R. H. McLAIN.

CONTROL OF ELECTROMAGNETIC SWITCHES.

APPLICATION FILED OCT. 29, 1917.

1,419,872. Patented June 13, 1922.

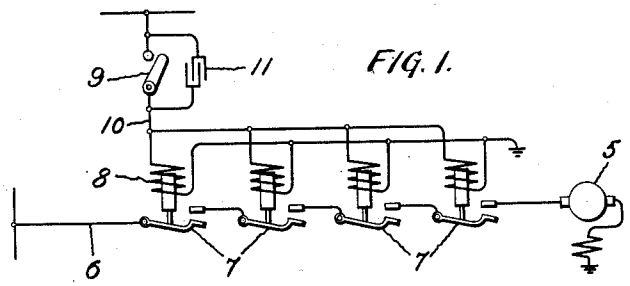


FIG. 1.

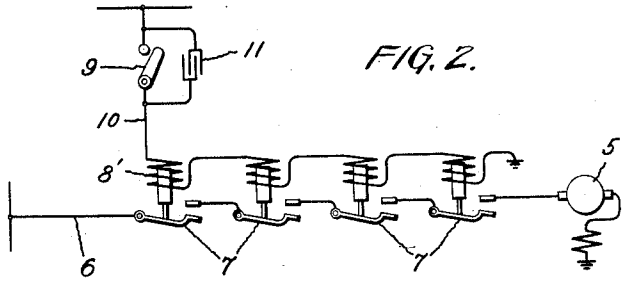


FIG. 2.

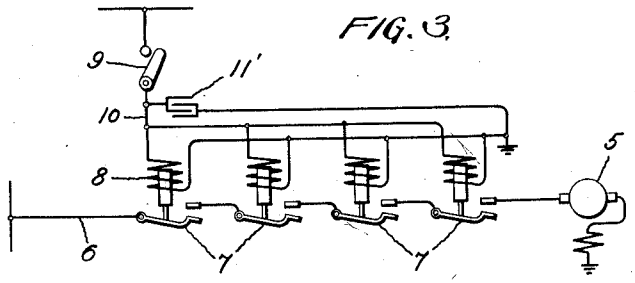


FIG. 3.

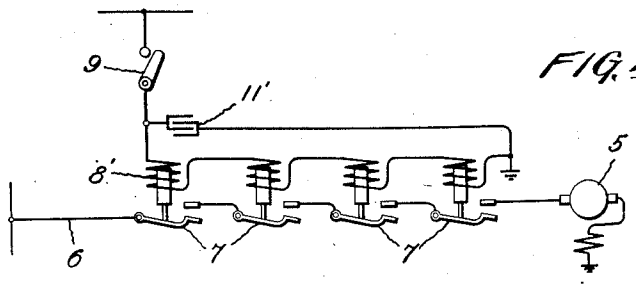


FIG. 4.

Inventor:
Robert H. McLain,
by Albert G. Davis
His Attorney.

UNITED STATES PATENT OFFICE.

ROBERT H. McLAIN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CONTROL OF ELECTROMAGNETIC SWITCHES.

1,419,872. Specification of Letters Patent. Patented June 13, 1922.

Application filed October 29, 1917. Serial No. 198,944.

To all whom it may concern:

Be it known that I, ROBERT H. McLAIN, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Control of Electromagnetic Switches, of which the following is a specification.

This invention relates to means for controlling electric circuits and has for its object the provision of improved means for breaking electric circuits carrying heavy currents.

More specifically this invention relates to electric circuits controlled by switches or circuit interrupting devices under the control of a master switch and is designed to effect a quick and substantially simultaneous opening of the contacts of such interrupting devices.

Where electric circuits are broken carrying heavy currents, several hundred amperes for instance, a large amount of heat energy must be dissipated in a very short time in order to avoid overheating the interrupting contacts. This is especially the case where the circuits are opened and closed at very short intervals and in order to divide the energy to be dissipated, it is desirable to divide the spark, and consequently to place the interrupting contacts or contactors for controlling the current in series. These mechanically independent contactors, in order to divide up the energy to be dissipated, must be made to open simultaneously or substantially so, otherwise one contactor would be made to dissipate the whole amount of heat.

To effect the substantially simultaneous opening of the contactors when the master switch is opened, I have found it necessary to provide positive means, since the time constant for the opening movement of contactors, as manufactured, is not ordinarily the same. The time constants also may be changed by wear after the contactors are installed thus causing the arc to be disrupted by that portion of the contactors which opens more quickly. Such means, I have ascertained, advantageously consists of a condenser or capacity placed in parallel either with the master switch or with the windings of the contactors.

A capacity so placed forces a demagnetizing current, engendered by the opening of the master switch, to flow for an instant in the windings of the contactors, which will force the contactors to open substantially simultaneously.

For a more complete understanding of the nature and objects of this invention reference should be had to the following detailed description taken in connection with the accompanying drawing, in which Figs. 1 and 2 show, in diagrammatic fashion, parallel and series arrangements respectively of the electromagnetic windings of the contactors, which are in series, under the control of a master switch having capacity in parallel therewith; and Figs. 3 and 4 show similar arrangements having a capacity in parallel with the contactor windings.

Referring now to the drawing, 5 denotes a motor or any piece of electrical apparatus consuming electric energy, the circuit 6 of which is controlled by the contactors 7 placed in series relation. These contactors are actuated by individual electromagnets and their movable elements are mechanically independent of each other.

The electromagnetic windings 8 of these contactors 7, in the arrangement shown in Figs. 1 and 3 are placed in parallel relation with respect to each other but in series with the master switch 9 of the control circuit 10, while in Figs. 2 and 4 the contactor windings 8′ are shown in series arrangement with respect to each other and with the master switch 9.

To effect the substantially simultaneous opening of the contactors 7 when the master switch 9 is opened, I may place a capacity, such as condenser 11, in parallel with the master switch 9 as shown in Figs. 1 and 2, or I may place a condenser, as 11′, in parallel with the contactor windings themselves in the manner shown in Figs. 3 and 4.

The operation of this invention is as follows:

To start the motor 5, the master switch 9 is closed, which energizes the contactor windings 8 or 8′ thereby causing the contactors 7 to close, completing the motor circuit.

When it is desired to break the motor circuit, the master switch 9 is opened. The capacity 11 or 11′ at this instant, permits the counter E. M. F., engendered in the contactor windings by the waning flux of the broken control circuit, to force a demagnetiz-

ing current to flow for an instant in these windings which causes all the contactors to open substantially at the same time. The current drawn by the motor 5 is thus substantially simultaneously broken at a plurality of points, dividing the spark and consequently the heat energy to be dissipated in a manner that will not injure the contactors by overheating.

While I have here shown and described several embodiments of my invention which are at present the best means known to me for carrying the same into effect, I would have it understood that they are merely illustrative and that I do not mean to be limited to the precise details disclosed nor in the choice of recognized equivalents except as defined in my claims hereunto annexed.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The combination with an electric circuit having a plurality of mechanically independent circuit interrupting devices in series relation therein and a plurality of operating electromagnets for the same, one for each circuit interrupting device, a portion of said devices having normally a different time constant in opening than the remainder, of a control circuit for actuating said circuit interrupting devices having a master switch and a single means opposing the counter-electromotive force of the said electromagnets for effecting the substantially simultaneous opening of said circuit interrupting devices when the master switch is opened.

2. The combination with an electric circuit having a plurality of mechanically independent circuit interrupting devices in series relation therein and a plurality of operating electromagnets for the same, one for each circuit interrupting device, a portion of said devices having normally a different time constant in opening than the remainder, of a control circuit having a master switch for energizing and deenergizing the electromagnets of said devices and a single condenser connected across the contacts of the master switch for forcing a demagnetizing current to flow in said electromagnets when the master switch is opened, whereby the said circuit interrupting devices are opened substantially simultaneously.

3. The combination with an electric circuit having a plurality of mechanically independent circuit interrupting devices in series relation therein and a plurality of operating electromagnets for the same, one for each circuit interrupting device, a portion of said devices having normally a different time constant in opening than the remainder, of a control circuit having a master switch for energizing and deenergizing the electromagnets of said devices and a condenser connected to said control circuit to discharge and cause a demagnetizing current to flow in said electromagnets when the master switch is opened, whereby the said circuit interrupting devices are opened substantially simultaneously.

4. The combination with an electric circuit having therein a plurality of mechanically independent contactors arranged in series relation, a portion of said contactors having normally a different time constant in opening than the remainder of a plurality of electromagnetic windings for operating said contactors, one for each contactor, a control circuit having a master switch for energizing and deenergizing said electromagnetic windings and a condenser connected to said control circuit so that a demagnetizing current flows for an instant in said windings when the master switch is opened, whereby the said contactors are opened substantially simultaneously.

5. The combination with an electric motor, of a plurality of contactors in series relation with said motor and with each other, electromagnetic windings for operating said contactors, a control circuit having a master switch for energizing and deenergizing said windings, and a condenser arranged in parallel with said master switch whereby a demagnetizing current flows in said windings when the master switch is opened to force the substantially simultaneous opening of said contactors.

In witness whereof, I have hereunto set my hand this 26th day of October, 1917.

ROBERT H. McLAIN.