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NONSPARKING SWITCH

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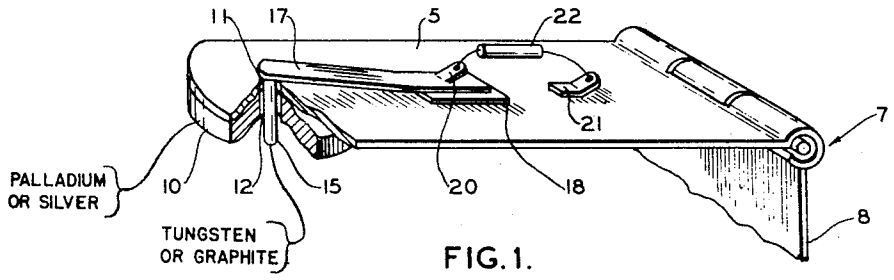


FIG. 1.

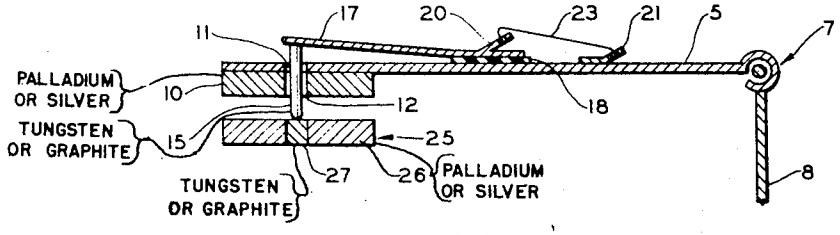


FIG. 2.

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NONSPARKING SWITCH

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4 Claims. (Cl. 200—146)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to electrical contacts, useful in circuit breakers, relays, magnetic contactors, and especially in inductive and capacitive circuits.

Electrical contacts should have a low resistivity and a high melting point, the former property so that temperature rise due to RI^2 loss may be kept low, and the latter property so that the contact may not be damaged or destroyed by arcing.

The metals having the desirably low resistivity, such as silver or palladium, for example, have undesirably low melting points. Electric arcs formed on such metals used as contacts, particularly the relatively intense arcs formed when opening and closing inductive or capacitive circuits carrying substantially large currents, at least oxidize and often partially fuse these contacts, and weld them to their co-acting contacts.

On the other hand, contacts of high melting point materials, such as graphite or tungsten, for example, have high resistance, and therefore not only become oxidized, if metallic, and lose too much power, but become heated to such a degree that the resilient contact arms on which they are mounted lose their spring tension or resiliency.

Both classes of contacts being unsatisfactory for the reasons mentioned, it is an object of this invention to provide a contact which is free from the stated defects, and having therefore longer life and greater efficiency. This is done in a novel manner by employing an element having a low arcing characteristic as the make-and-break contact, and an element having a relatively low resistivity as the main contact for carrying the greater part of the load. A specific form of the invention includes a dual electrical contact comprising a main contact, of relatively low electrical resistivity, adapted to carry the greater part of the load, and having a transverse aperture therethrough, and a resiliently mounted make-and-break contact, having a relatively low arcing characteristic, electrically connected in parallel with the main contact and extending through and beyond the mentioned aperture thereof.

The drawings show one embodiment of the invention, and in these:

Figure 1 is a perspective view of the new contact, partly broken away; and

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Figure 2 is a view of the contact, slightly modified and mostly in central longitudinal section, this view showing additionally a contact which co-acts with the main contact.

Referring to the drawing for a more detailed description thereof, the numeral 5 indicates a resilient metal contact arm which may be mounted on or move with the armature of a relay (not shown), the arm being shown as hingedly connected at 7 to a plate 8, as usual for an armature relay. To the under surface of the free end of the arm is affixed a main contact 10 of low electrical resistivity, having a very large contact area, such contact being made of palladium or silver, for example. This main contact, being of low resistance, carries the greater part of the load. It will be seen that the arm 5 and the main contact 10 have registering transverse apertures, designated 11 and 12 respectively, these apertures being formed to allow the passage therethrough, and the movement therein, of a make-and-break plunger contact 15, which is of smaller diameter than the apertures to provide the necessary clearance, and extends beyond the contacting face of the contact 10. As illustrated, it is approximately one-twelfth the diameter of the contact 10. Contact 15 may be, and preferably is, made from a material having a low arcing characteristic, such materials, as tungsten or graphite for example, having high melting points. The contact 15 is resiliently mounted on a spring arm 17, being secured to the lower surface of the free end thereof. The other end of the spring arm is fixedly mounted on an insulating member 18 which is fastened to the main arm 5, the spring arm being thus spaced and insulated from the main arm 5.

An apertured lug 20 rises from the fixed end of the spring arm 17 and another apertured lug, 21, rises from the main arm 5, these two lugs being provided so that either a resistor 22 as shown in Figure 1, or a conductor 23 as shown in Figure 2, may connect the two lugs and thereby connect the arms 5 and 17, thereby connecting the contacts 10 and 15 in parallel. In Figure 1, the resistor 22 additionally functions to prevent surging currents and therefore destructive arcing, it being understood that the value of the resistance is adjusted to the work load. In Figure 2, the necessary resistance is incorporated in the arm 17, preferably by using the proper composition or alloy to give that resistance. In either case, the resistance used, if

any, is in series with the make-and-break contact 15 and has the effect stated.

As shown in Figure 2, a contact 25 is disposed opposite contact 10, to co-act with the dual contact above described. Contact 25 comprises an outer large area portion 26 and a central core 27. Like contact 10, the outer part 26 of this contact has a low resistivity, being of such material as silver or palladium, for example, while the core 27 is of the same material as the contact 15 and makes contact only with the latter.

In operation, it will readily be seen that contact 15, extending, as it does, beyond the contacting face of contact 10, is the first to make contact with contact 25 on closing action and is the last to break with the same contact, being therefore called the make-and-break contact. Since this contact has a low arcing characteristic, and is of high melting point material, it is adapted to withstand any arcing which may occur. Being of relatively high resistivity, and also being of smaller diameter than contact 10, contact 15 carries only a minor part of the load, while contact 10, and also the outer part 26 of the contact 25, being of low resistivity, carry the major part of the load, and without undue rise of temperature. It will also be appreciated that contact 10, being separated from contact 25 before the break is made between contacts 15 and 25, will not be subjected to arcing and will therefore not be damaged in that way.

It will also be apparent that by the relatively great areas of the contacts 10 and 25 surrounding the contact 15 and core 27 such sparking as may occur at make and break of contact by the contact 15, will be substantially shielded by the members 10 and 25.

What is claimed is:

1. An improved electrical switch device comprising a base contact of large area and low resistance, a switch arm conductor movably mounted a distance from the contact to swing toward and from the contact, a second contact of low resistance, fixed on the arm to engage the base contact at one limit of movement of the arm, and constructed to engage the base contact over a large area, said arm and second contact being apertured to afford a small clearway therethrough centrally of the said area of the second

contact, a spring arm having a base end mounted on said switch arm opposite to and insulated from said second contact, its free end spaced from the switch arm and located over said aperture in the arm, and a third contact fixed on the free end of the spring arm extended through said apertures and beyond said second contact in spaced relation to the sides of said apertures to initially engage yieldingly the base contact on closing movement of said arm, whereby the second contact may engage the base contact thereafter on final closing movement of the arm, and whereby the third contact will disengage said base contact after disengagement of the second contact on opening movement of the said arm, said third contact being of high melting point material having low arcing and low resistance characteristics, and a resistance connection between the arm and third contact.

2. The structure of claim 1, wherein said base contact has fitted centrally therein and electrically joined thereto to align with the third contact a button contact consisting of material of high melting point, low resistance and low arcing characteristic operative for said initial engagement by the third contact on closing of the switch and said last disengagement therefrom by the third contact on opening of the switch.

3. The structure of claim 2 wherein said third contact and said central contact material of the base contact are of tungsten.

4. The structure of claim 2 wherein said third contact and said central contact material of the base contact are of pure graphite.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
627,242	Taylor	June 20, 1899
896,210	James	Aug. 18, 1908
977,577	Wikander	Dec. 6, 1910
1,500,847	Rall et al.	July 8, 1924
1,529,616	Dodgson	Mar. 10, 1925
1,901,573	Wilms	Mar. 14, 1933
2,341,931	Lloyd	Feb. 15, 1944