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1,673,544

J. C. WOODSON
FURNACE CONTROL SYSTEM

Filed May 6, 1926

Fig. 1.

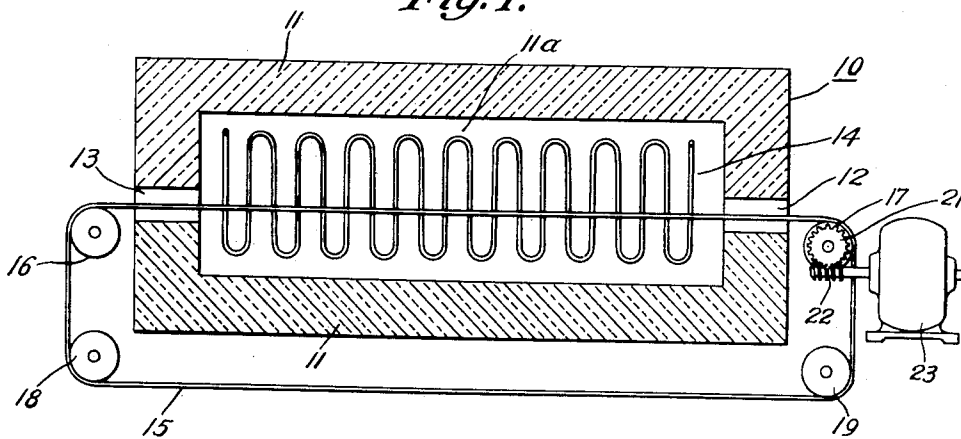
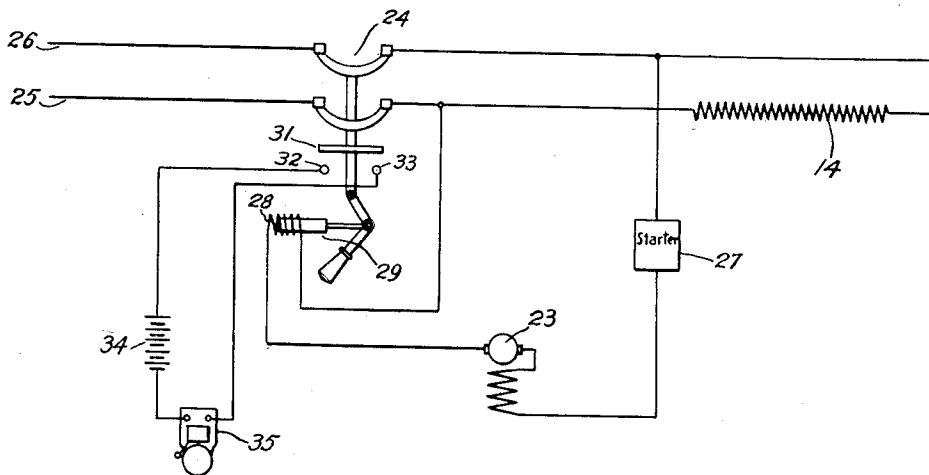


Fig. 2.



WITNESSES:

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JAMES C. WOODSON, OF EAST PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

FURNACE-CONTROL SYSTEM.

Application filed May 6, 1926. Serial No. 107,081.

My invention relates to furnaces and particularly to methods of control for such furnaces.

An object of my invention is to provide a relatively simple system for insuring the safety of material to be heat-treated while traversing a furnace.

In practicing my invention, I provide a furnace, material-moving means associated therewith and moving material to be heat-treated through the furnace, a motor for actuating the material-moving means and a circuit interrupting device for the heating means.

In the single sheet of drawings,

Figure 1 is a view, in horizontal longitudinal section through a furnace, with which is associated the system embodying my invention, and

Fig. 2 is a diagram of electrical connections embodying my invention.

Referring more particularly to Fig. 1 of the drawings, I have there illustrated a furnace structure 10, schematically only, as embodying heat-insulating walls 11 enclosing a furnace chamber 11^a, and provided with an inlet opening 12 and an outlet opening 13 in two opposed walls of the furnace. Heating means located in the furnace chamber is indicated as an electric resistor member 14 suitably suspended from one or more of the furnace walls. While I have indicated an electric heating means, the system embodying my invention is not restricted thereto and it is to be understood that the heating means 14 represents any heating means usually employed in the art.

Means for moving material through the chamber of the furnace structure 10 comprises an endless belt or chain 15, the upper run of which is supported by rollers 16 and 17, rollers 18 and 19 being provided to maintain the material-moving means in proper operative position. One of the rollers, for instance roller 17, may be provided with a worm gear 21 mounted in operative relation thereto, which is engaged by a worm 22 mounted on the shaft of an electric motor 23. The motor is therefore operative, when properly energized, to cause the material-moving means 15 to move through the furnace so that material to be heat-treated in any manner whatsoever, which is placed thereon, will be moved through the furnace

chamber within a predetermined time, dependent of course, upon the speed of travel of the material-moving means 15 and the length of the furnace chamber. While I have shown an endless belt, any other material moving means may be employed.

Referring more particularly to Fig. 2 of the drawing, the energization of the heating unit 14 is controlled by a circuit interrupter 24, electric energy being supplied from electric circuit conductors 25 and 26. The circuit breaker 24 is shown in its closed position in which the heating unit 14 is energized and in which energy is also conducted to the motor 23, provided a starter 27 has been operated to permit an electric current to traverse the motor 23.

The current traversing the motor 23 traverses also an actuating coil 28 which is in operative relation to a core member 29 which is connected to the actuating means of the circuit breaker 24. If, for any reason, an excessive current traverses the motor 23, the energization of the coil 28, caused by this excessive current, will move the core member 29 to such an extent that the circuit breaker 24 is opened and will remain in the open position until closed manually by an operator.

In order to indicate operation of the circuit breaker 24 from its normally closed position to an open position, a contact bridging member 31 may be provided thereon which is adapted to engage fixed contact members 32 and 33, one of which is connected to one terminal of a source of current 34, and the other of which is connected to one terminal of an audible signal device 35, the other terminals of the signal device and of the source of energy being connected together. Thus, if the circuit breaker opens, the bridging member 31 engages the contact members 32 and 33, thereby closing the circuit through the device 35 which gives an audible signal as a warning to the operator.

The operation of the system embodying my invention is as follows. In heat-treating material of any kind whatsoever, it is usual to subject it for a predetermined length of time, to the action of heat at a predetermined temperature. In many forms of heat treating, damage to either the material or the coating thereon being heat treated, will occur if the material or the coating is subjected to the temperature of the furnace chamber

for too long a time. Thus, in case the material-moving means 15 were to become jammed for any reason, as by the piling up of the material thereon at the outlet opening, or for any other reason, so that the material-moving means would cease to move, damage might result to the motor, whose circuit would be interrupted if it were controlled by the usual overload circuit-controlling devices employed therewith. This would result in stopping the motor, but would also result in the material in the furnace remaining stationary and subjected to the temperature thereof for such a length of time as might seriously damage it.

In the system embodying my invention, in case the material-moving means is stopped, an overload will be thrown upon the motor, the current traversing it and the coil 28 will increase to an abnormally large value, and the circuit breaker 24 is actuated to open the circuit through not only the motor 23, but also through the heating units 14, whereby they are deenergized and the temperature within the furnace chamber will immediately decrease. This greatly reduces the danger of damage to material held stationary in the furnace chamber, if it does not entirely overcome such danger, and the audible signal will give notice to an operator that abnormal conditions of some kind exist and require immediate attention, in order that the normal process of heat treating shall continue.

Various modifications may be made in my invention without departing from the spirit and scope thereof and I desire that only such limitations shall be placed thereon as are imposed by the prior art.

I claim as my invention:

1. The combination with a furnace, heating means therein, and motor-operated means for moving material through the furnace, of means for controlling the energization of said heating means in accordance with the

load on the motor of the material-moving means.

2. The combination with a furnace, heating means therein, material-moving means, and an electric motor for driving said material-moving means, of means for controlling the energization of the heating means in accordance with abnormal conditions in the motor circuit.

3. The combination with a furnace, heating means therein, material-moving means, and an electric motor for driving said material-moving means, of means for effecting de-energization of the heating means upon occurrence of abnormal conditions in the motor circuit.

4. The combination with a furnace, heating means therein, material-moving means, and an electric motor for driving said material-moving means, of means for effecting de-energization of the heating means upon occurrence of an abnormal overload on the motor.

5. The combination with a furnace, electric heating means therefor, material-moving means associated with the furnace, an electric motor for driving the moving means, and means for interrupting the circuit of the heating means, of an actuating coil for the circuit interrupting means traversed by the motor current and effective to cause the circuit interrupting means to de-energize the heating means upon occurrence of an extreme overload on the motor.

6. The combination with a furnace, heating means therefor, means for moving material through the furnace, and a motor for driving the material-moving means, of means for effecting de-energization of the heating means upon stoppage of the motor and of the material-moving means.

In testimony whereof, I have hereunto subscribed my name this 28 day of April, 1926.

JAMES C. WOODSON.