April 2, 1940. R. V. CRAGGS 2,195,407

CONTROL DEVICE FOR PNEUMATIC CONVEYERS FOR CIGARETTE MACHINES

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Fig.1.

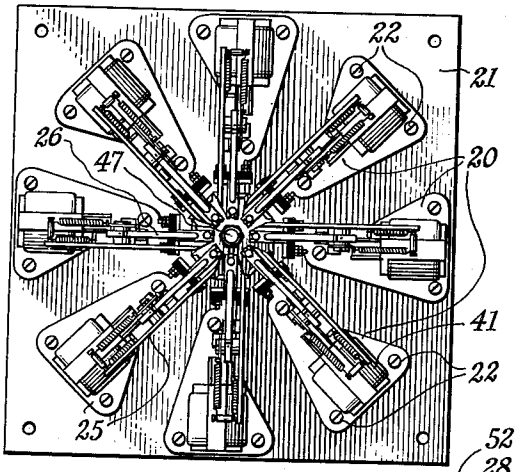


Fig.4.

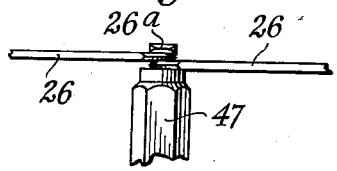


Fig.2.

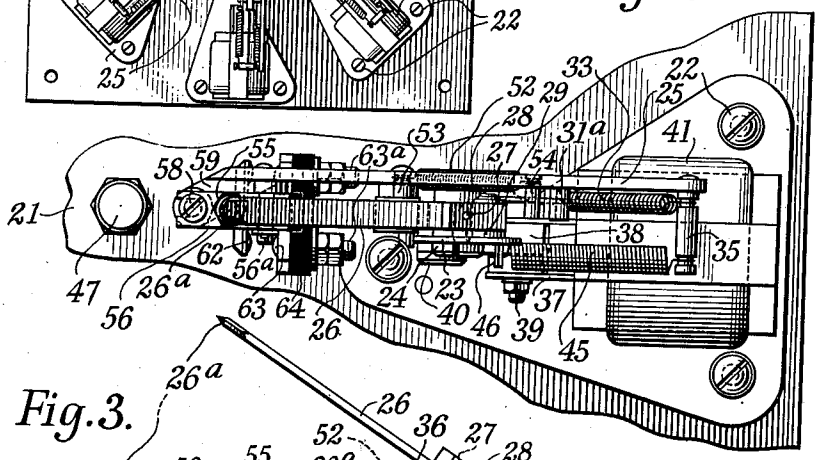
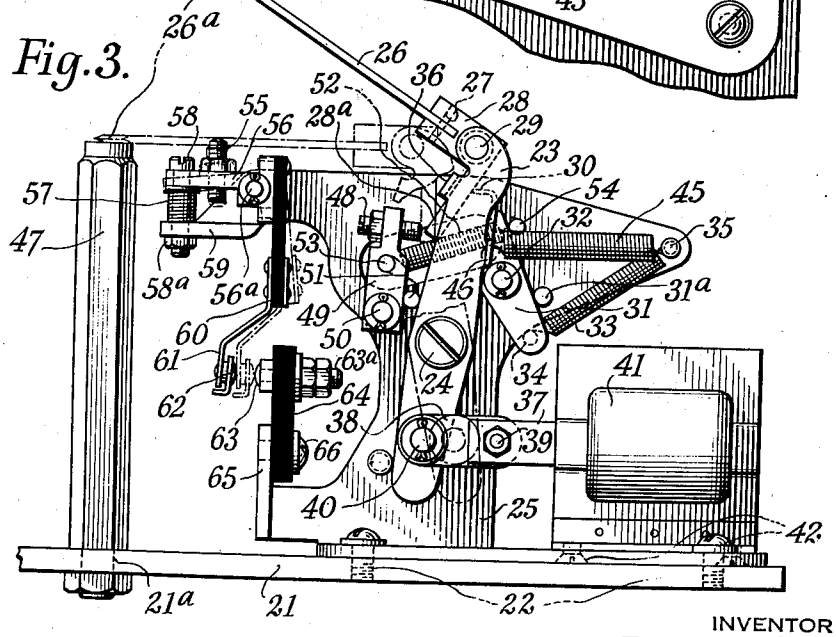


Fig.3.



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Fig. 5.

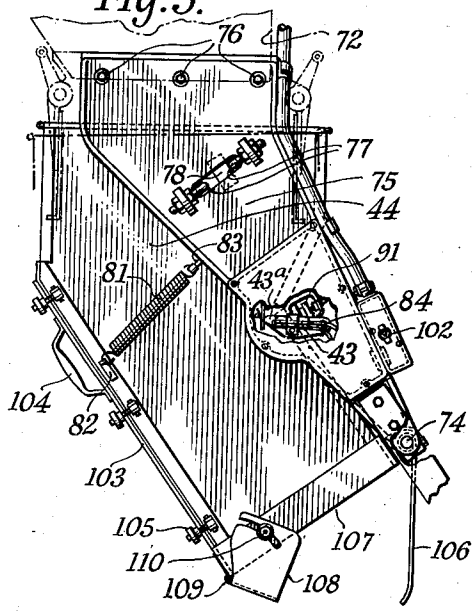


Fig. 6.

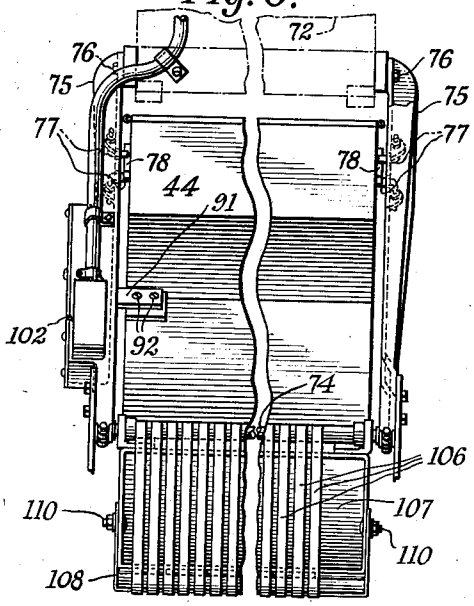


Fig. 7.

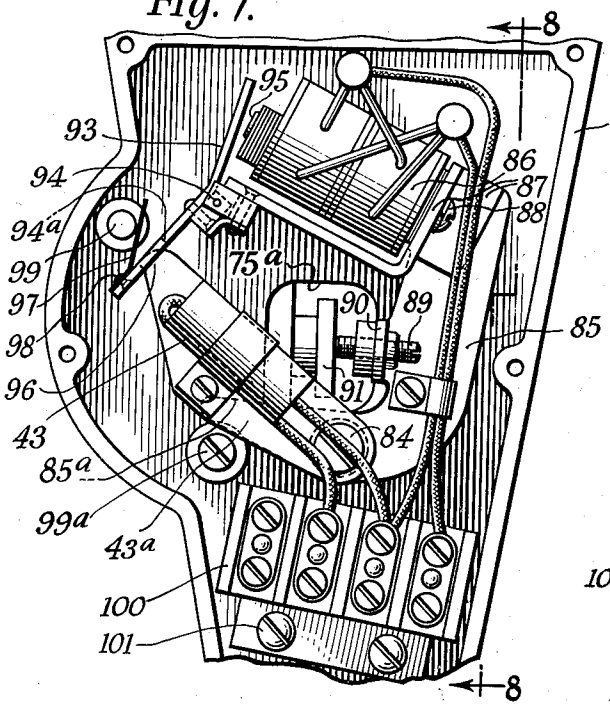
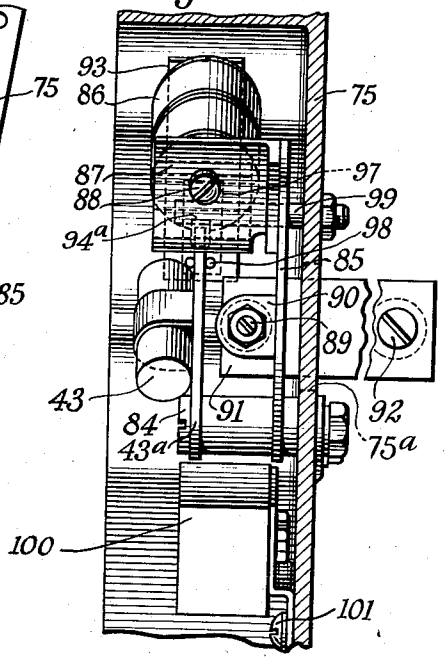


Fig. 8.



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Fig. 9.

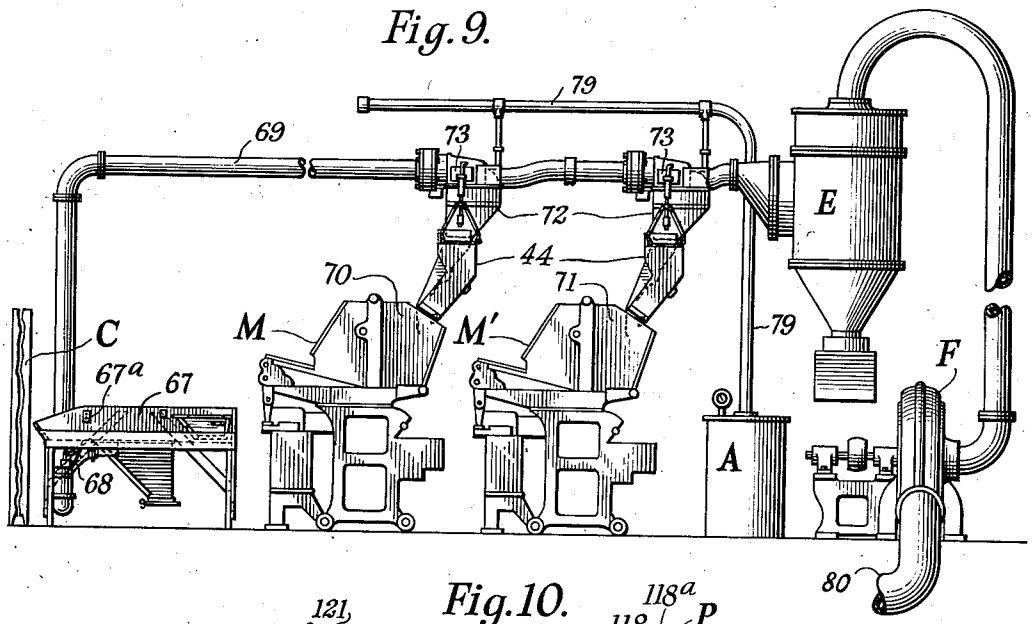
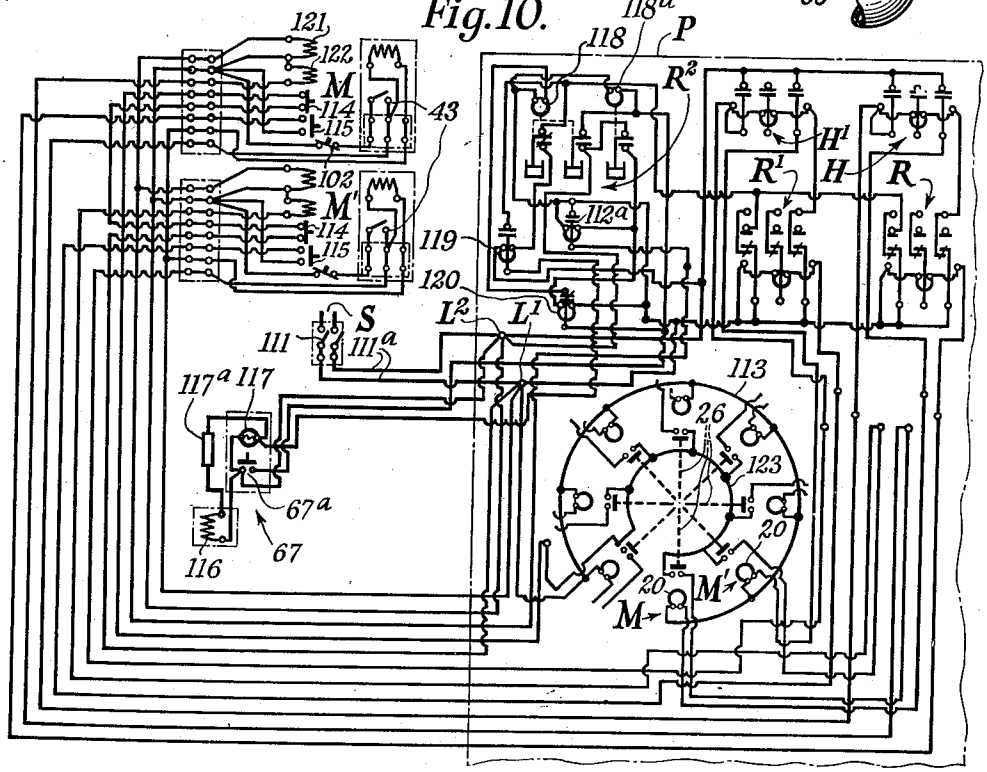


Fig. 10.



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FIG. 11

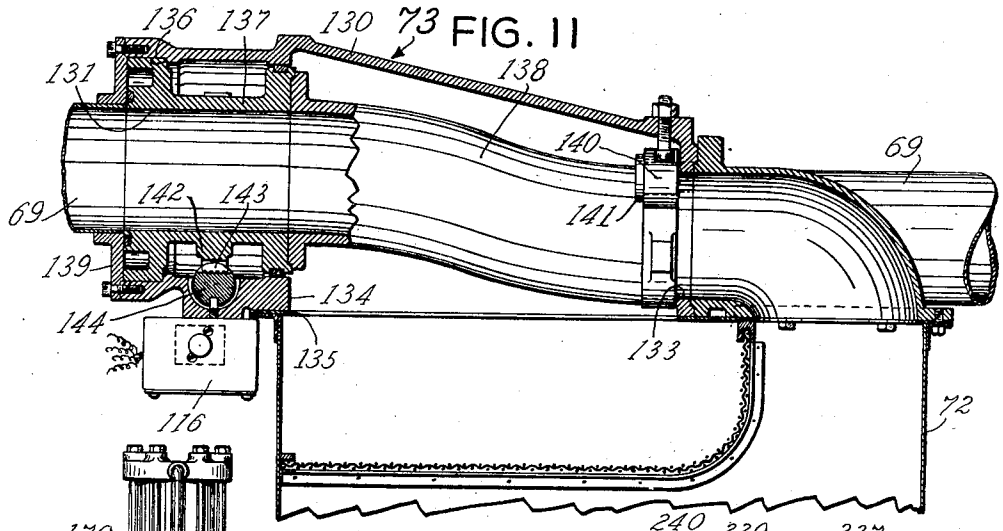


FIG. 13

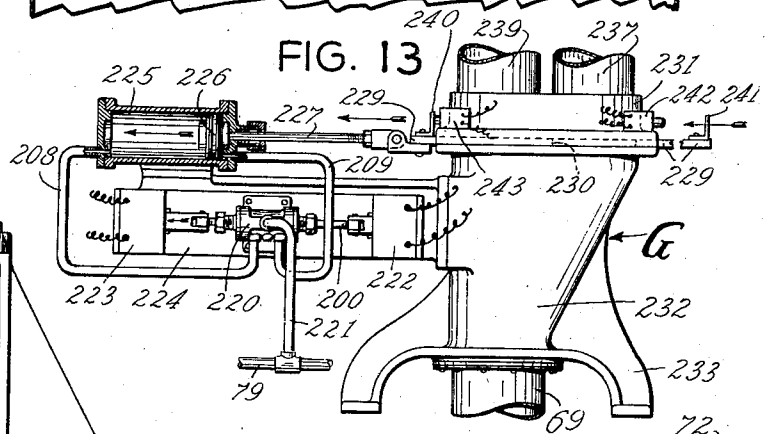


FIG. 12

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Patented Apr. 2, 1940 2,195,407

UNITED STATES PATENT OFFICE

2,195,407

CONTROL DEVICE FOR PNEUMATIC CONVEYERS FOR CIGARETTE MACHINES

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Application May 8, 1937, Serial No. 141,503

5 Claims. (Cl. 302—28)

This invention relates to pneumatic conveyers, more particularly to tobacco conveyers for supplying tobacco to a battery of cigarette making machines from a storage chamber. The main object of this invention is to automatically convey disintegrated tobacco or other material from its place of storage to the feed hoppers of a battery of cigarette making or other type of machines and dispatch the same automatically in the order in which the automatic signals are received, thereby relieving the attendant of the responsibility for the correct sequence. Another object of this invention is to provide means for automatically setting into operation a pneumatic conveyer at intervals corresponding to the transmission of a signal from depleted machines whereby to maintain the supply of tobacco or other material approximately at the same level in the feed hoppers of the various machines. To this end auxiliary hoppers are provided to receive the material from the conveyer outlets to each individual machine and to automatically transmit a signal upon depletion thereof. There is also provided an electric selector device actuated by the signals for dispatching the charges in the same sequence the signals are received. Accordingly, still another object of the invention is to provide a novel selector device.

These objects may be achieved in the embodiment of the invention selected for illustration herein, by connecting the tobacco feed hoppers of the desired number of cigarette making machines by means of a single pipe line, the end of which is led to a continuously running suction fan; the discharge pipe of the latter may return to the place of storage. The arrangement of the selector device herein illustrated to serve eight machines may, of course, be varied. The conduit is provided with outlets above the feed hopper of each machine and also with an automatically operated valve for diverting the tobacco into the collecting chamber which together with an auxiliary hopper may overlie the feed hopper of a cigarette making machine. Between the end of said pipe line and the suction fan, a dust collector and separator may be provided. The auxiliary hopper of each cigarette making machine is equipped with an electric signalling device such as a mercoid switch actuated when the auxiliary hopper moves from its normal position as the tobacco content is reduced to a predetermined minimum point. This signalling device communicates with a selector device which receives all signals and dispatches the charges manually inserted into the conveyer intake, in the same sequence in which they were received. The tobacco is fed into the intake at the charging tabe in small quantities and conveyed pneumatically through the feed line to the cigarette making machine which has sent in a signal.

In addition to the obvious advantages of this improved pneumatic conveyer system over hand feeding which advantages include speed and an assurance that the tobacco arrives at the feed hoppers in the same proper condition as it left the storage room, without impairing its condition by additional handling, it is now possible to supply the tobacco in the order in which each machine automatically signals its requirement and a desired level of tobacco for all machines will thus be automatically preserved.

As each machine is fed in its turn according to signalled requirements, the amount of tobacco is maintained at approximately the same height in each machine hopper, and the production of more uniform cigarettes is aided. The present control device insures prompt and correct selection of the machine to be fed, eliminating any chance of error on the part of an operator, and clean tobacco from which dust has been removed retains the benefit of the humidified conditioned air of the supply room while being conveyed to the cigarette making machine.

With these and other objects not specifically mentioned in view, the invention consists in certain constructions and combinations hereinafter fully described and then specifically set forth in the appended claims.

In the accompanying drawings which form a part of this specification and in which like characters of reference indicate the same or like parts:

Fig. 1 is a plan view of an electromagnetic selector device constructed in accordance with my invention;

Fig. 2 is a plan view (enlarged) of one unit of the mechanism shown in Fig. 1;

Fig. 3 is a side elevation of the unit shown in Fig. 2;

Fig. 4 is a fragmentary view of the common stop with one finger resting thereon and other fingers from various selector units in juxtaposition, awaiting their turn to establish a circuit by contact with the common stop;

Fig. 5 is a side elevation of the auxiliary hopper in normal position;

Fig. 6 is a front elevation of the auxiliary hopper;

Fig. 7 is an enlarged view of the mercoid switch on the auxiliary hopper;

Fig. 8 is a section taken on lines 8—8 of Fig. 7;

Fig. 9 is a side view of the pneumatic conveyor system; and

Fig. 10 is a diagram showing the wiring of the selector device and other electrical instrumentalities of a conveyor system connected for two cigarette making machines;

Fig. 11 is a fragmentary detail view on an enlarged scale, showing partly in vertical section and partly in side elevation one of the discharge outlet valves of the type of which two are illustrated in Fig. 9, with enough of the associated parts to make clear their combinative relationship;

Fig. 12 is a plan view of said discharge valve; and

Fig. 13 is a view in side elevation of an automatic valve operating mechanism for introducing to the main supply conduit, charges of tobacco to be conveyed therein to the cigarette machines in selective response to demanding signals sent from said machines for replenishment of tobacco as and when needed.

Referring to Figs. 1, 2 and 3 of the accompanying drawings, a number of selector units 20 are arranged on a base 21 an suitably fastened thereto as by cap-screws 22 to serve a like number of cigarette making machines and are enclosed in a dust-proof control box C (Fig. 9). A lever 23 of each unit (Fig. 3) is fulcrumed at 24 to a pedestal 25 secured to the base 21 by the screws 22 and carries a selector finger 26 attached at 27 to a bracket 28 pivoted on a pintle 29 set in one arm of lever 23, one leg 28*a* of bracket 28 engages the forwardly projecting edge 30 of a lever 31 pivoted at 32 and yieldingly held in a position to raise the finger 26 by a spring 33 attached to a pin 34 on the free end of lever 31 and anchored to a pin 35 on the vertical web of the pedestal 25. A stop pin 31*a* on the pedestal 25 limits the movement of the lever 31 under the tension of the spring 33. The lever 23 has an inwardly projecting lug 36 which acts as a stop for the leg 28*a* of the bracket 28 when the finger 26 is in its raised position. A plunger 37, through a link 38 suitably connected thereto at 39 and pinned to the lever 23 at 40, is operated from a solenoid 41, whose core it constitutes, mounted at 42 on the base of the pedestal 25.

When a signalling switch 43 on one of the auxiliary hoppers 44 (Figs. 5, 7 and 9) is operated, as will be presently explained, and the solenoid 41 of the corresponding selector device is subsequently energized, the plunger 37 rocks the lever 23 against the resistance of a return spring 45 attached thereto at 46 and anchored to the pin 35 on the pedestal 25, thereby bringing the selector finger 26 to bear on the stop or post 47 suitably fastened on the base 21 by a stud 21*a*. During this operation the leg 28*a* is checked by a stop screw 48 mounted on an arm 49 which is pivoted at 50 and held against a pin 51 by a return spring 52 secured to the arm 49 at 53 and to a pin 54 on the pedestal 25. Accordingly, the selector finger 26 is first swung into a horizontal position and then lowered into contact with the top of the post 47, meanwhile depressing an adjustable screw 55 mounted on a bracket 56 and thereby compressing a spring 57 on a bolt 58 passing through the arm 56 and a lug 59 of the pedestal 25. The bracket 56 pivoted at 56*a* on the plate 25 and its upward movement under the influence of the spring 57 is limited by the nut 58 on the latter. To the hub of the bracket 56 is fastened an insulating block 60 carrying a contact arm 61 which is swung into position to bring its contact point 62 into engagement with a contact point 63 adjustable at 63*a* on an insulating block 64 secured to a lug 65 of the pedestal 25 at 66, whenever the bracket 56 is depressed.

The contact of points 62 and 63 in any one of the selector units establishes an electrical circuit for actuating the discharge valve 73 (Fig. 9) of the corresponding hopper, as will be presently described, and sets it to a discharging position which is maintained until after the complete charge of tobacco has been delivered, whereupon it is reset to its closed position. When the solenoid has been de-energized the spring 33 will return the selector finger 26 to the raised position. When another one or all of the tobacco feeds of the various machines signal their requirements during the time one feed is being served the respective selector fingers will come down in the sequence of their requesting signal, one atop the other (Fig. 4), but since the discharge valves are controlled by a contact made through the corresponding selector, only that particular finger which rests directly on the stop 47 will be effective to operate a valve to its discharge position, for the control circuit operated by each of the other fingers will be kept open by the action of its particular spring 57, which swings contact 62 away from contact 63 (see Fig. 3). The free ends of the selector fingers are rounded and chamfered to a thin edge 26*a* in order to facilitate positioning one finger above another.

A conveyer, which includes a charging table 67 (Fig. 9), is connected by means of an intake valve 68 electrically operated and controlled by each of the several selector units 20, to a main conduit or pipe line 69. The construction of the charging table is similar to that shown in applicant's copending application noted, Serial No. 65,676, now issued as Letters Patent No. 2,140,128, dated December 13, 1938, wherefore further description thereof at this point is deemed unnecessary except to state that the valve is automatically opened as will be hereinafter described. The charging table 67 is provided with a signal light to notify the operator when to supply a measured amount of tobacco and a push button to reset all operating connections. Both the light and button are conveniently placed on a panel (Fig. 9) fastened to the table. Suction may be created in the conduit 69 by a suction fan F located adjacent the outlet end thereof. Above each tobacco feed hopper 70 and 71 respectively, of any suitable number of cigarette making machines M and M' illustrated herein, is discharging mechanism including a collecting chamber 72 inter-communicating the conduit 69 through an electrically controlled air valve 73. The construction of collecting chambers 72 is illustrated in sufficient detail in Figs. 11 and 12, herein, and forms the subject-matter in part of my said Letters Patent No. 2,140,128 wherefore reference may be had to the same for a description of the intended diversion of the air current from the conduit 69 to the desired chamber when its valve is actuated. For a more detailed recital of the valve structure and its associated parts, reference may be had to the co-pending application of Randolph, Serial No. 231,149. As indicated in Fig. 9 herein, the air is diverted through the chamber 72 and then returned to the conduit in order that the charge of tobacco being pneumatically conveyed may be deposited in the collecting chamber. There is arranged below each collecting chamber an auxiliary hopper 44 pivotally

supported at 74 on the brackets 75 which are secured to the collecting chamber by studs 76. Stops 77 on the brackets 75 coact with lugs 78 on the auxiliary hopper 44 to limit its change of position when the loss of the tobacco deposited therein causes it to move and operate a signal switch on the bracket 75 as will be described later.

Each feed or discharge valve 73 (Figs. 9, 11 and 12) is actuated by compressed air supplied through a pipe line 79 and branch 179 from a source of compressed air such as a compressor A and is electrically controlled by two solenoids operated through a selector unit 20, as will be hereinafter described. Between the last discharge valve 73 on the conduit and the suction fan F there may be connected a dust collector and separator E of well known construction. If it is desired, the charging table may be placed in an air conditioned tobacco storage room and the conditioned air taken from the room may be returned thereto by connecting the exhaust pipe 80 of the suction fan F to said room, or the fan itself may be located there. The control box C is dust-proof and the individual time relays used in nection with the various circuits together with the selector units 20 are arranged for effective operation therein. Each discharge valve 73 comprises preferably a housing 130 (see Fig. 11) which is provided with an opening 131 in communication with an abutting opening of the main conduit 69, and in the housing is mounted rotatably a valve device 137 having a nozzle extension 138 (Fig. 11) which can be swung, as by a rack 143, engaged with an arcuate rack 142, to bring the swinging end of the nozzle 138 alternatively into communication with the inlet opening 133 of the corresponding collecting chamber 72, or into communication with the opening 132 into the next stretch of the main conduit 69. The housing 130 has an opening 134 in its lower part which registers with an opening 135 in the upper end of the collecting chamber 72, the suctional effect in conduit 69 being maintained through these registering openings 134—135 when a charge is being supplied to chamber 72. As a convenient form of mechanism to actuate the rack 143, it is formed on a rod 144 (Fig. 12) connected, as at 145, with the rod of a piston (not shown) in a fluid-pressure cylinder 146, the operating ducts 178 and 179 of which are energized by a suitable fluid-pressure medium supplied through the conduit 79, and regulated by a suitable electric intake valve solenoid, as 116.

The auxiliary hopper 44 is normally urged by a tension spring 81 secured thereto at 82 and to the bracket 75 at 83 into position to bring its lug 78 (see Figs. 5 and 6), against the uppermost stop 77 of the bracket 75 and thereby tilt the mercoid switch 43 sufficiently out of horizontal position so that a circuit is established for sending a signal to the corresponding selector unit 20. For this purpose the mercoid switch 43 is carried by a plate 43a mounted on a pivot 84 on the bracket 75 together with a bracket 85 which supports an electromagnet 86 on a plate 87 suitably secured thereto at 88. Normally a stop screw 89 on the lug 90 of bracket 87 is engaged by a stop 91 suitably secured to the auxiliary hopper 44 by studs 92, thereby swinging the mercoid switch into the inclined position wherein it closes the circuit to the selector unit. The bracket 85 is provided with a leg 85a whose movement is limited by a stop 99a. When the auxiliary hopper 44 is loaded it is swung down on its pivot 74 against the tension of the spring 81 by the weight of the tobacco and the mercoid switch 43 is thereby positioned horizontally so as to break the circuit through and deenergize the relay coils 86. This occurs as stop 91 of the hopper recedes from the stop-screw 89 on arm 85 and thereby permits the weight of the switch 43 to swing it into a horizontal position when it is unlatched. As soon as a signal is transmitted to the signal lamp on the panel board P (Fig. 10), the circuit is broken by the mercury switch 43 which is unlatched directly following the energization of the electromagnet 86 which controls a latch member 93.

When the tobacco is depleted in the hopper 44 the spring 81 raises the auxiliary hopper 44, swinging it so that its stop 91 rocks the bracket arm 85 backward together with the relay coils 86 mounted thereon. The electromagnetic latch 93 is supported by a hinge 94 on the plate 87 and retains the mercury switch 43 in tilted position upon engagement of the nose 96 of the switch plate 43a in an opening 94a thereof. A leaf spring 97 secured to the latch at 98 bears against a stop 99 on the bracket 75 for yieldingly retaining the latch in latching position. When the bracket arm 85 has been rocked backward the switch 43 will be in a tilted position (see Fig. 7), wherein the level of mercury is sufficient to establish a circuit through and energize the electromagnet 86 to attract the latch 93 to its armature 95 and unlatch the mercury switch 43 which then falls back to its horizontal position breaking the circuit through the signal lamp and the electromagnet 86. A terminal block 100 for the electrical connections is fastened to the bracket 75 by screws 101 and a toggle switch 102 (Fig. 5) is provided outside the bracket 75 to permit the attendant to break the circuit through the mercoid switch. A hinged door 103 (Fig. 5) provided with a handle 104 permits access to the interior of the auxiliary hopper 44 upon unloosening the bolts 105 thereof. Fingers 106 pivotally mounted between the brackets 75 on the cross-bar act as a gate to control the direction taken by the tobacco and the distribution thereof at the outlet 107 as it is fed into the feed hopper of the cigarette making machine. A guide bail 108 pivoted at 109 on the auxiliary hopper 44 is adjustably held to a suitable angle by a bolt and slot connection 110.

Referring to the wiring diagram (Fig. 10) showing the selector connections as well as the other electrical controls of the conveyer system, the supply mains S are connected in parallel through the double-pole switch 111 and line wires 111a to cigarette making machines M and M' and their respective discharge valves 73, safety or limit switches 114 and 115, time relays R^2, releasing relays R' and R, holding relays H and H' and selector units 20 on a panel P, as well as to the intake valve 68 of charging table 67. It will be understood that the particular wiring diagram shown is merely illustrative and any suitable circuit may be employed.

In the operation of the conveyer system illustrated, when a circuit is established by the mercoid switch 43 of cigarette machine M the current flows from the line 111a at L^2 through the switch and continues to the secondary of the three-point holding relay H, whereupon current flows from the line L^2 through the primary circuit of relay H and returns through the solenoid 41 of the selector unit 20 for the machine M and on through the wire 113, common to all selectors,

to the other line 111a at L^1 completing the circuit.

Upon energization of the solenoid 41 of selector 20, its contact arm 26 closes the circuit through the solenoid 122, thereby setting into operation the pneumatic mechanism for displacing the valve 73 into position to divert the air current into the chamber 72, the circuit including a limit or safety switch 114, which is connected in series therewith and returning to the line 111a at L^1. When the valve 73 reaches its displaced position the switch 115 is closed and the current flows to the releasing relay R which is thus energized to break the secondary circuit of the holding relay H wherefore the primary circuit of the latter is also interrupted. The current from the main line 11a flows through the releasing relay R from the relay 119 for the circuit through intake valve solenoid 116, thereby establishing a circuit through the latter and its series resistance 117a as well as the signal light 117. In this manner the intake valve 229 is opened and the signal lamp lighted.

The safety or limit switches 114 and 115 are respectively closed and opened by pneumatic mechanism similar to that shown in the co-pending application identified above, when the discharge valve 73 is in position to divert the air current from the conduit into the chamber 72. After the tobacco is fed into the intake, the operator presses the push button 67a which permits the main line current to energize one relay 118 of a group of time relays R^2 which cuts out the relay 119 for the circuit of the intake valve solenoid and lamp 117, permitting the intake valve to close after a predetermined interval sufficient for the inserted tobacco to reach the chamber 73. At the same time the time relay 118a is actuated so that it energizes the supplemental relay 120, after the time relay 118 falls out, and thereby actuates the small line relay 112a which in turn puts the closing solenoid 121 in operation to return the valve 73 to its open position.

The filling of the depleted tobacco feed of a cigarette making machine M is now effected and safety or limit switches 114 and 115 resume their normal open and closed position respectively and the intermediate releasing relays R fall out when the switch 115 is opened. The electrical operation and connections described are similar for the cigarette making machine M'.

In Fig. 13 is disclosed an automatically operated main intake valve for controlling the introduction of charges of tobacco to the main conduit 69 at the point indicated at 68 (Fig. 9) on the table 67. This switch is similar to that illustrated and described more at length in my co-pending application, Serial No. 65,676, to which reference may be had if desired for detailed description of structural features.

Such an intake valve, designated generally by the reference character G in Fig. 13, may comprise a slide 229, provided with a suitable aperture 230 and slidably mounted between the upper section 231 and lower section 232 of the intake housing mounted on the base 233 which also supports the feed table 67. The main conduit 69 is connected to the discharge end of the housing part 232, and the intake pipe from the table is designated 239, while 237 is a pipe leading to a dust-collecting chamber, placed in communication when the valve 29 is in the position indicated in Fig. 13, the opening 230 being in registry with said pipe 237, and with the corresponding opening into the lower part 232 of the housing. When so disposed the valve cuts off access of tobacco from the table 67 to the main conduit 69, but permits suction to be maintained through 237—230—232—69, by fan F. When the slide valve 229 is moved toward the left and brings the opening 230 into registry with the pipe 239, tobacco from the table is drawn down through G into 69 and constitutes a charge for the selected collecting chamber of one of the machines M, M'.

Movements of the valve 229 are accomplished by a piston rod 227 actuated by piston 226 in fluid pressure cylinder 225, from which ducts 208 and 209 lead to a pilot valve 220 connected with the compressed air line 79 by means of pipe 221.

The ends of the piston rod 200 of pilot valve 220 are connected to solenoids 222 and 223 attached, together with the pilot valve 220, to a bracket 224 mounted on the lower intake valve housing 232, the solenoids 222 and 223 being connected in series with the set of solenoids O1, O2, and O3 and the sets of solenoids K1, K2 and K3, respectively. Said bracket 222 also carries the cylinder 225.

The ends of valve 229 are equipped with contact makers 240 and 241, the latter depressing a push button of a switch 242 when valve 229 is in open (left hand) position, while finger 240 depresses the button of a switch 243, as shown in Fig. 6, when the valve is in "closed" position, i. e., with tobacco shut off.

Switches 242 and 243 may be connected in series with the solenoids 222 and 223 respectively. The switch 242 may be arranged, when depressed, to close the circuit through the coil of a suitable time relay, as TR, for the purpose of determining the proper length of the respective charging periods; and the switch 243 may be arranged to close a contact in the circuit through the contacts N and P, for a like purpose.

What is claimed is:

1. In a pneumatic conveyer, the combination with a conduit having an intake and a plurality of outlets, of means for pneumatically conveying material intermittently from said intake to said outlets including means for creating a substantially continuous suctional effect in said conduit at a region in advance of said outlets, a plurality of hoppers underlying said outlets to receive material therefrom, said intake being provided with an inlet valve adapted to be opened to admit material to the air stream in said conduit for conveyance to said outlets as and when needed, each of said hoppers being provided with means for automatically opening said valve upon depletion of the material deposited in each such hopper from the respective conduit outlet, and mechanism for putting the depleted hopper into communication with said conduit to cause the conveyed tobacco to be deposited therein, said mechanism including a device for successively putting said hoppers into communication with the conduit in the same sequence in which they are depleted.

2. In a pneumatic conveyer for cigarette machines, the combination with a conduit having an intake and a plurality of outlets, of means for pneumatically conveying charges of tobacco intermittently from said intake to said outlets including means for creating a substantially continuous suctional effect in said conduit, at a region in advance of said outlets, a plurality of cigarette machine feed hoppers underlying said outlets to receive material therefrom as and when needed, a plurality of devices each for diverting the conveyed tobacco through one of said outlets

to the respective cigarette machine feed hopper whenever the weight of the tobacco in the latter falls below a predetermined amount, and an electrical selector controlling said devices for effecting the necessary diversion of the conveyed tobacco to the various hoppers in the same sequence that their depletion occurs.

3. In a pneumatic conveyer for cigarette machines, the combination with a conduit having an intake and a plurality of outlets, of means for pneumatically conveying charges of tobacco intermittently from said intake to said outlets including means for creating a substantially continuous suctional effect in said conduit, at a region in advance of said outlets, a plurality of cigarette machine feed hoppers underlying said outlets to receive material therefrom as and when needed, a plurality of devices each for diverting the conveyed tobacco through one of said outlets to the respective cigarette machine feed hopper whenever the weight of the tobacco in the latter falls below a predetermined amount, and an electrical selector controlling said devices for effecting the necessary diversion of the conveyed tobacco to the various hoppers in the same sequence that their depletion occurs, said selector including an electrical circuit including a stationary contact, and movable contact fingers actuated by said devices into position to engage said stationary contact.

4. In a pneumatic conveyer for cigarette machines, the combination of means for delivering charges of tobacco to any one of a series of cigarette machine feed hoppers, each adapted to change its position when emptied, and devices, actuated by such movement of the hoppers individually, for indicating to an operator at the intake end of said means that one or more of said hoppers requires replenishment, and mechanism controlled by the order in which said devices are operated to determine the order in which the hoppers are replenished by said means.

5. In a pneumatic conveyer for cigarette machines, the combination of means for delivering charges of tobacco to any one of a series of cigarette machine feed hoppers, each adapted to change its position when emptied, and devices, actuated by such movement of the hoppers individually, for detecting and indicating to an operator at the intake end of said means that one or more of said hoppers requires replenishment, means, operable manually at said intake end by said operator to supply said charges for delivery, and mechanism controlled by the order in which said devices are operated to determine the order in which the hoppers are replenished by said delivery means, free from volitional effort by said operator at the intake end.

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