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H. N. WADE

APPARATUS FOR SUPPRESSING ARCS

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Fig. 1.

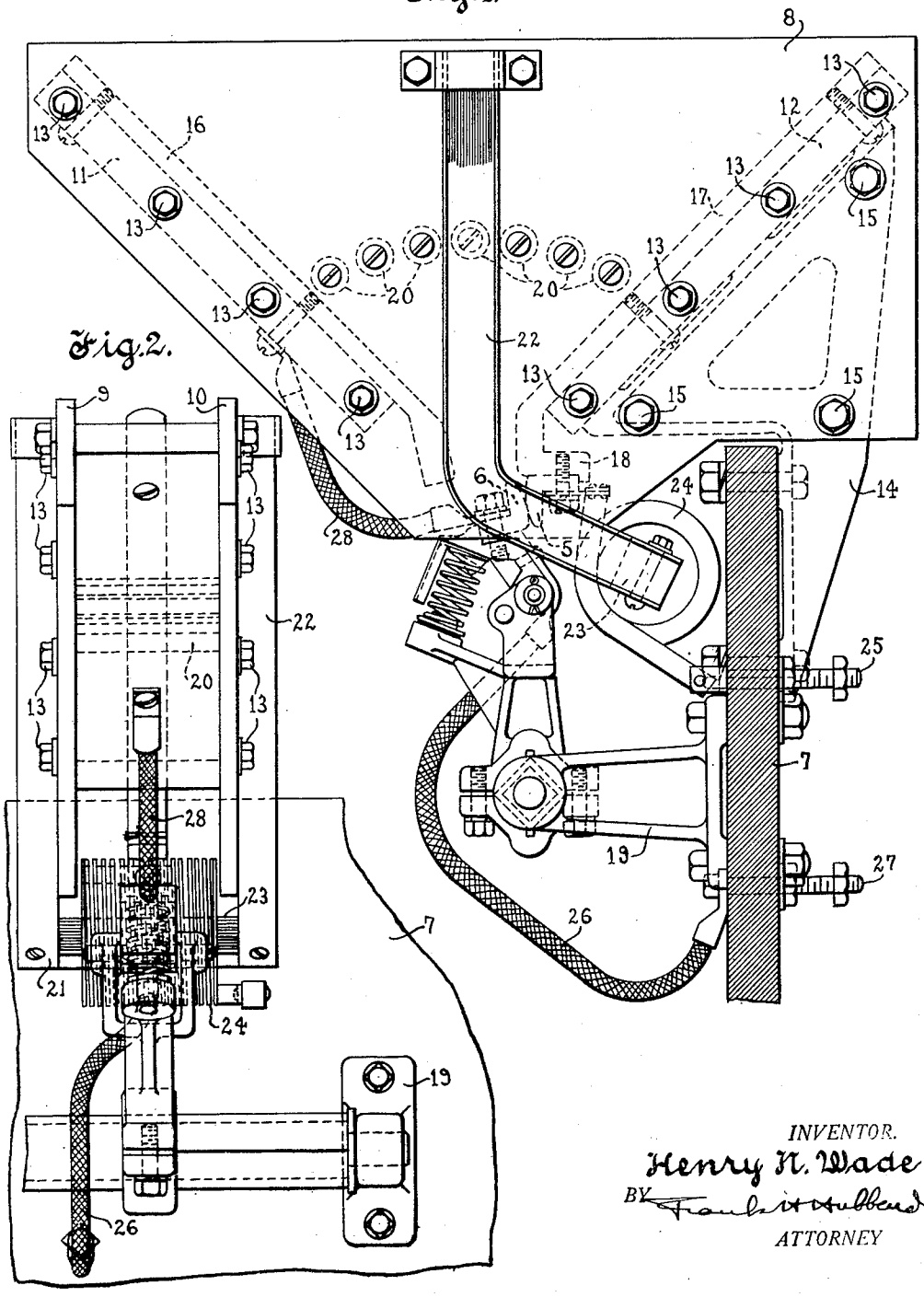


Fig. 2.

INVENTOR.
Henry N. Wade
BY
ATTORNEY

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HENRY N. WADE, OF SHOREWOOD, WISCONSIN, ASSIGNOR TO THE CUTLER-HAMMER MFG. CO., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

APPARATUS FOR SUPPRESSING ARCS.

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This invention relates to apparatus for suppressing arcs formed incident to operation of electric circuit controllers.

More particularly the invention relates to the suppression of such arcs in air.

An object of the invention is that of providing improved apparatus for effecting the foregoing result.

A further object is that of providing a novel and improved high tension contactor having features adapting the same to act in accordance with the instant method for interruption or suppression in air of any arcs formed incident to operation thereof.

Other objects and advantages will hereinafter appear.

In the accompanying drawing, wherein is disclosed a preferred embodiment of such apparatus,

Figure 1 is a side elevational view of such apparatus; while

Fig. 2 is a front elevational view of the same.

In the operation of such apparatus, the arc formed incident to separation of electrical contacts is subjected to electro-magnetic influence for causing the same to travel outwardly away from such contacts and between divergently arranged conductive members for stretching of the arc, numerous conductive barriers or electrodes being located in the path of the attenuated arc for separating the latter into a corresponding number of sections of reduced length, such electrodes acting in the manner of known forms of multigap lightning arrester for suppression of such arc.

In the drawing is illustrated a conventional circuit controller structure provided with arc suppressing means adapted to act in accordance with the foregoing.

In said drawing a pair of relatively movable switch contacts 5 and 6 are carried by a suitable insulating panel 7, an arcing chute 8 being arranged to receive the arc drawn incident to separation of said contacts and moreover being provided with means to be hereinafter described for suppressing or disrupting such arc.

In practice said chute preferably comprises a pair of similar side elements 9 and 10 composed of insulating material and a pair of similar end elements 11 and 12, also of insulating material, secured edgewise therebetween, said latter elements having corresponding ends thereof located adjacent one another and having their opposite ends divergent as illustrated. Bolts 13 serve to maintain the aforementioned elements of the chute in assembled relation.

The chute is in practice preferably supported by and upon the panel 7 by means of a bracket member 14 bolted to the latter and having an inclined surface to coact directly with the outer surface of the end element 12 of the chute for support thereof. Bolts 15 are preferably extended through the side elements 9 and 10 and through the bracket 14 for rigidly securing the chute.

Arcing horns 16 and 17 composed of conductive material such as zinc or the like are secured to the adjacent divergent surfaces of the end elements 11 and 12 of the chute, the adjacent terminal portions of said horns being preferably bent into approximate parallelism with one another as illustrated, said horns thus providing a passage for the arc therebetween. The terminal portion of the horn 17 is further provided with a flange 18 for directly securing the fixed contact 5 of the switch thereto. The movable switch contact 6 is preferably supported pivotally upon a bracket 19 which projects forwardly from the panel whereby said contact is adapted to be moved into and out of engagement with its co-operating fixed contact and in so doing to move across the aforementioned passage between the adjacent portions of the arcing horns 16 and 17. The precise manner of support of said movable contact being in other respects not herein important will not be described in further detail.

A plurality of electrodes 20 preferably of zinc and of substantially cylindrical contour are arranged within the chute in the path of the arc traversing the latter and preferably in the curved relation illustrated.

A pair of laminated magnetic pole pieces 21 and 22 are secured outside the arcing chute as shown, being of sufficient length to extend materially beyond the electrodes aforementioned. Said pole pieces are preferably bent backwardly toward the panel 7 as illustrated and are there magnetically connected by a laminated member 23 as shown, said latter member being surrounded by a magnetizing coil 24 and said coil being terminally connected between the

fixed contact 5 of the switch and its associated terminal bolt 25 whereby the coil is arranged in series in the circuit controlled by the switch. A flexible lead 26 serves to connect the movable switch contact 6 with its terminal bolt 27 while a second flexible lead 28 serves to connect said movable contact with the arcing horn 16 as illustrated.

The operation of the device for suppressing or extinguishing arcs may be briefly stated as follows. Assuming energization of the controlled circuit by heavy current of high voltage, upon movement of contact 6 away from its associated fixed contact 5, an arc is drawn between said contacts whereas energization of the magnetizing coil 24 is maintained under these conditions. Said arc is thus subjected to a blow-out action by the flux between said pole pieces 21 and 22 for causing the arc to travel upwardly away from said contacts and within and between the arcing horns aforedescribed. The horn 17 being permanently electrically connected with the fixed contact 5 as described, said arc is adapted immediately to leave said fixed contact under the aforementioned blow-out action and to attach itself to the adjacent portion of said horn whereas upon movement of contact 6 outwardly beyond the arc passage the former passes below and in close proximity to the lower end of arcing horn 16. Thus as the distance between said contacts becomes greater than that between the horns the arc is adapted to move from the contact 6 to the horn 16, it being recalled that said horn is electrically connected with said contact by means of the flexible lead 28 aforedescribed. It thus follows that practically immediately following separation of said contacts the arc is transferred away from both of said contacts due to the blow-out action of the polepieces 21 and 22 and then extends between the arcing horns.

Following such separation of the arc from the switch contacts the electro-magnetic influence of said pole pieces continues to force the arc upwardly and outwardly of the chute and since the arcing horns diverge rapidly as described, the arc is thus materially attenuated during such progress. As the arc arrives at the set of electrodes 20 the same is at once broken up into a succession of series related sections of materially reduced length according to the number of said electrodes, the latter serving thus to effect extinguishment of the arc in a manner similar to that of certain known forms of multi-gap lightning arrester.

While the foregoing effect has been amply demonstrated practically the cause thereof is believed never to have been fully explained. It is known that an arc tends to become extinguished when cooled and also when divided into a plurality of series related sections, both of which effects are produced by the electrodes aforedescribed. Moreover, it has been fully demonstrated that the relative spacing of the individual electrodes is a matter of prime importance, the persistence of the arc being found to vary, within limits, with the distance between electrodes. Thus to insure extinction of the arc under conditions of heavy current at voltages about fifteen hundred, it is decidedly advantageous that the space between individual barriers should not materially exceed one sixteenth of an inch and that the number of barriers be sufficient to effect approximately six series related sections of the arc. Further the use of metallic zinc or other member of the same elemental group, or an alloy thereof, in the construction of the parts directly influencing the arc has been found greatly to facilitate suppression of the latter.

It has also been demonstrated experimentally that the arc suppressing action is considerably facilitated and augmented by concentration of the magnetic blow-out effect along a relatively narrow portion of the chute as illustrated.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with relatively movable contacts, of means for extinguishing arcs drawn therebetween, comprising a succession of electrodes spaced and insulted from said contacts and from one another and means for causing the arc to separate from said contacts and travel in a direction substantially at right angles to said succession of electrodes for causing the arc to attach itself to the individual electrodes, said latter means including means to concentrate its influence upon a reduced portion of the total length of the arc when the latter is attached to said electrodes.

2. The combination with relatively movable contacts, of means for extinguishing arcs drawn therebetween, comprising a succession of electrodes spaced and insulated from said contacts and from one another, means, including electromagnetic means, for causing the arc to separate from said contacts and travel in a direction substantially at right angles to said succession of electrodes for causing attenuation of the arc and attachment thereof to said individual electrodes, said electromagnetic means having parts arranged to maintain the concentration of the electromagnetic effect upon a given portion of the arc substantially undiminished during such attenuation and travel of the arc.

In witness whereof, I have hereunto subscribed my name.

HENRY N. WADE.