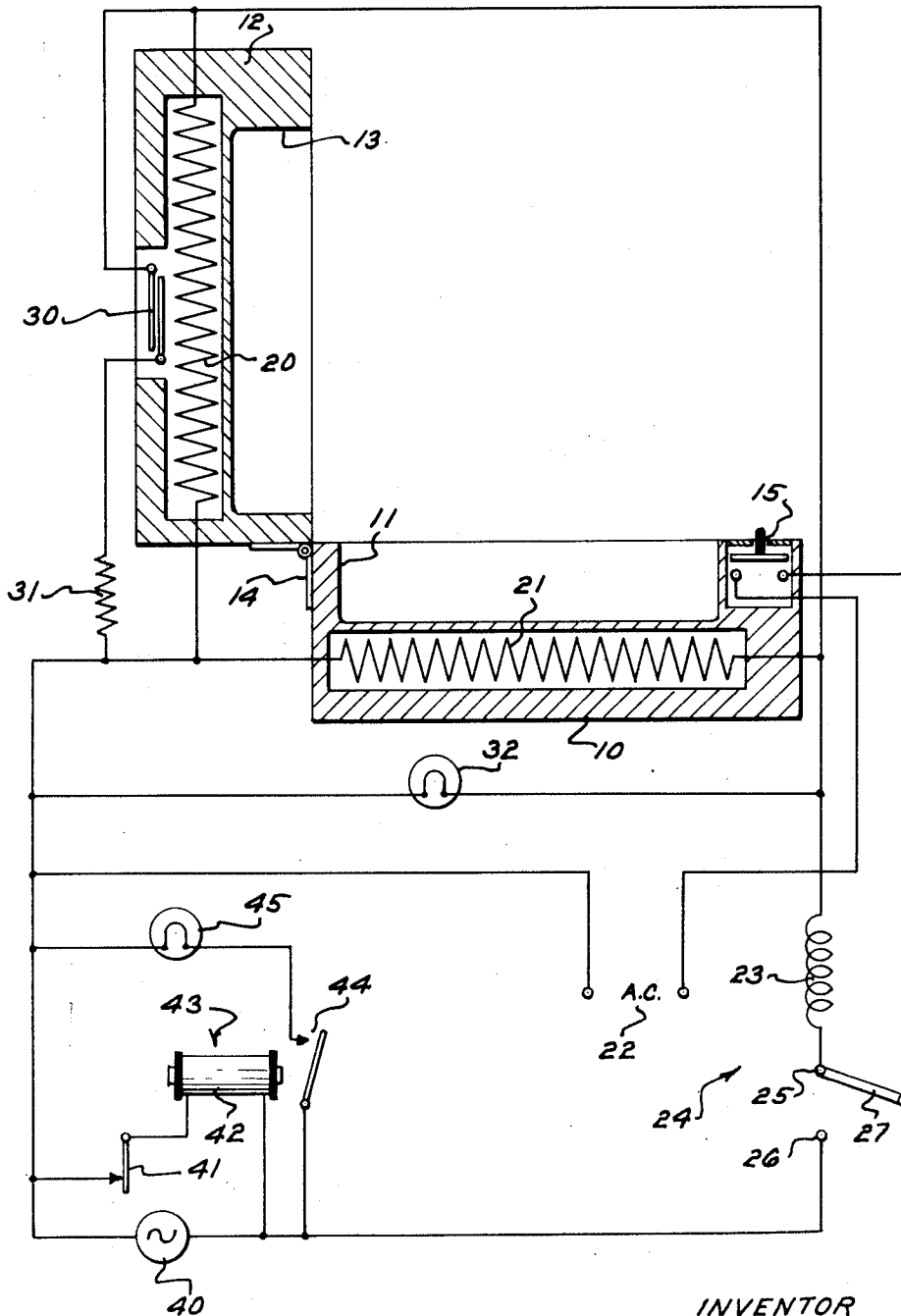


Oct. 21, 1952

P. J. MAMOLA
VULCANIZING APPARATUS

2,615,082

Filed July 19, 1950



INVENTOR
P. J. MAMOLA
BY *E. F. Kane*
ATTORNEY

UNITED STATES PATENT OFFICE

2,615,082

VULCANIZING APPARATUS

Peter J. Mamola, Astoria, N. Y., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application July 19, 1950, Serial No. 174,635

10 Claims. (Cl. 177—311)

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This invention relates to vulcanizing apparatus and more particularly to an indicating and control circuit for electrically heated vulcanizers.

In vulcanizing apparatus, it is necessary to subject the article being vulcanized to a predetermined amount of heat, after which the heat source must be disconnected and the article allowed to cure before being exposed to the atmosphere.

It is an object of this invention to provide new and improved means for automatically determining and indicating the vulcanizing and curing cycles during a vulcanizing operation.

In accordance with a preferred embodiment of the invention, an electrically heated mold is provided wherein the power circuit thereto is so connected through a double-contact circuit breaker that actuation of the circuit breaker causes the power to be transferred to a curing timer, which is thereby actuated to determine the curing cycle. The actuation of the circuit breaker is effected by providing a thermally responsive element and resistance in parallel with the resistance heating elements in one of the mold sections, in such a manner that the thermal element will close when the temperature in the mold reaches a predetermined maximum value. This action results in a lowered effective resistance, and thus a higher current flow through the circuit breaker, thereby causing the breaker to trip to its second set of contacts.

A more complete understanding of the invention may be had by referring to the following detailed description, when read in conjunction with the accompanying single figure drawing which schematically represents a vulcanizing mold and a circuit for controlling the heating of the mold in accordance with the invention.

The apparatus consists of a lower fixed mold section 10 having a lower mold cavity 11, and an upper movable mold section 12 having an upper mold cavity 13. The upper mold cavity 13 is adapted to be moved into register with the lower mold cavity 11 by means of a hinged connection 14, and such movement results in the closure of a normally open microswitch 15 which initiates energization of electrical heating elements carried by the two mold sections.

For the purpose of heating the mold sections a pair of resistance heating elements 20 and 21 are provided, which elements are disposed in thermal relationship with, but electrically insulated from, the upper and lower mold sections 10 and 12 respectively. The heating elements 20 and 21 are preferably connected in parallel

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across a source of current 22 with one side of the parallel connection being completed directly to the source 22. The other side of the parallel connected heating elements is adapted to be connected to the source 22 through an actuating coil 23 of a single pole double throw circuit breaker 24 provided with alternate fixed contacts 25 and 26 and a movable contact 27. The circuit through the coil 23 to the source 22 is completed when the movable contact 27 is in its normal position in contact with fixed contact 25, and microswitch 15 is closed. The fixed contact 26 is so arranged with respect to movable contact 27, that an excessive current flow through the coil 23 results in the movable contact 27 being shifted to a position wherein it makes electrical contact with contact 26. The movable contact 27 then remains in contact with contact 26 until it is manually reset.

In order to determine the amount of heat which is applied to the article being vulcanized in the cavities 11 and 13, an inverse thermoswitch 30 is provided, which thermoswitch is characterized by its ability to provide a closed electrical circuit when the temperature thereof reaches a predetermined maximum value. The thermoswitch 30 may be mounted in thermal relation with either one of the mold sections 10 or 12, and is here shown as mounted in the section 12. The thermoswitch 30 is connected in series with a resistance 31 having an ohmic value relatively smaller than the resistance of either of the heating elements 20 and 21. The series connected thermoswitch 30 and resistance 31 are connected in parallel with the heating elements 20 and 21, and an indicator lamp 32 is likewise connected in parallel with the elements 20 and 21. Thus it will be observed that the lamp 32 will be lighted during the time that the elements 20 and 21 are energized, and the closure of thermoswitch 30 results in completion of a circuit through the resistance 31 thus increasing the current through coil 23 to such an extent that movable contact 27 is switched from its contact with fixed contact 25 to contact with fixed contact 26, thereby stopping the flow of current from the source 22 to the heating elements 20 and 21 and extinguishing the lamp 32.

Movement of movable contact 27 of the circuit breaker 24 into engagement with its fixed contact 26 results in the energization of a synchronous timing motor 40. The timing motor 40 is provided with a pair of timer contacts 41 which are normally in their closed position, but which open at the end of a predetermined curing cycle

as measured by the timer motor 40. The timer contacts 41 are connected in series with the operating coil 42 of a relay 43 and the series-connected contacts 41 and operating coil 42 are connected in parallel with the energizing windings on the timer motor 40. Thus it is obvious that the relay 43 will be operated only during the timing cycle of the motor 40. The relay 43 is provided with a pair of normally open contacts 44 connected in series with an indicator lamp 45 across the source 22, and such an arrangement provides an instant indication of the completion of a curing cycle.

In operation, the operator places an article to be vulcanized into the lower mold cavity 11, after which the upper mold section 12 is lowered thereby closing the microswitch 15 and energizing the heating elements 20 and 21, and at the same time lighting the lamp 32 to give the operator visual evidence that the molds are heating. When the molds reach a predetermined temperature, the thermoswitch 30 closes the circuit through the low resistance 31 thereby increasing the current flow through the coil 23 of the circuit breaker 24. The increased current flow is of such magnitude, as determined by the operating conditions of the circuit elements, to cause the movable contact 27 to be moved out of engagement with fixed contact 25 and into engagement with fixed contact 26, thereby extinguishing the lamp 32 and stopping the flow of current to the heating elements 20 and 21. Engagement of contact 27 with contact 26 immediately starts motor 40 on a timing cycle and simultaneously energizes the operating coil 42 of relay 43, thereby closing contacts 44 to light the indicator lamp 45 to give the operator visual evidence that a curing cycle is in progress. When the timer motor times out, its contacts 41 open, thereby deenergizing the operating coil 42 and consequently extinguishing the lamp 45 due to opening of the contacts 44 controlled by the coil 42.

It is to be understood that the accompanying drawings are purely schematic in nature, and the equipment used in actual practice ordinarily includes suitable housings for the parts here described. The shape of the mold cavity may assume any desired form depending upon the article being vulcanized. For example, each of the sections may be provided with a semi-cylindrical cavity of such size as to be capable of advantageous use as a splice vulcanizer for cables. Any convenient means may be employed for closing the sections and securing them in closed position, such, for example, as a handle and toggle mechanism. It will be observed that the circuit breaker 24 acts in a manner similar to a marginal relay and the latter may be employed without departing from the scope of the invention.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In vulcanizing apparatus, a pair of mold sections, electrical resistance heating elements in each mold section, a serially connected thermal responsive switch and resistance combination shunting the heating elements in said sections, said switch being in thermal relationship with one of said sections and adapted to be closed upon attainment of a predetermined heating

temperature in said mold sections, a source of current for energizing said elements, a circuit breaker connected in series with said elements and adapted to be released upon lowering of the resistance in the heating circuit due to closure of said thermal responsive switch, a visual indicator in shunt with said elements and adapted to be deenergized by said breaker, an auxiliary contact on said breaker positioned to complete a secondary circuit from said source upon release of said breaker, a synchronous timing motor in said secondary circuit, a relay having its operating coil in parallel with said synchronous motor, a pair of timing contacts controlled by said motor connected in series with said operating coil, a set of normally open contacts on said relay, and a visual indicator energizable by closure of said last named contacts, said last named visual indicator being adapted to be deenergized at the end of the timing cycle of said motor through opening of said timer contacts and deenergization of said relay coil.

2. Vulcanizing apparatus comprising in combination, a vulcanizing chamber, resistance heating elements for heating said chamber, a serially connected thermal responsive switch and resistance combination shunting said elements, said switch being in thermal relationship with said chamber and adapted to be closed upon attainment of a predetermined heating temperature therein, a source of current for energizing said elements, a circuit breaker connected in series with said elements and adapted to be released upon lowering of the resistance in the heating circuit due to closure of said thermal responsive switch, a visual indicator in shunt with said elements and adapted to be deenergized by said breaker, an auxiliary contact on said breaker positioned to complete a secondary circuit from said source upon release of said breaker, a synchronous timing motor in said secondary circuit, a relay having its operating coil in parallel with said synchronous motor, a pair of timing contacts controlled by said motor connected in series with said operating coil, a set of normally open contacts on said relay, and a visual indicator energizable by closure of said last named contacts, said last named visual indicator being adapted to be deenergized at the end of the timing cycle of said motor through opening of said timer contacts and deenergization of said relay coil.

3. Vulcanizing apparatus comprising means to initiate a heating cycle, visual indicating means energizable throughout said heating cycle, a curing cycle timer, means responsive to attainment of a predetermined temperature in said apparatus to stop said heating cycle and energize said curing cycle timer, visual indicating means energizable throughout the curing cycle, and means operative at the completion of said curing cycle to deenergize said curing cycle indicating means.

4. Vulcanizing apparatus comprising a vulcanizing chamber, electrical resistance heating means to heat said chamber, a serially connected thermal responsive switch and resistance combination shunting said heating means, said thermal switch being in thermal relation with said chamber and adapted to close upon a predetermined temperature rise therein, a source of current for said heating means, a marginal relay connected between said source and heating means, said relay being actuable by a predetermined increase in current flow therethrough caused by closure of said thermal switch to

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break the circuit to said heating means, a set of auxiliary contacts on said relay closable by actuation of the relay, indicating means shunting said heating means, curing cycle timing means associated with said auxiliary contacts and energizable by closure thereof and indicating means energizable throughout the timing cycle of said curing cycle timing means.

5. Vulcanizing apparatus comprising means to initiate a heating cycle in said apparatus, indicating means energizable throughout said heating cycle, a curing cycle timer, a thermo-switch responsive to a predetermined temperature in said apparatus and operative to stop said heating cycle and energize said curing cycle timer, a relay having its operating coil in parallel with said timer, a set of normally closed contacts on said timer in series with said relay operating coil, a curing cycle indicator, and a set of normally open contacts on said relay in series with said curing cycle indicator, whereby completion of the curing cycle as timed by said timer results in opening of said timer contacts and consequent deenergization of said relay operating coil and curing cycle indicator.

6. A signalling and controlling system for an electrically heated device wherein such device requires a heating and a cooling period, comprising an electrical heating element associated with said device, an electrically energized signal energizable coextensive with the energizing period of said element, thermo-affected means associated with said device and shunting said element operative upon being heated to a predetermined value to complete an auxiliary circuit therethrough of substantially less resistance than the resistance of said element taken alone, an electromagnetic switch having an operating coil effective in response to a predetermined current therethrough, said switch having normally closed contacts in series with said shunt connected element and thermo means, a source of current for said element connected through said operating coil and said normally closed contacts, a curing cycle timer, an electrically energized signal energizable coextensive with the timing period of said timer, and a set of normally open auxiliary contacts on said switch connected between said source and said timer and closable by virtue of a flow of current through said operating coil of at least said predetermined value.

7. In a vulcanizing apparatus a source of current, a heating element, means to connect said heating element to said source of current including a circuit breaker having its coil in series with said source of current and said heating element, a thermo-responsive switch in parallel with said element for shunting said element to supply a surge of current through the coil of the circuit breaker when said apparatus reaches a predetermined temperature and means under

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control of the circuit breaker for measuring and indicating a time interval after said predetermined temperature is reached.

8. In a vulcanizing apparatus, a source of current, a heating element, means to connect said heating element to said source of current including a circuit breaker having its coil in series with said heating element and said current source, a thermo-responsive switch positioned to be actuated in response to a predetermined temperature condition in said apparatus, said thermo-responsive switch being connected in shunt with said element to supply a surge of current through the coil of the circuit breaker when said predetermined temperature is reached, indicating means shunting said element and means under control of the circuit breaker for measuring a time interval after said predetermined temperature is reached.

9. In a vulcanizing apparatus, a source of current, a heating element, a visual indicator shunting said element, means to connect said heating element and visual indicator to said current source including a marginal relay having its operating coil in series with said heating element and said current source, a temperature responsive switch in thermal relation with said apparatus, said temperature responsive switch being connected in parallel with said element thereby to supply a surge of current through the operating coil of said marginal relay when said apparatus reaches a predetermined temperature and a timing motor under control of said marginal relay for measuring a curing time interval after said predetermined temperature is reached.

10. In a vulcanizing apparatus, a source of current, a heating element, means to connect said heating element to said current source including a circuit breaker having its coil in series with said heating element and said current source, a relatively low resistance adapted to shunt said heating element, means responsive to a predetermined temperature in said apparatus to render said resistance effective to supply a surge of current through the coil of the circuit breaker, and means including a timing motor and an indicator under control of the circuit breaker for measuring and indicating a time interval after said predetermined temperature is reached.

PETER J. MAMOLA.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,412,568	Mortensen	Apr. 11, 1922
1,588,287	Willmann	June 8, 1926
2,427,444	Colombo	Sept. 16, 1947
2,509,693	Morrison	May 30, 1950