May 19, 1953 E. W. RICKMEYER 2,639,344

ELECTRIC SWITCH

Filed Aug. 16, 1949 2 Sheets-Sheet 1

Fig. 1.

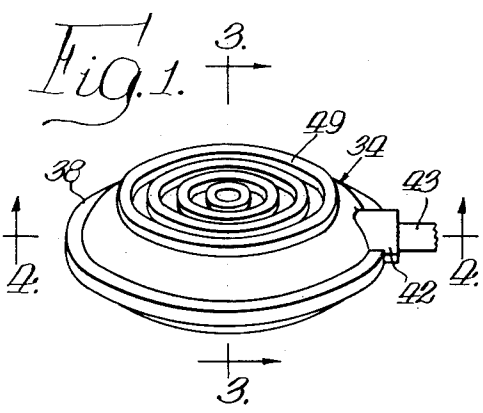

Fig. 2.

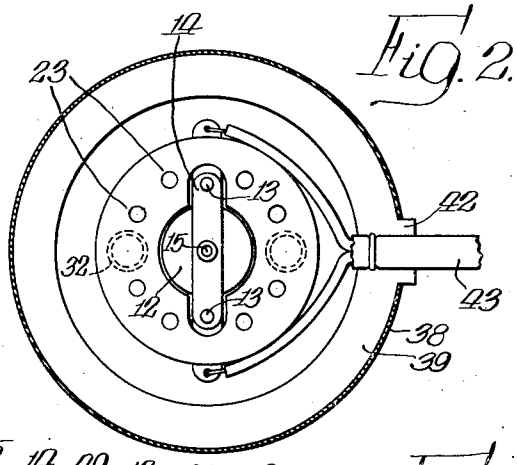

Fig. 3.

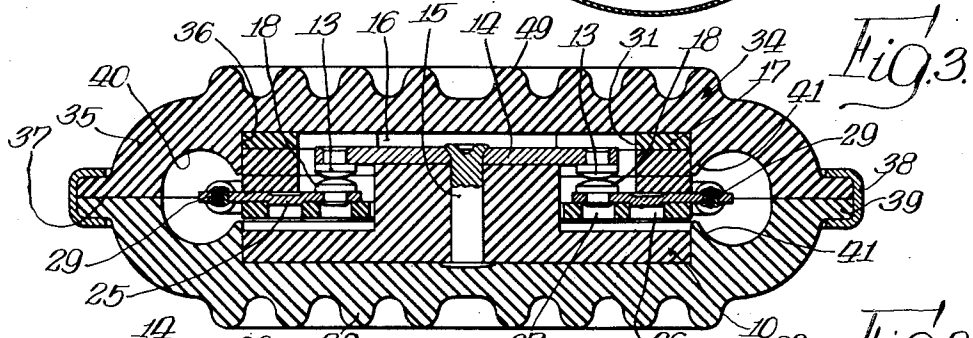

Fig. 4.

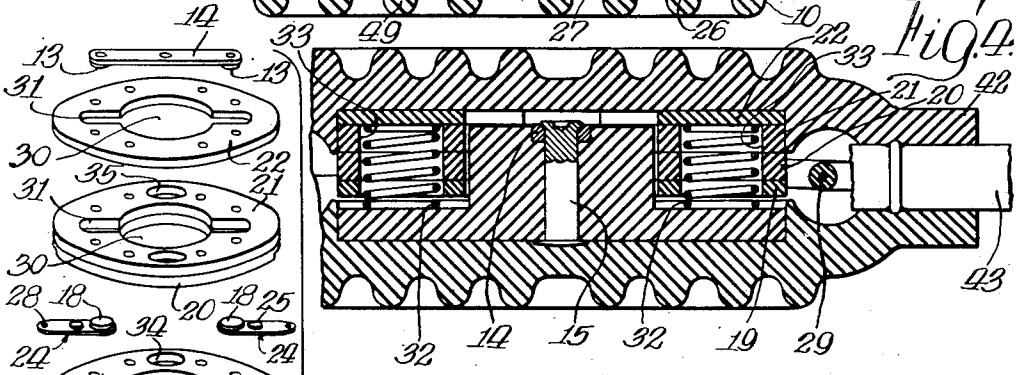

Fig. 5.

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Fig. 6.

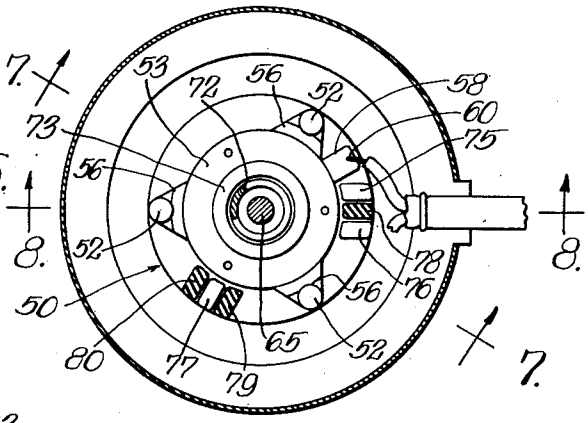


Fig. 7.

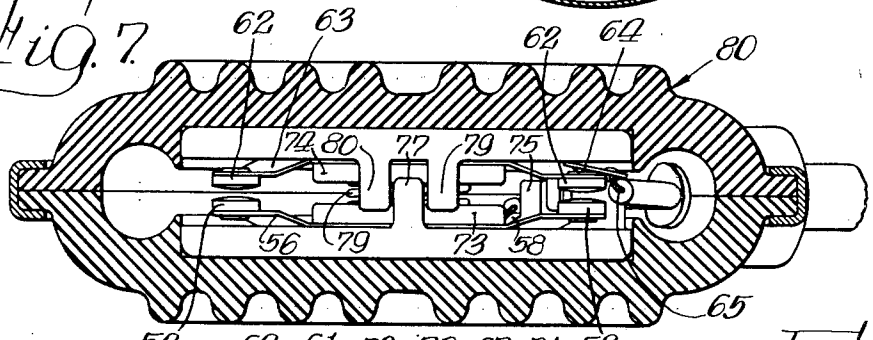


Fig. 8.

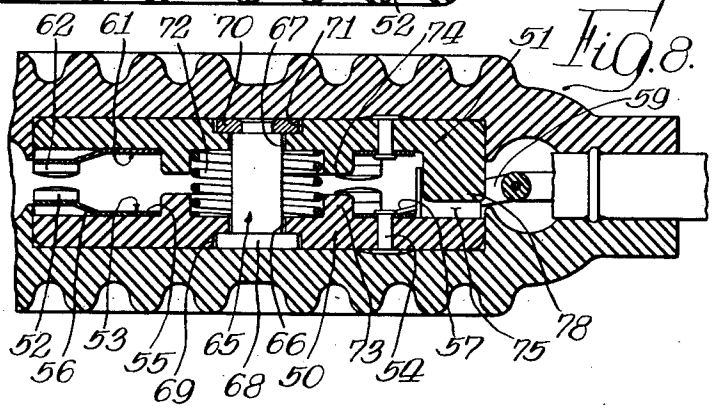
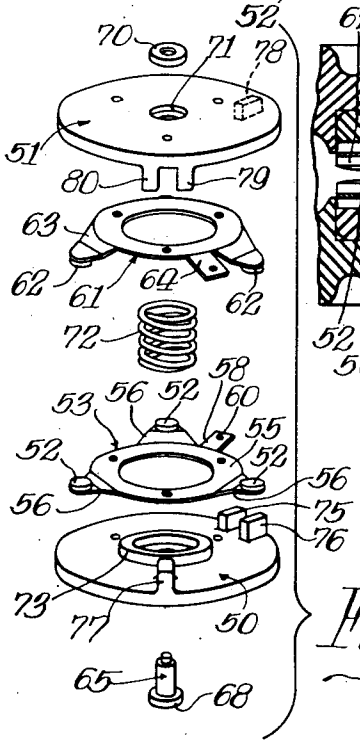


Fig. 9.



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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

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Application August 16, 1949, Serial No. 110,609

12 Claims. (Cl. 200—86)

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This invention relates generally to electric switches and has to do more particularly with a switch of the type which is resiliently biased toward one position and is adapted to be actuated, by foot or hand pressure, to a second position to make or break an electrical circuit connection.

An object of this invention is to provide an improved electric switch of the foregoing character.

Another object is to provide an electric switch which may be operated by foot or hand pressure applied thereto, substantially irrespective of the point or direction of application of such pressure on the switch.

Another object is to provide an electric switch adapted to be operated by foot or hand pressure, which switch is adapted to be disposed on a supporting surface such as the floor or the top of a desk and which switch may be moved readily from place to place but which at the same time resists any tendency to slide along the surface while in use.

A further object is to provide a small and compact electric switch adapted to be operated by foot or hand pressure and which is strong and rugged and not readily damaged even if stepped upon.

A further object is to provide an electric switch adapted to be operated by foot or hand pressure in which the electrical conducting members are inclosed and effectively protected against dirt and moisture.

A still further object is to provide an electric switch of the character described which is simple and inexpensive to manufacture and assemble, which has few moving parts, which requires no adjustment of parts after assembly, which is not likely to get out of order even though subjected to considerable abuse, and which is not subject to material wear of parts over a long period of use.

Other objects and advantages of the invention will appear from the following description taken in connection with the appended drawings, in which:

Figure 1 is a perspective view of one embodiment of my invention;

Fig. 2 is an enlarged top plan view of the switch of Fig. 1, certain of the parts being broken away to show the interior of the switch;

Fig. 3 is an enlarged, transverse sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary, enlarged transverse sectional view taken along line 4—4 of Fig. 1;

Fig. 5 is an exploded perspective view of the interior mechanism of the switch of Fig. 1;

Fig. 6 is a top plan view, with certain parts broken away, showing a second embodiment of my invention;

Fig. 7 is an enlarged, sectional view taken along line 7—7 of Fig. 6;

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Fig. 8 is a fragmentary, enlarged sectional view taken along line 8—8 of Fig. 6; and

Fig. 9 is an exploded perspective view of the interior mechanism of the switch of Fig. 6.

The switch of the present invention is adapted for a large number of applications where it is desired that the switch be operated by foot or hand pressure and particularly where it is desired that the switch operate even though no particular care is exercised by the operator as to the direction in which the actuating pressure is applied. One application to which the switch of this present invention is especially well adapted is in connection with sound recording and reproducing machines used in giving and transcribing dictation wherein it is desirable to provide a control switch for starting and stopping the machine, which switch is placed on the floor for foot operation so that the user's hands are freed for other purposes, as for example, the operation of a typewriter.

In accordance with the present invention, the switch includes a pair of contact-carrying members which are connected in substantially parallel coaxial relation for relative movement toward and away from each other in a direction along their common axis and for universal relative rocking movement. The contact-carrying members are normally spring biased to a first limit position in which they are substantially parallel and spaced apart a maximum distance and are adapted to be moved closer together toward a second limit position by the application of foot or hand pressure exerted against the switch casing from substantially nearly any direction, whereupon the switch members are moved relatively, either in an axial direction, or are rocked, or both, to bring at least the peripheral portions of the members closer together. Cooperable electrical contact elements are carried on the members in a position to abut when the members are in one of the two limit positions and to be separated when the members are moved into the other of the limit positions.

Referring now particularly to Fig. 3 of the drawings, the switch in one embodiment includes a first contact-carrying member 10 preferably of discoidal form and having a body portion 11 and a post portion 12 upstanding centrally from the body portion. The member 10 is adapted to insulatingly carry electrical contact elements hereinafter described and is formed preferably of insulating material. For convenience in manufacture, the member 10 is made as a single body of molded insulating material, such as hard rubber or a suitable plastic.

The member 10 carries a pair of contact elements 13 of suitable electrically conductive material which elements are disposed on diametrically opposite sides of the axis of the member 10

and spaced outwardly from the axis a substantial distance. The contact elements 13 are carried by a rigid bridge member 14 of electrically conductive material, such as brass or copper, secured to the member 10 by a rivet 15. Preferably, the bridge member is disposed in a slot 16 in the member 10 in order to maintain the former against angular displacement about the axis of the member 10. The bridge member 14 serves both to carry the contact elements 13 and connect them electrically and also serves as a retaining element for a second contact-carrying member 17 now to be described.

The second contact-carrying member 17 preferably is of discoidal shape and of a diameter equal to that of the member 10. The member 17 is adapted to insulatingly carry a pair of contact elements 18 and therefore preferably is itself formed essentially of insulating material. The member 17 preferably is formed by a plurality of discoidal members or laminations 19, 20, 21, 22 of insulating material secured together in a stack by a plurality of metal rivets 23, arranged in a generally circumferential pattern. While the laminations 19, 20, 21, 22 may be formed of any suitable material, I prefer to employ molded material of a known type formed by impregnating paper or cloth with a moldable plastic material, in order to provide the desired strength.

The contact elements 18 are disposed on diametrically opposite sides of the axis of this member and spaced outwardly therefrom a suitable distance whereby when the contact-carrying members 10 and 17 are assembled in operative relation, the contact elements 13 and 18 are in alignment. Each contact element 18 is carried by a terminal member 24 of electrically conductive material. While the contact element 18 may be formed integrally with the terminal member 24, preferably I form it separately and rivet it to the terminal member. Each terminal member 24 is secured in the contact-carrying member 17 by inserting the former between the laminations 19 and 20 before they are riveted together. Each terminal member 24 is formed with a small projection 25 which is adapted to be received in a corresponding recess 26, which conveniently may be formed by perforating the lamination 19, whereby the terminal member is locked against displacement on the member 17. Also, the contact element 18 preferably is formed as a rivet, the lower head of which enters a recess 27, preferably formed by perforating the member 19, which may provide additional locking effect.

The terminal members 24 extend outwardly from the periphery of the contact-carrying member 17 and each is preferably provided with a perforation 28 by which a conductor 29 may be attached.

The contact-carrying member 17 is formed with a central, circular opening 30 adapted to receive the post 12 of the other contact-carrying member 10, whereby to permit the contact-carrying members 10 and 17 to be assembled in general coaxial, parallel relation, with the contact-carrying member 17 assembled over the post portion 12. The laminations 20, 21 and 22 are each formed with diametrically opposed radially extending notches 31 which receive the radially extending portion of the bridge member 14. It will be understood, of course, that the contact-carrying members 10 and 17 are assembled prior to the attachment of the bridge member 14 to the contact-carrying member 10.

When the members 10 and 17 are assembled in the manner illustrated, the bridge member 14 serves to limit separation of the members 10 and 17 in an axial direction and also cooperates with the post portion 12 in preventing transverse separation of the members 10 and 17. However, the members 10 and 17 are free to move relatively to a limited extent in a direction along their common axis. Also, sufficient clearance is provided between the post portion 12 and the central opening 30 to permit the members 10 and 17 to be rocked relatively in any direction. Thus, the members 10 and 17 may either be moved axially or rocked, or both, simultaneously, to a limited extent.

The contact-carrying members 10 and 17 are normally urged resiliently toward the first limit position in which they are disposed substantially parallel and are a maximum distance apart (as in Figs. 3 and 4). To this end, a pair of coil springs 32 are provided (Fig. 4) which are received in diametrically opposed recesses 33 in the contact-carrying member 17 by perforations 34 and 35 formed in the laminations 19, 20 and 21. Each of the springs 32 bears at one end against the body portion 11 of the member 10 and at the other end against the lamination 22 of the member 17. The springs 32 are located on a diameter of the member 17 which extends perpendicularly to the diameter in which the contact elements 18 are located.

When the contact-carrying members 10 and 17 are in their first or normal limit position, as established by the biasing action of the springs 32, the contact elements 18 and 13 are in contact and an electric circuit is established from one of the conductors 29 through the corresponding terminal member, the contact elements 18 and 13 and the bridge member 14 to the other set of contact elements 13 and 18 and the terminal 25 carrying the latter to the second conductor 29. Relative movement of the contact-carrying members 10 and 17 out of the aforesaid limit position causes separation of one or both of the sets of cooperable contact elements 13 and 18, thereby interrupting the electrical connection between the two conductors 29. Such separation of the contacts may be accomplished either by the relative movement of the contact-carrying members 10 and 17 toward each other in a direction along their common axis, or by relative rocking movement of the contact-carrying members 10 and 17, whereby the latter are brought closer together at least at one peripheral portion thereof. Such relative movement of the contact-carrying members 10 and 17 as will effect separation of one or both of the sets of contact elements may be produced by applying opposed forces on the contact-carrying members from any direction, except in a plane passing perpendicularly to the common axis of these members. Thus the circuit which is completed by the switch when in normal condition may be interrupted by disposing the switch on a supporting surface, with either of the contact-carrying members uppermost, and depressing the uppermost member. The switch also may be actuated by squeezing it between the fingers although the previously described mode of operation is generally preferred.

It will be seen that where the uppermost contact element is moved toward the other in a direction along the common axis of the contact-carrying members, both sets of contact elements are separated. On the other hand, where the

uppermost contact-carrying member is rocked relatively to the other member only one set of contact elements may be separated. However, even in this latter case, the circuit is interrupted.

The switch mechanism thus far described is fully effective to function as an electric switch and may be employed with or without a casing. However, for the purpose of protecting the mechanism against dirt and moisture, and also for the purpose of protecting the user against contact with bare electrical conducting members, the mechanism preferably is inclosed in a protective casing 34. The casing of my invention not only protects the mechanism and safeguards the operation but, in addition, permits the easy operation of the switch by the foot of the operator.

To this end, the casing 34 is formed of insulating material which is sufficiently yieldable to permit actuation of the switch and sufficiently resilient to return to its initial shape after removal of the actuating force. The casing also preferably is formed of a moisture-proof material. I prefer to form the casing from relatively soft rubber.

The casing preferably is formed by two similar members or sections 34, each of which is of generally discoidal shape and is cupped to provide a circular recess 36 adapted to receive the switch mechanism. Outwardly of the recess 36 is a flat annular face 37 adapted to abut the similar face on the other casing section whereby the sections define a substantially closed chamber. The sections are secured together in the manner illustrated and preferably are vulcanized together at the faces 37 to insure against the entry of dirt and moisture. In order to provide a certain degree of rigidity to the peripheral portion of the casing a rigid metal ring 38 is provided which is secured to radially extending flanges 39 of the casing sections. The ring is of relatively small height and does not interfere with the actuation of the switch.

Outwardly of the recess 36 is an annular recess 40 which opens throughout its inner circumference into the recess 36 and is adapted to receive the projecting portions of the terminals 24 and the conductors 29 attached thereto. The switch mechanism is retained against lateral displacement in the casing by inturned flanges 41 which separate the recesses 36 and 40. At one point around its periphery, each casing section is provided with an outwardly extending trough shaped projection 42 which projections together define an outlet for the conductors 29, which preferably are inclosed in an insulating sheath 43.

Since the casing is formed of relatively soft rubber it resists rather strongly any tendency to slide on the supporting surface during operation. However, I prefer to increase the resistance to such sliding by suitably forming the exterior of the casing. I do this preferably by providing a series of concentric circular ribs 45 on the exterior of both faces of the casing.

A second embodiment of my invention is illustrated in Figs. 6 to 9 of the drawings to which reference now is made. In this embodiment the switch is normally open and is adapted to be closed by foot or hand pressure.

Two contact-carrying members 50 and 51 are provided which are similar in construction and therefore only one will be described in detail. The member 50 is formed as an insulating member and preferably is formed from a suitable molded plastic such as a synthetic resin reinforced as by paper or cloth incorporated in the course of the molding operation.

The contact-carrying member 50 carries three contact elements 52 which are disposed outwardly from the axis of the member 50 and are equally spaced circumferentially about the member 50. The contact elements 52 are carried by and electrically connected by a connector or bridge member 53 of electrically conductive material such as copper or brass secured to the contact-carrying member 50 as by rivets 54. While the contact elements preferably are formed separately and attached to the connector 53, they may be formed integrally therewith.

The connector 53 is formed with a body portion 55 of annular shape and three ears 56 extending outwardly therefrom and carrying at their ends respectively the contact elements 52. Each ear 56 is bent out of the plane of the body portion 55 to normally hold the contact element 52 away from the member 50 and is sufficiently yielding to permit the contact element 52 to be moved toward the member 50 but is sufficiently resilient to return to its initial position when pressure on the contact element 52 is removed.

Extending laterally from the body portion 55 of the connector 53 is an ear 58 to which a conductor 59 may be attached, the ear being preferably provided with a perforation 60 for this purpose.

The second contact-carrying member 51 has attached thereto a connector 61 which is generally similar to the connector 53 and has contact elements 62 carried on ears 63 similarly to the manner in which the contact elements 52 are carried on the connector 53. The connector 61 has an ear 64 for attachment of a conductor 65 which ear 64 is arranged at a different relative position around the periphery of the body portion of its connector 61 than in the case of the ear 60 of the connector 53. This arrangement prevents contact between the ears 58 and 64 when the contact-carrying members are assembled as hereinafter described.

The contact-carrying members 50 and 51 are connected in coaxial, substantially parallel relation for relative movement toward and away from each other in a direction along their common axis and for universal rocking movement. Such connection is provided by a center post 65 which extends freely through axially disposed openings 66 and 67 respectively in the contact-carrying members 50 and 51. The center post 65 is provided at one end with a head 68 which seats loosely in a recess 69 in the member 50 and a washer 70 is riveted on the other end and seats loosely in a recess 71 in the member 51 for limiting separation of the members 50 and 51. The contact-carrying members 50 and 51 thus may be moved relatively along their common axis and may be rocked relative to each other.

The contact-carrying members are normally urged apart and into a first limit position wherein they are substantially parallel and at a maximum distance apart. This is accomplished by providing a coil spring 72 which is compressed between the members 50 and 51, such spring 72 being retained in axial alignment with the members by upstanding annular flanges 73 and 74 integral with the members 50 and 51 respectively.

The contact-carrying members 50 and 51 are assembled in such manner that their respective contact elements 52 and 62 are positioned to engage when the members 50 and 51 are moved

out of the above-described first limit position and toward a second limit position in which the members 50 and 51 are at a minimum distance apart. It will be seen that where the members 50 and 51 are moved out of the first limit position and into a second limit position wherein they remain in parallel relation, all of the contact elements 52 will contact the corresponding contact elements 62. However, because of the 120° circumferential spacing of the contact elements on each contact-carrying member at least one set of cooperable contacts 52 and 62 will contact even if the contact-carrying members are rocked out of the first limit position and toward a second limit position, instead of being moved axially.

Means are provided for preventing relative rotational movement of the contact-carrying members about their common axis, but which means does not interfere with the desired axial relative displacement or relative rocking movement of the contact-carrying members. Such means includes a plurality of upstanding projections 75, 76 and 77 on the member 50 and projections 78, 79 and 80 on the member 51. The projections 75 and 76 are arranged as a pair, being closely spaced at a distance sufficient to freely receive the projection 78 therebetween when the members are assembled and the projections 79 and 80 also are paired, being spaced in an analogous manner to receive the projection 77 therebetween. The projection 77 is disposed at an angle of 120° around the circumference of the member 50 from the space between the projections 75 and 76. As explained above, the projections 79 and 80 and the projection 78 on the member 51 are complementally arranged to the projections on the member 50. Accordingly, while the several projections serve to prevent any substantial relative rotational movement of the members 50 and 51 about their common axis the arrangement of the projections is such as to permit the members 50 and 51 to be moved relatively in an axial direction or rocked relatively.

In connection with the foregoing, it will be noted that while the projections 77 and 78 extend into the spaces between the pairs 79, 80 and 75, 76 respectively, yet the projections are of such height that sufficient clearance is provided when the members 50 and 51 are in normal position to permit the desired axial movement of those members. Moreover, the spacing between the projections of each pair is sufficient to permit the desired rocking movement or the axial movement.

The switch mechanism of the embodiment illustrated in Figs. 6 to 9 preferably is inclosed in a casing 90 similar to the casing illustrated and described in connection with the first embodiment of the invention.

From the foregoing it will be seen that the present invention provides a new and improved electric switch which is capable of use in a large number of applications where it is desired to operate the switch by continued application of foot or hand pressure to maintain a certain circuit condition. The switch is especially well adapted for controlling the operation of an office dication recording and reproducing machine.

Because of the novel structure the switch may be operated by foot or hand pressure applied from almost any direction and without particular attention being paid to the exact point or direction of application of force. For this reason the switch is well adapted for use as an emergency switch which may be operated by the knee or elbow, for example.

The switch is simple and inexpensive to manufacture but at the same time may be made very strong and rugged. The construction is such that the switch is not easily damaged and may even be stepped on by the operator without damage.

The switch mechanism is inclosed and substantially sealed against contact with dirt or moisture. Thus the switch may be disposed on a dirty or moist floor without damage to the switch. Also, since the mechanism is inclosed in air sealed, moisture proof and insulating casing there is little danger due to sparking. Moreover there is little chance of the operator receiving an electric shock from the switch, even where it is located on a moist floor.

The switch may be constructed so as to be operated by a relatively light force and a relatively slight movement of the relatively movable parts. Thus the operator may obtain the desired response in the electric circuit quickly and with a minimum of movement of the foot or hand. On the other hand the switch may be made so that the operating pressure required may be relatively heavy, in cases where this type of switch is desired.

There are but few moving parts in the switch and such parts are not subject to undue wear. Therefore, the switch is capable of use over a long period without repair or replacement. It does not require any adjustment after assembly and no servicing or adjustment during use.

I claim:

1. An electric switch comprising a pair of discoidal shape, contact-carrying members disposed normally in generally coaxial parallel relation, guiding and retaining means connecting said members for relative movement toward and away from each other in a direction along their common axis and for universal relative rocking movement between a first limit position in which said members are substantially parallel and at a maximum distance apart and a second limit position in which said members are at a minimum distance apart at least at one peripheral portion, spring means urging said members toward said first limit position, and contact elements insulatingly carried by said members respectively, outwardly of their centers, positioned for mutual abutment when said members are in one of said limit positions and separation when said members are in the other of said limit positions, and a generally discoidal shape casing of flexible, resilient insulating material surrounding and enclosing said contact-carrying members and the contact elements carried thereby, said casing having normally parallel, generally flat opposite portions closely fitting respective ones of said contact-carrying members and interengaging peripheral portions surrounding the periphery of said members, said casing being adapted to be flexed and compressed by pressure upon any peripheral portion thereof for moving the corresponding peripheral portions of said contact-carrying members relatively together, and being adapted to return to its normal condition upon release of said pressure, said casing being imperforate except for a portion having an opening adapted to receive conductors leading into said casing.

2. An electric switch comprising a first generally discoidal contact-carrying member having an upstanding post extending centrally therefrom in an axial direction, and a second contact-carrying member having a central opening freely receiving said post for guiding said members for

axial relative movement and relative universal rocking movement, spring means urging said members apart, a bridge member secured to the outer end of said post and extending radially outwardly beyond said post in two opposite directions and across an adjacent underlying portion of said second contact-carrying member to limit separating movement of said contact-carrying members and thereby establish a limit position of said contact-carrying members, a first pair of contact elements carried by said bridge member outwardly of said post and a second pair of contact elements carried by the underlying portion of second contact-carrying member in position to abut said first contact elements respectively in said limit position, said second contact-carrying member having a circumferential portion disposed axially beyond said post and bridge member when the two contact-carrying members are a maximum distance apart whereby to enable the members to be moved relatively toward each other in response to pressure applied to any portion of the opposite sides of the members.

3. An electric switch comprising a first contact-carrying member having a generally cylindrical central portion and an annular flange extending outwardly therefrom, a second contact-carrying member of generally cylindrical form disposed in coaxial parallel relation to said first contact-carrying member having a central opening extending axially therethrough and receiving said central portion therein for axial relative sliding movement between said contact-carrying members, said second contact-carrying member having two recesses extending from its outer face to short of its inner face and opening into said central opening throughout their lengths, on diametrically opposite sides thereof, a first set of contact elements carried by said second contact-carrying members in said recesses, and a second set of contact elements carried by and radially outwardly from said central portion on diametrically opposite sides thereof and disposed in said recesses in position to abut said first contact elements, and spring means urging said contact-carrying members apart to effect abutment of said contact elements.

4. An electric switch comprising a first contact-carrying member having a generally cylindrical central portion and an annular flange extending outwardly therefrom, a second contact-carrying member of generally cylindrical form disposed in coaxial parallel relation to said first contact-carrying member having a central opening extending axially therethrough and receiving said central portion therein for axial relative sliding movement between said contact-carrying members, said second contact-carrying member having two recesses extending from its outer face to short of its inner face and opening into said central opening throughout their lengths, on diametrically opposite sides thereof, a first set of contact elements carried by said second contact-carrying members in said recesses, and a second set of contact elements carried by and radially outwardly from said central portion on diametrically opposite sides thereof and disposed in said recesses in position to abut said first contact elements, said second contact-carrying element having recesses extending from its inner face to short of its outer face, and springs disposed in said last-named recesses for urging said contact-carrying members apart to effect abutment of said contact elements.

5. An electric switch comprising a pair of substantially identical, generally discoidal contact-carrying members disposed in spaced, coaxial and generally parallel relation, means for guiding and retaining said contact-carrying members including a guide member extending axially between said contact-carrying members and on which at least one of said contact-carrying members is universally rockable and axially slidable, spring means between and centrally of said contact-carrying members, urging them apart, at least three contact elements carried on each of said contact-carrying members, outwardly of the center thereof and circumferentially spaced uniformly, with the contact elements on each contact-carrying member being aligned and in opposed relation with those on the other contact-carrying member whereby at least one pair of contact elements abuts when the contact-carrying members are urged together by either relative rocking or axial movement, and interengageable means on the members operative for restraining the member against relative rotational movement in both directions.

6. An electric switch comprising a pair of generally discoidal contact-carrying members disposed in spaced, coaxial and generally parallel relation, means for guiding and retaining said contact-carrying members including a guide member extending axially between said contact-carrying members and on which at least one of said contact-carrying members is universally rockable and axially slidable, spring means between and centrally of said contact-carrying members, urging them apart, at least three contact elements carried on each of said contact-carrying members, outwardly of the center thereof and circumferentially spaced uniformly, with the contact elements on each contact-carrying member being aligned and in opposed relation with those on the other contact-carrying member whereby at least one pair of contact elements abuts when the contact-carrying members are urged together by either relative rocking or axial movement and projections extending from each contact-carrying member toward the other contact member at points outwardly from the centers thereof with the projection extending from one contact-carrying member being circumferentially adjacent the projection extending from the other contact-carrying member to prevent relative rotational movement of said contact-carrying members about their common axis.

7. An electric switch comprising a generally cylindrical switch mechanism including a pair of contact-carrying members connected for relative movement toward and away from each other and having contact elements thereon adapted to abut in one position of said contact-carrying members and to be separated in another position of said contact-carrying members and spring means urging said contact-carrying members apart, and a casing of flexible resilient, insulating and moisture proof material surrounding and inclosing said switch mechanism, said casing having a generally cylindrical inner chamber in which said mechanism snugly fits, said casing being adapted to be compressed for moving said contact-carrying members toward each other, said inner chamber being effective for retaining said contact-carrying members centrally in the casing, said casing having an annular chamber radially outwardly of and opening throughout its circumference into said inner chamber for receiving conductors connected to said mechanism, and an

outlet extending from said outer chamber for the conductors.

8. An electric switch comprising a pair of contact-carrying members disposed in coaxial, generally parallel relation, means connecting said members for relative universal rocking movement, said members having portions in telescoped relation, a pair of contact elements carried by each contact-carrying member outwardly and on diametrically opposite sides of the center thereof, and in alignment with the contact elements of the other contact-carrying element for abutment therewith when said contact-carrying members are urged apart, all of the contact elements being disposed radially inwardly of the periphery of the members, and spring means urging said members apart to resiliently and yieldingly maintain said contact elements in mutual abutment.

9. An electric switch comprising a pair of discoidal shape contact-carrying members disposed in coaxial, generally parallel arrangement, means connecting said members for movement toward and from each other and for relative universal rocking movement, a set of three contact elements carried by each contact-carrying member outwardly of the center thereof at circumferentially equally spaced points, the contact elements of each set being disposed in alignment with those of the other set respectively for abutment between at least one contact element with the aligned contact element when said contact-carrying members are rocked, spring means urging said contact-carrying members apart to resiliently and yieldingly maintain all of said contact elements out of abutment, and a casing of electrically insulating and waterproof material surrounding and inclosing said contact-carrying members, said casing having a generally discoidal overall shape providing two external generally parallel major surfaces both shaped so that either surface is effective for stably supporting said switch on a flat surface for actuation by foot pressure applied from any angle in the direction of the supporting surface, said casing being formed of resilient, flexible, relatively soft, rubber-like material having a high coefficient of friction against a flat surface.

10. An electric switch comprising a pair of discoidal shape, contact-carrying members disposed normally in generally coaxial parallel relation, said contact-carrying members being of substantially identical peripheral outline, guiding and retaining means connecting said members for relative movement toward and away from each other in a direction along their common axis and for universal relative rocking movement between a first limit position in which said members are substantially parallel and at a maximum distance apart and a second limit position in which said members are at a minimum distance apart at least at one peripheral portion, spring means urging said members toward said first limit position, and contact elements insulatingly carried by said members respectively, outwardly of their centers, positioned for mutual abutment when said members are in one of said limit positions and separation when said members are in the other of said limit positions, and a discoidal shape casing of flexible, resilient insulating material surrounding and inclosing said contact-carrying members and the contact elements carried thereby, said casing including substantially identical opposite portions having recesses receiving respective ones of said contact-carrying members, said opposite portions of said casing being normally parallel and adapted to be flexed and compressed by pressure upon any peripheral portion thereof for moving the corresponding peripheral portions of said contact-carrying members relatively together, and being adapted to return to normal condition upon release of said pressure, said casing being imperforate except for a portion having an opening adapted to receive conductors leading into said casing.

11. An electric switch comprising a pair of discoidal shape contact-carrying members having contact elements thereon, guiding and retaining means connecting said members for relative movement toward and away from each other and universal rocking movement between a contact engaging position and a position in which at least certain of the contacts are disengaged, spring means urging said contact-carrying members apart and into one of said positions, and a casing of electrically insulating and waterproof material surrounding and inclosing said contact-carrying members, said casing having a generally discoidal overall shape providing two external generally parallel major surfaces both shaped so that either surface is effective for stably supporting said switch on a flat surface for actuation by foot pressure applied from any angle in the direction of the supporting surface, said casing being formed of resilient, flexible relatively soft, rubber-like material having a high coefficient of friction against a flat surface.

12. An electric switch comprising a pair of generally discoidal contact-carrying members disposed in spaced, coaxial and generally parallel relation, means for guiding and retaining said contact-carrying members including a guide member extending axially between said contact-carrying members and on which at least one of said contact-carrying members is universally rockable and axially slidable, spring means urging the contact-carrying members apart, a plurality of contact elements carried by each of said contact-carrying members, between the center thereof and circumferentially spaced uniformly, with the contact elements on each contact-carrying member being aligned and in opposed relation with those on the other contact-carrying member whereby at least one pair of contact elements come into and out of contact in response to relative movement between the contact-carrying members by either rocking or axial movement, and interengageable means on the members operative for restraining the members against relative rotational movement in both directions.

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