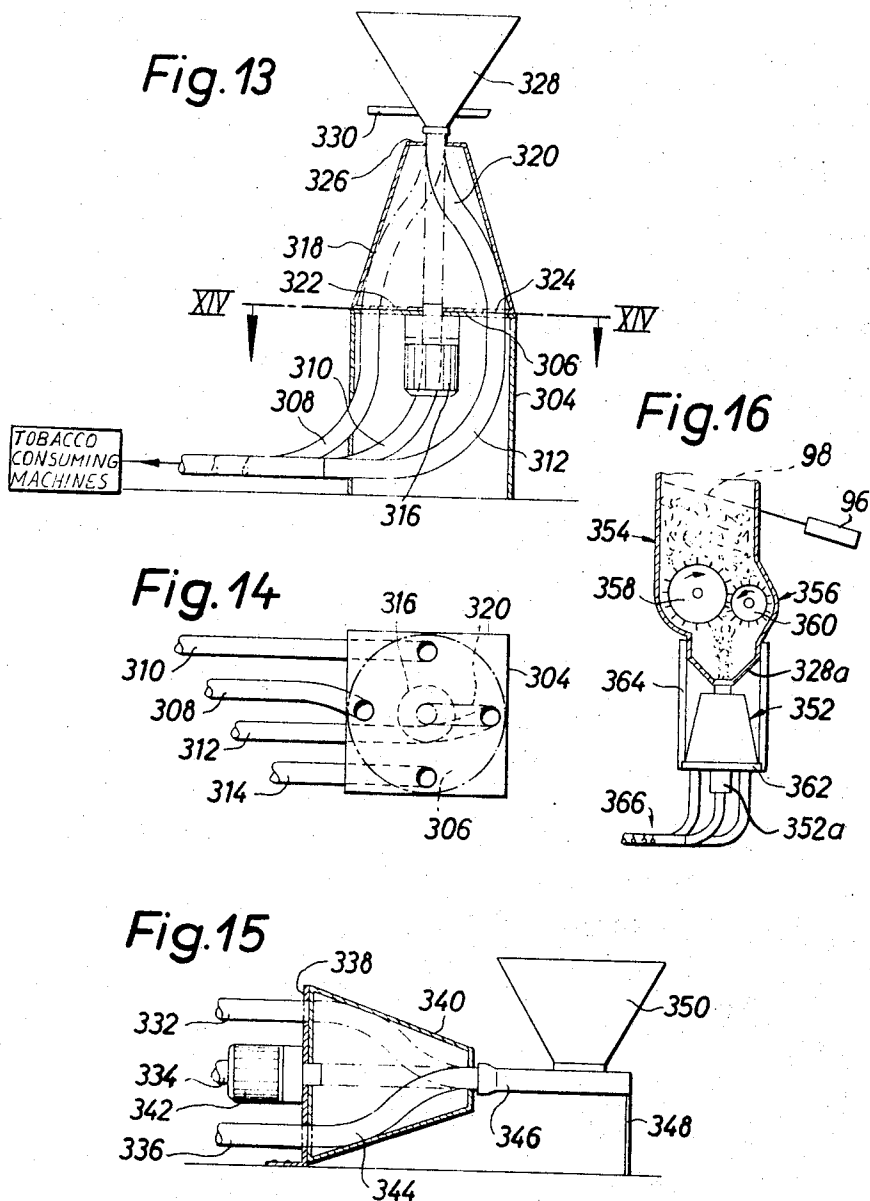
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METHOD AND APPARATUS FOR FEEDING TOBACCO

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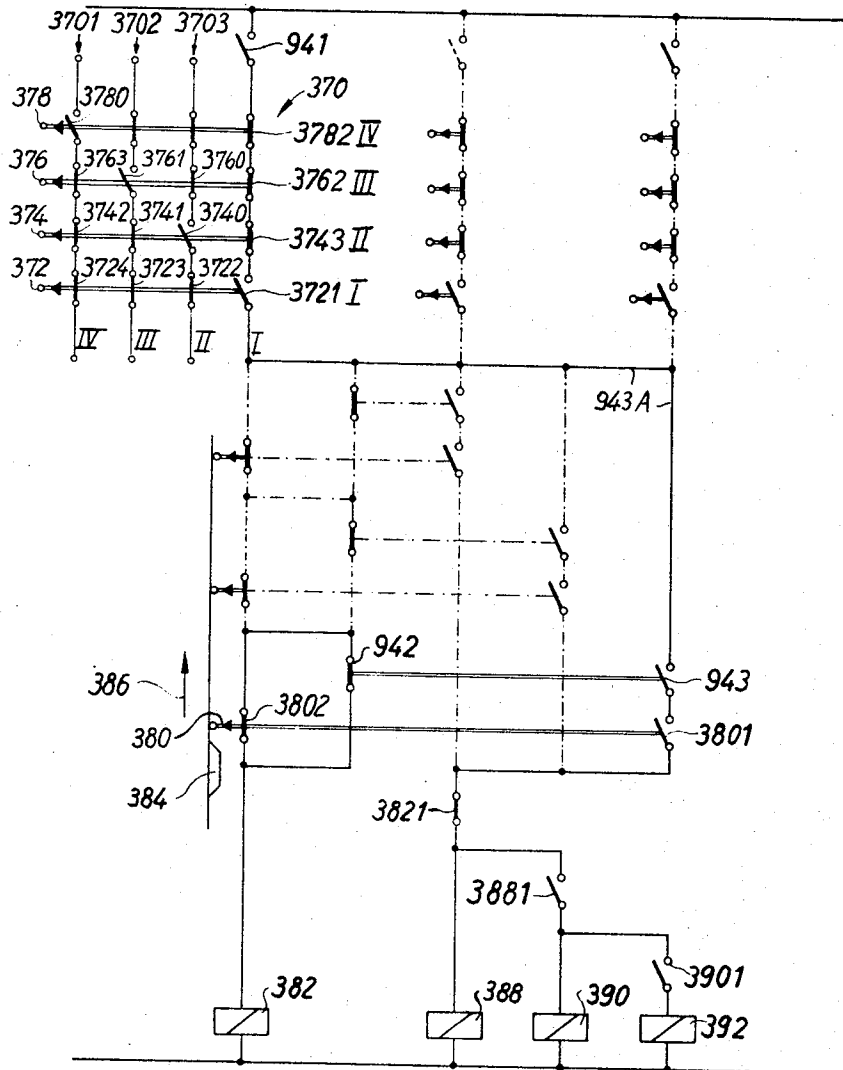
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Fig. 18



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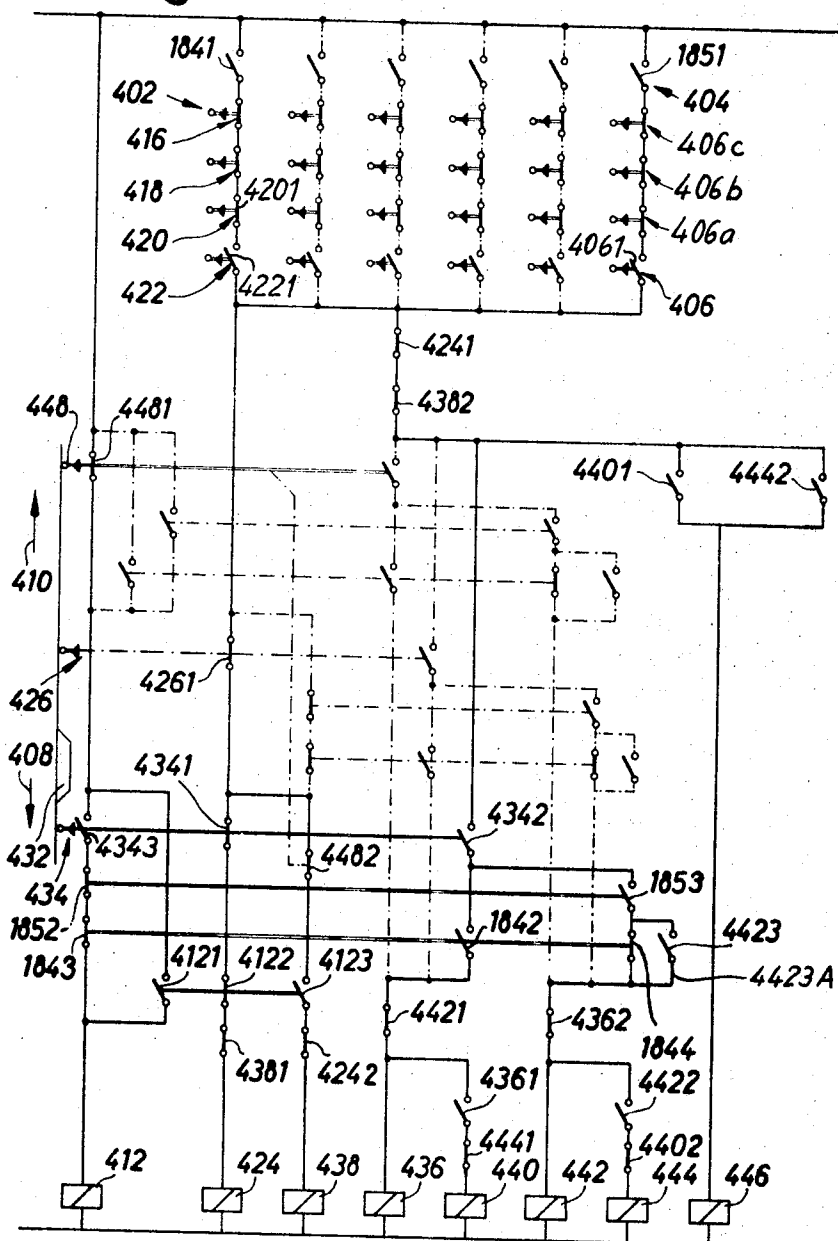
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Fig. 19



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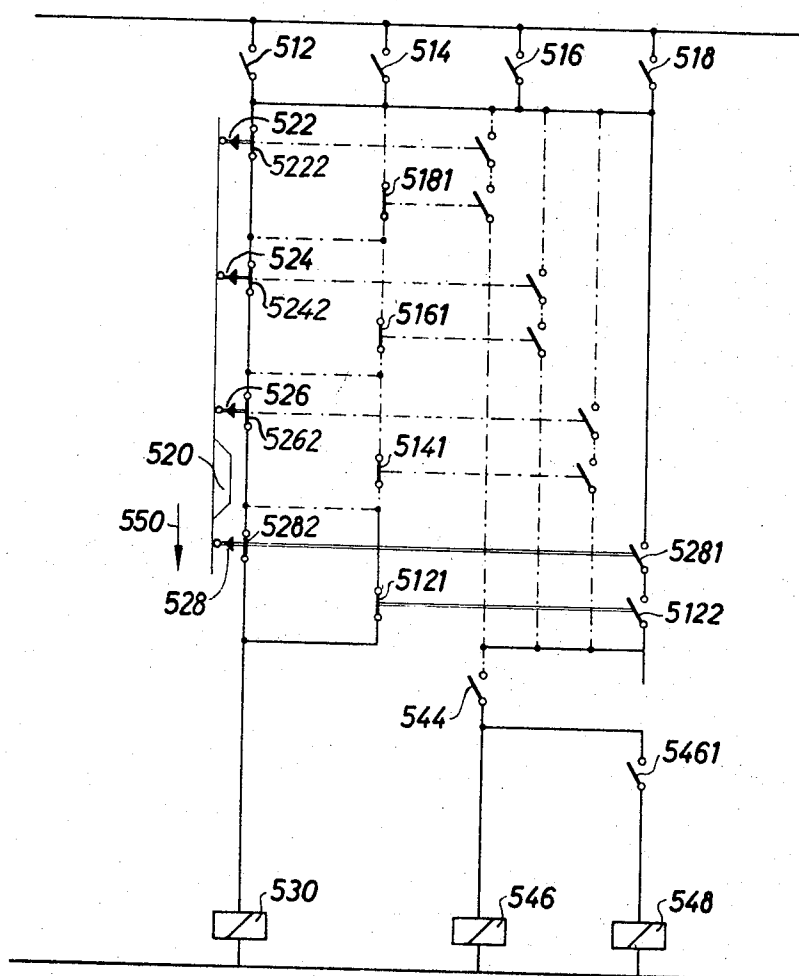
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Fig. 20



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METHOD AND APPARATUS FOR FEEDING TOBACCO

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54 Claims. (Cl. 214—16)

ABSTRACT OF THE DISCLOSURE

Each of a series of magazines in a tobacco feeding apparatus can receive tobacco from each of two or more transfer conveyors, and each such transfer conveyor receives a different type of tobacco from a separate supply conveyor which withdraws tobacco from one of several sources. Each magazine can supply tobacco to one or more consuming machines and each transfer conveyor can deliver fresh tobacco to a magazine regardless of whether or not the magazine discharges tobacco. A supply of fresh tobacco is held in reserve on the supply and transfer conveyors to be ready for delivery into magazines without delay.

The present invention relates to a method and apparatus for feeding tobacco to one or more batteries or groups of cigarette rod formers or other types of tobacco consuming or processing machines. More particularly, the invention relates to improvements in a method and apparatus for feeding two or more different types or brands of shredded or otherwise comminuted tobacco particles to a large number of tobacco consuming machines.

It is an important object of the present invention to provide a method of feeding tobacco to each of a large number of consuming machines in such a way that the delivery of tobacco to such machines will take place with a minimum of delay, without uncontrolled escape of tobacco particles, in a small area, and in any desired sequence.

Another object of the invention is to provide a method of the just outlined characteristics according to which two or more different brands of tobacco leaves or comminuted tobacco particles may be furnished to different consuming stations in a simultaneous operation or consecutively, depending on the momentary needs of machines which are accommodated at such stations.

A further object of the instant invention is to provide a method of delivering accurately measured batches of tobacco particles to tobacco consuming machines in such a way that portions of a supply of tobacco delivered to and built up at a single distributing station may be fed on two or more consuming machines.

An additional object of our invention is to provide a method of the above outlined characteristics according to which any surplus of a given tobacco brand need not be returned to the source of such tobacco in the event that the quantity which has been withdrawn exceeds the momentary needs of a given group of consuming machines.

Still another object of the invention is to provide a method according to which two or more tobacco types or brands may be blended or mixed, in a controlled manner, on their way to the consuming machines.

Another object of the invention is to provide a method according to which a small number of tobacco supplying and transferring instrumentalities will suffice to feed two or more types of comminuted tobacco particles to an exceptionally large number of consuming machines, and ac-

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cording to which each individual consuming machine may receive any of several types of tobacco particles.

A further object of the invention is to provide a method of the just outlined characteristics according to which each individual consuming machine may receive a first type of tobacco and thereupon a second or third type of tobacco with a minimum of delay and without any danger of uncontrolled mixing of tobacco brands.

An additional object of the invention is to provide a process according to which the number of tobacco consuming machines which receive different types of tobacco particles may exceed many times the number of different tobacco brands and wherein various types of tobacco need not cover distances of different length in order to reach a given consuming machine.

A concomitant object of the invention is to provide a novel tobacco feeding apparatus which may be utilized in practicing the above method and to construct and assemble the apparatus in such a way that its components will occupy a space which happens to be available in a cigarette manufacturing plant or in another tobacco processing establishment.

A further object of the invention is to provide a tobacco feeding apparatus which is particularly suited for use in tobacco processing plants wherein two or more groups of tobacco consuming machines utilize the same type of tobacco and wherein additional groups of such machines utilize at least one other type of tobacco.

Another object of our invention is to provide a tobacco feeding apparatus wherein a supply of each tobacco brand is always kept ready for immediate delivery to one or more consuming machines and wherein two or more different types of comminuted tobacco particles may be fed in a simultaneous operation, in rapid sequence, at regular intervals, at irregular intervals, in a fully automatic way, or in a semiautomatic way.

A further object of the present invention is to provide a tobacco feeding apparatus which can deliver a first quantity of one tobacco brand and a different quantity of each other tobacco brand, and wherein the likelihood of uncontrolled mixing of different tobacco brands is practically impossible even though, and if the need arises, the apparatus may be operated in such a way that the consuming machines receive a blend or two or more tobacco types.

Still another object of the invention is to provide a tobacco feeding apparatus of the above outlined characteristics wherein the number of tobacco consuming machines may be a whole multiple of and may exceed many times (for example, ten, twenty or more times) the total number of conveyors which are needed to deliver various tobacco brands from the respective sources and on to the distributing devices which actually effect rationing of such tobacco for delivery to the individual consuming machines.

Another object of the invention is to provide a novel distributor which may be utilized in an apparatus of the above outlined characteristics and to construct the distributor in such a way that it automatically delivers a requisite quantity of tobacco to the magazine or hopper of that consuming machine which has sent a signal or which has been selected by the personnel to receive a fresh supply of tobacco particles.

Briefly stated, one feature of our invention resides in the provision of a method of feeding different types or brands of tobacco particles to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines. In its simplest form, the method of our invention comprises the steps of withdrawing tobacco from each of a plurality of sources of different tobacco brands and building up intermediate supplies or stores of such tobacco, and de-

livering tobacco from such built-up supplies to the stations according to the needs of the machines at such stations so that each supply can be replenished while a portion thereof is being fed on to one or more consuming machines.

In accordance with another feature of our invention, two or more supplies may be replenished in a simultaneous operation and one or more portions of each built-up supply may be fed to two or more grouped consuming machines in a simultaneous step. At this time, we prefer to feed tobacco from such built-up supplies by means of pneumatic conveyors which are operated in a given sequence or randomly, depending on the needs of the respective consuming machines.

In accordance with a further feature of our invention, the delivery of tobacco from the respective sources to the built-up supplies may take place at different levels and, in order to insure that each supply is replenished without undue delay or without any delay, a batch of tobacco particles may be held ready between the sources and the respective supplies for immediate delivery to the supplies as soon as the need arises, i.e., as soon as the quantity of tobacco in any given supply has been reduced to a certain minimum quantity. The delivery of tobacco from the various sources to the respective supplies may take place in automatic response to withdrawal of tobacco from such supplies for delivery to the associated consuming machines, or at regular intervals.

In accordance with a more specific but highly advantageous feature of our method, the path in which the tobacco particles are conveyed from the sources to the corresponding supplies may remain at least partially filled with tobacco to make sure that the replenishing of each supply will take place without delay as soon as the conveying instrumentalities which take care of delivery from the sources to the respective supplies are set in motion. Each individual source may feed tobacco to two or more supplies or stores so that the number of such supplies is a multiple of the number of sources, and the number of consuming machines may be a multiple of the total number of supplies.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved tobacco feeding 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 drawings, in which:

FIG. 1 is a diagrammatic top plan view of a tobacco feeding apparatus which is constructed and assembled in accordance with a first embodiment of our invention and wherein the conveyors which transfer tobacco to various supplies or stores are rotatable about a common vertical axis;

FIG. 2 is a central vertical section substantially as seen in the direction of arrows from the line II—II of FIG. 1;

FIG. 3 is an enlarged fragmentary side elevational view of the discharge end of a transfer conveyor, further showing a collecting receptacle which receives tobacco from the transfer conveyor;

FIG. 4 is a horizontal section substantially as seen in the direction of arrows from the line IV—IV of FIG. 2 and illustrates certain details of a distributor which may be used in the apparatus of FIGS. 1 and 2;

FIG. 5 is a diagrammatic top plan view of a second tobacco feeding apparatus wherein the transfer conveyors are reciprocable in the longitudinal direction of two rows of magazines which accommodate supplies of various tobacco brands;

FIG. 6 is an enlarged transverse vertical section substantially as seen in the direction of arrows from the line VI—VI of FIG. 5;

FIG. 7 is an enlarged end elevational view of a transfer conveyor which is utilized in the apparatus of FIG. 5;

FIG. 8 is a diagrammatic top plan view of a third tobacco feeding apparatus wherein the transfer conveyors are reciprocable with reference to a group of parallel auxiliary conveyors;

FIG. 9 is a fragmentary front elevational view of the third apparatus substantially as seen in the direction of the arrow IX in FIG. 8 and with the magazines illustrated in vertical section;

FIG. 10 is an end elevational view of the third apparatus substantially as seen in the direction of the arrow X in FIG. 8;

FIG. 11 is an enlarged end elevational view of a transfer conveyor which forms part of the apparatus shown in FIG. 8, certain parts being shown in vertical section;

FIG. 12 is an end elevational view of a fourth tobacco feeding apparatus which constitutes a slight modification of the apparatus shown in FIG. 8 and wherein the transfer conveyors are disposed at different levels;

FIG. 13 is a partly elevational and partly vertical sectional view of a modified distributor with a rotary manifold pipe which may be used in the apparatus of FIGS. 1, 4, 8 and 12 and which is arranged to feed tobacco to a group of four consuming machines;

FIG. 14 is a horizontal section as seen in the direction of arrows from the line XIV—XIV of FIG. 13;

FIG. 15 is a partly elevational and partly vertical sectional view of a distributor which constitutes a slight modification of the distributor shown in FIGS. 13 and 14;

FIG. 16 is a partly elevational and partly vertical sectional view of a distributor which also constitutes a modification of the distributor shown in FIGS. 13 and 14;

FIG. 17 is a vertical sectional view of a further distributor;

FIG. 18 is a diagram of the control circuit for a portion of the tobacco feeding apparatus shown in FIGS. 1 and 2;

FIG. 19 is a diagram of a portion of the control circuit for the tobacco feeding apparatus of FIG. 5; and,

FIG. 20 is a diagram of a control circuit for the distributor of FIGS. 13 and 14.

Referring first to FIGS. 1 and 2, there is shown an apparatus which is utilized for feeding comminuted tobacco particles to a plurality of receiving stations. This apparatus comprises an annulus 2 of receiving stations each of which accommodates a stack or column 3 of four superimposed ducts 20, 22, 24 and 26. The lowermost duct 20 of each column 3 is located above a magazine 92. In the illustrated embodiment, the annulus 2 comprises a total of thirty-two columns, i.e., thirty-two magazines 92 and an equal number of ducts 20, 22, 24 and 26.

The apparatus further comprises a plurality of supply conveyors including the conveyors 12, 14, 16 and 18 which are located at different levels I, II, III and IV and comprise endless belts trained around suitable rollers (not shown). The discharge end of each supply conveyor is located in the center 11 of the annulus 2 formed by the columns 3, and the arrow 18a indicates in FIG. 1 the direction in which the upper stringers of the belts forming part of the supply conveyors 12, 14, 16 and 18 advance to feed different types of tobacco particles to the first transfer station which, as mentioned above, is located in the center 11 of the annulus 2 formed by the columns 3.

Each supply conveyor cooperates with a transfer conveyor so that, and since the apparatus is shown as comprising a total of four supply conveyors 12, 14, 16 and 18, it also comprises the same number of transfer conveyors which are indicated at 4, 6, 8 and 10. FIG. 2 shows that the receiving end of the lowermost transfer conveyor 4 is located below the discharge end of the corresponding lowermost supply conveyor 12. The receiving end of the next lowermost transfer conveyor 6 is located below the discharge end of the corresponding supply conveyor 14, the transfer conveyor 8 receives tobacco from the supply

conveyor 16, and the uppermost transfer conveyor 10 receives tobacco from the uppermost supply conveyor 18.

The transfer conveyors are free to revolve about the center 11 of the annulus 2 formed by the columns 3 so that their outer (discharge) ends travel along consecutive columns 3 and may be brought to a halt in any of thirty-two angular positions in each of which they are ready to deliver tobacco to one of the columns 3, namely, to one of the ducts 20, 22, 24, 26 forming part of a selected column 3. The arrow 5 indicates in FIG. 1 the direction in which the transfer conveyors 4, 6, 8 and 10 may rotate to advance their discharge ends along the inner sides of the columns 3. Each transfer conveyor is disposed at such a level that its discharge end may deliver tobacco to one of the four ducts 20, 22, 24 or 26 of any given column 3. Thus, and as shown in FIG. 2, the lowermost transfer conveyor 4 will deliver tobacco to the lowermost ducts 20, the transfer conveyor 6 will deliver tobacco to the ducts 22, and the transfer conveyors 8, 10 respectively deliver tobacco to ducts 24 and 26.

It is clear that the number of supply conveyors and transfer conveyors may be more or less than four, depending on the number of ducts in each of the columns 3 and also depending on the number of different tobacco types which are to be fed to a series of cigarette machines or other tobacco consuming or processing apparatus. The angular positions of the transfer conveyors 4, 6, 8 and 10 shown in FIG. 1 were selected solely for the purposes of illustration and are not indicative of a specific relationship of such transfer conveyors with reference to each other.

FIG. 2 shows that each of the ducts 20, 22, 24, 26 respectively comprises an inlet 28, 30, 32, 34 which is normally closed by a hinged cover or lid 44, 46, 48, 50. The means for opening the covers 44, 46, 48, 50 comprises normally deenergized electromagnets 52, 54, 56, 58 which, when energized, cause the respective covers to swing upwardly and to assume open positions in which the upper ends 36, 38, 40, 42 of the corresponding inlets are exposed and may receive tobacco supplied by the transfer conveyors 4, 6, 8 and 10. The left-hand cover 44 shown in FIG. 2 is held in open position, its electromagnet 52 having been energized due to the fact that the transfer conveyor 4 is in the process of supplying tobacco through the upper end 36 of the corresponding inlet 28 and into the left-hand duct 20.

The means for rotating the transfer conveyors in a clockwise direction, as viewed in FIG. 1 (arrow 5), comprises four drives 60, 62, 64 and 66 which may comprise electric motors or transmissions capable of rotating the respective transfer conveyors through a desired angle and into registry with the inlets 28, 30, 32 or 34. In addition, the transfer conveyors 4, 6, 8, 10 respectively comprise second drives 68, 70, 72, 74 which serve to advance their endless belts in directions to deliver tobacco received from the supply conveyors 12, 14, 16, 18 radially outwardly and toward the momentarily aligned inlets 28, 30, 32 or 34. The endless belts of the supply conveyors 12, 14, 16 and 18 are respectively advanced by drives 76, 78, 80 and 82 shown in FIG. 2.

In accordance with a more specific feature of our invention, the transfer conveyors 4, 6, 8 and 10 need not discharge directly into the inlets 28, 30, 32 and 34. FIG. 3 shows a collecting receptacle 84 which is mounted at the discharge end of the transfer conveyor 4 and comprises an openable bottom portion in the form of a swingable gate 86. This gate 86 is normally held in closed position by a strong return spring 90 but may be swung open by the armature of an electromagnet 88 which is strong enough to overcome the bias of the spring 90 and to swing the gate 86 to the open position 86' indicated in FIG. 3 by phantom lines. Thus, the batch of tobacco particles which is delivered by the upper stringer of the endless belt forming part of the transfer conveyor 4 will be discharged into the receptacle 84 which opens in response to short-lasting energization of the electromagnet 88 and

dumps its contents into one of the inlets 28. The discharge ends of the other three transfer conveyors 6, 8 and 10 are provided with similar receptacles 84.

Each magazine 92 resembles a hollow upright tubular body the upper part of which accommodates a sensing element 94 serving to produce impulses when the supply of tobacco in the respective magazine drops below a predetermined lower level or rises to or above a predetermined upper level. Each magazine 92 further contains a fork-shaped gate 98 which may be actuated by the armature of an electromagnet 96 and which is located at a level below the respective sensing element 94. The lower zone of each magazine 92 is enlarged to accommodate a distributor including a carded roller or drum 100 and a rapidly revolving picker roller or drum 102. The drums 100 and 102 cooperate to feed a shower of tobacco particles into an outlet 104 which, as shown in FIG. 4, may comprise a hopper 106 discharging into three pneumatic conveying conduits 108, 110, 112 each leading to the hopper of a separate cigarette machine or another tobacco consuming or processing apparatus. In other words, the apparatus shown in FIGS. 1 to 4 may supply tobacco to a total of ninety-six cigarette machines provided, of course, that the magazine 92 of each column 3 supplies tobacco to three pneumatic conduits 108, 110, 112.

Referring again to FIG. 1, it will be readily understood that all of the supply conveyors need not be directly superimposed above each other as actually shown in the drawings. For example, one, two or three of the conveyors 12, 14, 16 and 18 may extend in the direction indicated by the arrow 18b or, alternatively, the annulus 2 may be provided with more than two gaps so that each of the supply conveyors 12, 14, 16, 18 may be disposed in a different vertical plane which passes through the center 11.

The supply conveyors 12, 14, 16, 18 and the transfer conveyors 4, 6, 8, 10 are never empty if the apparatus is to deliver tobacco on short notice. Thus, the upper stringer of each of these conveyors preferably supports a supply of tobacco so that the delivery of tobacco to a selected duct may begin immediately after the discharge end of a transfer conveyor has been moved into accurate registry with the selected duct. Once the selected duct receives a requisite quantity of tobacco particles, the transfer conveyor is brought to a halt simultaneously with the corresponding supply conveyor so that each of these conveyors carries a supply of tobacco which extends along its upper stringer. Consequently, such conveyors are immediately ready to supply tobacco into another duct as soon as the transfer conveyor completes its angular movement (arrow 5) to move its discharge end into alignment with the newly selected duct. This is of advantage because the delivery of tobacco into a selected duct can begin with a minimum of delay, i.e., only with a delay which is needed to move the transfer conveyor into registry with the inlet of that duct whose sensing element 94 sends a signal that the corresponding magazine 92 requires a fresh supply of tobacco.

FIG. 18 illustrates a portion of the electric control circuit for the apparatus of FIGS. 1 to 4. This illustration shows by full lines only that part of the circuit which is used to control the delivery of tobacco to and from a single column 3, namely, to the column 3' which is shown in section in the left-hand part of FIG. 2 (see the lower part of the section line II—II of FIG. 1). Certain other parts of the electric control circuit are shown by phantom lines and they indicate control elements which are used to regulate the delivery and discharge of tobacco from the remaining columns 3.

The numeral 370 denotes a series or chain of switch contacts which are selectively opened or closed, depending upon whether the transfer conveyors 4, 6, 8, 10 should deliver tobacco to the duct 20, 22, 24 or 26 of the column 3'. The four limit switches 372, 374, 376 and 378 are respectively actuated by the covers 44, 46, 48 and 50 of the ducts 20, 22, 24 and 26 forming part of the column 3'.

The delivery of tobacco to one of the ducts 20, 22, 24, 26 is started by opening one of the covers 44, 46, 48, 50, depending upon whether the magazine 92 of the column 3' is to receive a first type I of tobacco (supply conveyor 12), a second type II of tobacco (supply conveyor 14), a third type III of tobacco (supply conveyor 16), or a fourth type IV of tobacco (supply conveyor 18).

Each of the limit switches 372, 374, 376, 378 comprises four serially arranged movable contacts which are disposed in four chains or series 370, 3701, 3702, 3703. The chain 370 comprises the contacts 3721, 3743, 3762 and 3782 which respectively belong to the limit switches 372, 374, 376 and 378. The contact 3721 of the limit switch 372 is open when the cover 44 is closed but this contact 3721 will close in response to opening of the cover 44. The contact 3743 is closed when the cover 46 is closed but will open in response to opening of the cover 46. In other words, the chain 370 will allow a current to flow therethrough when the covers 46, 48, 50 are closed but the cover 44 is open which means that the lowermost duct 20 of the column 3' is ready to receive tobacco from the lowermost transfer conveyor 4.

The contacts 3722, 3723, and 3724 of the limit switch 372 will open when the cover 44 is moved to open position. This is a safety measure to insure that the ducts 22, 24 and 26 cannot receive tobacco when the cover 44 of the lower duct 20 is open. The chains 3701, 3702, 3703 shown in FIG. 18 respectively serve to control the delivery of tobacco to the ducts 26, 24, 22 and it will be seen that the continuity of the chain 370 is broken to prevent the flow of current (and hence the delivery of tobacco to the lower duct 20) when the limit switch 374, 376 or 378 is actuated to respectively complete the chain 3703, 3702 or 3701.

It is to be understood that the control circuit shown in FIG. 18 by solid lines regulates only the admission of tobacco to the ducts 20, 24, 26, 28 of the column 3' and that a similar control circuit is provided for each other column 3. Certain parts of such additional circuitry are shown in FIG. 18 by phantom lines. In fact, the structure shown in FIG. 18 by solid lines is sufficient only to control admission of tobacco to the lowermost duct 20 of the column 3'.

At least one contact of each limit switch (372, 374, 376, 378) remains open at all times, and when only one contact of a limit switch is closed, the corresponding cover 44, 46, 48 or 50 has been moved to open position. The remaining three contacts of such limit switch then prevent delivery of tobacco to the other three ducts. FIG. 18 illustrates the control circuit in such condition in which all four covers (44, 46, 48, 50) of the column 3' are closed. This means that only one contact (3721, 3740, 3761, 3780) of each limit switch (372, 374, 376, 378) remains open. On shifting of the limit switch 372 to the other end position, the contact 3721 closes but the contacts 3722, 3723 and 3724 open to prevent the flow of current through the chains 3701, 3702, 3703 simultaneously with completion of chain 370 by the contact 3721. Should an operator accidentally shift the limit switch 374, 376 or 378 from the position shown in FIG. 18 at the time the contact 3721 of the limit switch 372 is closed, all of the chains 370, 3701, 3702 and 3703 would be interrupted with the result that neither of the four ducts 20, 22, 24, 26 in the column 3' would receive tobacco. In other words, simultaneously delivery of two types of tobacco into the same column is impossible, and simultaneous opening of two covers will automatically result in blocking of delivery to any one of the four ducts. When the switch 374 is shifted to the other end position, its contacts 3741, 3742, 3743 will open but the contact 3740 closes to complete the chain 3703 so that the duct 22 of the column 3' may receive tobacco of the type II because only the cover 46 has been moved to open position. Analogously, when the limit switch 376 is shifted to the other end position, the contact 3761

closes but the contacts 3760, 3762, 3763 open to insure that only the duct 24 can receive tobacco of the type III while the covers 44, 46 and 50 remain in closed position.

It is now assumed that the magazine 92 of the column 3' should receive tobacco particles of the type I, namely, tobacco which must be delivered by the conveyors 12 and 4. The electromagnet 52 is energized to open the cover 44 whereby the latter shifts the limit switch 372 in a direction to the right, as viewed in FIG. 18, so as to close the contact 3721 and to complete the chain 370. The ducts 20, 22, 24, 26 of the column 3' respectively carry second limit switches 380 (hereinafter called end switches) which are actuated by the respective transfer conveyors. Thus, the end switch 380 of the lowermost duct 20 in the column 3' will be actuated by the transfer conveyor 4 when the latter has been caused to rotate in the direction indicated by the arrow 5 (FIG. 1) and through such an angle that its discharge end registers with the exposed end 36 of the inlet 28 of the duct 20.

When the supply of tobacco in the magazine 92 of the column 3' descends to a predetermined lower level, the sensing element 94 changes its position and closes its normally open master contact 941 which is connected in series with the chain 370 (see FIG. 18). This completes the circuit of a first relay 382 to start the motor of the drive 60 which rotates the lowermost transfer conveyor 4 about the center 11 so that the latter begins to turn and ultimately engages the end switch 380 on the lowermost duct 20 of the column 3'. Of course, the motor of the drive 60 need not be set in operation if the discharge end of the transfer conveyor 4 happens to be aligned with the inlet 28 of the duct 20. The arrow 386 of FIG. 18 corresponds to the arrow 5 of FIG. 1 and indicates the direction in which the transfer conveyor 4 rotates toward the position of registry with the duct 20. This conveyor 4 carries a cam or trip 384 which engages the end switch 380 and opens a contact 3802 which means that the circuit of the relay 382 is open and the transfer conveyor 4 comes to a halt in an optimum position for delivery of tobacco to the duct 20. The opening of the contact 3802 takes place simultaneously with closing of a second contact 3801 of the end switch 380 and follows the closing of a contact 943 and opening of a contact 942, these latter two contacts forming part of the sensing element 94. The contacts 943, 3801 now complete a bypass circuit (see the conductor 943A) to energize a second relay 388. The contact 942 is opened in response to movement of the sensing element 94 in the magazine 92, and its opening results in automatic closing of the contact 943. The contact 3821 of the relay 382 is closed when the latter is deenergized so that the circuit of the relay 388 can be completed only when the circuit of the relay 382 is open. The relay 388 energizes shortly the electromagnet 88 (see FIG. 3) for the gate 86 of the receptacle 84 at the discharge end of the transfer conveyor 4 whereby the gate 86 rapidly swings to and back from the open position 86' to discharge a batch of tobacco particles through the exposed upper end 36 of the inlet 28 and into the duct 20 of the column 3'. The relay 388 also closes its contact 3881 to complete the circuit of a third relay 390 which starts the belt drive 68 of the transfer conveyor 4. The contact 3901 closes on energization of the relay 390 to energize a fourth relay 392 which starts the drive 76 for the supply conveyor 12. Thus, the supply conveyor 12 delivers tobacco to the transfer conveyor 4 and the latter delivers a fresh batch of tobacco into the respective receptacle 84 so that the latter is refilled and is ready to dump such freshly received batch in response to next-following energization of the electromagnet 88. The gate 86 is closed because the energization of electromagnet 88 is short-lasting and is just sufficient to insure full evacuation of a batch in response to movement of the gate 86 to the phantom-line position 86' of FIG. 3.

When the sensing element 94 detects that the supply of tobacco in the magazine 92 of the column 3' has risen

above the aforementioned lower limit and has reached an upper limit, the contact 941 of the sensing element 94 opens and the flow of current to the relays 390 and 392 is terminated so that the conveyors 4 and 12 are arrested.

The delivery of tobacco to the ducts 22, 24, 26 of the column 3' and to the ducts of the other columns 3 takes place in analogous fashion.

A very important advantage of the improved tobacco feeding apparatus is that the distributor of each of the magazines 92 can deliver comminuted tobacco particles to the respective consuming machines while the transfer conveyor 7, 8, 10 and/or 12 supplies fresh tobacco to any one of the magazines 92. Also, two or more magazines 92 may receive a fresh supply of tobacco in a simultaneous operation as long as such magazines do not store the same type of tobacco. Each magazine 92 can store a sufficient supply of tobacco particles to insure that, even after the sensing element 94 sends a signal indicating that the supply of tobacco in the respective magazine needs replenishing of tobacco, this same magazine can continue to feed tobacco to the associated consuming machine or machines if the delivery of fresh tobacco is delayed due to the fact that another magazine is in the process of receiving the same type of tobacco or that the transfer conveyor which must deliver such type of tobacco is about to deliver tobacco to one or more magazines whose sensing elements were actuated earlier. For example, the magazine 92 of the right-hand column 3 shown in FIG. 2 can store enough tobacco of the type I to supply the respective cigarette rod machines even if its sensing element 94 has detected that the supply of tobacco is low and even if the lowermost transfer conveyor 4 must stop at the lower ducts 20 of one or more additional columns prior to reaching the column 3 of FIG. 2. Of course, and as mentioned hereinabove, the transfer conveyors 4, 6, 8 and 10 can deliver different types of tobacco particles in a simultaneous operation and each of these transfer conveyors may deliver different quantities of tobacco at a time, depending on the setting of sensing element 94, on the capacity of the magazines 92, on the rate at which the machines which are connected to the pneumatic conduits 108, 110, 112 consume tobacco, and on certain other factors. Each magazine 92 need not have the same capacity and each magazine need not be connected with the same number of consuming machines. Also, certain consuming machines may be held idle for shorter or longer periods of time so that the corresponding magazines 92 will receive no tobacco for a full day, for a week or even longer. Thus, an important feature of our invention resides in that the various types of tobacco are always in storage in immediate proximity to the respective pneumatic conduits for instantaneous delivery to the corresponding consuming machines. In other words, even if the supply of tobacco in a magazine 92 needs replenishing, the consuming machines which depend for feed of tobacco from such magazine are not likely to run dry because the magazine can deliver tobacco even while the supply therein has been reduced to 50 percent or less of its maximum volume.

Still further, it will be readily understood that the apparatus of FIGS. 1 and 2 may be converted for feeding not only four but five, eight or more different types of tobacco particles without increasing the number of transfer conveyors and/or supply conveyors. For example, the four supply conveyors 12, 14, 16 and 18 can deliver first four types of tobacco during a first shift and thereupon second four types of tobacco during the next-following shift. Alternatively, three of the supply conveyors can deliver three different types of tobacco whereas the fourth supply conveyor delivers a fourth type of tobacco during a first shift, a fifth type of tobacco during a second shift, and so forth. It will be seen that the number of possible variations is almost inexhaustible, even if the number of transfer conveyors is reduced to three or two, and particularly if the number of such transfer conveyors is increased to five or more.

Also, the apparatus of FIGS. 1 and 2 may be used to blend two or more types of tobacco for delivery to certain magazines 92 or into each of these magazines. Such blending may be carried out in the distributors of the respective magazines or by special agitating instrumentalities which can be installed in the magazines or in the lower ducts 20. Thus, the construction of the control circuit shown in FIG. 18 can be modified with a view to allow for delivery of two or more types of tobacco into the same column 3 and in a simultaneous operation. It is also possible to leave the control circuit as it is and to feed different types of tobacco into a selected magazine 92 in a series of two or more consecutive steps. Since the transfer conveyors 4, 6, 8 and 10 are disposed at different levels, they cannot interfere with each other and each thereof can deliver the respective brand of tobacco at the same time. The overall number of columns 3 will depend solely on the dimensions of such columns, on the dimensions of the space or area which is available for the annulus 2 of FIG. 1, on the length of the transfer conveyors (i.e., on the radius of the annulus 2) and on the overall number of tobacco consuming machines.

An advantage of the receptacles 84 is that they contribute to a further reduction of the time necessary to deliver fresh tobacco to a magazine 92. This will be readily understood since each receptacle 84 keeps a batch of tobacco particles which can be dumped without any delay as soon as the respective transfer conveyor moves into registry with a selected column 3. Immediate starting of the transfer conveyors and supply conveyors following the dumping of a batch from a receptacle 84 is necessary only for the purpose of insuring that a freshly evacuated receptacle 84 is immediately refilled to be ready for delivery of tobacco to the next magazine 92 whenever necessary, i.e., as soon as the sensing element 94 of a magazine sends a signal to the corresponding part of the control circuit. The provision of receptacles 84 is of particular advantage in such apparatus wherein the magazines are relatively small or wherein the sensing elements 94 are adjusted in such a way that they send signals at the time the supply of tobacco in the respective magazines is nearly exhausted.

Of course, the feature that the upper stringers of the supply conveyors and transfer conveyors are preferably loaded with tobacco of the respective type also contributes to a reduction in the length of intervals between consecutive deliveries to various magazines 92. Thus, and if a certain type of tobacco must be delivered to two or more magazines 92 in rapid sequence, the respective receptacle 84 is refilled very rapidly because the corresponding transfer conveyor begins the delivery as soon as its belt is set in motion.

An additional feature of the apparatus shown in FIGS. 1 and 2 is that the distance between the actual source of various tobacco brands (i.e., the sources which feed tobacco to the supply conveyors 12, 14, 16 and 18) and each of the columns 3 is the same. This will be readily understood since the length of each transfer conveyor is the same (it corresponds substantially to the radius of the annulus 2) and because the length of each of the supply conveyors 12, 14, 16, 18 can be the same.

Each column 3 may be readily transformed by changing its height in response to removal or addition of one or more ducts. The ducts are preferably detachable from each other and from the magazines 92 so that the columns 3 will be assembled of prefabricated parts which are stacked in such numbers as necessary in a certain tobacco processing plant. In other words, the capacity of the improved tobacco feeding apparatus may be varied not only by inactivating one or more magazines 92 but also by changing the number of ducts in each column 3 and/or by changing the total number of transfer and supply conveyors. The apparatus is very compact because the inlets of all ducts are located in the interior of the space surrounded by the annulus 2 so that the length of the transfer conveyors can be reduced to a minimum. This also insures that each transfer conveyor supports

a relatively small quantity of exposed tobacco particles which is of importance if the surrounding air is not conditioned to prevent uncontrolled changes in moisture content or other characteristics of such tobacco. The closures for the inlets of various ducts are normally held in sealing position to prevent dust or other contaminants from entering the magazines 92 and also to prevent simultaneous delivery of two tobacco brands to the same magazine.

Referring now to FIGS. 5 and 6, there is shown a second apparatus comprising two aligned rows of columns 120 and wherein each row contains a single file of fourteen columns. Each column 120 comprises an upper duct 156, a lower duct 154 and a magazine 158 which is located below the duct 154.

Two elongated transfer conveyors 122, 124 are adjacent to one side of the double row of columns 120, and two similar transfer conveyors 126, 128 are located at the other side of the double row. Each transfer conveyor is associated with two auxiliary transfer conveyors so that the apparatus of FIGS. 5 and 6 comprises a total of eight auxiliary transfer conveyors, namely, the conveyors 130, 132 at the ends of the transfer conveyor 122, the conveyors 134, 136 at the ends of the transfer conveyor 124, the conveyors 138, 140 at the ends of the transfer conveyor 126, and the conveyors 142, 144 at the ends of the transfer conveyor 128. The transfer conveyors and the associated auxiliary transfer conveyors are bodily movable in the longitudinal direction of the double row of columns 120.

The transfer conveyors 122, 124, 126, 128 respectively receive tobacco from four supply conveyors 146, 148, 150, 152, and these supply conveyors extend at right angles to the longitudinal direction of the respective transfer conveyors, i.e., the supply conveyors are parallel with the auxiliary transfer conveyors.

The length of each transfer conveyor is selected in such a way that the associated auxiliary transfer conveyors register with the same column 120 in each of the two rows of columns. For example, and as shown in FIG. 5, the left-hand auxiliary conveyor 130 of the transfer conveyor 122 is aligned with the fourth column 120 of the left-hand row and the right-hand auxiliary conveyor 132 of the same transfer conveyor 122 is aligned with the fourth column 120 of the right-hand row. The supply conveyors 146, 148, 150, 152 are stationary, excepting of course, that their belts may be driven in a sense to advance the upper stringers toward the associated transfer conveyors. The transfer conveyors 124, 128 are located at a level above the transfer conveyors 122, 126 but below the supply conveyors 148, 152 and the supply conveyors 146, 150 are located at a level below the transfer conveyors 124, 128 but above the transfer conveyors 122, 126. The auxiliary conveyors are located at levels below the ends of the respective transfer conveyors.

FIG. 6 shows that the conveyors 124, 128, 134, 136, 142, 144, 148, 152 serve to deliver tobacco to the upper ducts 156 and that the remaining conveyors 122, 126, 130, 132, 138, 140, 146, 150 serve to deliver tobacco to the lower ducts 154. The discharge end of each supply conveyor is invariably located at a level directly above the associated transfer conveyor, regardless of the momentary position of such transfer conveyors. For example, when the endless belt of the supply conveyor 148 delivers a certain type of tobacco to the upper stringer of the transfer conveyor 124 (arrow 148a) and the upper stringer of the endless belt of the transfer conveyor 124 advances in a direction to the right (arrow 410) to supply tobacco onto the upper stringer of the endless belt of the auxiliary conveyor 136, the latter will advance tobacco in the direction indicated by an arrow 136a and will deliver such tobacco to the upper duct 156 of a selected column 120a in the right-hand row shown in FIG. 5. If the direction of movement of the upper stringer of the endless belt forming part of the transfer conveyor

124 is reversed (arrow 408), the latter will discharge tobacco onto the upper stringer of the belt of the auxiliary conveyor 134 and the conveyor 134 will feed tobacco in the direction of the arrow 134a and into the upper duct 156 of the column 120b in the left-hand row of columns 120. The operation of the remaining conveyors is analogous, and it will be seen that the supply of tobacco in each magazine 158 may be replenished with tobacco delivered by either of the four supply conveyors 146, 148, 150, 152.

As explained in connection with FIGS. 1-4, each of the various supply and transfer conveyors preferably carries a mass of tobacco particles to insure that the delivery can begin without any delay or with a minimal delay such as is required to move a selected auxiliary conveyor and the corresponding transfer conveyor into alignment with the selected duct or ducts, i.e., with a delay caused by movement of a transfer conveyor longitudinally of the columns 120.

Referring again to FIG. 6, it will be seen that the upper duct 156 comprises two inlets 164, 166 which may receive tobacco from the discharge ends of the adjoining auxiliary conveyors. The lower duct 154 has inlets 160, 162. The upper end of each inlet is normally closed by a hinged closure or cover or door such as the covers 168, 170, 172, 174 which respectively close the inlets 162, 160, 164 and 166. The covers 168, 170, 172, 174 are pivotable by electromagnets 180, 182, 178 and 176. The cover 174 is shown in open position because its electromagnet 176 is energized so that the inlet 166 may admit a certain type I of tobacco which is fed via conveyors 148, 124 and 134, it being assumed that the transfer conveyor 124 has been shifted in a direction as indicated by the arrow 408 (FIG. 5) so that the auxiliary conveyor 134 is aligned with the leftmost column 121 (see the section line VI-VI in FIG. 5).

The upper portion of each magazine 158 accommodates a sensing element 184 and the lower portion of each of these magazines accommodates a forked gate 186 which is controlled by an electromagnet 188. Below the gate 186, the magazine 158 comprises an enlarged portion which accommodates a distributor including a carded drum 190 and a rapidly revolving picker drum 192. The latter is located at a level below the carded drum 190. The lowermost part of the magazine 158 has an outlet 104A which may be constructed in the same way as the outlet 104 of FIG. 4.

The transfer conveyors 122, 124, 126, 128 are mounted in frames 196 one of which is shown in FIG. 7. This frame 196 is provided with wheels 198, 200 and is arranged to travel on rails or ways 202, 204 which extend in the longitudinal direction of the rows of columns 120. FIG. 7 shows the frame 196 for the transfer conveyor 124, and this frame also supports the two auxiliary conveyors 134, 136 (only the conveyor 134 being visible in FIG. 7). The transfer conveyor 124 is driven by a reversible gear motor 206, and a second motor 208 is used to drive the auxiliary conveyor 134. The wheels 198, 200 are driven by a reversible motor 210 which is attached to a bracket 212 carried by the frame 196.

The frames for the remaining transfer conveyors 122, 126, 128 are of analogous construction.

A portion of the electric control circuit for the apparatus of FIGS. 5 to 7 is shown in FIG. 19. In this circuit, the limit switches 416, 418, 420, 422 for the covers 168, 170, 172, 174 of the ducts 154, 156 in the column 121 of FIG. 6 are shown in a highly schematic way. Each of these limit switches comprises four contacts of which only one is shown in FIG. 19. Such one contact of each of the limit switches 416, 418, 420, 422 assumes the position of FIG. 19 when the four covers 168, 170, 172, 174 are in closed position. The chain 402 of FIG. 19 is completed when the normally open contact 4221 of the limit switch 422 is closed on opening of the cover 174 for the inlet 166 of the upper duct 156.

The chain 404 including four limit switches 406, 406a, 406b, 406c controls the delivery of tobacco to the ducts of the rightmost column 123 shown in FIG. 5. Each of the ducts 154, 156 may be equipped with a limit switch which is actuated by the respective cover 168, 170, 172 or 174 when the latter moves to open position in response to energization of the associated electromagnet 180, 182, 178 or 176. However, and since each end of each transfer conveyor (122, 124, 126, 128) can deliver tobacco to one-half of the columns 120 shown in FIG. 5, it suffices if only the ducts 154, 156 of the left-hand or right-hand row of columns 120 are equipped with such limit switches or if half of the ducts in the left-hand row and half of the ducts in the right-hand row of columns 120 comprise limit switches.

To deliver tobacco of the type I into the upper duct 156 of the column 121 shown in FIGS. 5 and 6, the transfer conveyor 124 must be shifted in the direction indicated by the arrow 408 so that its left-hand auxiliary conveyor 134 moves into registry with the inlet 166. In the first step, the electromagnet 176 is energized to open the cover 174 for the inlet 166 whereby the cover actuates the limit switch 422 to close the normally open contact 4221 and to thus complete the chain 402. When the supply of tobacco in the magazine 158 of the column 121 descends to a predetermined lower level, the sensing element 184 closes a master contact 1841 which is connected in series with the chain 402. The circuit of a first relay 412 is now completed and the relay 412 prepares the motor 210 on the frame 196 of the transfer conveyor 124 in a sense to insure that the motor 210 is ready to advance this conveyor in the direction indicated by the arrow 408. The circuit of a second relay 424 is completed through the contact 4261 of an end switch 426, through the contact 4341 of an end switch 434 on the duct 156 of the column 121, through the contact 4122 of the relay 412 and through the contact 4381 of a third relay 438. The relay 424 starts the motor 210 and causes it to shift the transfer conveyor 124 in the direction indicated by the arrow 408. The relay 438 is energized when the motor 210 of the transfer conveyor 124 is to drive the latter in the direction indicated by the arrow 410 (FIG. 5). The motor 210 drives the wheels 198, 200 on the frame 196 until the auxiliary transfer conveyor 134 moves into registry with the exposed inlet 166 in the duct 156 of the column 121. The conveyor 134 carries a cam or trip 432 which actuates the end switch 434 on the duct 156 so that the contact 4341 of the switch 434 opens the circuit of the relay 424 with the result that the motor 210 comes to a halt, i.e., the conveyors 124 and 134 are arrested in the positions shown in FIG. 6.

When the relay 424 is deenergized, a relay 436 starts the motor 208 for the auxiliary conveyor 134. The circuit of the relay 436 is completed through the contacts 4241, 4382 of the relays 424, 438, these contacts being closed when the respective relays are deenergized. The circuit of the relay 436 further includes a contact 4342 of the end switch 434 whereby the contact 4342 closes when the end switch 434 is actuated by the trip 432 of the auxiliary conveyor 134. The circuit of the relay 436 also includes a contact 1842 which is closed by the sensing element 184 in the magazine 158 when the supply of tobacco in this magazine drops to below a predetermined lower level. Still further, the circuit of the relay 436 includes the normally closed contact 4421 of a relay 442 for the second auxiliary conveyor 136 of the transfer conveyor 124.

When the auxiliary conveyor 134 is set in motion because the relay 436 is energized, the contact 4361 of the relay 436 closes to complete the circuit of a relay 440 which starts the motor 206 for the belt of the transfer conveyor 124. The circuit of the relay 440 further includes the normally closed contact 4441 of a relay 444 which, when energized, starts the motor 210 for the frame 196 of the conveyor 124 in the direction indicated

by the arrow 410. The relay 440 comprises a normally open contact 4401 which is closed when the relay 440 is energized so as to complete the circuit of a further relay 446 serving to start the drive of the supply conveyor 148. Thus, the supply conveyor 148 delivers tobacco of the type I onto the transfer conveyor 124 which delivers such tobacco onto the auxiliary conveyor 134, and the latter delivers through the inlet 166 and into the upper duct 156 of the column 121.

When the supply of tobacco I in the magazine 158 of the column 121 raises to a predetermined upper level, the sensing element 184 opens its master contact 1841 to open the chain 402 and to thereby arrest the belts of conveyors 124, 134, 148 because the relays 436, 444, 446 are deenergized. Since the column 121 is the leftmost column of the rows shown in FIG. 5, the auxiliary relay 412 is energized because its circuit is completed through the normally closed contact 4481 of an end switch 448, through the normally closed contact 1852 of the sensing element 185 for the magazine of the rightmost column 123, through the closed contact 4343 of the end switch 434 on the duct 156 of the column 121 (when the end switch 434 is engaged by the trip 432 of the auxiliary conveyor 134), and the contact 1843 of the sensing element 184. The contacts 4121, 4122, 4123 of the auxiliary relay 412 are then closed resp. opened. The contact 4121 is connected in the holding circuit of the relay 412, the contact 4122 blocks the movement of the transfer conveyor 124 in the direction of the arrow 408, and the contact 4123 prepares the motor 210 on the frame 196 of the conveyor 124 in a sense to be ready for moving the conveyor 124 in the direction indicated by the arrow 410. In other words, and since the conveyor 124 has reached the left-hand end of its path along the rails 202, 204 for the frame 196, the relay 412 immediately prepares its motor 210 for operation in a direction to move the conveyor to the right, as viewed in FIG. 5, and into a position for delivery of tobacco I to another column 120.

If the sensing element 185 (FIG. 5) of the rightmost column 123 detects that the supply of tobacco I in the corresponding magazine has descended to a predetermined lower level, its master contact 1851 (see FIG. 19) closes to complete the chain 404. The inlet 166 of the upper duct 156 in the column 123 is exposed because the corresponding electromagnet 176 has been energized to lift the cover 174 to open position and to actuate the limit switch 406. The contact 4061 of the limit switch 406 is now closed and the relay 438 is energized to start the motor 210 on the frame 196 of the conveyor 124 in a sense to advance the latter in the direction indicated by the arrow 410. The circuit of the relay 438 is completed through the normally closed contact 4482 of an end switch 448, through the temporarily closed contact 4123 of the auxiliary relay 412, and through the normally closed contact 4242 of the relay 424. The motor 210 drives the wheels 198, 200 and the transfer conveyor 124 advances in a direction to the right (arrow 410 in FIG. 5) until the trip 432 of the auxiliary conveyor 136 actuates the end switch 448 on the upper duct 156 of the column 123. The end switch 448 opens its contact 4482 to deenergize the relay 438 so that the transfer conveyor 124 is arrested in a position in which the auxiliary conveyor 136 registers with the exposed inlet 166 of the upper duct 156 in the column 123. The contacts 4241 and 4382 of the relays 424, 438 are closed, and so is the contact 4342 of the end switch 434 and the contact 1853 of the sensing element 185. The contact 4362 of the relay 436 for the auxiliary conveyor 134 is closed so the relay 442 is energized and starts the belt drive of the auxiliary conveyor 136. The contact 4421 of the relay 442 and the contact 4402 of the relay 440 completed the circuit of the relay 444 which drives the motor 206 in a sense to advance the upper stringer of the belt of the transfer conveyor 124 in a direction as indicated by the arrow 410. The working contact 4442 of the relay 444 closes to com-

plete the circuit of the relay 446 which is energized to start the belt drive of the supply conveyor 148.

If the contact 1853 of the sensing element 185 closes together with the contact 1842 of the sensing element 184, the signal produced by the contact 1842 has precedence because closing of the contact 1842 results in opening of a contact 1844 which opens the circuit of the relay 442 for the belt drive of the auxiliary conveyor 136. If the sensing element 184 closes its contact 1842 subsequent to closing of the contact 1853 of the sensing element 185, the auxiliary conveyor 136 is already in motion and its relay 442 keeps closed a contact 4423 in a bypass circuit 4423A which insures that the circuit of the relay 442 remains completed despite the fact that the sensing element 184 opens its contact 1844.

When the magazine 158 of the column 123 is filled to a desired level, the sensing element 185 opens the master contact 1851 and the drives for the conveyors 148, 124, 136 are arrested. The operation of the transfer conveyors 122, 126, 128 (and of the associated supply conveyors and auxiliary conveyors) is analogous to that of the conveyor 124. Certain elements of the control circuitry for the remaining columns 120 are indicated in FIG. 19 by phantom lines.

The apparatus of FIG. 5 will find preference over the apparatus of FIGS. 1 and 2 when the delivery of tobacco to various columns must take place at such a rapid rate that the transfer conveyors 4, 6, 8, 10 of FIGS. 1 and 2 would be likely to strew tobacco in response to the action of centrifugal forces. For example, and if the transfer conveyor 8 were to be moved rapidly from the position shown in FIG. 1 into registry with the column 3' (arrow 5), its receptacle 84 would be likely to strew tobacco into the receptacles 84 of the transfer conveyors 4 and 6 which are located below the level of the conveyor 8. However, the likelihood of such uncontrolled escape or spreading of tobacco particles is very remote, especially if the transfer conveyors are provided with the receptacles 84.

Another important advantage of the apparatus shown in FIG. 5 is that the columns 120 may be installed along a straight wall and that each magazine 158 may be located in close or immediate proximity to the associated tobacco consuming machine or machines. In other words, the length of each pneumatic conveyor which delivers tobacco from the outlet 104A of a magazine 158 to a cigarette rod former or another tobacco consuming machine may be the same, and each such pneumatic conveyor may be of small length to insure rapid refilling of the hopper in the associated machine.

By the simple expedient of providing each duct 154 or 156 with two inlets, we insure that the apparatus of FIG. 5 can supply four different types of tobacco particles even though each column comprises only two ducts. The number of such ducts may be increased to three, four or more if the apparatus is to feed six, eight or more different types of tobacco particles. In other words, the ducts may be stacked on top of each other to form columns of requisite height and to enable the apparatus to feed a requisite number of different tobacco brands. In some instances, the upper ducts 156 may be removed so that the apparatus of FIG. 5 will deliver only two types of tobacco particles at a time. The apparatus of FIG. 5 shares that advantage of the apparatus shown in FIGS. 1 and 2 according to which only one supply conveyor and only one transfer conveyor is needed for each type of tobacco. Also, the length of the transfer conveyors 122, 124, 126, 128 is less than the overall length of the two rows of columns 120. This also holds true for the apparatus of FIGS. 1 and 2 wherein the length of a transfer conveyor 4, 6, 8 or 10 is equal to the radius of the annulus 2 formed by the columns 3. Another important advantage of the apparatus shown in FIG. 5 is that the transfer conveyors need not change their position longitudinally of the columns 120 if they are to deliver a given type of tobacco first to a certain column (e.g., 120b) in

the left-hand row and thereupon to the corresponding column (120a) in the right-hand row, or vice versa.

FIGS. 8-10 illustrate a third apparatus which comprises a single series or row of magazines 214. These magazines carry a platform 252 so that the personnel in charge may inspect the operation, namely, the delivery of tobacco to any one of the magazines 214. Each magazine 214 may receive tobacco from the discharge end 266 of a separate auxiliary conveyor 216, and it will be noted that the longitudinal directions of the auxiliary conveyors 216 are normal to the series or row of magazines 214. The upper stringers of the endless belts forming part of the auxiliary conveyors 216 are located in a common horizontal plane, see FIGS. 9 and 10. Such upper stringers are located directly below the outlets of elongated horizontal ducts 234 each of which is provided with four outlets closable by hinged covers 268, 270, 272, 274, see FIG. 10. The four inlets 226, 228, 230, 232 of the rightmost duct 234 are shown in the right-hand portion of FIG. 8. In the left-hand portion of FIG. 8, the ducts 234 for the auxiliary transfer conveyors 216a, 216b, 216c, 216d are omitted to show the upper stringers of these auxiliary conveyors, and the arrows 216e indicate the directions in which the upper stringers of the belts forming part of the conveyors 216a-216d advance to deliver tobacco into the respective magazines 214.

The apparatus of FIG. 8 further comprises four transfer conveyors 236, 238, 240, 242 which are mounted at a level above the ducts 234 and whose upper stringers are located in a common horizontal plane. Such upper stringers respectively receive tobacco particles from the discharge ends of four supply conveyors 244, 246, 248, 250. For example, the upper stringer of the endless belt forming part of the supply conveyor 244 will deliver tobacco onto the upper stringer of the belt forming part of the transfer conveyor 236, and the upper stringer of the conveyor 236 can be driven in a direction to the left or to the right, as viewed in FIG. 8, to deliver tobacco into the inlet 232 of a selected duct 234. Such tobacco then descends through the outlet of the selected duct 234 (with the cover 274 in open position) and onto the auxiliary transfer conveyor 216 which is located therebelow. The upper stringer of such auxiliary transfer conveyor delivers tobacco particles to the corresponding magazine 214. The upper stringers of the supply conveyors 244, 246, 248, 250 are located in a common horizontal plane. The transfer conveyors 236, 238, 240, 242 can be shifted in the longitudinal direction of the row of magazines 214, i.e., transversely of the auxiliary transfer conveyors 216 and transversely of the supply conveyors 244, 246, 248, 250. The supply conveyors need not be shifted; however, their belts may be driven to supply tobacco to the respective transfer conveyors. The discharge end of each supply conveyor is located at a level above the upper stringers of the respective transfer conveyor regardless of the position of such transfer conveyor.

The passages defined by the ducts 234 taper downwardly toward the upper stringers of the respective auxiliary conveyors 216. The frames of the transfer conveyors 236, 238, 240, 242 are provided with wheels 256 (see FIG. 9) which travel on pairs of rails 254.

The upper end portion of each magazine 214 diverges outwardly (see FIG. 9) and each of these magazines accommodates a sensing element 258. The lower portions of the magazines 214 accommodate distributors each of which includes a carded drum 260 and a rapidly revolving combing drum or picker drum 262. The means for driving the drums 260, 262 includes gear motors 276 one of which is shown in FIG. 10. The numerals 264 shown in FIGS. 9 and 10 denote the outlets of the magazines 214. Each such outlet may resemble the outlet 104 shown in FIG. 4, i.e., each magazine 214 may deliver tobacco to three cigarette rod formers.

Each transfer conveyor may feed tobacco to each auxiliary conveyor 216 via the corresponding duct 234. For

example, the supply conveyor 248 may deliver a first type of tobacco to the transfer conveyor 240 and when the latter's belt is driven to advance its upper stringer in a direction to the right, as viewed in FIG. 8, tobacco travels to the inlet 228 of the rightmost duct 234 to pass through the outlet exposed by the cover 270 and onto the rightmost auxiliary conveyor 216 which feeds such tobacco to the rightmost magazine 214. In contrast to the apparatus of FIGS. 1-4 and 5-7, the auxiliary conveyors 216 are normally empty and discharge all of the tobacco into the corresponding magazines 214. The reason for this will be readily understood since each auxiliary conveyor 216 delivers four types of tobacco and, in order to avoid uncontrolled mixing of tobacco, the upper stringers of the conveyors 216 should remain empty excepting at the time when a transfer conveyor is driven to feed tobacco thereto. However, the transfer conveyors 236, 238, 240, 242 and the supply conveyors 244, 246, 248, 250 need not remain empty and are preferably loaded with tobacco to make sure that the delivery of tobacco to a selected magazine 214 may begin with a minimum of delay.

FIG. 11 illustrates in greater detail a portion of the apparatus shown in FIGS. 8 to 10, and more particularly the construction and mounting of the transfer conveyor 240. This conveyor is mounted in a frame 286 having wheels 256 which travel on the rails 254. The endless belt of the transfer conveyor 240 is driven by a reversible motor 292 and the wheels 256 are driven by a reversible motor 294. The rails 254 are mounted on top of the ducts 234 and extend at right angles thereto. One end wall 296 of each duct 234 and two side walls 298 of each duct 234 extend all the way to the upper stringer 300 of the respective auxiliary conveyor 216. The cover or closure 270 for the inlet 228 of the duct 234 shown in FIG. 11 is controlled by an electromagnet 302 which normally holds the cover in closing position. The funnel surrounding the inlet 228 is shown at 233. Two side walls 287, 289 form a chute which guides tobacco particles delivered by the supply conveyor 248 onto the upper stringer of the transfer conveyor 240.

FIG. 12 illustrates a portion of an apparatus which constitutes a modification of the apparatus shown in FIGS. 8 to 11. The upper stringers of belts forming part of the auxiliary conveyors 216 are inclined upwardly toward the inlets at the upper ends of the respective magazines 214. The upper stringers of adjoining auxiliary conveyors 216 are separated from each other by partitions or baffles 278 which extend all the way to hinged covers 284 for the inlets to the magazines 214. The frames of transfer conveyors 236, 238, 240, 242 are mounted on wheels which are guided by rails 254. It will be seen that the transfer conveyors are located at different levels, i.e., the conveyor 238 is located at a level between the conveyors 236, 240 and the conveyor 242 is located at a level above the conveyor 240. The ducts 234 of FIGS. 8 to 10 are replaced by longitudinally extending apertured plates or floors 280 which are disposed below the corresponding transfer conveyors and are formed with longitudinally spaced apertures each of which is sealable by a hinged cover 282. The supply conveyors 244, 246, 248, 250 are located at levels above the respective transfer conveyors and are parallel therewith. Each transfer conveyor is movable in the longitudinal direction of the series or row of arrayed magazines 214 but its upper stringer invariably remains below the discharge end of the respective supply conveyor. For example, the next-to-the-lowermost supply conveyor 246 will discharge a certain type of tobacco onto the corresponding transfer conveyor 238 which is moved to a certain position in which one of its longitudinal ends discharges tobacco through a selected aperture in the corresponding floor 280 and into the channel between a pair of adjoining partitions 278. Such tobacco descends onto the respective auxiliary conveyor 216 whose upper stringer travels upwardly and toward the cover 284 of the corresponding magazine 214. The cover 284 is open so that the

upper end turn of the auxiliary conveyor 216 discharges tobacco into the magazine. The numeral 276 shown in FIG. 11 again denotes a motor which drives the distributor of the magazine 214. The outlet of the magazine 214 is shown at 264 and the platform at 252.

The construction of frames for the transfer conveyors 236, 238, 240, 242 of FIG. 12 is analogous to that of the frame 286 shown in FIG. 11.

The control circuit of the apparatus shown in FIGS. 8 to 11 or in FIG. 12 is analogous to the circuit of FIG. 19. When the sensing element 258 in a magazine 214 detects that the supply of tobacco has descended to a predetermined lower level, the drive for the corresponding auxiliary conveyor 216 is started and the auxiliary conveyor continues to feed tobacco until the corresponding element 258 sends a signal that the magazine 214 is filled to a desired level. The corresponding transfer conveyor 236, 238, 240 or 242 is started together with the auxiliary conveyor and the latter is brought to a halt following the inactivation of the transfer conveyor to make sure that all of the tobacco delivered by the transfer conveyor is actually admitted into a magazine, i.e., when idle the auxiliary conveyors 216 are empty.

The apparatus of FIGS. 8-11 is of particular advantage in tobacco processing plants wherein the apparatus must be installed in a low-ceilinged hall. This is accomplished in a very simple and economical manner by providing each duct 234 with a series of horizontally aligned (rather than vertically spaced) inlets and by providing a separate auxiliary conveyor 216 for each individual magazine 214. Though the auxiliary conveyors 216 are preferably closely adjacent to each other, the baffles 278 prevent uncontrolled mixing or blending of different tobacco types. The chute including the side walls 287, 289 prevents uncontrolled escape of tobacco particles from the upper stringers of the transfer conveyors 236, 238, 240, 242.

An advantage of the apparatus shown in FIG. 12 is that its width is reduced to a minimum because the supply conveyors 244, 246, 248, 250 are parallel with the transfer conveyors 236, 238, 240, 242. Also, this apparatus can be accommodated in a hall whose roof slants downwardly from above the magazines 214 toward the supply conveyor 244.

The part of the distributor shown in FIGS. 13 and 14 may replace the structure of FIG. 4. This distributor includes a frame or support 304 having a cover or lid 306 at its upper end. Several pneumatic conveying conduits 308, 310, 312, 314 are connected to the cover 306 and each thereof has an intake end which communicates with an aperture provided in this cover. FIG. 13 illustrates that the conduits 308, 310, 312, 314 extend horizontally and that their intake ends are bent upwardly so as to form an annulus of equidistant pipes which is concentric with the cover 306. A frustoconical dome 318 is rotatable by a motor 316, and its bottom wall 322 rests on and is in sealing engagement with the cover 306. The dome 318 accommodates a suitably bent manifold pipe 320 whose discharge end 324 travels along a circular path and registers with the intake ends of consecutive conduits 308, 310, 312, 314 when the dome 318 rotates. The upper or intake end of the pipe 320 is rigid with the top wall 326 of the dome 318 and is rotatably secured to the outlet of a funnel 328 which is mounted on stationary brackets 330 and receives tobacco particles from a magazine, for example, from one of the magazines 92 shown in FIG. 2. It is clear that the structure of FIGS. 13 and 14 may comprise only two or three pneumatic conduits or more than four conduits, depending on the total number of tobacco consuming machines which are fed from a magazine 92.

The distributor of FIG. 15 also comprises a stationary funnel 350 which may receive tobacco particles from a magazine 92, 158 or 214 and which discharges such particles into a horizontal delivery tube 346 mounted on a stationary frame 348. The discharge end of the delivery tube 346 is connected to the intake end of a rotary mani-

fold pipe 344 which is mounted in a frustoconical dome 340. The larger-diameter end wall of the dome 340 is in sealing abutment with a fixed vertical panel 338 secured to the ground and corresponding to the cover 305 of FIG. 13. The panel 338 supports a plurality of pneumatic conveying conduits 332, 334, 336. When the dome 340 is driven by its motor 332, the manifold pipe 344 discharges tobacco into consecutive pneumatic conduits for delivery to the respective consuming machines. Here, again, the number of pneumatic conduits may be only two or four or more. It will be seen that the main difference between the distributors of FIGS. 13-14 and 15 is that the latter comprises a dome 340 which rotates about a horizontal axis whereas the dome 318 rotates about a vertical axis.

FIG. 16 shows a magazine 354 which is analogous to a magazine 92, 158 or 214 and is combined with a distributor resembling the one shown in FIGS. 13 and 14. However, the funnel 328a above the rotary dome 352 is directly supported by or is integral with the lower end of the magazine 354. The panel 362 corresponds to the cover 306 of FIG. 13 or 14 and is connected with the intake ends of four pneumatic conveying conduits 366 which receive tobacco particles from a manifold pipe mounted in and rotatable with the dome 352. The carded drums 358, 360 are mounted in the relatively wide lower zone 356 of the magazine 354 and form part of the distributor by delivering tobacco particles at a constant rate into the funnel 328a so that such particles may enter the manifold pipe in the dome 352. The motor 352a drives the dome 352 intermittently or continuously so as to insure that the conduits 366 receive requisite quantities of a certain type of tobacco at desired intervals. The forked gate 98 in the upper part of the magazine 354 is controlled by an electromagnet 95. The frame 364 is secured to the lower part of the magazine 354 and supports the panel 362.

The circuits shown in FIGS. 18 and 19 serve to control the delivery of tobacco particles to the magazines of the apparatus shown in FIGS. 1 and 5. The circuit of FIG. 20, on the other hand, serves to control the feed of tobacco from a magazine into the hopper of a tobacco consuming machine, for example, a cigarette rod former or the like. This circuit will be explained with reference to FIGS. 13 and 14, i.e., the circuit of FIG. 20 is used to control the feed of tobacco from the magazine which discharges into the funnel 328 and on to several consuming machines which receive such tobacco through the pneumatic conduits 308, 310, 312 and 314. Each tobacco consuming machine is provided with a signal generating contact 512, 514, 516, 518 which respectively initiates the feed of tobacco through the conduit 308, 310, 312, 314. The numeral 520 denotes in FIG. 20 a trip or cam on the manifold pipe 320 of FIG. 13, and this trip serves to actuate limit switches 522, 524, 526 and 528 which are provided at the intake ends of the conduits 308, 310, 312, 314.

For example, if the conduit 308 is to feed tobacco to the machine which includes the contact 512, the latter is closed by the operator or in automatic response to a reduction in the supply of tobacco in the hopper of the respective machine. The contacts 5222, 5242, 5262, 5282 of the limit switches 522, 524, 526, 528 are connected in series with the contact 512 and are closed when the trip 520 is in an intermediate position. Therefore, and as soon as the contact 512 closes, it completes the circuit of a relay 530 which is energized and starts the motor 316. The limit switch 528 is associated with the intake end of the conduit 308 and is actuated by the trip 520 to open the contact 5282 by simultaneously closing a second contact 5281. The closing of the contact 512 results in opening of a contact 5121 and in closing of a contact 5122. The motor 316 continues to rotate the dome 318 in a clockwise direction, as viewed in FIG. 14, until the discharge end of the pipe 320 registers with the intake end

of the conduit 308. Such direction of rotation is indicated in FIG. 20 by an arrow 550. When the trip 520 actuates the limit switch 528 of the conduit 308, the limit switch 528 opens the contact 5282 to deenergize the relay 530 so that the motor 316 comes to a halt and holds the dome 318 in an angular position in which the pipe 320 registers with the conduit 308. The limit switches 522, 524, 526 are inoperative because the contacts 5141, 5161, 5181 (associated with open contacts 514, 516, 518) remain closed. Thus, it does not matter that, on its way from an intermediate position toward engagement with the limit switch 528, the trip 520 might actuate one, two or all three remaining limit switches 522, 524, 526. As the contact 5282 opens and the contact 5281 closes, a current can flow through the closed contact 5122 (this latter contact is closed only in response to closing of the contact 512) and through a vacuum switch 544 to energize a relay 546. The switch 544 controls the pressure in the conduit 308. The relay 546 starts the motor which drives the cooperating carded drums in the distributor for that magazine which feeds tobacco to the funnel 328. For example, and if the magazine which feeds into the funnel 328 is similar to the magazine 354 of FIG. 16, the relay 546 will start the motor which drives the drums 358, 360. The relay 546 also closes a contact 5461 to complete the circuit of a relay 548 which energizes the electromagnet 96 for the gate 98 shown in FIG. 16. The opening of the gate 98 allows the tobacco to fall down on the carded drums 358, 360.

The delivery of tobacco to the conduit 310, 312 or 314 will take place in response to closing of the contact 514, 516 or 518 and in response to resulting opening of the contact 5141, 5161 or 5181.

The circuit of FIG. 20 may be used, with minor modifications, to control the operation of the distributor shown in FIG. 15.

A simplified version of the circuit shown in FIG. 20 may be utilized to control the operation of the distributors for the magazines 92 of the columns 3 shown in FIGS. 1 and 2, of the distributors for the magazines 158 of the columns 120 shown in FIGS. 5 and 6, or of the distributors for the magazines 214 shown in FIGS. 8-10 and 12. Such simplified circuits require only two relays (corresponding to the relays 546 and 548 of FIG. 20) because they do not comprise rotary manifold pipes such as the pipe 320 of FIGS. 13 and 14, the pipe 344 of FIG. 15, or the pipe in the rotary dome 352 of FIG. 16.

FIG. 17 shows the lower end portion of a further distributor which delivers tobacco particles from a magazine 94B analogous to one of the magazines 92 shown in FIG. 2. However, it is clear that the distributor of FIG. 17 is equally useful in other types of magazines such as the magazine 158 of FIG. 6 or the magazine 214 of FIG. 10 or 12. The lower end of the magazine 94B discharges tobacco onto the upper stringer of an endless belt 560 which delivers onto the upper stringer of a carded belt 562. The belt 562 delivers tobacco into a pneumatic conveying conduit 566. The upper stringer of the belt 562 cooperates with a carded refuser drum 564 which insures that the conduit 566 receives a uniform shower of tobacco particles, this shower being conveyed through an arcuate tunnel 568.

The circuit which controls the operation of the distributor shown in FIG. 17 may be a simplified version of the circuit shown in FIG. 20. The relay 546 will start the drive for the belts 560, 562 and refuser drum 564.

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 and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is:

1. A method of feeding different types of tobacco particles to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types and building up supplies of such tobacco at at least two separate locations each of which is associated with at least one station and each of which can receive tobacco from several sources; and delivering tobacco from said locations to the corresponding stations according to the needs of consuming machines at the stations so that the supply of tobacco at each of said locations can be replenished while portions thereof are being fed to one or more consuming machines.

2. A method of feeding different types of tobacco particles to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types and building up supplies of such tobacco at at least two separate locations each of which is associated with at least one station and each of which can receive tobacco from several sources; and pneumatically feeding tobacco from said locations to the corresponding stations according to the needs of consuming machines at the stations so that the supply at each of said locations can be replenished while portions thereof are being fed to one or more consuming machines.

3. A method of feeding different types of tobacco particles to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types and building up supplies of such tobacco at a plurality of separate locations each of which is associated with at least one station and can receive tobacco from several sources; and simultaneously feeding tobacco from said locations to the corresponding stations according to the needs of consuming machines at the stations so that a plurality of said supplies can be replenished in a simultaneous operation while portions thereof are being fed to one or more consuming machines.

4. A method of feeding different types of tobacco particles to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types; delivering the thus withdrawn tobacco at different levels; building up supplies of such tobacco at a plurality of separate locations each of which is associated with at least one station and can receive tobacco from several sources; and delivering tobacco from said locations to the corresponding stations according to the needs of consuming machines at the stations so that each supply can be replenished while portions thereof are being fed to one or more consuming machines.

5. A method of feeding different types of tobacco particles to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types; conveying such tobacco in separate paths; building up separate supplies of each type of tobacco particles at the ends of said paths; assembling a batch of each type of tobacco particles in a zone adjacent to the end of the respective path; feeding tobacco from said supplies to said stations according to the needs of consuming machines at such stations; replenishing each supply by addition of batches from the respective paths; and immediately assembling a fresh batch upon addition of the preceding batch to one of said supplies.

6. A method of feeding different types of tobacco particles to a plurality of stations, particularly to stations

which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types and building up supplies of such tobacco at a plurality of separate locations each of which is associated with at least one station and can receive tobacco from several sources; feeding tobacco from said locations to the corresponding stations according to the needs of consuming machines at the stations; and replenishing each supply in automatic response to depletion of such supply below a predetermined minimum volume.

7. A method of feeding different types of tobacco particles to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types; conveying such tobacco in separate paths; building up separate supplies of each type of tobacco particles at the ends of said paths; maintaining a reserve of tobacco particles in each of said paths; feeding tobacco from said supplies to said stations according to the needs of consuming machines at such stations; replenishing each supply by addition of reserve tobacco from the respective paths; and immediately accumulating a fresh reserve upon delivery of preceding reserve to one of said supplies.

8. A method of feeding different types of tobacco particles to a plurality of stations whose total number exceeds the number of tobacco types, particularly for feeding tobacco to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types and building up such tobacco into supplies at a plurality of separate locations each of which is associated with at least one station and whose total number exceeds the total number of tobacco types so that at least two of said supplies contain the same type of tobacco and that each of said supplies may meet the needs of at least one consuming machine, each of said locations being adapted to receive tobacco from several sources; feeding tobacco from said locations to the corresponding consuming machines according to the needs of such machines; and replenishing each of said supplies from a source when the supplies are depleted to a predetermined minimum volume.

9. A method as set forth in claim 8, wherein each of said locations is associated with at least two consuming machines and wherein the feed of tobacco from said locations to said stations takes place by suction.

10. A method as set forth in claim 8, wherein said locations are arranged in the form of an annulus and wherein the delivery of tobacco from the sources to said locations takes place radially inwardly toward the center and thereupon radially outwardly away from the center of said annulus.

11. A method as set forth in claim 8, wherein said locations are arranged in the form of a straight row and wherein the delivery of tobacco from the sources to said locations takes place first at right angles, thereupon in parallelism with, and finally again at right angles to said row.

12. A method as set forth in claim 8, wherein said locations are arranged in the form of a straight row and wherein the delivery of tobacco from the sources to said locations takes place first in the longitudinal direction of and thereupon at right angles to said row.

13. A method of feeding different types of tobacco particles to a plurality of stations whose total number exceeds the number of tobacco types, particularly for feeding tobacco to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising the steps of withdrawing tobacco from a plurality of sources of different tobacco types; mechanically conveying such tobacco in elongated paths; dumping the thus

conveyed tobacco from each path to build up supplies of tobacco at a plurality of separate locations each of which can receive tobacco from several sources and whose total number exceeds the total number of tobacco types so that at least two of said supplies contain the same type of tobacco and that each of said supplies may meet the needs of at least one consuming machine; feeding tobacco by suction from said locations to the corresponding consuming machines according to the needs of such machines; and replenishing each of said supplies from the respective source when the supplies are depleted to a predetermined minimum volume.

14. A method as set forth in claim 13, wherein said paths are located at the same level.

15. A method as set forth in claim 13, wherein said paths are located at different levels.

16. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a plurality of receiving means each arranged to accommodate a supply of tobacco; a plurality of conveying means, one for each of said receiving means, for delivering tobacco from the respective receiving means to at least one station; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said receiving means; and drive means for moving each of said transfer conveyor means between said delivery positions to deliver to registering receiving means tobacco of that type which is fed by the respective supply conveyor.

17. An apparatus as set forth in claim 16, wherein each of said conveying means comprises at least one suction conduit, wherein each of said supply conveyors comprises an endless belt having an upper stringer which receives tobacco from the respective source, and wherein each of said transfer conveyor means comprises at least one endless belt.

18. An apparatus for feeding different types of tobacco to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising a plurality of arrayed magazines each arranged to accommodate a supply of tobacco; a plurality of conveying means, one for each of said magazines, for delivering tobacco from the respective magazines to at least one station; a plurality of stationary supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said magazines; and drive means for moving each of said transfer conveyor means between said delivery positions so that such transfer conveyor means can deliver to registering magazines tobacco of that type which is fed by the respective supply conveyor.

19. An apparatus for feeding different types of tobacco to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising a plurality of arrayed magazines each arranged to accommodate a supply of tobacco; a plurality of conveying means, one for each of said magazines, for delivering tobacco from the respective magazines to at least one station; a plurality of stationary supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means having a discharge end; a receptacle located at the discharge end of

each of said transfer conveyor means for receiving and accumulating batches of tobacco in response to delivery of tobacco by the respective transfer conveyor means, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective receptacle registers with one of said magazines and each of said receptacles comprising means for evacuating the batches therefrom; and drive means for moving said transfer conveyor means between said delivery positions so that the corresponding receptacles can evacuate into registering magazines tobacco of that type which is fed by the respective supply conveyor.

20. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a plurality of columns each including a magazine arranged to accommodate a supply of tobacco and at least one tobacco-admitting duct disposed above the magazine; a plurality of conveying means, one for each of said columns, for delivering tobacco from the respective magazines to at least one station; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said ducts; and drive means for moving each of said transfer conveyor means between said delivery positions so that such transfer conveyor means may deliver into the registering ducts tobacco of that type which is fed by the respective supply conveyor.

21. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a plurality of columns each including a magazine arranged to accommodate a supply of tobacco and a plurality of detachable superimposed tobacco-admitting ducts located above the magazine, the ducts of each of said columns having separate inlets for different types of tobacco; a plurality of conveying means, one for each of said columns, for delivering tobacco from the respective magazines to at least one station; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with that inlet of a duct which is to receive tobacco of the type transported by such transfer conveyor means; and drive means for moving said transfer conveyor means between said delivery positions so that the transfer conveyor means may deliver to registering inlets tobacco of that type which is fed by the respective supply conveyors.

22. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a plurality of magazines each arranged to accommodate a supply of tobacco; a plurality of conveying means, one for each of said magazines for delivering tobacco from the respective magazines to at least one station; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said magazines; drive means for moving said transfer conveyor means between said delivery positions so that the transfer conveyor means may deliver to registering magazines tobacco of that type which is fed by the respective supply conveyors; and control means for starting said supply conveyors and said transfer conveyor means and for moving said transfer conveyor means into registry with magazines wherein the

supply of tobacco requires replenishing, said control means comprising sensing elements provided in said magazines for initiating the delivery of tobacco when the supply of tobacco in a magazine descends to below a predetermined minimum level.

23. An apparatus for feeding different types of tobacco to a plurality of stations, comprising an annulus of magazines each arranged to accommodate a supply of tobacco; a plurality of conveying means, one for each of said magazines, for delivering tobacco from the respective magazines to at least one station; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources and for delivering such tobacco to the center of said annulus; a plurality of transfer conveyors, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyors being rotatable about the center of and extending radially outwardly toward said annulus; and drive means for rotating said transfer conveyors about the center of said annulus so that each transfer conveyor may be moved into registry with any one of said magazines to deliver thereto tobacco of that type which is fed by the respective supply conveyor.

24. An apparatus as set forth in claim 23, wherein each of said magazines constitutes the lower part of an upright column and wherein the upper part of each column comprises a plurality of superimposed ducts, one for each type of tobacco and each having an inlet facing the center of said annulus so as to receive tobacco from the radially outer end of the respective transfer conveyor means.

25. An apparatus as set forth in claim 24, wherein each of said ducts comprises a normally closed cover for the respective inlet.

26. An apparatus as set forth in claim 24, wherein said supply conveyors are disposed at different levels and wherein each of said transfer conveyor means is located at a level below the respective supply conveyor.

27. An apparatus as set forth in claim 26, wherein at least two of said supply conveyors are disposed in a common vertical plane.

28. An apparatus as set forth in claim 23, wherein the number of said magazines is a multiple of the number of said supply conveyors and wherein the number of said stations is a multiple of the number of said magazines.

29. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a series of aligned magazines each arranged to accommodate a supply of tobacco; a plurality of conveying means, one for each of said magazines, for delivering tobacco from the respective magazines to at least one station; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources and for delivering such tobacco into the proximity of said series of magazines; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable longitudinally of said series between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said magazines; and drive means for moving said transfer conveyor means between said delivery positions.

30. An apparatus as set forth in claim 29, wherein said series of magazines comprises a plurality of rows.

31. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a series of aligned columns each including a magazine arranged to accommodate a supply of tobacco and at least one duct on top of the magazine, each of said ducts having a pair of inlets disposed at the opposite sides of said series of columns and each duct communicating with the interior of the respective magazine; a pair of supply conveyors for withdrawing different types of tobacco from separate sources and for delivering such tobacco in zones located

close to but at the opposite sides of said series of columns; a pair of elongated transfer conveyors extending in parallelism with and at the opposite sides of said series of columns and each arranged to receive tobacco from one of said supply conveyors, each of said transfer conveyors being movable longitudinally of said series of columns between a plurality of delivery positions in each of which the respective transfer conveyor registers with the corresponding inlet of one of said ducts; drive means for moving the transfer conveyors between said delivery positions; and conveying means for delivering tobacco from each of said magazines to at least one station.

32. An apparatus as set forth in claim 31, wherein each of said transfer conveyors comprises an endless belt having a tobacco-conveying upper stringer movable in opposite directions, and further comprising a pair of auxiliary conveyors for each transfer conveyor, each of said auxiliary conveyors being arranged to receive tobacco from one end of the respective upper stringer and being adapted to deliver such tobacco to one duct at a time, said auxiliary conveyors being connected for movement with the respective transfer conveyors longitudinally of said series of columns and one auxiliary conveyor of each pair being in a position for delivery of tobacco to one of said ducts when the other auxiliary conveyor of the same pair is in similar position with reference to another duct.

33. An apparatus as set forth in claim 32, wherein said auxiliary conveyors are parallel with said supply conveyors.

34. An apparatus as set forth in claim 31, wherein each of said columns comprises a plurality of superimposed ducts and further comprising a pair of additional supply conveyors and a pair of additional transfer conveyors for each duct in excess of one, the transfer conveyors at each side of said series of columns being located at different levels.

35. An apparatus as set forth in claim 34, wherein each of said conveyors has a tobacco supporting upper stringer which is located in a horizontal plane.

36. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a row of aligned magazines each arranged to accommodate a supply of tobacco; auxiliary conveyors, one for each of said magazines and each inclined with reference to said row, each of said auxiliary conveyors having a discharge end arranged to deliver tobacco into the respective magazine; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources and for delivering such tobacco to a level above said auxiliary conveyors; a plurality of transfer conveyors, one for each supply conveyor, for receiving tobacco from the respective supply conveyors, said transfer conveyors being located between said supply conveyors and said auxiliary conveyors and each thereof extending substantially longitudinally of said row of magazines, each of said transfer conveyors being movable longitudinally of said row between a plurality of delivery positions in each of which the respective transfer conveyor registers with one of said auxiliary conveyors whereby each magazine may receive a selected type of tobacco; drive means for moving the transfer conveyors between said delivery positions; and conveying means for delivering tobacco from each of said magazines to at least one station.

37. An apparatus as set forth in claim 36, wherein said auxiliary conveyors have tobacco supporting upper stringers which are disposed in a common plane.

38. An apparatus as set forth in claim 37, wherein said common plane is inclined with reference to a horizontal plane.

39. An apparatus as set forth in claim 38, wherein said transfer conveyors are located at different levels.

40. An apparatus as set forth in claim 39, wherein said

supply conveyors are parallel with the respective transfer conveyors.

41. An apparatus as set forth in claim 36, wherein said conveyors have tobacco supporting upper stringers and wherein the upper stringers of said auxiliary, transfer and supply conveyors are respectively located in common horizontal planes, said supply conveyors being parallel with said auxiliary conveyors and normal to said transfer conveyors.

42. An apparatus as set forth in claim 36, further comprising a duct disposed between said transfer conveyors and each of said auxiliary conveyors, said ducts having separate tobacco admitting inlets for each of said transfer conveyors and normally closed outlets located above the respective auxiliary conveyors.

43. An apparatus as set forth in claim 42, wherein each of said transfer conveyors comprises an endless belt and said drive means comprises means for driving each belt in opposite directions so that such transfer conveyors may feed tobacco to spaced auxiliary conveyors by reversing the direction of movement of the respective belts.

44. An apparatus as set forth in claim 36, further comprising partitions provided between said auxiliary conveyors and chutes for delivery of tobacco from said supply conveyors to the respective transfer conveyors.

45. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a plurality of magazines each arranged to accommodate a supply of tobacco; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said magazines; drive means for moving the transfer conveyor means between said delivery positions; a plurality of conveying means associated with each of said magazines for delivering tobacco to separate stations; and distributor means, one for each of said magazines, for feeding tobacco from the respective magazines to the associated conveying means.

46. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a plurality of magazines each arranged to accommodate a supply of tobacco; a plurality of supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said magazines; drive means for moving the transfer conveyor means between said delivery positions; a plurality of pneumatic conduits associated with each of said magazines for delivering tobacco to separate stations; and distributor means, one for each of said magazines, for feeding tobacco from the respective magazines to the associated conduits.

47. An apparatus for feeding different types of tobacco to a plurality of stations, comprising a plurality of arrayed magazines each arranged to accommodate a supply of tobacco; a plurality of stationary supply conveyors for withdrawing different types of tobacco from separate sources; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said magazines; drive means for moving the transfer conveyor means between said delivery positions; a plurality

of conveying means associated with each of said magazines for delivering tobacco to separate stations; and distributor means, one for each of said magazines, for feeding tobacco from the respective magazines to the associated conveying means.

48. An apparatus as set forth in claim 47, wherein each of said distributor means comprises a rotary manifold pipe having an intake end connected with the respective magazine and a discharge end which travels in a circle in response to rotation of said pipe about a fixed axis, said conveying means comprising pneumatic conveying conduits having intake ends located on said circle so that each thereof may receive tobacco when registering with the discharge end of said pipe.

49. An apparatus as set forth in claim 48, further comprising control means including a signal generator provided at each of said stations for initiating movement of said pipe into registry with the respective conduits when the supply of tobacco at the corresponding station requires replenishing.

50. An apparatus as set forth in claim 47, wherein each of said distributors comprises motor-driven carded members for withdrawing tobacco at a constant rate from the respective magazines when said carded members are driven.

51. An apparatus as set forth in claim 50, wherein said carded members are drums.

52. An apparatus for feeding different types of tobacco to a plurality of stations, particularly to stations which accommodate cigarette rod formers or analogous tobacco consuming machines, comprising a plurality of regularly arrayed magazines each arranged to accommodate a supply of tobacco; a plurality of conveying means, one for each of said magazines, for delivering tobacco from the respective magazines to at least one station; a plurality of stationary supply conveyors for withdrawing different types of tobacco from separate sources, the total number of said magazines being a multiple of the total number of said supply conveyors; a plurality of transfer conveyor means, one for each of said supply conveyors, for receiving tobacco from the respective supply conveyors, each of said transfer conveyor means and each of said supply conveyors comprising at least one tobacco transporting belt and each of said transfer conveyor means being movable between a plurality of delivery positions in each of which the respective transfer conveyor means registers with one of said magazines to deliver thereto tobacco of that type which is fed by the respective supply conveyor so that each of said magazines may receive any one of said tobacco types; and drive means for moving the transfer conveyor means between said delivery positions.

53. An apparatus as set forth in claim 52, further comprising means for preventing simultaneous delivery of two tobacco types into any of said magazines.

54. An apparatus as set forth in claim 52, further comprising distributor means for feeding tobacco from said magazines to the respective conveying means, said distributor means being operative to feed tobacco simultaneously with delivery of tobacco to said magazines so that the replenishing of supply in a magazine can take place simultaneously with feed of tobacco from such supply to one or more stations.

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