

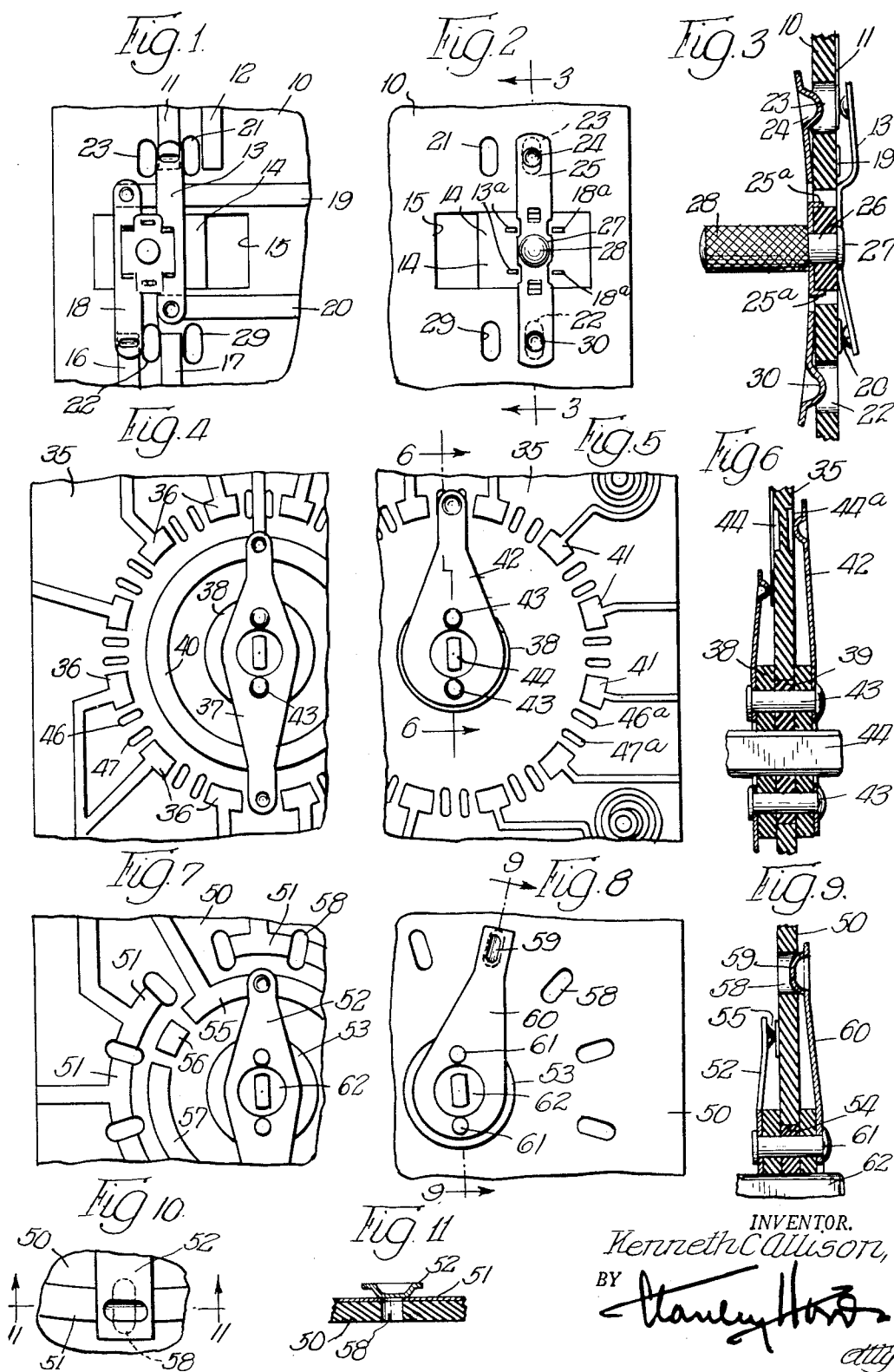
July 17, 1956

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2,755,347

ELECTRIC SWITCH CONSTRUCTION

Filed July 16, 1952



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ELECTRIC SWITCH CONSTRUCTION

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Application July 16, 1952, Serial No. 299,096

4 Claims. (Cl. 200—11)

This invention relates to improvements in electrical switches of the type wherein a contact blade supported on a panel or base of insulating material for switching movement in a fixed path has wiping engagement with the surface of said base as well as wiping engagement with spaced apart stationary contacts fixed on said base in the path of said blade. In this style of switch the stationary contacts are in the form of separated areas of conductive material applied to the base in a relatively thin layer or coating, as by electrodeposition or various other processes.

The surface of the base between such contacts is particularly susceptible to the development of current leakage paths in that particles of conductive material which are loosened incident to the mechanical abrasion occurring between the interengaging surfaces of the blade and the stationary contacts are deposited by the blade along the line of motion of the latter between such contacts thereby resulting in erratic operation of switches of this type.

It is accordingly an object of this invention to provide means for preventing the collection of such abraded particles of conductive material on the surface of the base between such stationary contacts whereby the formation of such current leakage paths is avoided and dependable and efficient operation of switches of this type is maintained over long periods of time.

Means for so preventing the formation of leakage paths, as contemplated by the present invention, consists in providing gaps or openings in the surface of the insulating base between such fixed contacts.

A further object of this invention is the provision of such openings in the surface of the insulating base between such fixed contacts and combining with such a base a detent blade or arm adapted to cooperate with such openings on the side of the base opposite the side having such fixed contacts for indexing the position of the movable contact blade in operative relation to said fixed contacts, thus eliminating the necessity for a separate indexing means.

Other and further features and objects of this invention will be apparent from the description which follows, read in connection with the accompanying drawings, in which:

Fig. 1 is a fragmentary front elevation of a sliding switch embodying the features of this invention.

Fig. 2 is a similar rear elevation of the switch shown in Fig. 1.

Fig. 3 is a slightly enlarged fragmentary sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary front elevation of a rotary switch of the non-shorting type illustrating a modified arrangement of recesses or openings between the fixed contacts.

Fig. 5 is a similar rear elevation of the switch shown in Fig. 4.

Fig. 6 is a slightly enlarged fragmentary sectional view taken on line 6—6 of Fig. 5.

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Fig. 7 is a fragmentary front elevation of a rotary switch embodying the features of this invention as applied to a switch wherein the circuit is of the shorting type.

Fig. 8 is a rear elevation of the switch shown in Fig. 7 showing the use of the detent arm.

Fig. 9 is a slightly enlarged fragmentary sectional view taken on line 9—9 of Fig. 8.

Fig. 10 is a detail view of a rotary contact blade as in Fig. 7 showing the blade when rotated into a position bridging the space between adjacent fixed contacts.

Fig. 11 is a sectional view taken on line 11—11 of Fig. 10.

One form of switch structure to which the present invention is applied as shown in Figs. 1, 2 and 3, and commonly known as a two-pole two-position printed circuit slide switch, comprises a panel or base 10 of insulating material having a pair of stationary contacts 11 and 12 of conductive material applied to the base 10 in a relatively thin film by electrodeposition or any other suitable process, said contacts 11 and 12 being disposed in spaced relation to each other along the path of a resilient contact blade 13 carried by a block 14 of insulating material slidably mounted in a recess 15 formed in the base 10. A second pair of stationary contacts 16 and 17, like contacts 11 and 12, are disposed in spaced apart relation along the path of a second resilient contact blade 18 carried by the block 14. A strip of conductive material applied to the base 10 in the same manner as the contacts 11 and 12 and 16 and 17 provides a stationary contact member 19 with which the blade 13 has continuous engagement during switching movement between the contacts 11 and 12 and a second strip provides a stationary contact member 20 like the member 19, with which the blade 18 has continuous engagement while undergoing switching movement between the contacts 16 and 17. Because the surface of the base 10 between the contacts 11 and 12 coincident with the path of the blade 13 is susceptible to the formation of a leakage path made up of particles of conductive material loosened by the abrasion occurring during interengagement of the blade 13 and the contacts 11 and 12 which are deposited by the blade 13 along said surface of the base between the contacts 11 and 12, the present invention contemplates an opening 21 in the base 10 between such contacts. The opening 21 provides such an interruption in the base coincident with the path of the contact blade 13 as to maintain the contact engaging portion thereof clear of the area between said contacts and thus avoiding the deposit of conductive particles on the base between said contacts. A similar opening 22 provided in the base 10 between the contacts 16 and 17 likewise provides means for avoiding the deposit of conductive particles on the base between said contacts incident to movement of the contact blade across said area.

An opening 23 formed in the base 10 on the side of the contact 11 facing away from the contact 12 and directly across from and identically like the opening 21 cooperates with the latter opening to present a pair of gaps in the face of the base 10 opposite the face thereof on which the contacts 11 and 12 are situated. These gaps cooperate with a projection 24 at one end of a resilient detent blade 25 to selectively position the blade 13 in alignment with the contacts 11 and 12 and the blade 18 in alignment with the contacts 16 and 17 as the block 14 is operated in the recess 15 of the base 10. The blade 25 is fixed to the block 14 by means of a pin 26 penetrating the block 14 and staked as at 27 through an opening in the blade 25, said pin 26 forming an extension of a handle 28 protruding from the surface of the block opposite to that facing the blade 25, which handle is manipulated to operate the switch block 14.

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A similar opening 29 formed in the base 10 on the side of the contact 16 away from the contact 17 likewise cooperates with the slot 22 to provide recesses with which a projection 30 at the opposite end of the spring blade 25 is selectively engageable to supplement the indexing accomplished through the projection 24 and the openings 21 and 23. As shown in Figs. 1 and 2, when the blades 13 and 18 are engaged with the stationary contacts 11 and 16 respectively, the slots 23 and 22 are engaged by the projections 24 and 30 of the detent blade 25. Accordingly, when the block 14 is moved to the opposite end of the recess 15 in the base 10, the openings 21 and 29 are engaged by the projections 24 and 30, respectively, of the detent blade 25 to position the blades 13 and 18 with the stationary contacts 12 and 17 respectively.

Another form of switch in which the present invention has application as shown in Figs. 4, 5 and 6, and commonly known as a non-shorting type rotary printed circuit switch, comprises a panel or base 35 of insulating material having a series of stationary contacts 36 of conductive material applied to one face of the base 35 in a relatively thin film like that of the stationary contacts described in connection with the switch shown in Figs. 1, 2 and 3, said contacts 36 being disposed in spaced apart relation to each other coincident with the circular path of a resilient contact blade 37 secured to a rotor 38 mounted for rotation in a central opening 39 formed in the base 35. A continuous strip of conductive material applied to the base 35 and disposed in a circular pattern concentric with the rotor 38 and arranged approximately midway between the circular row of contacts 36 and the rotor 38 provides a stationary contact member 40 with which the blade 37 has continuous engagement during switching movement between the contacts 36. A series of stationary contacts 41 of conductive material applied to the opposite face of the base 35 in a manner similar to and in directly opposed relation to the contacts 36 are engageable by a resilient contact blade 42 also secured to the rotor 38. The blade 42 and the blade 37 together with the rotor 38 are maintained in fixed assembly by means of suitable pins 43 as shown in Fig. 6 and a shaft 44 having diametrically opposed flat portions fitting an opening of similar contour in the rotor 38 is operable to turn the rotor and the blades 42 and 37 fixed thereto to accomplish the desired switching movement between the contacts 36, 40 and 41. As shown in Figs. 4 and 5, the area between the contacts 36 is provided with two spaced apart depressions 46 and 47 while the corresponding area between the contacts 41 is formed with a similar pair of spaced apart depressions 46^a and 47^a. These depressions provide for the interruption of the surface of the base between such contacts as to avoid the formation of a current leakage path between each of the contacts 36 and 41 and the contact next thereto in the same manner that the openings 21 and 22 function in connection with the switch shown in Figs. 1, 2 and 3. The use of a pair of separated depressions or openings, such as the depressions 46—47 and 46^a—47^a is especially desirable in switches of the non-shorting type so as to assure contact blade engaging surfaces on the base at opposite sides of said depressions at a distance apart less than the dimension of the contact engaging portion of the contact blade measured lengthwise of said distance, and yet presenting an area between each contact 36 and 41 and the contact next thereto of greater dimension than the contact blade to establish positive detachment of the blades 37 and 42 from each of its corresponding contact 36 and 41 respectively before engagement with the contact next thereto.

A still further form of switch to which the present invention is applied as shown in Figs. 7 to 11 inclusive and commonly referred to as a rotary printed circuit switch with detent includes a panel or base 50 of insulating material having a series of stationary contacts 51

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of conductive material applied to one face of the base 50 in a relatively thin film characteristic of contacts in printed circuits. As shown in Fig. 7, the contacts 51 are disposed in spaced apart relation to each other along a path coincident with the path of a resilient contact blade 52 secured to a rotor 53 mounted for rotation in an opening 54 formed in the base 50. Segmental strips of conductive material applied to the base 50 and disposed in a circular arrangement concentric with the rotor 53 and arranged approximately midway between the row of contacts 51 and the rotor 53 furnish stationary contact members 55, 56 and 57 with which the blade 52 has wiping engagement during switching movement of the blade 52. Each contact 51 is separated from its neighboring contact 51 by an opening 58 formed in the base 50 which is operative to so interrupt the surface of the base 50 in the path of the blade 52 between the contacts 51 as to prevent the formation of a leakage path between said contacts. Said openings 58, as shown in Fig. 8, each present indexing recesses on the opposite face of the base 50 which cooperate with a projection 59 at the outer end of an indexing spring 60 in the same manner as the detent blade 25 functions in cooperation with the openings formed in the base of the switch shown in Figs. 1, 2 and 3. As shown in Fig. 9, the spring is secured to the rotor 53 by means of pins 61 piercing the rotor, as well as the blade 52 and spring 60 which retain the rotor, blade and indexing spring in fixed rotative position. It will be noted that the spring 60 occupies a rotated position at an angle to the rotated position of the blade 52 so as to position the latter in operative engagement with a selected contact 51 in each rotated position of the indexing spring 60 in engagement with a selected opening 58. Such rotation of the rotor, blade and spring is performed through manipulation of an operating shaft 62 to which the rotor is rotatively locked.

As shown in Fig. 10, the opening 58 provides positive separation between adjacent contacts 51 but yet allows the blade 52 to simultaneously engage said contacts 51 as desired in shorting type switches.

It will be understood that the problem of controlling the formation of current leakage paths made of particles of conductive material loosened from the cooperating surfaces of the contact members is not confined to switches having contacts formed by electrodeposition or electrotyping, but is present in varying degrees in a variety of contact constructions including those in which the conductive material is embedded in a base of insulating material by running molten metal into grooves of the base, or metal sprayed on the base through a stencil or metal foil cemented to the base. It is also to be noted that the tendency of conductive particles from the contacts and the movable contact blade with which the contacts have wiping engagement to be deposited on the surface of the insulating base between such contacts is greater in switches having bases of a material having minute recesses such as bases of ceramic construction.

While specific examples of the invention have been described, it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. An electric switch having a base of insulating material, a resilient contact blade supported thereon for switching movement in a fixed path in wiping engagement with the surface of said base, spaced apart stationary contacts fixed on said base in the path of said blade and with which the latter has wiping engagement, a resilient detent arm supported on said base for movement in a fixed path corresponding to the path of the contact blade in wiping engagement with the surface of the base opposite to that facing the contact blade, an opening formed in the insulating base in the path of the contact blade between such stationary contacts operative to prevent the deposit on said latter surface of particles of conductive material loosened by abrasive action between the interengaging

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surfaces of the blade and said stationary contacts, said opening being engageable by said detent arm when the contact blade is in operative engagement with a selected stationary contact other than the contacts separated by said opening.

2. An electric switch having a base of insulating material, a block of insulating material slidably mounted on said base for movement in a fixed path, a resilient contact blade carried by said block and having wiping engagement with the surface of said base, a pair of stationary contacts secured to said base with which said blade has wiping engagement, said contacts being spaced apart, an opening formed in said base in the space between said contacts, a second opening formed in said base at the side of one of said contacts away from said first opening, a detent blade carried by said block and facing the surface of the base opposite to that facing the contact blade, said detent blade being engageable with said second opening when the contact blade is engaged with one of said stationary contacts and said detent blade being engageable with said first opening when the contact blade is in engaged relation to the other of said stationary contacts.

3. An electric switch having a base of insulating material provided with a rotor receiving recess, a rotor movably supported in said recess, a resilient contact blade carried by said rotor and having wiping engagement with the surface of said base, a series of stationary contacts secured to said base in spaced apart relation coincident with the path of said contact blade with which the latter has wiping engagement, an opening formed in the base between each pair of said stationary contacts, a detent blade carried by said rotor and facing the surface of said base opposite to that facing the contact blade, said detent blade being engageable with said openings according to selected positions of the contact blade relative to said stationary contacts.

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4. An electric switch having a base of insulating material, a resilient contact blade supported thereon for switching movement in a fixed path in wiping engagement with the surface of said base, spaced apart stationary contacts fixed on said base in the path of said blade and with which the latter has wiping engagement, each of said contacts comprising a conductive coated area of such thickness as to be incapable of maintaining its configuration independently of said base, means operative to prevent the formation of a current leakage path between such stationary contacts made up of particles of conductive material loosened by abrasive action between the interengaging surfaces of the blade and said stationary contacts and deposited on the surface of the base between such stationary contacts by the blade, said means including a gap formed in the surface of the insulating base between such stationary contacts, and a resilient detent arm supported on said base for movement in a fixed path corresponding to the movement of said contact blade, said detent arm being engageable with one of said gaps when the contact blade is in operative engagement with a selected contact other than the contacts separated by said gap.

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