March 16, 1965 B. J. GOLBECK 3,174,000

ARC RESISTANT SWITCH

Filed Sept. 19, 1962

Fig. 1.

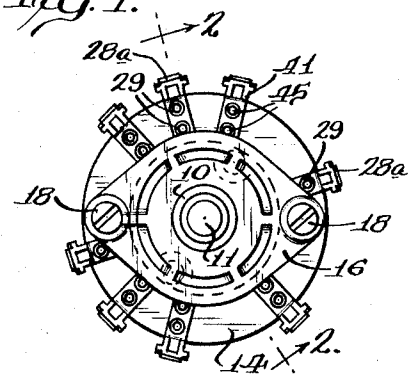


Fig. 2.

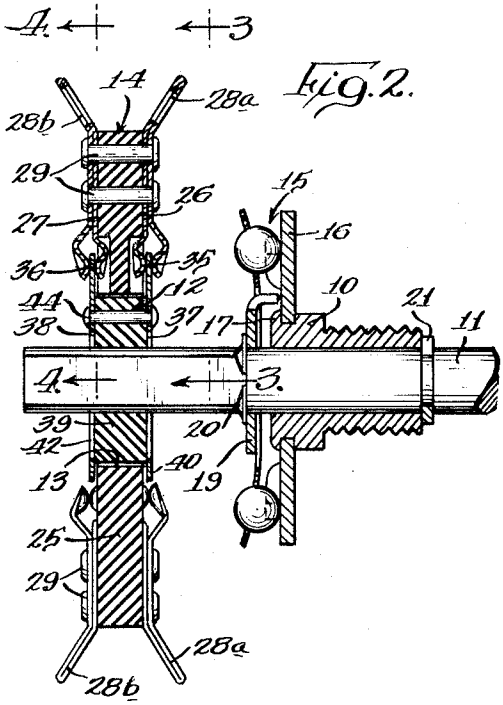


Fig. 3.

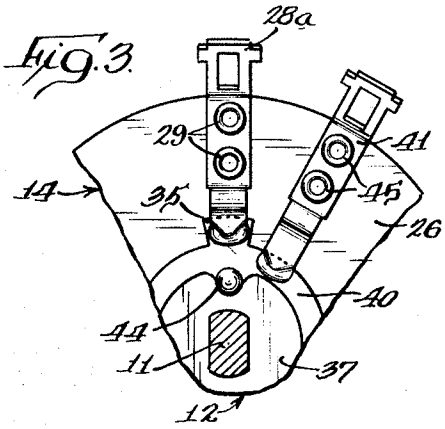


Fig. 4.

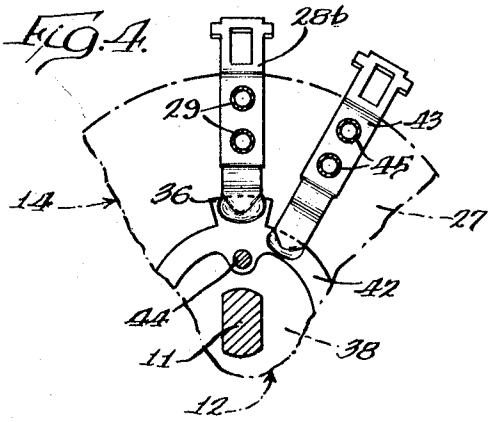


Fig. 5.

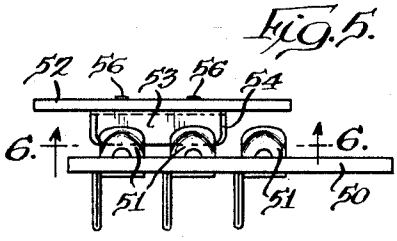
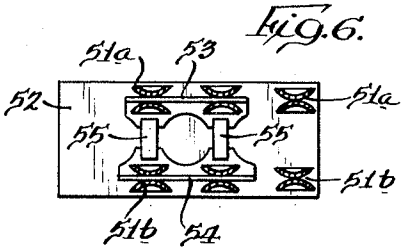


Fig. 6.



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ARC RESISTANT SWITCH

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11 Claims. (Cl. 200—11)

This invention relates to an electric switch, and more particularly to a high power capacity electric switch.

In high power capacity electric switches, arcing across switch contacts presents a major problem particularly during opening of the contacts and to some extent upon closing of the contacts. Various expedients have been suggested for overcoming such arcing problems, often by provision of low resistance contact for carrying normal electrical loads when the switch is closed and a high arc resistant contact for controlling arcing as the switch is being opened. However, such prior expedients have generally entailed complicated switch constructions, often of a basically impractical nature, or of such a nature as to substantially increase the cost of the switch.

The primary object of this invention is to provide a new and useful electrical switch.

An important object is provision of a new and useful electric switch for controlling arcing during operation of the switch.

A more specific object is provision of a new and useful high power capacity electric switch having a high arc resistant contact electrically connected with a high conductive contact, and mounted in operative assembly in a simple and practical manner.

Other objects and advantages of the inveniton will become readily apparent from the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a facial view of an embodiment of an electric switch incorporating features of the invention;

FIGURE 2 is an enlarged, fragmentary sectional view taken generally along the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view taken generally along the line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary sectional view taken generally along the line 4—4 of FIGURE 2;

FIGURE 5 is a side view of another embodiment of an electric switch incorporating features of the invention; and

FIGURE 6 is a sectional view taken generally along the line 6—6 FIGURE 5.

While illustrative embodiments of the invention are shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms, and it should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

The invention is, in brief, directed to a practical solution to the problem of contact arcing during operation of high power capacity electric switches. This problem is solved by providing cooperating contacts in a switch including a high arc resistant contact electrically connected with a high conductive contact in such a manner as to provide a simple and durable commercially practical switch assembly.

With reference to FIGURES 1 through 4 of the drawings, a rotary electric switch has a threaded hub **10** for mounting the switch in a suitably apertured panel, or the like. A rotary switch operating shaft **11** is journalled in hub **10** and mounts a switch rotor **12** received within a central opening **13** of a switch stator **14**. In the illustrated embodiment a ball detent-type indexing assembly **15** includes a plate **16** fixedly secured to hub **10** in any suitable manner as by a rolled connection **17**, and plate **16** fixedly secured to stator **14** in any suitable manner as by diametrically opposed bolts **18** which may be telescoped through sleeves (not shown) between plate **16** and stator **14**. Indexing assembly **15** also includes a small plate **19** telescoped on shaft **11** and held against axial movement along the shaft toward rotor **12** by staked shaft portions **20**, thus holding shaft **11** against movement through hub **10** in a direction to the right as viewed in FIGURE 2. A C-washer **21** received in a circumferential groove in shaft **11** prevents movement of the shaft in an opposite direction.

Stator **14** has a non-conductive body **25** of any suitable material, for example, a ceramic, and this body has opposite parallel faces **26** and **27**, with resilient jaw contacts **28***a* and **28***b* on opposite faces **26** and **27**, respectively, of the stator and connected by electrically conductive fasteners such as rivets **29** to define pairs of contacts. The resilient jaws of the pair of contacts **28***a* and **28***b* are positioned in a path for engagement with contacts **35** and **36** on opposite parallel faces **37** and **38**, respectively, of a non-conductive body **39** of rotor **12**. Contact **35** is part of a contact ring **40** extending slightly outwardly from rotor body face **37** so that it may be received between resilient jaws of a stator contact **41**. Similarly, rotor contact **36** is part of a contact ring **42** on rotor face **38** and extends slightly outwardly from rotor body **39** and is received between resilient jaws of a stator contact **43**. Rings **40** and **42** are mounted on opposite faces of rotor body **39** and are electrically connected with each other by means of a rivet **44** extending through the rings and rotor body. Stator contacts **41** and **43** are mounted on opposite faces of stator body **25** and electrically connected with each other as by rivets **45**, in a manner similar to the connection of pairs of contacts **28**.

With the exception of contacts **28***b*, and rotor ring **42** and including its contact **36**, all of the other contact structures previously described are preferably of a high electrically conductive material thus providing a low contact resistance for carrying normal electrical loads, and a suitable material for this purpose is coin silver. Contacts **28***b* and rotor ring **42** are of a high arc resistant material such as silver-cadmium alloy or silver-nickel alloy, and contact **36** is wider around a circumferential path of movement about the axis of shaft **11** than is rotor contact **35**, so that as pairs of contacts **28***a* and **28***b* are engaged by the rotor contacts, rotor contact **36** engages its cooperating contact **28***b* of the pair before high conductance rotor contact **35** engages its stator contact **28***a*. A circuit is completed from contact **43** through contact **36** to contact **28***b* of the pair of contacts before a circuit is completed from stator contact **41** through contact **35** to the other contact **28***a* of the pair of contacts, preventing arcing between cooperating normal load carrying contacts **28***a* and **35** of high current conductive material, upon closing of cooperating contacts. Similarly, high conductance rotor contact **35** disengages its cooperating stator contact **28***a* before high arc resistant rotor contact **36** disengages its rotor contact **28***b*, again preventing arcing which would damage the high conductive contacts. Contacts **28***b* and rotor ring **42** may be made of high conductive material, in which event they absorb arcing until the contact **36** is burned to the same width as contact **35**.

Referring to FIGURES 5 and 6, a slide-type switch is shown wherein a non-conductive base **50** carries a series of pairs of contacts **51***a* and **51***b* which are connected together. Contacts **51***a* and **51***b* may both be of high conductive material in order to facilitate economic manufacture of the switch, or contacts **51***a* may preferably be of high arc resistant material, and the same consideration applies to the foregoing embodiment. The contacts of

each pair are opposed to each other along opposite edge portions of the base, and secured to the base in any suitable manner. A slide 52 has a relatively short high conductive contact 53 movable in a path for engaging contacts 51*a* along one edge of base 50, and a relatively long contact 54, longer than contact 53 and mounted for movement on slide 52 to engage the contacts 51*b* along the other edge of base 50. Contact 54 may be made of high conductive material but is preferably of high arc resistant material for the same reasons as previously discussed. Contacts 53 and 54 are connected to each other in a suitable manner as by connectors 55 and are mounted on the slide as by tabs 56 so that high arc resistant contact 54 engages its cooperating contact 51*b* of the respective pair of contacts prior to engagement of high conductive conductive contact 53 with its cooperating contact 51*a* of the respective pair. As previously described, high arc resistant contact 54 disengages its cooperating contact 51*b* of the respective pair of contacts after high conductive contact 53 has disengaged its cooperating contact 51*a* of the respective pair of contacts.

I claim:

1. In an electric switch for controlling arcing during operation of the switch: a non-conductive base; a plurality of pairs of contacts disposed in a path; electrical conductive means, one connected with the contacts of each pair of contacts; means mounting the pairs of contacts on said base; a non-conductive member movable along said path, with a high conductive contact and a high arc resistant contact mounted on said member, said high arc resistant contact being longer along said path than said high conductive contact, and electrical conductive means connected with the member contacts whereby the member contacts selectively engage said pairs of contacts upon movement of said member along said path with said high conductive contact engaging one contact of the selected pair of contacts and said high arc resistant contact engaging the other contact of the selected pair prior to said engagement of said high conductive contact, and with said high arc resistant contact disengaging said other contact after disengagement of said high conductive contact from said one contact of the selected pair; and means mounting said member for movement along said path and said member contacts in said path.

2. In an electric switch for controlling arcing during operation of the switch: a base; a pair of contacts mounted on said base and electrically connected with each other, one of said contacts being a high conductive contact and the other contact being a high arc resistant contact; a member movable in a given path with respect to said base and in consistent spaced relationship with respect to said base; a high conductive contact and a high arc resistant contact on said member movable into and out of engagement with said high conductive base contact and said high arc resistant base contact, respectively, said high arc resistant member contact having a greater span of engagement with its base contact than said high conductive member contact has with its base contact; and means mounting the member contacts for releasable engagement with their respective base contacts upon movement of said member along said path with said high arc resistant contact engaging its base contact prior to engagement of said high conductive contact with its base contact, and with said high arc resistant contact disengaging its base contact after disengagement of said high conductive contact from its base contact; and means mounting said member for movement of said member contacts in said path.

3. In an electric switch for controlling arcing during operation of the switch: a base; a pair of contacts mounted on said base and electrically connected with each other; a member movable in a given path with respect to said base and in consistent spaced relationship with respect to said base; contacts on said member, one movable into and out of engagement with each of said base contacts, a first of said member contacts having a greater span of engagement with its base contact than the other member contact has with its base contact; and means mounting the member contacts for releasable engagement with their respective base contacts upon movement of said member along said path with said first member contact engaging its base contact prior to engagement of said other member contact with its base contact, and with said first member contact disengaging its base contact after disengagement of said other member contact from its base contact; and means mounting said member for movement of said member contacts in said path.

4. In a slide-type electric switch for controlling arcing during operation of the switch: a non-conductive base having a face; a plurality of pairs of contacts mounted on said face in a predetermined path, each contact being electrically connected with the other contact of its pair; a non-conductive slide member movable along said path in consistent spaced relationship with respect to said base and having a face opposed to the base face; a high conductive contact and a high arc resistant contact electrially connected to each other, said high arc resistant contact being wider along said path than said high conductive contact, and means mounting the last said contacts on the slide face for selective engagement with said pairs of contacts upon movement of said slide along said path with said high conductive contact connecting first contacts of each of two selected pairs of contacts and said high arc resistant contact connecting second contacts of each of the last said two selected pairs of contacts prior to said high conductive contact engaging both said first contacts, and with said high arc resistant contact disengaging one of said second contacts after disengagement of said high conductive contact from one of said contacts of the selected pair; and means mounting said slide for sliding movement with respect to said base with said slide face opposed to said base face and said slide contacts in said path.

5. In a slide-type electric switch for controlling arcing during operation of the switch: a base; a plurality of pairs of contacts mounted on said base to define a predetermined path, each contact being electrically connected with the other contact of its pair; a slide movable along said path and opposed to the base; a high conductive contact and a high arc resistant contact electrically connected to each other, said high arc resistant contact being wider along said path than said high conductive contact; and means mounting the last said contacts on said slide body for selective engagement with said pairs of contacts upon movement of said slide along said path with said high conductive contact engaging a first contact of the selected pair of contacts and said high arc resistant contact engaging a second contact of the selected pair of contacts prior to said high conductive contact engaging said first contact, and said high arc resistant contact disengaging said second contact after disengagement of said high conductive contact from said first contact of the selected pair; and means mounting said slide for sliding movement with respect to said base and with said slide contacts in said path.

6. In a slide-type electric switch for controlling arcing during operation of the switch: a base; a pair of electrically interconnected contacts mounted on said base and disposed in a predetermined path; a slide movable along said path and opposed to the base; a high conductive contact and a high arc resistant contact electrically connected to each other and one movable into and out of engagement with each of the base contacts, said high arc resistant contact having a greater span of engagement with its base contact than said high conductive contact has with its base contact; and means mounting the high arc resistant and high conductive contacts on said slide for selective engagement with said base contacts upon movement of said slide along said path with said high arc resistant contact engaging its base contact prior to engagement of said high conductive contact with its base contact and said high arc resistant contact disengaging its base contact after dis-

engagement of said high conductive contact from its base contact; and means mounting said slide for sliding movement with respect to said base with said slide contacts in said path.

7. In a slide-type electric switch for controlling arcing during operation of the switch: a base; a pair of electrically interconnected contacts mounted on said base and disposed in a predetermined path; a slide movable along said path and opposed to the base; a pair of contacts electrically connected to each other and one movable into and out of engagement with each of the base contacts, a first of said pair of contacts having a greater span of engagement with its base contact than the other of said pair of contacts has with its base contact; and means mounting said pair of contacts on said slide for selective engagement with said base contacts upon movement of said slide along said path with said first contact engaging its base contact prior to engagement of said other contact with its base contact and said first contact disengaging its base contact after disengagement of said other contact from its base contact; and means mounting said slide for sliding movement with respect to said base with said slide contacts in said path.

8. In a rotary-type electric switch for controlling arcing during operation of the switch: a stator base having a non-conductive body with opposite faces; a plurality of pairs of contacts radially disposed about an axis, the contacts of each pair being opposed to each other, one on each of said stator faces; electrical conductive fastening means extending through said stator body, one connected with the contacts of each pair of contacts and mounting the respective pair of contacts on said body; a rotor member movable in a predetermined path and in consistent spaced relationship with respect to said stator, said rotor having a non-conductive body with opposite faces; a high conductive contact on one of said rotor faces and a high arc resistant contact on the opposite rotor face and opposed to said high conductive contact, said high arc resistant contact being wider along said path than said high conductive contact; electrical conductive fastening means extending through said rotor body and connected with the rotor contacts and mounting the rotor contacts on said rotor body for selective engagement with said pairs of contacts upon movement of said rotor along said predetermined path with said high conductive contact engaging one contact of the selected pair of contacts and said high arc resistant contact engaging the other contact of the selected pair prior to said engagement of said high conductive contact, and with said high arc resistant contact disengaging said other contact after disengagement of said high conductive contact from said one contact of the selected pair; and means mounting said rotor for rotation about said axis and said rotor contacts in said path.

9. In a rotary-type electric switch for controlling arcing during operation of the switch: a stator having a body with opposite faces, pairs of contacts disposed about an axis, one contact of each pair on each of said stator faces; means electrically connecting the contacts of each pair; a rotor movable in a predetermined path with respect to said stator, said rotor having a body with opposite faces, a high conductive contact on one of said rotor faces and a high arc resistant contact on the opposite rotor face, said high arc resistant contact being wider along said path than said high conductive contact, means electrically connecting the rotor contacts; means mounting the rotor contacts on said rotor body for selective engagement with said pairs of contacts upon movement

of said rotor along said predetermined path with said high conductive contact engaging one contact of the selected pair of contacts and said high arc resistant contact engaging the other contact of the selected pair prior to said engagement of said high conductive contact, and with said high arc resistant contact disengaging said other contact after disengagement of said high conductive contact from said one contact of the selected pair; and means mounting said rotor for rotation about said axis and said rotor contacts in said path.

10. In a rotary-type electric switch for controlling arcing during operation of the switch: a stator having a body; a pair of contacts mounted on said body and electrically connected with each other; a rotor having a body movable in a predetermined path with respect to said stator; a high conductive contact and a high arc resistant contact on said rotor body and one movable into and out of engagement with each of said stator contacts, said high arc resistant contact having a greater span of engagement with its stator contact than said high conductive contact has with its stator contact; means mounting the rotor contacts on said rotor body for releasable engagement with said stator contacts upon movement of said rotor along said predetermined path with said high arc resistant contact engaging its stator contact prior to engagement of said high conductive contact with its stator contact, and with said high arc resistant contact disengaging its stator contact after disengagement of said high conductive contact from its stator contact; and means mounting said rotor for rotation of said rotor contacts in said path.

11. In a rotary-type electric switch for controlling arcing during operation of the switch: a stator having a body; a pair of contacts mounted on said body and electrically connected with each other; a rotor having a body movable in a predetermined path with respect to said stator; a pair of contacts on said rotor body and one movable into and out of engagement with each of said stator contacts, a first of said rotor contacts having a greater span of engagement with its stator contact than the other of said rotor contacts has with its stator contact; means mounting the rotor contacts on said rotor body for releasable engagement with said stator contacts upon movement of said rotor along said predetermined path with said first rotor contact engaging its stator contact prior to engagement of said other rotor contact with its stator contact, and with said first rotor contact disengaging its stator contact after disengagement of said first rotor contact from its stator contact; and means mounting said rotor for rotation of said rotor contacts in said path.

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