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ARRANGEMENT TO AVOID SPARKING IN INDUCTIVE DIRECT-CURRENT CIRCUITS

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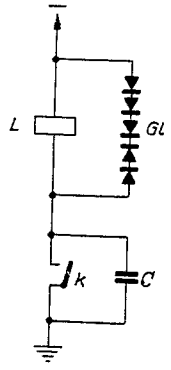


Fig. 1

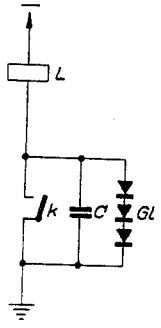


Fig. 2

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ARRANGEMENT TO AVOID SPARKING IN INDUCTIVE DIRECT-CURRENT CIRCUITS

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Claims priority, application Germany December 21, 1951

1 Claim. (Cl. 317—11)

To avoid sparking at contacts which are included in inductive direct-current circuits, arrangements are known that have a large condenser joined in series with an attenuation resistance and connected in parallel with the respective contact. Arrangements so constructed are successful in spark-quenching, but the time taken to disconnect the inductance is in general too long.

The invention concerns a circuit arrangement which is likewise intended to avoid sparking, but in which the said disconnecting time is short. This is accomplished in such a manner that a small condenser and a voltage-controlled resistor are connected in parallel with the contact.

With small condensers employed to prevent sparking, the induced voltage at the contacts, which is brought about by the inductance, is required to be kept small. This is achieved by the use of said voltage-controlled resistor, such as a silicon-carbide selenium rectifier. It makes no difference whether such resistor is connected in parallel with the contact or with the inductance. In the case of large condensers sparking-at-make may occur when the contact is reclosed a short interval after it has been opened.

Figs. 1 and 2 illustrate the principle of the invention. The voltage-controlled resistors here shown by way of example are rectifiers.

The arrangement represented in Fig. 1 has the rectifier G1 joined in parallel with the inductance L. The by-path must here be blocked in both directions in order that no steady current shall be able to flow over this by-path. When contact K becomes opened, condenser C is thereby charged and then prevents sparking until the voltage at contact K has attained a value that permits the voltage-controlled resistor G1 to lead away the arising induction-voltage, so that sparking can not occur.

In the arrangement according to Fig. 2 the rectifier

G1, constituting a voltage-controlled resistor, is connected in parallel with both the contact K and condenser C. The by-path is required to be blocked in one direction only as the direction of the current does not change at contact K. In this arrangement too, condenser C becoming charged through opening the contact *k*, sparking is retarded until the intensified voltage at this contact can be led away over rectifier G1.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claim.

What is claimed is:

An arc suppression arrangement for a keyed inductive circuit comprising an inductance, a source of normal voltage, a pair of movable contacts serially connected between said source and said inductance, a condenser directly connected across said contacts, said condenser having a capacity less than that which would cause arcing upon re-closure of said contacts, and a group of serially connected oppositely poled voltage controlled rectifier elements, said group connected in parallel relation with said inductance whereby said elements present a high reverse resistance to current flow from said source and a relatively low reverse resistance to a high inductive voltage produced by said inductance upon opening of said contacts, said condenser adapted to charge until said inductive voltage attains a value sufficient to decrease the effective resistance of said rectifier elements.

References Cited in the file of this patent

UNITED STATES PATENTS

1,844,121	Hibbard	Feb. 9, 1932
1,966,077	Nyman	July 10, 1934
2,052,318	Siegmond	Aug. 25, 1936
2,476,843	Curtis	July 19, 1949

FOREIGN PATENTS

120,484	Australia	Nov. 8, 1945
597,869	Germany	June 1, 1934
604,911	Germany	Oct. 31, 1934
613,832	Germany	May 27, 1935

OTHER REFERENCES

"Varistors" (a group of articles reprinted from Bell Laboratories Record). Copy received in Division 48, U. S. Patent Office on May 11, 1945.