

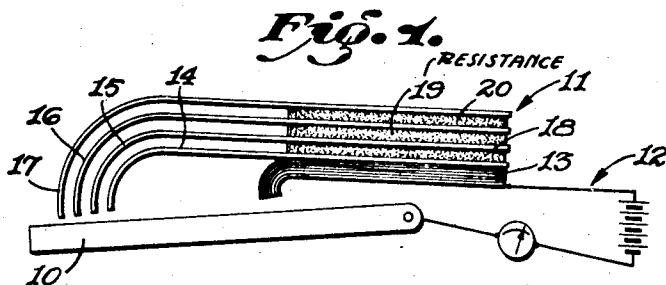
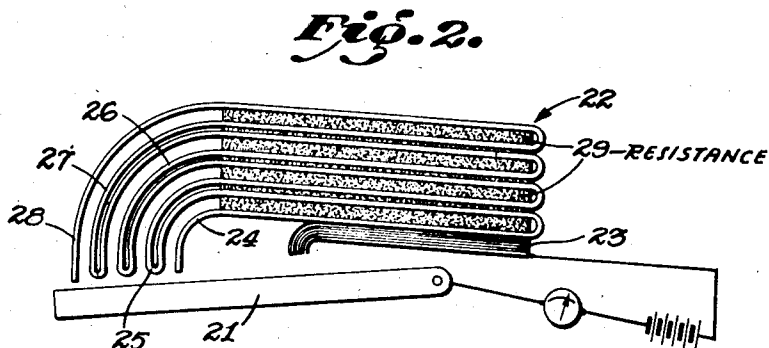
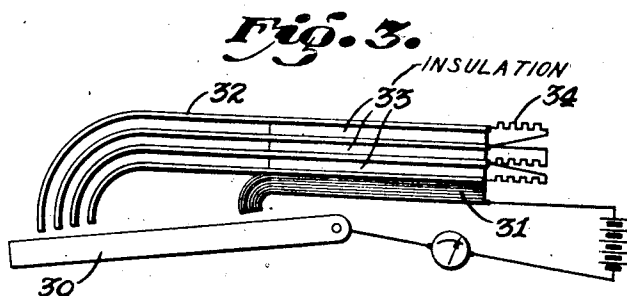
June 15, 1948.

W. E. DE COURSEY
NONARCING SWITCH CONTACT

2,443,230

Filed Oct. 13, 1944

2 Sheets-Sheet 1



WILLIAM E. DE COURSEY
INVENTOR.

BY
Hazard and Miller
ATTORNEYS

Filed Oct. 13, 1944

NONARCING SWITCH CONTACT

2 Sheets-Sheet 2

Fig. 1 is a perspective view of a mechanical device. It consists of a rectangular frame with two large circular openings. A central shaft (42) passes through these openings, supported by bearings (44, 45). A lever arm (43) is attached to the shaft. A resistance element (40) is positioned below the lever arm, with a label 'RESISTANCE' pointing to it. Other components are labeled 41, 46, 47, and 48.

WILLIAM E. DE COURSEY
INVENTOR.

BY
Hazard and Miller
ATTORNEYS

ATTORNEYS

UNITED STATES PATENT OFFICE

2,443,230

NONARCING SWITCH CONTACT

William E. De Coursey, West Los Angeles, Calif.

Application October 13, 1944, Serial No. 558,580

6 Claims. (Cl. 200-146)

1

This invention relates to an electrical contacting device for electric circuits.

It is primarily designed for use in electric circuits carrying heavy currents which, when the circuit is broken produce arcing.

A primary object of the present invention is to produce an electrical contacting device which is so designed that when the circuit is opened or broken the arcing will be either greatly reduced or completely eliminated. Heretofore electrical contacting devices have been developed wherein one of the contact members is made up of a series of laminations presenting contact portions engageable with the other contact member. In some instances, the laminations are arranged to progressively or consecutively engage and disengage the opposed contact member, the object being that the arcing instead of being distributed over all of the laminations would be confined to that lamination which is first to engage and last to disengage the opposed contact member. Sometimes such lamination has been suitably tipped so as to be armored against the detrimental effects of the arcing that is thus confined thereto.

An object of the present invention is to provide an electrical contacting device of this same general character, but which is so designed that a resistance or resistances will automatically be placed in series with the lamination last to disengage the opposed contact member so that as the contacts are separated or opened a maximum resistance is automatically placed in circuit with the lamination last to disengage and which is designed to reduce or eliminate the arcing that would normally take place between the opposed contact member and the lamination last to disengage.

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a view in side elevation of one form of electrical contact device embodying the present invention;

Fig. 2 is a similar view of an alternative form of construction embodying the present invention;

Fig. 3 is a similar view illustrating still another form of electrical contact device embodying the present invention; and

Figs. 4 and 5 are a top plane view and view in side elevation, respectively, of a balanced relay employing a form of electrical contact device embodying the present invention.

2

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, and particularly to that form illustrated in Fig. 1, the electrical contact device illustrated in this figure consists of two

opposed, mutually engageable contact members 10 and 11 which are adapted to open and close any electrical circuit, such as for example the circuit generally indicated at 12. The contact member 10 may be any form of construction and is illustrated as being merely a heavy copper bus bar. The contact member 11 may be pivoted for movement as a unit into engagement and out of engagement with contact member 10 or it may be so arranged that it is moved toward and away from contact member 10 in closing and opening the circuit. In some instances, contact member 11 may be stationary and contact member 10 be pivoted or bodily moved toward and away from it.

Contact member 11 is illustrated as made up of a plurality of laminations 13, the ends of which are adapted to simultaneously engage the contact member 10 when the circuit is fully closed. Associated with these laminations there are a plurality of spaced flexible laminations 14, 15, 16, and 17. These laminations are flexible and have their ends engageable with and disengageable from contact member 10 progressively. Thus, in closing the circuit by bringing the two contact members 10 and 11 into mutual engagement lamination 17 will engage contact member 10 in advance of the end or contact portion of lamination 16. Lamination 16, in turn, will engage the contact member 10 in advance of lamination 15, which, in turn, is in advance of lamination 14. In opening the circuit the reverse is true. Thus, laminations 13 will immediately disengage contact member 10 and the contact portions of laminations 14, 15, 16, and 17 will progressively disengage it thereafter with lamination 17 being the last to disengage contact member 10.

Between the laminations 14, 15, 16, and 17 there are resistances indicated at 18, 19, and 20. These resistances may be in the form of mere carbon plates secured between the laminations or in some instances, they may be in the nature of specified films between the laminations. In other instances, these plates may be in the nature of any compound material offering a high electrical resistance which can be compressed into plates and positioned between the laminations.

With this arrangement, it will be appreciated that on opening the contact device, when laminations 13 and 14 disengage the contact member 10 the resistance 18 is placed in series with the

3

laminations 15, 16, and 17 which remain in contact with contact member 10. When lamination 15 disengages contact member 10 resistance 19 is added in series with laminations 16 and 17 and when lamination 16 disengages the maximum resistance of all resistances 18, 19, and 10 is placed in series connection with lamination 17. Thus, at the time lamination 17 disengages contact member 10 there is a maximum resistance in the circuit with the contact portion that is about to break the last electrical connection with the contact member. This resistance added into the circuit automatically in the process of breaking the circuit serves to reduce and in many instances, completely eliminate arcing which would otherwise take place between contact member 10 and the contact portion of lamination 17.

In the form illustrated in Fig. 2, there is a contact member 21 adapted to be engaged by and disengaged from a contact member 2. Contact member 22 is made up of a plurality of laminations 23 and laminations 24, 25, 26, 27, and 28. Laminations 24 to 28 inclusive, are constructed of a material which inherently possesses a high electrical resistance, such as for example "nichrome" ribbon. This ribbon is reversely folded back and forth upon itself to provide the various laminations some of which are doubled as indicated at 25, 26, and 27. The convolutions are spaced from each other, such as by insulators 29. The lowermost lamination 24 is, of course, electrically connected to laminations 23. In this form of construction, on opening the circuit laminations 23 and 24 will first disengage contact member 21, thus placing the resistance of the lower half of lamination 25 in series with the remaining laminations that are contacting contact member 21. When lamination 25 has its contact portion disengage contact member 21 the resistance of this lamination is added in series with the remaining laminations. Finally, when lamination 28 is about to disengage contact member 21, the resistance of all laminations is placed in series with it so that at the moment the circuit is broken there is a maximum resistance in the circuit which will reduce or eliminate the arcing that would otherwise take place between contact member 21 and the contact portion of lamination 28.

In the form illustrated in Fig. 3, there is a contact member 30, laminations 31 engageable therewith, and resilient laminations 32 which are spaced from each other and which are mutually independent by means of insulators 33. These laminations however are electrically connected to each other through external resistors 34 which may be of any preferred or desired construction. In this form of construction also, on breaking the circuit the resistors 34 are progressively brought into series connection with the laminations remaining in contact with contact member 30 so that when the final lamination 32 is about to disengage contact member 30 a maximum resistance will be automatically placed in series therewith.

In Figs. 4 and 5, I have illustrated a relay in which the contact device embodying the present invention has been employed. In the construction illustrated therein, there are two bus bars 40 and 41 between which an electrical connection is to be made and broken. The relay is illustrated as having two solenoids 42 and 43 which, when energized, will attract a pivoted armature 44 pivoted as at 45. The armature carries upper and lower sets of laminations those of the upper set being indicated at 46 and those of the lower

4

set being indicated at 47. These laminations are spaced from each other by electrical resistances 48. The laminations of the upper set 46 progressively increase in length upwardly whereas the laminations of the lower set progressively increase in length downwardly so that when the solenoids 42 and 43 are deenergized and the armature is allowed to turn in a clockwise direction from the position shown, such as by a spring or by gravity, the uppermost lamination and the lowermost lamination will be the last to disengage the bus bars 40 and 41, respectively. In the course of disengaging the bus bars by such rotation it will be noted that the laminations nearest the pivot 45 will be the first to disengage their respective bus bars. Thus, progressively the resistances 48 will be placed in series with the uppermost and lowermost laminations respectively. When the circuit is finally broken by the uppermost and lowermost laminations disengaging their respective bus bars all of the electrical resistances will be placed in series between the uppermost and lowermost laminations, thus reducing or eliminating arcing.

It will be understood by those skilled in this art that the number of the laminations employed may vary considerably and the magnitude and number of resistances may likewise be varied to a considerable extent. These factors will ordinarily be determined by the magnitudes of the currents in the circuit that will be normally present. Thus, if the currents are not very high, the number of laminations may be reduced and the magnitudes of the resistances may likewise be reduced. Where the currents are high, however, either or both the number of laminations and the magnitudes of the resistances may have to be materially increased.

Various changes may be made in the details of construction without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. An electrical contacting device comprising a pair of mutually engageable and disengageable contact members, one contact member having a plurality of flexible laminations, said laminations being electrically connected but being otherwise independent of each other, the laminations having contact portions spaced from each other and arranged to extend toward the other contact member in progressively decreasing lengths so as to progressively engage and disengage the other contact member, each lamination being doubled with the doubled portions in series connection with each other and with portions of adjacent laminations.

2. An electrical contacting device comprising a pair of mutually engageable and disengageable contact members, one contact member having a plurality of flexible laminations, said laminations being electrically connected but being otherwise independent of each other, the laminations having contact portions spaced from each other and arranged to extend toward the other contact member in progressively decreasing lengths so as to progressively engage and disengage the other contact member, each lamination being doubled with the doubled portions in series connection with each other and with portions of adjacent laminations and being formed of a material having a high electrical resistance.

3. A relay having a pair of contacts, a contactor therebetween rotatable about an axis between the contacts, a plurality of laminations carried by the contactor adapted upon rotation

of the contactor to engage the mentioned contacts, said laminations being arranged to progressively engage their respective contacts, and resistances between the laminations whereby those laminations which first engage the contacts will have the maximum resistance in circuit therebetween and those last to engage the contacts have a minimum if any resistance in circuit therewith.

4. A relay having a pair of contacts, a contactor therebetween rotatable about an axis between the contacts, a plurality of laminations carried by the contactor adapted upon rotation of the contactor to engage the mentioned contacts, said laminations being arranged to progressively engage their respective contacts, and resistances between the laminations whereby those laminations which first engage the contacts will have the maximum resistance in circuit therebetween and those last to engage the contacts have a minimum if any resistance in circuit therewith, the laminations being equally distributed and equally spaced on opposite sides of the axis of rotation of the contactor so that the contactor will be balanced about its axis of rotation.

5. A relay having a pair of spaced opposed contacts, a contactor rotatable about an axis therebetween, series of laminations on opposite sides of the axis of rotation of the contactor engageable with the contacts on rotation of the contactor, the laminations of each series progressively increasing in length away from the axis of rotation of the contactor so that the outermost laminations will engage their respective contacts in advance of the innermost laminations, and resistances between the laminations whereby when the outermost laminations engage their contacts there will be a maximum

resistance in circuit therewith and when the innermost laminations engage the contacts the resistances therethrough will be progressively decreased.

6. A relay having a pair of spaced opposed contacts, a contactor rotatable about an axis therebetween, series of laminations on opposite sides of the axis of rotation of the contactor engageable with the contacts on rotation of the contactor, the laminations of each series progressively increasing in length away from the axis of rotation of the contactor so that the outermost laminations will engage their respective contacts in advance of the innermost laminations, and resistances between the laminations whereby when the outermost laminations engage their contacts there will be a maximum resistance in circuit therewith and when the innermost laminations engage the contacts the resistances therethrough will be progressively decreased, the laminations being equally distributed and equally spaced on opposite sides of the axis of rotation of the contactor so that the contactor will be balanced about its axis of rotation.

WILLIAM E. DE COURSEY.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
752,552	Hewlett	Feb. 16, 1904
977,577	Wikander	Dec. 6, 1910
1,155,157	Lewis	Sept. 28, 1915
1,563,833	Christensen	Dec. 1, 1925
1,765,569	Corbett	June 24, 1930
1,952,679	Leveen	Mar. 27, 1934