Oct. 16, 1945. L. H. MATTHIAS 2,387,033

ARC EXTINGUISHING DEVICE

Filed Aug. 12, 1940 2 Sheets-Sheet 1

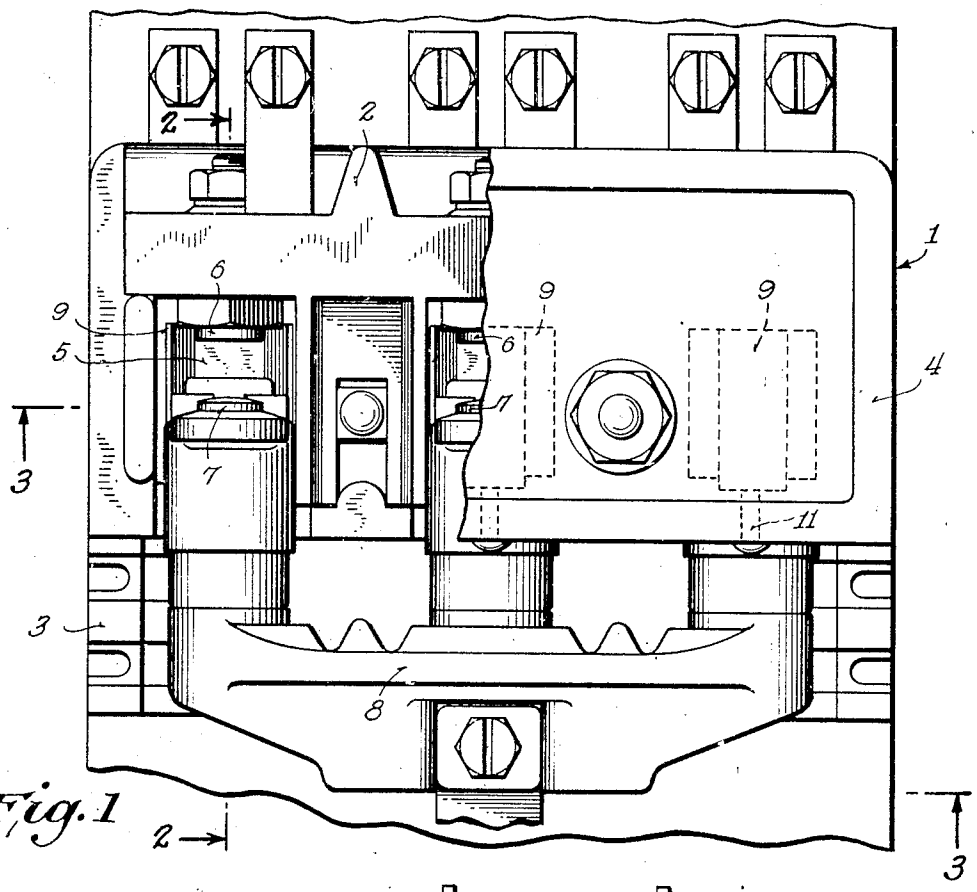


Fig. 1

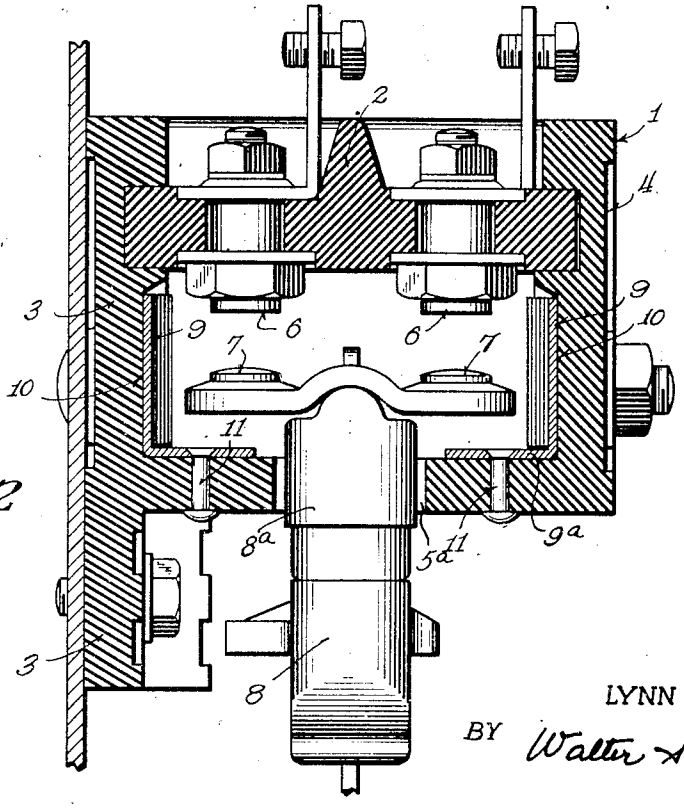


Fig. 2

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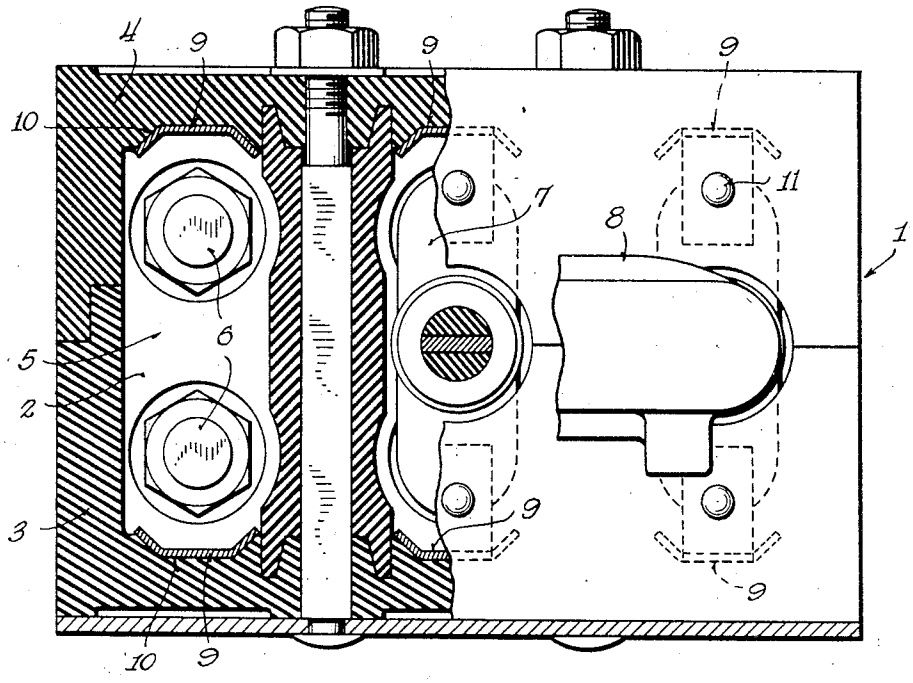


Fig. 3

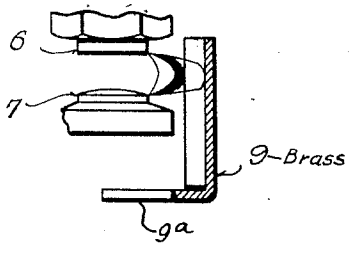


Fig. 4

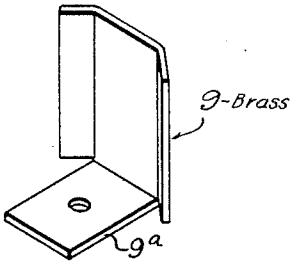


Fig. 5

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2,387,033

UNITED STATES PATENT OFFICE

2,387,033

ARC EXTINGUISHING DEVICE

Lynn H. Matthias, Fox Point, Wis., assignor to Allen-Bradley Company, Milwaukee, Wis., a corporation of Wisconsin

Application August 12, 1940, Serial No. 352,206

8 Claims. (Cl. 200—144)

The invention relates to improvements in a multipole switch of the type in which each pole is provided with double break contacts forming a magnetic loop to spread the arcs apart from each other.

The invention has for its object to expedite extinguishing the arcs upon opening the contacts.

Another object is to lessen the tendency of the gas in the vicinity of the contacts to sustain the arcs.

Another object is to create in the vicinity of the contacts a gas tending to extinguish the arcs.

Another object is to accelerate the transfer and dissipation of the heat from the arcs.

Other objects and advantages of the invention will appear from the embodiment thereof described herein.

According to the invention, a metallic body possessing a high specific thermal capacity and a high thermal conductivity is arranged in proximity to each arc and provided with an extension to transfer heat absorbed from the arc to a remote cool zone and dissipate it therein.

An embodiment of the invention is illustrated in the accompanying drawings which form a part hereof, in which:

Figure 1 is a partially sectioned front view of the switch made in accordance with the invention.

Figure 2 is a cross sectional view of the switch on the lines 2—2 in Figure 1.

Figure 3 is a partially sectioned view of the switch structure on the lines 3—3 in Figure 1.

Figure 4 is a view showing the arrangement of the electrical contacts and arcing electrode during the rupture of an electric arc.

Figure 5 is a perspective view of an arcing electrode.

The invention is illustrated in the drawings as embodied in a switch of the type exemplified in Patent No. 2,071,149, issued to Gustav O. Wilms and Hans Petersen, February 16, 1937.

The arc hood 1 as shown in Figures 1, 2 and 3 consists of mounting block 3, top block 2 and front block 4 that interfit and are held together by nut and bolt locking means to form three separate confined arc chambers 5. In each arc chamber there are two stationary contacts 6 mounted in the top block 2 and arranged to be bridged by a movable contact member 7. The movable contact member 7 is actuated by the switch actuating member 8 having a part 8a which passes through an opening in the lower wall of the hood 1 to provide a vent 5a which delivers external cool air to the chamber. The two spaced stationary contacts 6 and complementary bridging contact 7 form a U-shaped current path or magnetic loop in each arc chamber, whereby, upon interruption of the current, the two arcs formed in each chamber are repulsed away from the contacts and toward opposite walls of the arc chamber.

The mounting block 3 and front block 4 each have three recesses 10 each adapted to receive a metal plate or body 9 secured by means of a rivet 11. The plates are preferably made of brass or other metal having high specific capacity for heat and high heat conductivity. Each arcing chamber 5 is thus fitted with two plates 9 insulated from the associated switch structure and so disposed that the two arc streams that occur upon interruption of the circuit by separation of the contacts impinge upon the plates as shown in Figure 4. The plate 9 is provided with a depending extension 9a which extends laterally underneath the movable contact member 7 and terminates near the vent 5a.

When the arc gas impinges upon the plate 9, the latter absorbs heat from the arc at a rapid rate and the extension 9a conducts the absorbed heat rapidly away from the plate to the cool zone near the vent 5a and dissipates the heat at a rapid rate to the cool air which is admitted to the chamber by the vent 5a.

By embodying in the metal of the plate 9 a substance which is volatilizable by the heat of the arc to create an arc extinguishing vapor, some of the substance is vaporized upon the occurrence of an arc between the contacts, and the resulting arc extinguishing vapor is retained by the hood in proximity to the arc to accelerate its extinction, thus shortening the duration of the arc and reducing the wear of the contacts and increasing their interrupting capacity.

The switch described herein possesses by reason of the heat absorbing plates a much higher current interrupting capacity than the same switch without the heat absorbing plates, and its current interrupting capacity may be made sufficient to enable it to be employed to interrupt high current in rapid succession in industrial control service.

The heat absorbing plates are ordinarily disposed about the same distance from the contacts as the distance across the gap between the contacts.

This invention may be embodied in other forms than that described herein and still be within the purview of the following claims as construed in accordance with the foregoing description.

What I claim as my invention is:

1. A multiphase switching device suitable for heavy industrial service comprising in combination an insulating enclosure having a plurality of arc chambers, two spaced stationary contacts and a complementary bridging contact member arranged in a U within each arc chamber with said bridging contact member movable to and from a closed position relative to said stationary contacts to control the flow of an electric current, a metal plate for each set of contacts and disposed within the chamber transverse to the plane of the U and outwardly from each set of contacts at a distance substantially equal to the open circuit spacing of the contacts, said relative position of said contacts and bridging contact member to direct the arc streams occurring upon interruption of an electric current away from the contacts and against said metal plates, said metal plates containing a substance volatilizable by heat from the occurring arc streams to produce a gas to quench said arc streams and said arc chamber to confine the occurring arc streams and to retain said gas in the vicinity of said arc streams.

2. A multiphase switching device suitable for heavy industrial service comprising in combination an insulating enclosure having a plurality of arc chambers, two spaced stationary contacts and a complementary bridging contact member arranged in a U within each arc chamber with said bridging contact member movable to and from a closed position relative to said stationary contacts to control the flow of an electric current, a metal plate for each set of contacts and disposed within the chamber transverse to the plane of the U and outwardly from each set of contacts, said relative position of said contacts and bridging contact member to direct the arc streams occurring upon interruption of an electric current away from the contacts and against said metal plates, said metal plates containing a substance volatilizable by heat from the occurring arc streams to produce a gas to quench said arc streams, and said arc chamber to confine the occurring arc streams and to retain said gas in the vicinity of said arc streams.

3. A multiphase switching device suitable for heavy industrial service comprising in combination an insulating enclosure having a plurality of arc chambers, two spaced stationary contacts and a complementary bridging contact member arranged in a U within each arc chamber with said bridging contact member movable to and from a closed position relative to said stationary contacts to control the flow of an electric current, a metal plate for each set of contacts and disposed within the chamber transverse to the plane of the U and outwardly from each set of contacts, said relative position of said contacts and bridging contact member to direct the arc streams occurring upon interruption of an electric current away from the contacts and against said metal plates, said metal plates containing a substance such as zinc or cadmium volatilizable by heat of said arc streams to produce a gas to quench said arc streams, and said arc chamber to confine said arc streams and retain said gas in the vicinity of said arc streams.

4. An electrical switching device suitable for heavy industrial service comprising in combination an arc chamber, two spaced stationary contacts and a complementary bridging contact member arranged in a U within said arc chamber with said bridging contact member movable to and from a closed position relative to said stationary contacts to control the flow of an electric current, a metal plate for each set of contacts and disposed within the chamber transverse to the plane of the U and outwardly from each set of contacts, said relative position of said contacts and bridging contact member to direct the arc streams occurring upon interruption of an electric current away from the contacts and against said metal plates, said metal plates containing a substance volatilizable by heat from the occurring arc streams to produce a gas to quench said arc streams, and said arc chamber to confine the occurring arc streams and retain said gas in the vicinity of said arc streams.

5. An electrical switching device suitable for heavy industrial service comprising in combination an arc chamber, two spaced stationary contacts and a complementary bridging contact member arranged in a U within said arc chamber with said bridging contact member movable to and from a closed position relative to said stationary contacts to control the flow of an electric current, said stationary contacts and bridging contact member having contact faces essentially of silver, a metal plate for each set of contacts and disposed within the chamber adjacent an end wall outwardly from its set of contacts and transverse to the plane of the U, said relative position of said contacts and bridging contact member to direct the arc streams occurring upon interruption of an electric current away from the contacts and against said metal plates, said metal plates containing a substance such as zinc or cadmium volatilizable by heat of said arc streams to produce a gas to quench said arc streams, and said arc chamber to confine said arc streams and retain said gas in the vicinity of said arc streams.

6. A multiphase switching device suitable for heavy industrial service comprising in combination an insulating enclosure having a plurality of arc chambers, two spaced stationary contacts and a complementary bridging contact member arranged in a U within each arc chamber with said bridging contact member movable to and from a closed position relative to said stationary contacts to control the flow of an electric current, a metal plate for each set of contacts and disposed within the chamber adjacent an end wall and transverse to the plane of the U at a distance from each set of contacts substantially equal to the open circuit spacing of the contacts, said relative position of said contacts and bridging contact member to direct the arc streams occurring upon interruption of an electric current away from the contacts and against said metal plates, said metal plates containing a substance volatilizable by heat from the occurring arc streams to produce a gas to quench said arc streams, and said arc chamber having its principal dimension as defined by said end walls to confine the occurring arc streams and said gas to aid arc interruption.

7. An alternating current electric switch of the type provided with double break contacts having two stationary contacts and a horizontal bridging contact arranged to form a magnetic loop to spread the arcs between the contacts apart from each other in a horizontal direction and possessing capacity to carry and interrupt electric energy of an order tending to sustain an arc across the open air gaps between the contacts, comprising in combination with said double break con-

tacts, a metallic body having a high specific capacity for heat and arranged beyond each end of said bridging contact in a position to absorb heat from the adjacent arc and having an extension depending below said bridging contact to transfer heat at a rapid rate from said body to a remote cool zone and dissipate said heat into said cool zone at a rapid rate, and an actuator to operate said bridging contact in a vertical direction to engage and disengage said stationary contacts.

8. An alternating current electric switch of the type provided with double break contacts having two stationary contacts and a horizontal bridging contact arranged to form a magnetic loop to spread the arcs between the contacts apart from each other in a horizontal direction and possessing capacity to carry and interrupt electric energy of an order tending to sustain an arc across the open air gaps between the contacts, comprising in combination with said double break contacts, a metallic body having a high specific capacity for heat and arranged beyond each end of said bridging contact in a position to absorb heat from the adjacent arc and having an extension to transfer heat away from said body at a rapid rate to a remote cool zone and said body containing a volatilizable substance to create and diffuse about its adjacent arc an arc extinguishing vapor, a hood enclosing said contacts and said body to retain the arc extinguishing vapor in the vicinity of the arc and having a vent to deliver external cool air to said extension, and an actuator to operate said bridging contact in a vertical direction to engage and disengage said stationary contacts.

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