Dec. 22, 1931. T. T. GREENWOOD 1,837,812

ELECTRIC SWITCH AND ARCING MEMBERS THEREFOR

Filed June 28, 1927

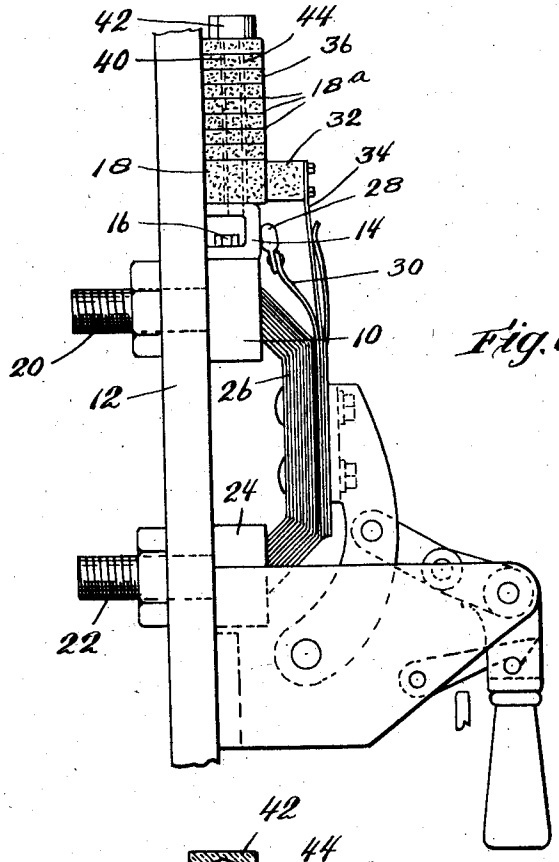


Fig. 1.

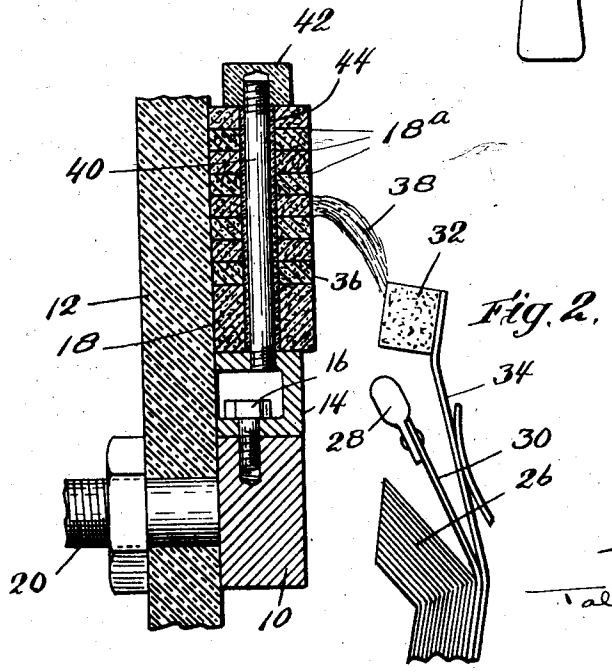


Fig. 2.

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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH AND ARCING MEMBERS THEREFOR

Application filed June 28, 1927. Serial No. 202,142.

This invention relates to electric switches and especially to contact and arcing members therefor.

When the contacts of an electric switch are separated by the opening of the switch under load an arc is drawn between the separated contact members and, if the load is heavy, the arc is not readily extinguished and may cause damage.

It is an object of this invention to provide a contact or arcing member for an electric switch having a substantial resistance and so arranged that, when the circuit-interrupting arc is drawn, the resistance is caused automatically to be included in the switch circuit by the action of the arc, thus to reduce the power in the arc and facilitate the extinguishment of the arc.

A further object of the invention is the provision of an arcing member for an electric switch characterized by having substantial length and resistance and an arcing surface along its length over which the arc is adapted to move from one end to the other, thus automatically to include the resistance of the arcing member in the arc circuit in a progressive manner.

A further object is generally to improve methods and apparatus for extinguishing electric arcs.

Fig. 1 is a partial side elevation of an air break circuit breaker embodying the invention.

Fig. 2 is a detailed sectional elevation of the contact and arcing members of the circuit breaker, in a partially separated position.

The electric switch herein chosen for the purpose of illustrating the invention is an air circuit breaker having a stationary main contact member 10 mounted on the insulating supporting base 12. An auxiliary contact member 14 in the form of a U-shaped metal channel member is attached to the upper face of the main contact member by a bolt 16. An auxiliary contact or arcing member 18 embodying this invention is secured to the upper face of the channel 14 and is electrically connected therewith. A stud 20 is connected with the main contact member and forms one of the switch terminals. A second stud 22 disposed below said stud 20 constitutes the other terminal of the switch. Said latter stud is connected with a second main contact member 24. The movable switch member includes a bridging or brush member 26 which is adapted to bear against the main contact members and close the switch circuit. An auxiliary contact member 28 is carried at the end of a spring-member 30 connected with the brush member and is adapted to engage the auxiliary contact member 14 as is usual in this type of switch. An arcing member, in the form of a carbon block 32 carried by the spring member 34 connected with the brush member is adapted to engage the arcing member 18. The arcing members are adapted to separate last when the switch opens, so that the circuit-interrupting arc is drawn between them, thus to prevent damage to the brush member and the main contact members.

In accordance with this invention at least one of the arcing members and as here shown, the arcing member 18 is characterized by having a substantial resistance in the direction of its length. Said arcing member is provided with an arcing face 36 which is here shown as being coextensive with the length of the member. The movable arcing member 32 is adapted to engage said arcing face at the bottom thereof, where the resistance is low, since the bottom of the stationary arcing member is connected electrically with the switch terminal 20 through the low resistance members 14 and 10. When the arcing members separate under load, the circuit-interrupting arc 38, Fig. 2, while originally struck from the bottom of the resistance arcing member 18, is caused to travel upwardly over the arcing face 36 thereof by thermal action and also by the magnetic effect of the current in the switch circuit, thus automatically to include the resistance of the arcing member in the arc circuit.

The progressive introduction of resistance in the switch circuit in this manner serves to reduce the load on the circuit without the formation of a surge and the resistance of the arcing member absorbs a large amount of the

total power to be interrupted and so reduces the power in the arc and thus reduces the dimensions of the arc flame, the amount of heated gas, and causes the arc to be extinguished rapidly.

The resistance of the arcing member 18 is obtained by forming the arcing member of a plurality of carbon plates 18*a* which are arranged in contact in superimposed order in a vertical pile or stack and held in place by a stud 40 which passes through the plates and is screw-threaded at its lower end in the channel 14. A nut 42, preferably composed of insulating material, is screw threaded on the upper end of the stud and serves to hold the plates together. The stud is insulated from the plates by an insulating sleeve 44 which may be of mica so that the current is constrained to pass downwardly through the plates and the contact junctions therebetween to the channel member 14 and thence to the switch terminal 20. The carbon plates thus form a resistance-pile wherein the resistance is located mainly in the contact junctions between the plates. The resistance may be varied by varying the pressure on the plates by the nut 42. The front faces of the plates preferably are arranged in line so as to form the arcing face 36 which is practically continuous from end to end of the arcing member. It is apparent that the arc in traveling over the arcing member from the bottom to the top thereof automatically cuts into the arc circuit successive contact junctions in series and so automatically and successively increases the resistance in the arc circuit.

This arrangement forms a cheap and effective way of increasing the interrupting ability of electric switches and can be applied to existing switches with little difficulty.

In arrangements of contact members wherein the thermal action of the arc and the magnetic effects of the switch circuit cannot be relied upon to move the arc over the arcing member, I can make use of a blow-out magnet the construction and action of which is so well known as not to require further explanation.

While I have illustrated the invention as applied to air break switches it is obvious that it is not necessarily so limited. It is also obvious that the construction and arrangement herein shown may be modified without departing from the spirit of the invention.

I claim:

1. In an electric switch, the combination of a pair of separable arcing members one of which comprises a plurality of plates arranged in superimposed order in a pile and presenting an arcing face at the edges of the plates which extends along the length of the pile and is adapted to be traversed by the circuit-interrupting arc, the pile having provision for connection with an electric circuit at one end thereof.

2. An electric switch having cooperating separable arcing members one comprising a plurality of plates arranged in superimposed order in a pile and presenting an arcing face at the edges of the plates which extends along the length of the pile and is adapted to be traversed by the circuit-interrupting arc, the pile having provision for connection with an electric circuit at one end thereof, and means to apply pressure on the pile in the direction of the length thereof.

3. An electric switch having cooperating separable arcing members one comprising a plurality of carbon plates arranged in superimposed order in contact in a pile and presenting an arcing face at the edges of the plates which extends along the length of the pile and is adapted to be traversed by the circuit-interrupting arc, the pile having provision for connection with an electric circuit at one end thereof.

4. An electric switch having cooperating separable arcing members one comprising a plurality of carbon plates arranged in superimposed order in contact in a pile and presenting an arcing face at the edges of the plates which extends along the length of the pile and is adapted to be traversed by the circuit-interrupting arc, the pile having provision for connection with an electric circuit at one end only thereof.

5. An electric switch having cooperating separable arcing members one comprising a plurality of carbon plates arranged in superimposed order in contact in a pile and presenting an arcing face at the edges of the plates which extends along the length of the pile and is adapted to be traversed by the circuit-interrupting arc, the pile having provision for connection with an electric circuit at one end thereof, and means to apply pressure on the pile in the direction of the length thereof.

6. An electric switch having cooperating separable arcing members one comprising a pile of carbon plates arranged in contact and providing material resistance at the contact junctions and having arcing faces at the edges of the plates adapted to be traversed by the circuit-interrupting arc whereby to include a variable number of contact junctions in the arc circuit.

7. In an electric switch, an arcing member comprising a carbon resistance pile having an arcing face extended along the length thereof, and means to cause the circuit-interrupting arc to move along said arcing face.

8. In an electric switch, a conducting support, an arcing member comprising a pile of conducting plates on and extended above and electrically connected with said support at the bottom of the pile, and means to strike a circuit-interrupting arc at the base of the pile

and cause it to travel upwardly over the pile.

9. In an electric switch, cooperating stationary and movable arcing members one of which has a fixed end connected with the switch circuit and an electrically free end and has material resistance between its ends and is composed of a series of abutting plates providing resistance in their contact junctions, and means to cause the circuit-interrupting arc to travel over the member from the fixed toward the free end thereof and across the contact junctions.

10. An electric switch having cooperating separable contact members, one of which is composed of a stack of conducting plates arranged one in contact with another and having substantial resistance at their contacts, and the other of which makes and breaks contact at one end of the stack, the circuit-interrupting arc adapted to be moved from one to another of the plates of the stack and across the contacts therebetween, whereby to interpose resistance in the arc circuit.

In testimony whereof, I have signed my name to this specification.

TALMA T. GREENWOOD.