

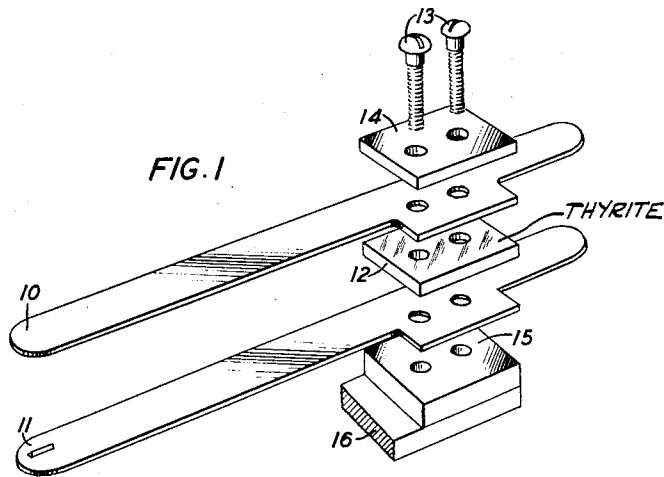
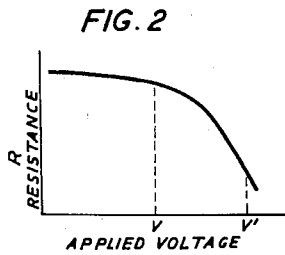
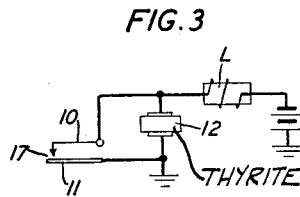
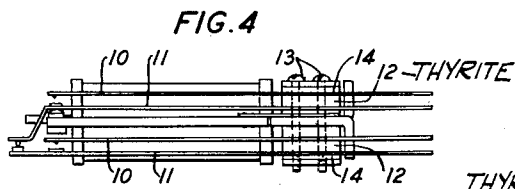
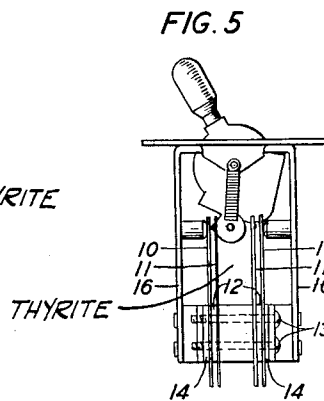
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ELECTRIC SWITCHING DEVICE

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ELECTRIC SWITCHING DEVICE

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5 Claims. (Cl. 200-146)

This invention relates to electric contact protection and more particularly to means for protecting the contacts of electric switching devices against erosion such as is caused at the contacts by sparks resulting from the interruption of highly inductive circuits.

The effective control of electric circuits generally, and telephone circuits particularly, depends to a large extent upon the accurate engagement of the contact elements which constitute a part of the controlling circuit. It has been found that the interruption of a highly inductive circuit is accompanied by the dissipation of energy in the form of a spark at the interrupting contacts caused by an abnormal increase in voltage due to the opening of the inductive circuit. Such contact sparking causes a rapid deterioration of the contact metal and renders the switching device less reliable in operation.

Several expedients in the nature of spark suppressors, such as condensers, filters, copper oxide rectifiers, and the like, have been resorted to in an effort to render the contact elements of switching devices immune to the deleterious effects of sparking. The use of such remedial measures, however, requires a suitable mounting for the suppressor which, for the best results, should be located close to the contacts with which it is to function. It also necessitates wiring the suppressor to the contacts or to the springs upon which the contacts are mounted which is usually accomplished after the switching device has been installed. Such requirements are not always easily satisfied and are, therefore, objectionable.

It is the object of this invention to provide protection for the contact elements of a switching device in such a manner that the objectionable features heretofore encountered are overcome.

This object is attained in accordance with a feature of the invention by the use of a Thyrite resistance element as the spark suppressor and by including the suppressor as an integral part of the spring pile-up in which the contact bearing springs are assembled as a unit.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing, in which:

Fig. 1 is an exploded view of a simple spring pile-up, such as may be employed in a relay, key or other type of switching device and which illustrates the position of the suppressor element

with respect to the contact springs with which it functions;

Fig. 2 is a characteristic curve illustrating the resistance voltage characteristic of Thyrite;

Fig. 3 is a circuit schematic showing the electrical connection of the Thyrite resistance in a contact controlled circuit; and

Figs. 4 and 5 show practical applications of the present invention to an electromagnetic switching device and a manually operated key, respectively.

In accordance with this invention, as illustrated by Fig. 1, the spring pile-up consists primarily of a pair of cooperating contact bearing springs 10 and 11 between which is interposed a block 12 of Thyrite of suitable dimensions and drilled as shown, with holes which align themselves with corresponding holes in the springs 10 and 11 for the reception of screws 13. Insulating separators 14 and 15, also provided with holes through which the screws 13 pass, complete the pile-up illustrated. The pile-up is assembled in the well-known manner, by placing the various elements 14, 10, 12, 11 and 15 thereof, one on top of the other, with their respective holes in alignment and passing the screws 13 through the aligned holes and screwing them into the mounting bracket 16. The element 12 serves the dual purpose of a spark suppressor and spring separator.

The substance, Thyrite, has a non-linear resistance characteristic such as illustrated by the curve in Fig. 2. It will be noted from the curve that the Thyrite has a substantially linear resistance at applied voltages below a certain value V but that when the applied voltage increases to a value of V' , the resistance is materially diminished. The voltage V' may be considered to be the peak voltage of the inductive discharge of the load L shown in Fig. 5 when the contacts 17 are opened. The resistance of the element 12 being very low at this voltage, the energy stored in the inductive load L finds a ready path to ground, said path being in shunt with the contact springs 10, 11. The stored energy is, accordingly, dissipated without injury to the contacts 17 and does not manifest itself in the form of a spark at these contacts.

The contact protector of this invention is simple, inexpensive and practicable and occupies less mounting space than other arrangements heretofore used for the same purpose.

Fig. 4 discloses an electromagnetic switching device, such as a relay, and Fig. 5 shows a manually operated key, in the spring pile-ups of each

of which is included a Thyrite block, such as 12, which functions in the manner just described to protect the contact elements of the springs against the deleterious effects of sparking.

5 What is claimed is:

1. In a switching device, a spring pile-up including a pair of cooperating contact bearing springs and a separator interposed between said springs, said separator comprising an electrical
10 conductor having a negative non-linear resistance-voltage characteristic.

2. In a switching device, a spring pile-up comprising three contiguous electrical conducting elements, one of said elements having a negative non-linear resistance-voltage characteristic
15 and located intermediate the other two elements.

3. In a switching device, a spring pile-up comprising a pair of circuit controlling contact

springs and a separator interposed between said springs, said separator constituting a high resistance shunt between said springs under certain voltage conditions and a shunt of considerably lower resistance under certain other higher
5 voltage conditions.

4. In a switching device, a pair of contact bearing springs, a separator having a negative non-linear resistance-voltage characteristic interposed between said contact springs, and means
10 for securing said springs and separator to said switching device.

5. In a switching device, a pair of contact bearing springs, a spark suppressor interposed between said springs, and means for securing said
15 springs and said suppressor, as a unit, to said device.

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