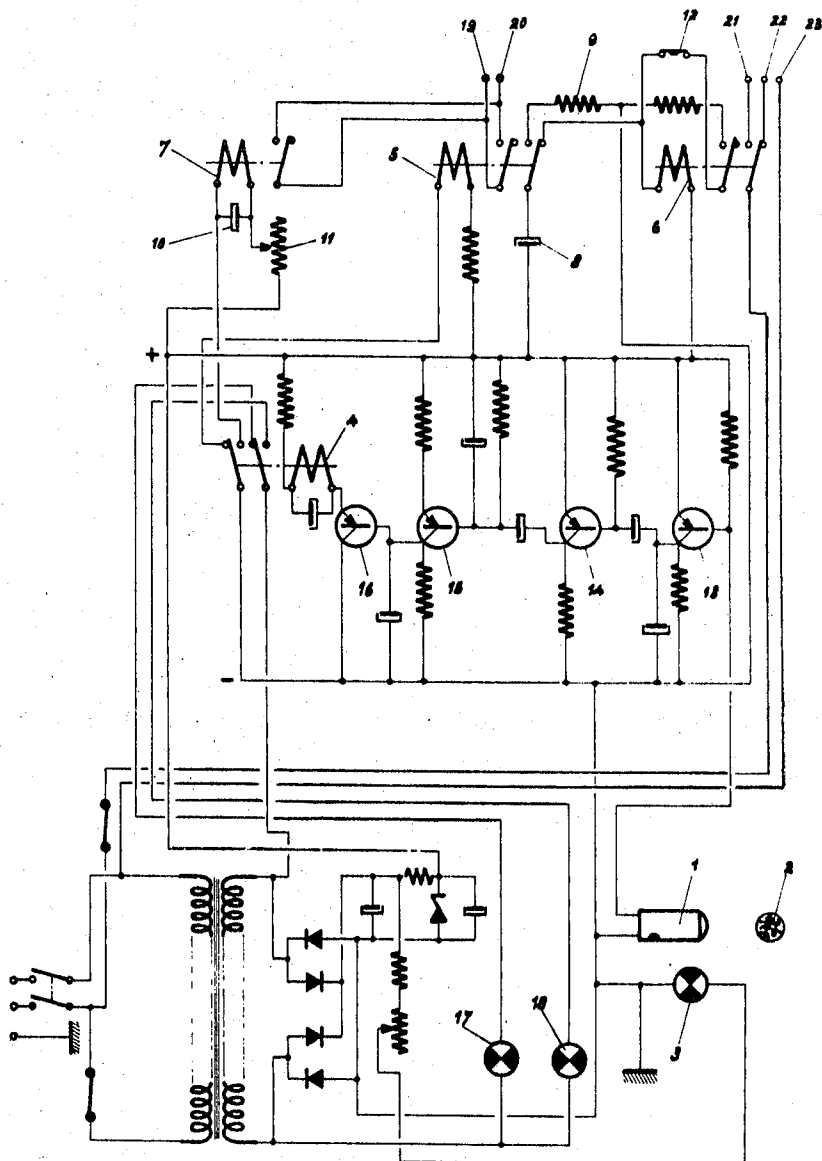


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DEVICE FOR THE AUTOMATIC STOPPING OF A MACHINE SUCH
AS A CIGARETTE-MAKING MACHINE
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1

2

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DEVICE FOR THE AUTOMATIC STOPPING OF A MACHINE SUCH AS A CIGARETTE-MAKING MACHINE

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ABSTRACT OF THE DISCLOSURE

A production machine is automatically stopped when a detecting means reacts on missing products. A time-delay device is arranged to render the stopping circuit temporarily inoperative when the machine is restarted, until perfect products are again delivered by the machine.

This invention relates to an electrical control system for stopping a machine automatically as and when products are no longer delivered by said machine. The invention is also concerned with a control system for re-starting the machine wherein the automatic stopping system is neutralized during the first revolutions performed after re-starting.

It frequently happens in practice that, at the time of re-starting, the machine forms a small number of products, then again ceases to deliver owing to the fact that the operation is not perfectly stabilized. In the case, for example, of a machine for forming cigarettes from a continuous rod of tobacco which is wrapped in a continuous paper strip and then severed into equal lengths, the rod which is manufactured at the time of start-up is not correctly formed even though it is admitted in the cutting section of the machine. This is due to a number of causes which lie either in the wrapped tobacco or in the longitudinal sealing of the wrapping paper. This fault condition can give rise to a further stoppage of production after only a few cigarettes are formed, with the result that the machine operator is obliged to re-insert the tobacco rod into the cutting section. Since this operation is performed without stopping the general controls of the machine, the operation of the machine-stopping device must accordingly be delayed until the operation of the cigarette-making machine is sufficiently stable.

The remainder of the description will be concerned with the automatic stopping of a cigarette-making machine. It will nevertheless be understood that the device herein described may be adapted to any machine which produces objects of any type in continuous sequence, wherein the positions of said objects as they are delivered successively from the machine are such that their time of transit in front of a given point as well as the spacing of said objects are substantially constant.

The following description specifically relates to a control unit constituted by a detector of the type described in the U.S. application No. 325,570 filed on Nov. 22, 1963, and comprising a light source and a photoelectric cell, wherein a light beam derived from the source is reflected towards the photoelectric cell by the moving cigarettes in a plane at right angles to the line of motion of said cigarettes or products. It will be clearly understood that, while preference is given to this arrangement, the invention is by no means limited to the control system referred-to, which can in any case be disposed in a different manner.

This invention is concerned with a device for the automatic operation of a machine which produces spaced objects in uninterrupted sequence, comprising means for monitoring the production of a machine and producing the stoppage of said machine automatically as soon as an interruption occurs in the delivery of products, means for re-starting the machine after operation of the stopping element and means for delaying resumption of production monitoring over a period of time after re-starting which is necessary to permit the machine to resume normal production and to prevent the monitoring units from initiating a further stoppage of the machine when this latter is re-started.

The means for monitoring the production of a machine and automatically initiating the stoppage of said machine as soon as this latter stops delivering products consist of a monitoring unit which delivers a pulse as each object or product passes, said monitoring unit being so designed as to energize an element for stopping the machine when the time interval which normally elapses between two consecutive pulses is exceeded.

The monitoring unit can be a photoelectric cell, the stabilization of which when no objects are being delivered energizes a stopping element which controls the self-supply circuit of the machine after a predetermined time delay.

The stopping element can be a relay which is connected to the output of a transistorized amplifier unit which transforms the pulses delivered by the monitoring unit.

The means for re-starting the machine after operation of the stopping element can consist in making provision for a detection element which is energized by the monitoring unit for controlling the stopping element which is connected in the self-supply circuit of the machine and, after a suitable time delay, for controlling an element which initiates the temporary closure of said self-supply circuit.

The means for delaying resumption of production of the machine over a period of time after re-starting which is necessary to permit the machine to resume normal production can consist in retarding to a suitable extent the operation of the detection element as initiated by the monitoring unit.

These means can also cooperate with a view to interrupting the operation of the ancillary elements of the machine by opening their supply circuits through the intermediary of a relay which is energized as a result of the opening of the machine-stopping element and which is maintained self-energized throughout the duration of stoppage of the machine.

The detection element can be an opening time-delay relay connected to the emitter circuit of a transistor which is connected in series with an amplifier unit.

The temporary closure element of the self-supply circuit of the machine can be a relay which is energized by the detection element with a time-lag both at opening and closing which are produced by a resistor and a capacitor which are respectively connected in series and in parallel with the relay coil.

The detection element operates a separate signalling means in the two positions thereof.

In the example of construction herein described, periodic variations in conductivity of a photodiode have the effect of maintaining in the rest position a time-delay detection relay which, when no such variations occur, is normally in the working position. Said relay is connected to an amplifier which is constituted by four transistors which are supplied at a stabilized voltage. The relay is energized by virtue of the arrangement of the fourth transistor which becomes conductive only when the photoelectric cell is no longer subjected to variations in il-

lumination which are produced by the motion of cigarettes in front of the light source.

It may be stated that the device is primarily characterized in that the detection element or elements initiate on the one hand the rapid stoppage of the machine by interrupting its direct holding circuit in the event that the quality of production falls short of accepted standards, said machine being accordingly brought to a standstill by means of a same signal and by means of a changeover element and accompanied if necessary by the stoppage of certain auxiliary devices and, on the other hand, with a slight time delay, the restoration of a holding circuit which permits the re-starting of the machine by means of a branch circuit, the aforesaid changeover element being set to provide a longer time delay in its other direction of operation in such a manner as to ensure that, at the time of re-starting of the machine, the detection circuit or circuits are momentarily inoperative until normal production conditions are resumed, the direct holding circuit of the machine being restored only after the above-mentioned time delay and the branch circuit being opened when a further short time interval has elapsed after the restoration of said holding circuit.

The time delays entailed in the making and breaking of the branch circuit starting from the command given by the changeover element can be equal to each other and determined by a same adjustable timing device.

The command or commands which govern the operation of the auxiliary devices can be either immediate or delayed, starting from the signal delivered by the changeover element which initiates the stoppage of the machine.

A condition can be established whereby a given number of auxiliary devices must be manually reset for normal conditions of service prior to re-starting of the machine, with the result that said machine cannot be set in motion if the manual operations involved have been overlooked.

A given number of auxiliary devices can be automatically restored to normal conditions of service at the time of start-up of the machine, either immediately or after predetermined time delays.

Reference being made to the accompanying drawing, the description which now follows will provide a clearer understanding of the exemplified embodiment of the invention.

The photoelectric cell 1 receives the light beam which is derived from the source 3 and reflected by the cigarette 2. The fixed and variable resistors which are inserted in the source circuit are intended to regulate the voltage so as to forestall any risk of damage to the bulb which might arise from overvoltage. The current supplied to the amplifier is rectified, filtered and stabilized by means of a unit comprising diodes, capacitors and resistors. The amplifier is constituted by the transistors 13 to 16 inclusive which are mounted together with various resistors and capacitors which serve to modify the input signal in order that the relay 4 which is connected in the emitter circuit of the last transistor should be operated under the best conditions. The time constants of the circuit are determined so as to ensure that the opening of the relay 4 provides the requisite time delay.

One of the contacts of the relay 4 serves to supply the optical signalling unit 17 or 18 as the case may be. Depending on its position, the other contact supplies either the stoppage relay 5 which, in the working position thereof, closes the self-supply circuit of the machine as represented by the supply leads 19 and 20 or the re-starting relay 7 which, in the working position thereof, supplies the same circuit. The supply circuit of relay 7 comprises a variable resistor 11 and a capacitor 10 which is connected in parallel with the relay coil.

The circuit for stopping the ancillary elements of the machine comprises a relay 6 which, in the working position, stops the operation of said elements. The relay 6

which comprises a self-supply circuit is energized by means of a capacitor 8 which is charged through the resistor 9. The self-supply circuit referred to above can be opened by the normally-closed push-button contact 12 which is operated at the time of re-starting of the machine.

When the machine produces cigarettes, the relay 4 in the rest position lights up the green signal lamp 17 and energizes the relay 5. Said relay holds the machine-stopping circuit 19, 20 in the closed condition and charges the capacitor 8 through the resistance 9. The relays 6 and 7 are in the rest position.

Should the machine form a faulty rod of tobacco and not cigarettes, the relay 4 which is energized accordingly closes, with the result that:

The red signal lamp 18 lights up,

The supply of current to the relay 5 is cut off,

The capacitor 10 is charged through the variable resistor 11.

Similarly, the opening of the relay 5 is attended by the following consequences:

The forming machine is stopped as a result of the opening of the self-supply circuit 19, 20 of the contactor of the general control units,

The capacitor 8 discharges into the coil of the relay 6 which accordingly closes and is self-supplied.

The last-mentioned relay actuates, for example, electrovalves which are connected to supply leads 21, 22, 23. The operation of said electrovalves can initiate, for example:

The lifting of the drying iron,

The upward motion of the pasting unit plunger.

As soon as the voltage developed across the terminals of the capacitor 10 becomes sufficient, the relay 7 again closes the circuit of the forming machine which can then be re-started. Accordingly, the machine operator presses the button 12 which cuts off the self-supply of the relay 6. By producing action on the electrovalves referred to above, said relay 6 restores the paste pressure and allows the machine operator to lower the drying iron.

When the machine is again making cigarettes, the photoelectric cell which is energized initiates the opening of the relay 4 after a time delay of a few seconds, the green signal lamp 17 lights up and the relay 5 which is energized closes the circuit 19, 20 which is already closed by the contact of the relay 7. The capacitor 10 discharges into the coil of the relay 7 which opens as soon as the voltage developed across the terminals of said relay becomes sufficiently low. The machine is thus monitored once again, the stoppage device is in readiness for any further operation if faulty rod-formation again occurs.

What we claim is:

1. An electrical control system for the automatic stopping of a machine such as a cigarette-making machine, said machine having auxiliary devices, said system comprising a direct circuit for holding said machine in operation, said circuit comprising first means for closing and opening of said direct holding circuit, detection means for monitoring the production of the machine, said detection means being designed to actuate said first means, said system further comprising a holding branch circuit, second means for closing and opening of said branch circuit, means for re-starting said machine, changeover means operated by said detection means, said changeover means designed to actuate both said first means for closing and opening of said direct holding circuit and said second means for closing and opening of said branch circuit in the opposite direction, first time-delay means for acting on said changeover means, said first time-delay means adapted to act on said second means for closing and opening of said branch circuit for closing of said branch circuit with a short time delay after the operation of said changeover means in one di-

5

rection and for operating of said changeover means in the opposite direction only for returning to the normal position thereof and for restoring of said direct holding circuit only after a predetermined time interval and for reopening of said branch circuit with a short time delay after said direct circuit having been restored.

2. An electrical control system according to claim 1, said first time-delay means acting on said second means for closing and opening of said branch circuit, said means for closing and opening said branch circuit consisting of a single adjustable element designed for determining equal making and breaking time delays starting from the impulse given by said changeover means.

3. An electrical control system according to claim 2, and further comprising means for controlling said auxiliary devices, the latter being actuated at the same time as said first means for closing and opening of said direct holding circuit.

4. An electrical control system according to claim 3, further comprising second time-delay means for operating said means for controlling said auxiliary devices.

5. An electrical control system according to claim 4, further comprising means for re-starting of said machine, said means designed for restoring at least one of said auxiliary devices to normal condition.

6. An electrical control system according to claim 1, said means for closing and opening said branch circuit comprising a relay, a variable resistor and capacitor, said resistor and said capacitor being connected in parallel, said resistor and said capacitor feeding into said relay.

7. In an electrical control system of a machine, such as a cigarette-making machine, said system comprising a circuit for holding said machine in operation, a first relay

6

switch means (5) having two positions for closing and opening said holding circuit, respectively, a manual switch means (B) for starting said machine, detection means (1, 2) for monitoring the production of said machine, control means (4) operated by said detection means (1, 2), said control means controlling said first relay switch means (5), a time-delay relay means (7) arranged parallel to said first relay switch means (5), said time-delay relay having two positions for closing and opening said holding circuit, respectively, and arranged to put automatically a determined time delay in the closing and opening positions, respectively, after said first relay switch means having been placed in the opening and closing positions, respectively, by said control means, (4).

8. In an electrical control system according to claim 7, a second relay switch means (6) for interrupting the operation of auxiliary devices of said machine, means operating said second relay switch means at the opening of said holding circuit and means (12) for restarting of the operation of said auxiliary devices.

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