

[54] **FEED RATE CONTROL DEVICE OF CIGARETTE PACKAGING MACHINE**

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[51] Int. Cl. B65b 67/16

[58] Field of Search 53/54, 53, 56, 60, 53/78, 151

[56] **References Cited****UNITED STATES PATENTS**

3,520,394	7/1970	Seragnoli	53/151 X
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[57] **ABSTRACT**

This control device is associated with a cigarette packaging machine comprising a main supply hopper subdivided into a plurality of channels at its lower portion for delivering cigarettes at dispensing stations and carried by a conveyor of the intermittent motion type; the device comprises several feelers electrically connected in parallel, adapted to register with and engage said channels; relay means responsive to said feelers for controlling the energizing circuit of other relay means controlling in turn the electric motor driving the packaging machine, said feelers are disposed at a higher level than planes of said dispensing stations where the layers of cigarettes are delivered to said* containers, said level corresponding to a height of five to seven times that of a single layer.

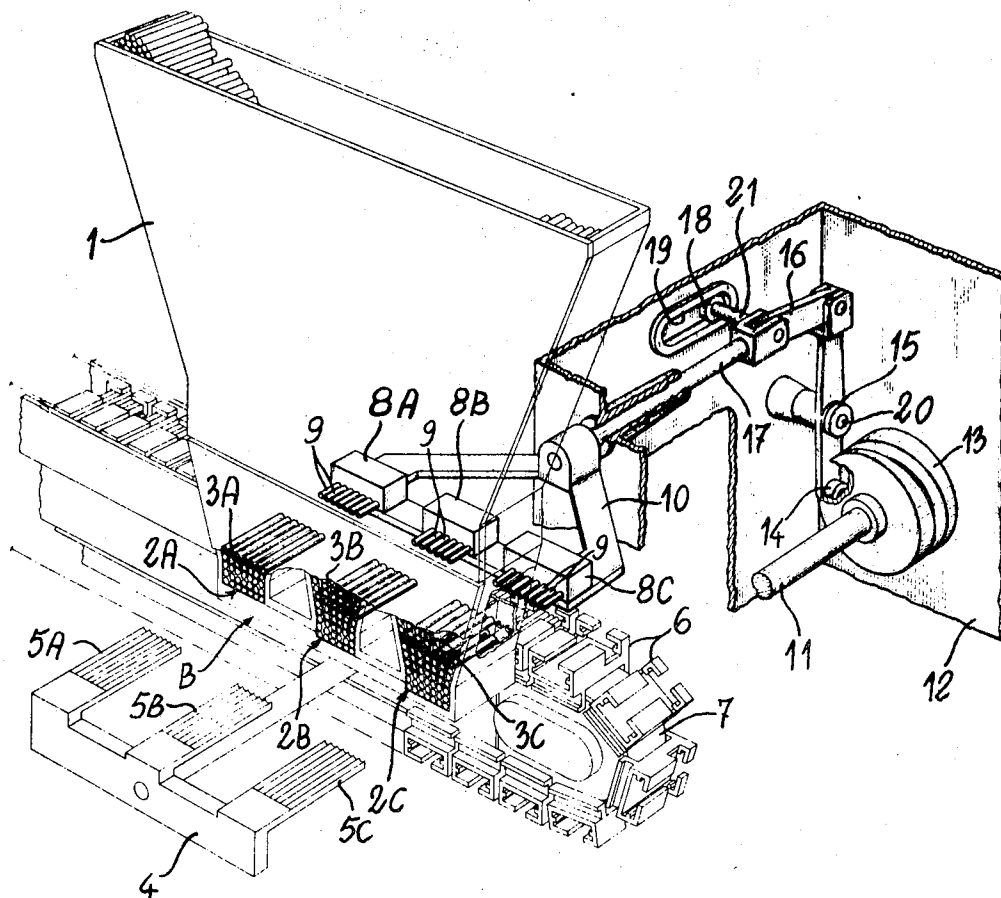
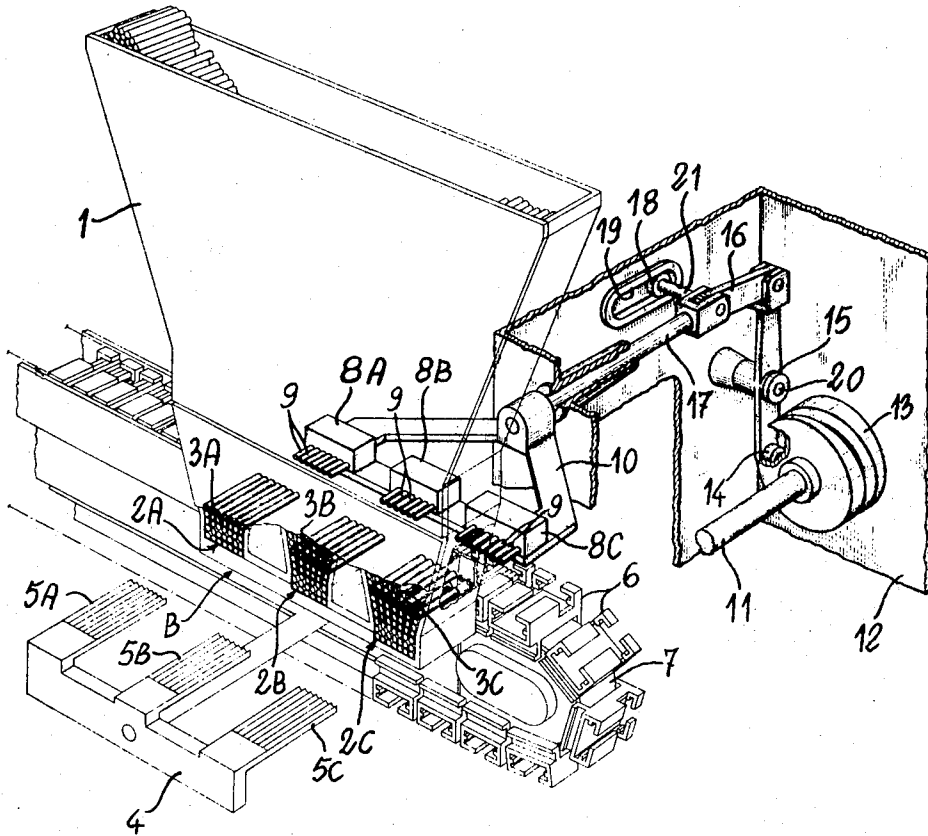
3 Claims, 2 Drawing Figures

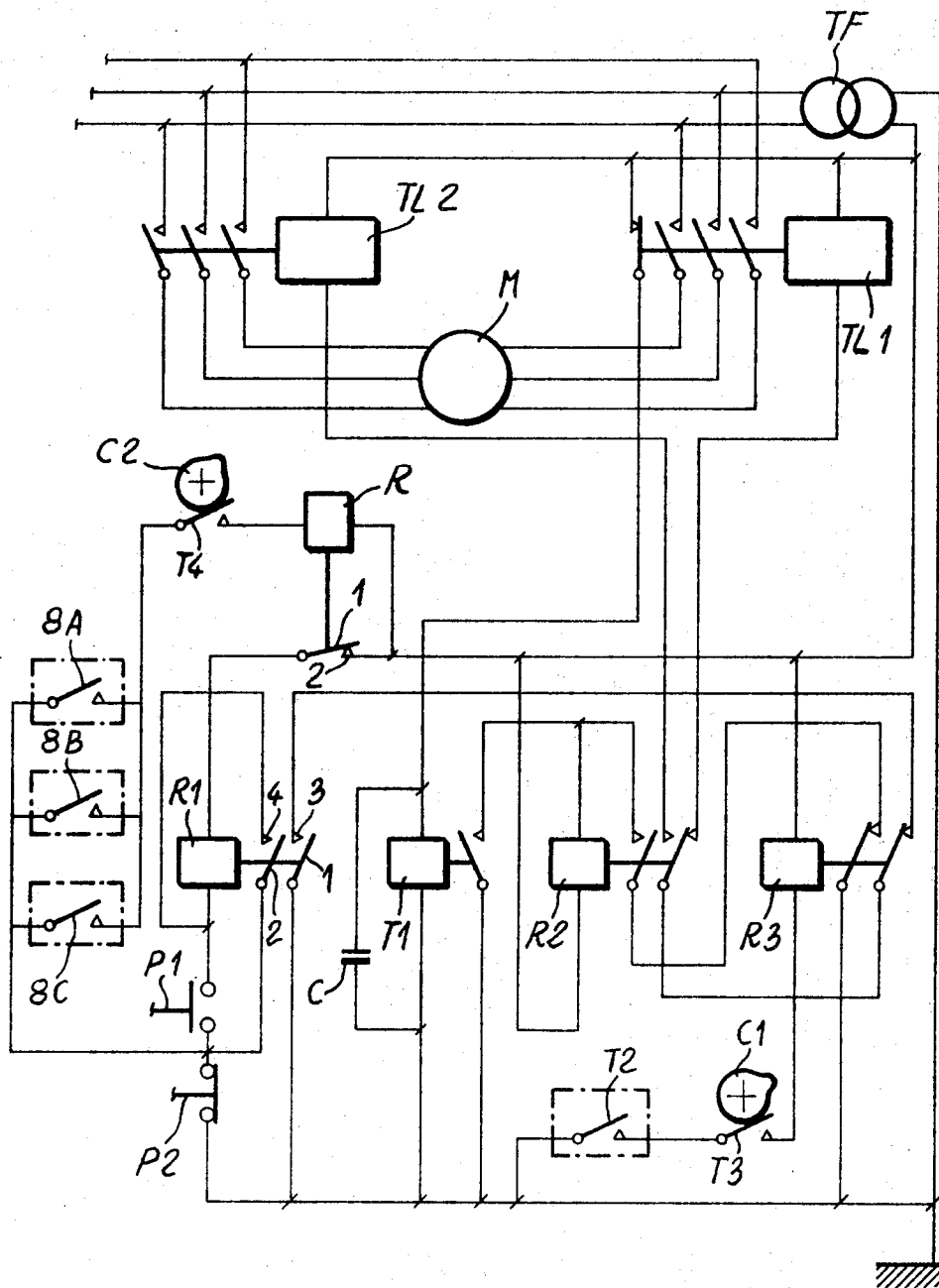
FIG. 1



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FIG-2



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FEED RATE CONTROL DEVICE OF CIGARETTE PACKAGING MACHINE

This is a Continuation-In-Part application of U.S. Ser. No. 721,525 of the same inventor, issued on Dec. 21, 1971 as U.S. Pat. No. 3,628,309.

The prior art is represented by U.S. Pat. No. 3,520,394, issued July 14, 1970 to the same inventor.

FIELD OF THE INVENTION

The present invention relates in general to cigarette packaging machines and has specific reference to control devices of the type applicable to machines designed for preparing a bundle of a predetermined number of cigarettes through successive and known steps, these machines forming firstly complete bundles ready for the packaging operation proper according to a predetermined number of layers comprising each a predetermined number of cigarettes, the bundles thus formed being subsequently packaged automatically. More particularly, this control device of cigarette packaging machines comprises a combination of means whereby the steadiness of the feed flow to the means dispensing the cigarette layers to be subsequently transformed into complete bundles is controlled cyclically.

DESCRIPTION OF THE PRIOR ART

These parent U.S. Pat. applications disclose a cigarette feed hopper of a depth or width corresponding to the length of the cigarettes to be handled; this hopper has its lower portion divided into a number of elementary or subhoppers corresponding in number to the number of cigarette layers of a complete batch to be packaged; each sub-hopper is provided with a plurality of partitions extending vertically downwards so as to form there between passages or channels equal in number to the number of cigarettes of the corresponding layer of a batch and having substantially the size of a cigarette diameter.

In accordance with the prior art the partitions are limited in the downward direction in order to preserve a certain gap between their lower ends and the bottom of the elementary hoppers.

The bottom of these hoppers functions as a dispensing outlet for layers of cigarettes disposed side by side and fed in succession by a push member, and subsequently superimposed in compartments of an endless conveyor operating intermittently.

With this arrangement the bundles of cigarettes resulting from the superimposition of the layers, are either incomplete or objectionable because they contain defective cigarettes, having a tobacco density below the requisite standard. In order to reject these defective groups and to remove them from the production line, in the prior art provides, also, along the path of the endless conveyor, means such as microfeed controls, in which twin beams of nucleonic particles compare the density of the cigarettes of a complete group and signal the presence of incomplete groups or groups containing defective cigarettes to a memory device; means responsive to the signals of the memory device to remove these groups from the production line and simultaneously discontinue the supply of the various package materials (such as paper wrap, foil, label and cellophane) which would have been allocated to the eliminated groups.

In cigarette packaging machines of the high production rate type, such as described in the US Pat. applica-

tion No. 721,525 this process (of the detection and elimination of the defective groups, of the actuation of means for feeding packaging materials, and eventually of the resumption of normal operative conditions) is accomplished in a fully automatic fashion.

However, when the normal operation is to be resumed, by re-starting the means for supplying the packaging materials after the temporary delay due to gaps in the production line caused by the removal of defective groups because of the high production rate.

A shift to normal between the product to be packaged and the packaging materials must be reinstated and for this subsequent checking means must be provided along the packaging line.

In order to avoid these inconveniences, the Applicant provided means for operating the high production rate cigarette packaging machine at different speeds to attain the rated or maximum speed by passing firstly through a "low speed" which is lower than the maximum or rated speed.

Such a machine at a rate depending substantially on the possibilities of rated-speed variation of the machine proper. The alternation of defective groups with sound and complete groups of cigarettes in the compartments of the endless conveyor permits the machine to operate continuously but in staccato jerks, which is uneconomical and inadequate.

Applicant discovered that the incompleteness of the groups or bundles of cigarettes frequently is caused in the step preceding the delivery of the cigarette layers to the compartments, and that, as the flow of cigarettes descending through the main hopper is subdivided into secondary supply flows directed to the elementary hoppers, discontinuities arise because clogging caused by the throttled inlet passage of the elementary hoppers, and that discontinuities also take place along the channels formed by the elementary hoppers, due to the presence therein of defective cigarettes and/or tobacco dust.

This in accordance with this invention in this zone and more particularly the control of the supply flow upstream of the feed or dispensing zone was provided.

SUMMARY OF THE INVENTION

It is therefore the primary object of the present invention to provide in a high speed cigarette packaging machine, means capable of assuring the continuity, at the dispensing stations, of the cigarette layers by controlling the steadiness of flow of the cigarettes themselves across the elementary hoppers. This and other objects are carried out with the device according to the present invention by controlling the feed flow rate in cigarette packaging machines of the type, comprising a feed hopper provided with a plurality of series of channels delivering the cigarettes at dispensing stations to compartments adapted to be stopped at these stations by an intermittent-motion conveyor. The device is provided with a plurality of sensors electrically connected in parallel to one another and registering with the channels, and on the other hand with electric relay means responsive to the sensors and adapted to control the circuit supplying current to other servo-action relay means for energizing the electric motor, which drives the cigarette packaging machine.

More particularly, the present invention relates to a machine for the formation of orderly groups of cigarettes constituted of orderly superposed layers of ciga-

rettes comprising means for dispensing the layers of cigarettes; a plurality of individual stations for receiving the respective layers; container means for receiving the groups of cigarettes; a plurality of pusher means, each of said pusher means for pushing a layer of cigarettes at a time into the container means; conveyor means for intermittently displacing the container means in an operative direction past the stations; each of said stations includes means defining a supporting surface for the cigarettes, the supporting surfaces being arranged in consecutive order in the operative direction along the conveyor means laterally offset thereto, the supporting surfaces being arranged at different levels with respect to each other increasing in the consecutive order, the level difference between next among the supporting surfaces corresponding at least to the thickness of a cigarette, and wherein the respective pusher means are arranged at a level corresponding to the level of the supporting surfaces and adapted to sweep the respective of the supporting surfaces to transfer the layer of cigarettes collected on the supporting surface onto a corresponding of the container means, the container means having open sides to receive sideways the respective layer of cigarettes transferred from the respective of the supporting surface, the container means having a bottom arranged on the conveyor means at a level corresponding to the lowermost level of the supporting surfaces; motor means for operating the machine; a device positioned adjacent the conveyor means for controlling the rate of flow of the respective layers of cigarettes dispensed from the dispensing means to the respective stations, the device including a plurality of feeler members mounted substantially opposed to the respective pusher means, the feeler members being electrically connected in parallel to one another and registering with the respective pusher means; and relay means responsive to the feeler members and adapted to control energizing circuit means of the relay means for controlling the operation of the motor means.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the "control device of this invention will appear more clearly from the following detailed description explained with reference to the accompanying drawings illustrating diagrammatically a preferred form of embodiment of the invention. In the drawings:

FIG. 1 is a diagrammatic perspective front view of the control device of this invention as used in a machine adapted to form groups of cigarettes comprising a plurality of separately superposed layers, and

FIG. 2 is a wiring diagram of the circuit controlling the complete cigarette packaging machine with the control device according to this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, the machine for successively forming groups of cigarettes comprising a plurality of superimposed layers of the type disclosed in the above-mentioned US Pat. applications No. 721,525 and No. 721, 532, to which the control device according to the present invention is applied, is shown diagrammatically in thin lines as comprising the cigarette feed hopper and the device for conveying complete groups of cigarettes, the thick lines showing the control device proper

and the kinematic means driving the same as shown in heavy lines.

The cigarette feed hopper which, is of the type disclosed in the US Pat. application No. 721,532 has its lower portion divided into three elementary or sub-hoppers 2A,2B and 2C having bottoms 3A,3B and 3C of gradually decreasing thickness in a downward direction.

A pushing system 4 is adapted to transfer by means of heads 5a, 5B and 5C respectively layers of cigarettes from the elementary hoppers 2A,2B and 2C into compartments or like containers 6 carried by the conveyor for supplying complete groups of cigarettes to the packaging line.

At a common level with reference to the base plane B of hopper 1 and above the delivery level of the three layers previously and properly formed and consisting of seven, six and seven cigarettes respectively, in the specific example considered herein for packaging 20 cigarettes per package, there are arranged, in proper alignment to the three elementary hoppers 2A, 2B and 2C, three sets of feelers or like sensors 8A, 8B and 8C, respectively, consisting in the whole of 20 properly located feeling rods 9, i.e., one rod per cigarette, supported by a horizontal flat bracket 10.

These feeler rods 9 are therefore disposed each coaxially with one cigarette contained in the elementary hoppers and are urged in their outermost position by easily compressible springs (not shown).

The feeler rods 9 are reciprocated bodily by the bracket 10 so as to "feel" at each cycle, during each working stroke, the ends of the cigarettes disposed of a common level in each channel in the layers so as to signal the possible absence of one or more cigarettes, or the insufficient filling thereof with tobacco, through electric contact means described and shown in detail on FIG. 2, each rod 9 being connected to a separate contact.

In accordance with this invention this control action is exerted on the cigarettes contained in the channels of the elementary hoppers to permit the proper and reliable checking of the regularity of the cigarette flow does not take place as previously suggested at the level where the layers of cigarettes are delivered to the containers 6, but at a somewhat higher level. The purpose hereof is to prevent layers, found defective from being transferred into the containers 6.

The reciprocating motion imparted to the feelers 9 is derived from the power shaft 11, rotatably supported by the frame 12 and driven from the main machine. Keyed or otherwise secured to one end of the shaft 11 is a cam 13 of the helical groove type; the cam groove is engaged by a roller 14 mounted for free rotation to one end of a two-armed lever 15 fulcrumed at 20 to the frame structure 12. At its opposite end the lever 15 is pivotably connected to a link 16, connected in turn to a rod 17 slidably mounted in the frame 12 and carrying at its end, protruding from the frame structure 12 the horizontal flat bracket 10 which supports the three sets of the sensors.

The pivot pin 21 interconnecting the link 16 and rod 17 has a lateral extension provided with a free rotating roller 18 engaging an elongated opening 19 in the frame as a guiding and stabilizing member for the kinematic assembly.

FIG. 2 illustrates by way of example a wiring diagram of the circuit for controlling the high-speed cigarette

packaging machine of the present invention. An electric motor 11 of the double polarity type, operates the packaging machine at two different speeds; two remote-controlled relays or like switches TL1 and TL2 control in turn the energization of the electric motor M; remotely controlled relays or switches R1, R2 and R3 are provided, R1 controlling the complete circuit and R2, and R3 controlling the remote controlled relays TL1 and TL2 respectively; finally, a time-lag device T1 with a capacitor C of suitable capacity, controls the said remote controlled relays TL1 and TL2. Furthermore, the circuit comprises a push-button starter switch P1 for starting the machine and stop push-button P2 for stopping the machine.

The contact T2 is the electrical equivalent of the feeler rods disclosed in the above mentioned U.S. Pat. application No. 721,532. A cyclic cam C1 adapted, during each cycle of operation of the machine, to close and re-open the switch T3 is connected in series to said contact T2.

A voltage transformer TF is connected to the main supply line for energizing the electric motor M and the said remote-controlled relays and time-lag relays.

For purposes of the present description, only the remote-controlled relay R1 for presetting the circuit operation needs to be considered. This relay R1 comprises a first movable contact arm R1-2, through which the circuit for self-energizing the remote-controlled relay R1 is adapted to be closed, a second movable contact arm R1-1 constituting the actual presetting element of the circuit through which the energizing circuit leading to the remote controlled relays for supplying current to motor M is closed, and a pair of corresponding fixed contacts R1-4 and R1-3, respectively. The circuit further comprises, as shown diagrammatically at 8A, 8B and 8C, separate, parallel connected contacts corresponding to the three sets of rods 9.

A cyclic cam C2 adapted, upon each revolution of the machine, to close and open the contact T4 inserted in series in relation to said set of feelers 8A, 8B and 8C shown in the form of parallel-connected contacts. A remote-controlled relay R having its energizing contact adapted to be closed through contact T4, the set of parallel-connected feelers 8A, 8B and 8C, and the stop push-button P2; this relay R comprises a movable contact arm R-1 which, in the de-energizing condition of said relay R, is closed by a corresponding fixed contact R-2.

The mode of operation of the control device according to this invention, under normal conditions, is as follows:

When the feeler rods 9 of the three groups 8A, 8B and 8C during their engagement in the corresponding discharged channels of the elementary hoppers 2A, 2B and 2C, detect a missing cigarette or a faulty or insufficient filling of one or more cigarettes, their corresponding contacts are closed.

As such contacts are closed, and when the contact T4 is also closed by the cyclic cam C2, the remote-controlled relay R is energized.

As a consequence of the energization of relay R, its movable back contact R-1, inserted in the energizing circuit of relay R1 for presetting the circuit in its operative condition, is opened, thus de-energizing this relay R1 and opening its contacts R1-1 and R1-2. The opening of contact R1-2 is attended by the de-energization of the holding or self-energizing circuit of said relay R1,

and the opening of contacts R1-1 disconnects the source of current from the windings or relays TL1 and TL2 controlling the energization of the motor M.

Thus, the motor M and therefore also the machine are stopped. This stoppage, especially in the case of a high-speed packaging machine, will take place, due to the considerable inertia, with a certain time lag, the value of which depends on the presence or absence of a brake.

For this reason, i.e. the unavoidable delay and therefore the number of cycles elapsing from the time supply of the energizing current to the motor M at which it is discontinued, to the actual stoppage of the machine, the three sets of feelers are positioned at a higher level, for example, in the case illustrated, from 5 to 7 layers above the plane of delivery of the same cigarette layers.

Thereby the layers, the deficiencies of which were detected by the sensitive devices are prevented from being transferred, during the above-defined time period, into the containers 6, thus providing time, so that effective steps may be taken for derouting the deficient cigarettes from the elementary hoppers.

The de-energization of motor M, as a consequence of the closing of one or a plurality of contacts in the group of parallel-connected members 8A, 8B and 8C, is irreversible.

Because of the delayed stoppage of the motor M the sensors may detect already during the next cycle, during their stroke a perfectly regular supply flow and will open all the contacts of the three sets 8A, 8B and 8C. This opening is caused by the de-energization of relay R and therefore by the closing of its movable contact arm R-1; however, relay R1 remains de-energized, its main energizing circuit being adapted to be re-closed through the normally open starting pushbutton P1, the self-energizing circuit of this relay being still open.

Under these conditions, even if the defects which caused the opening of the movable contact R1-1 of relay R1 for presetting the operation of the complete circuit are removed the motor M cannot start again.

Only when, in accordance with the information received from the sensor the continuity of the feed flow to the stations delivering the cigarette layers was restored manually through adequate control action, the packaging machine can be re-started by depressing the starting push-button P1. Of course, many modifications and variations may be made to the embodiment disclosed hereinabove without departing from the basic principles of the invention by those skilled in the art without departing from the spirit of this invention, which is to be comprehended within the meaning of the following claims.

I claim:

1. A machine for the formation of orderly groups of cigarettes constituted of orderly superposed layers of cigarettes comprising in combination:

means for dispensing the layers of cigarettes;

a plurality of individual stations for receiving the respective layers;

container means for receiving said groups of cigarettes;

a plurality of pusher means, each of said pusher means for pushing a layer of cigarettes at a time into said container means;

conveyor means for intermittently displacing said container means in an operative direction past said stations;

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each of said stations includes means defining a supporting surface for the cigarettes, said supporting surfaces being arranged in consecutive order in said operative direction along said conveyor means laterally offset thereto, said supporting surfaces being arranged at different levels with respect to each other increasing in said consecutive order, the level difference between next among said supporting surfaces corresponding at least to the said of a cigarette, and wherein said respective pusher means are arranged at a level corresponding to the level of said supporting surfaces and adopted to sweep the respective of said supporting surfaces to transfer the layer of cigarettes collected on said supporting surface onto a corresponding of said container means, said container means having open sides to receive sideways the respective layer of cigarettes transferred from the respective of said supporting surface, said container means having a bottom arranged on said conveyor means at a level corresponding to the lowermost level of said supporting surfaces;

motor means for operating said machine;

a device positioned adjacent said conveyor means for controlling the rate of flow of the respective layers

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of cigarettes dispensed from said dispensing means to said respective stations;

said device including a plurality of feeler members mounted substantially opposed to said respective pusher means;

said feeler members being electrically connected in parallel to one another and registering with said respective pusher means; and

relay means responsive to said feeler members and adapted to control energizing circuit means of the relay means for controlling the operation of said motor means.

2. A machine according to claim 1, wherein said means for dispensing the respective layers of cigarettes to said stations comprise a main supply hopper having a plurality of partitions in its lower portion thereof extending vertically downwardly to form a plurality of channels, said plurality of channels being equal in number to said distinct layers of cigarettes.

3. A machine according to claim 1, wherein said feeler members are disposed at a certain level in relation to the planes of said respective stations, said level corresponding to a height of five to seven times that of a single layer.

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