July 2, 1929. A. W. BURKE 1,719,096

ELECTRIC SWITCH

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Fig. 1.

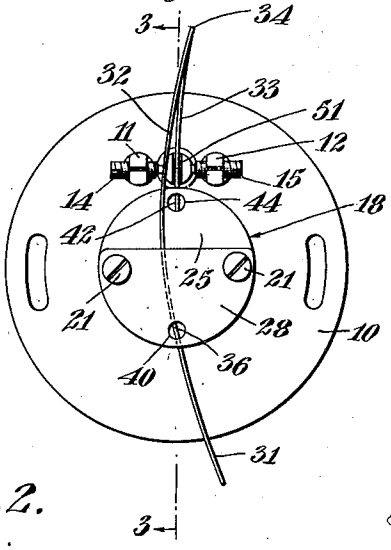


Fig. 2.

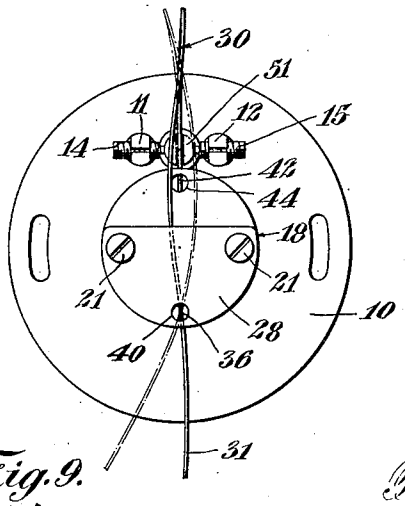


Fig. 3.

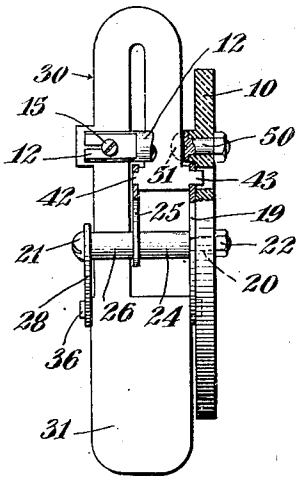


Fig. 9.

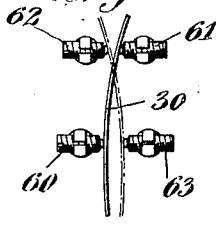
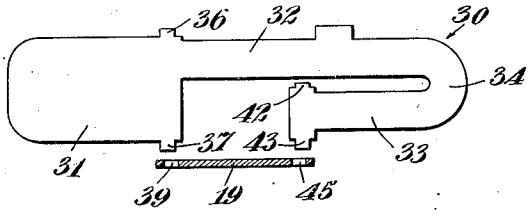


Fig. 4.



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Fig. 6.

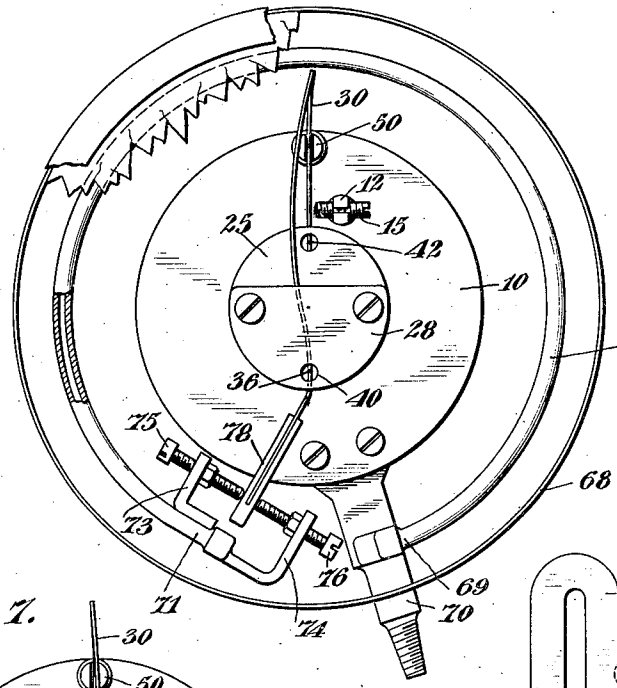


Fig. 7.

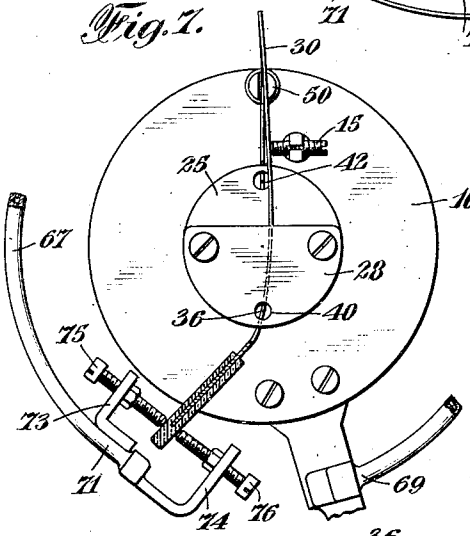


Fig. 8.

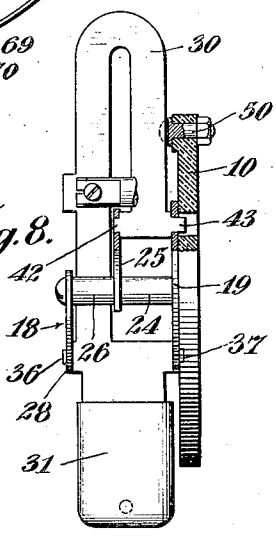
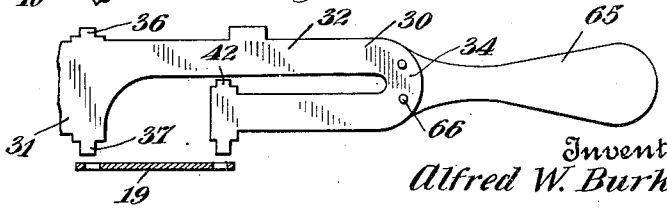


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

Application filed November 24, 1925. Serial No. 71,029.

This invention relates to an electric switch or circuit closer, and among the objects of my invention is to provide an improved switch or circuit closer wherein in making or breaking of the circuit, or both making and breaking of the circuit are accomplished by a quick snap action. Other objects of my invention are to provide a switch of this character which will be simple in construction, easily and economically manufactured, which has but few parts, occupies very little space, is readily accessible for repair and adjustment, efficient and durable in use and one which is easily manipulated either by hand or automatically.

In accordance with the preferred form of my invention, the movable part of the switch comprises a resilient member such as a strip of metal which is held in such a manner that the material of which said strip is composed is under strain, and the shape of the strip is distorted. The strip is so formed, and is held in such a manner, that upon application of an external force, in excess of a certain amount, to said strip, the strip suddenly changes its shape, and the portion of the strip, which carries or is connected with the switch contacts, moves suddenly so as to make or break an electric circuit through the contacts.

Numerous objects and advantages other than those above stated will appear from the following description, taken in connection with the accompanying drawing, wherein

Fig. 1 is a top plan view of a part of the switch, or circuit closer, embodying one form of my invention, and showing the circuit making and breaking elements in assembled relation.

Fig. 2 is a view similar to Fig. 1, but showing the contact making and breaking strip in the position which it assumes just prior to suddenly changing its shape.

Fig. 3 is a side elevation of the structure shown in Figs. 1 and 2, certain of the parts being shown in section on the line 3—3 of Fig. 1.

Fig. 4 is a detailed view of the circuit making strip and a portion of its supporting means in disassembled relation, so as to show the manner in which the strip is distorted when it is mounted on its supporting means.

Fig. 5 is a side elevation of the contact making and breaking strip and a handle attached thereto for manually operating the switch.

Fig. 6 is a view similar to Fig. 1, but showing a somewhat modified form of contact making and breaking mechanism occupying open circuit position, and also showing an automatic operating means for the switch which consists of a Bourdon tube.

Fig. 7 is a fragmentary view of the portion of the structure shown in Fig. 6, but showing the position which the parts of the switch assume when it has been thrown to circuit closing position.

Fig. 8 is a side elevation of the structure shown in Fig. 7, certain of the parts being broken away so as to show the manner in which the circuit making and breaking strip is supported.

Fig. 9 is a fragmentary view showing a modified form switch contacting means in which the movable contact element makes and breaks circuits at a plurality of contacts.

Referring to Figs. 1 to 3, 10 represents a base of insulating material upon which is mounted metal posts 11 and 12, each of which is split at its upper end and provided with a transverse screw threaded opening adapted to receive screws 14 and 15, one or both of which are provided at their inner ends with contact points formed, preferably, of refractory metal.

Likewise mounted on the base 10 is a strip holding member, or support 18, which comprises a disk 19 formed with openings 20 adapted to receive bolts 21 which extend through the base 10, and are secured in place by means of nuts 22, beneath the base. Surrounding the bolts 21 are collars 24 upon which is mounted a semi-circular intermediate disk 25. Likewise surrounding the bolts 21 above the intermediate disk 25, are collars 26, which support the upper semi-circular disk 28. The disks 19, 25 and 28, as well as the collars 24 and 26, are all held rigidly together and supported by the base 10 by means of bolts 21.

The member 18 serves to support the movable circuit making and breaking element 30. This element as shown is a strip of resilient sheet metal, which, when disconnected from the supporting member 18, may be flat, but when supported by the member 18 is curved

laterally as shown in Figs. 1 and 2. In side elevation, the strip has the form shown in Fig. 4 or 5. It comprises a relatively wide portion 31, and approximate parallel relatively narrow portions 32 and 33, the narrow portion 32 forming a continuation of the wide portion 31 and the narrow portion 33 being connected at its outer end to the outer end of the narrow portion 32 by a curved portion 34. The portions 32, 33 and 34 in effect form all with one leg longer than the other. At opposite sides of the wide portion 31, near its inner end are lugs 36 and 37, which are adapted to be received, respectively, in the recess 39 in the circular disk 19 of the member 18, and in the recess 40 in the semi-circular disk 28 of the member 18. The inner end of the narrow portion 33 of the strip 30 is provided with lugs 42 and 43, which are adapted to receive, respectively, in recess 44 in the semi-circular intermediate disk 25, and in the recess or opening 45 in the semi-circular bottom disk 19. It will be seen from Fig. 4, of the drawings, that the lugs 37 and 43, when the strip 30 is disconnected from its support, are farther apart than are the openings 39 and 45 in the circular disk 19. When the lugs 37 and 40 are inserted in the openings 39 and 45, respectively, the strip 30 assumes the distorted shape of approximate form shown in Fig. 1 of the drawing. The left hand side of the portion 32 of the strip 30 is shown in Fig. 1 as resting against the left hand contact screw 14, and the lug 36, which is in the recess 40, as well as the lug 37 in the recess 39 of the member 18, are slightly turned from the vertical. Upon application of a lateral pressure to the wide portion 31 of the strip 30, as indicated by the lower arrow in Fig. 1, or upon application of a lateral pressure to the curved portion 34 in a direction indicated by the upper arrow in Fig. 1, the strip 30 assumes the position and form shown in full lines in Fig. 2. If either of these pressures is then increased slightly, the strip 30 flies to the position shown in dotted lines in Fig. 2. The portion of the portion 32 of the strip leaving the contact screw 14 at the left and quickly moving into contact with the contact screw 15 at the right. If then, pressure is applied to the wide portion 31, or to the curved portion 34 in directions opposite to those indicated in the arrows shown in Fig. 1, the reverse operation takes place, and the strip 30 flies to the position shown in Fig. 1, breaking contact with the right hand screw 15 and making contact with the left hand screw 14.

I find it preferable to maintain the inner end of the narrow portion 33 of the strip 30 substantially rigid with the base 10, and for this purpose I may provide a bolt 50 secured to the base 10, and having a screw threaded head 51, which embraces the lower edge of the narrow portion 33. In Fig. 3, I have shown the bolt 50 located quite near the inner end of the portion 33, while in Fig. 8 the bolt 50 is located approximately midway between the ends of the portion 33.

By rigidly holding the inner end of the portion 33 and permitting its outer end, which is joined to the outer end of the portion 32, to have a lateral movement, the distance which the movable contact moves in making and breaking the circuit is greater than if the outer end of the portion 32 were held rigidly with the base 10.

When it is desired to employ the switch for the purpose of making and breaking a single circuit, one terminal of the circuit may be connected to either one of the posts 11 or 12, while the other terminal of the circuit may be connected through the supporting member 18 to the flexible strip 30.

When it is desired to employ the switch to break one circuit, and, at the same time, to make a second circuit, the connections will be the same as before mentioned with the addition that the third circuit terminal will be connected to the other of the post 11, 12.

The strip 30 should be made of material having a fair degree of resiliency, and of sufficient durability to prevent its being injured when distorted in the manner disclosed. Steel or phosphor bronze form satisfactory materials for the strip and in practice the strip 30 will be stamped from a sheet of material of this composition.

From the above, it will be seen, in the form invention disclosed, the contact making mechanism of the switch consists of a single movable element, which may be easily manufactured in quantities at a minimum expense. The remaining elements of the switch are simple in form and readily obtainable in quantities at low cost, and all of the parts of the switch may be easily assembled and disassembled.

The extent of movement of the operating means or the degree of force necessary to apply to the strip 30 to cause it to make and break a circuit may be varied by adjusting one or both of the contact screws 14, 15. Thus, by screwing the left hand screw outwardly, the pressure necessary to operate the switch from the position shown in Fig. 1 will be lessened. When the switch is operated by applying pressure to the wide portion 31 of the strip 30, as shown in the lower arrow in Fig. 1, it is preferable to have the contact screw adjusted so that the strip 30 will be normally in the dead center position, that is, the inner end of the screw 14 or 15 should be quite close to a position directly over the lower portion 33 of the strip 30. By adjusting the screw in this manner, a quick break of the circuit from the strip 30 to the left hand screw 14 is secured. When the operating force is applied to the curved portion 34 of the strip 30, as shown in the upper arrow in Fig. 1, the contact screw 14 may be posi-

tioned as shown in Fig. 1, or even a greater distance from the dead center position. The portion of the switch will result in a quick break at the screw 14 regardless of its position, the effect of the application of pressure, as shown in the upper arrow in Fig. 1, being, first to force the portion 32 of the strip 30 more firmly against the left hand screw 14 until a position similar to that as shown in Fig. 2 is reached when the portion 32 will jump away from the screw and quickly break the circuit. The portion 32 in moving into or out of contact with the contact screws 14, 15 has a rubbing or rolling motion around the screw point, thus insuring a good electrical contact which is self cleaning.

If desired, the movable contact member 30 may be made to close a pair of contacts in one position and a second pair of contacts in its other position in the manner shown in Fig. 9. In this figure the member 30 is shown in full lines as forming contact with the stationary contacts 60 and 61, while in the position shown in dotted lines, engagement with contacts 62 and 63 has been made and engagement with contacts 60 and 61 broken. While the stationary contacts disclosed are not yielding or resilient, it is obvious that they may be made so, or knife contact may be employed, if desired.

A variety of means may be employed for operating the movable member 30. In Fig. 5, I have shown a handle 65 secured by means of rivets 66 to the curved portion 34 of the member 30. It is obvious that by moving the handle so as to bend the member 30 laterally in one direction or the other, this member will operate to make and break the circuits as shown in Figs. 1 and 2.

In Figs. 6 and 7, I have shown an operating means for the member 30 which consists of Bourdon tube 67, which is rigidly secured to the casing 68 at one end 69 and is adapted to be supplied with pressure through a pipe 70. The other end 71 of the tube 67 is movable to the left or right, depending upon whether the pressure supplied to the tube 67 is increased or diminished. The end 71 of the tube 67 has secured thereto angular members 73 and 74, through which are threaded screws 75 and 76, respectively, that engage between their inner ends, the member 78 secured to the outer end of the movable strip 30. In Figs. 6 and 7, but one fixed contact screw 15 is shown, and operation of the switch serving to make and break the circuit through this contact.

As one of the many uses to which the switch shown in Figs. 6 and 7 may be put, may be mentioned the control of an electric motor for operating a refrigerating machine. Thus the Bourdon tube 67 may be connected to operate in accordance with changes in pressure in the cooling water supply pipe. When the water supply fails the Bourdon tube open the switch and refrigerating machine stops. When the water pressure comes on again, the switch is closed and the refrigerating machine is started. A switch such as is shown in Fig. 6 may close at a pressure of 20 pounds and open at a pressure of 5 pounds. By adjusting the set screws, their operating pressures may be varied. If desired, the set screw 76 may be omitted in which case the switch would not close automatically but must be closed by an attendant. In practice, the attendant would not close the switch until he had made an investigation of the cause of failure of the water supply and determined that it was proper to re-start the machine.

I claim:

1. In a switch, a fixed contact element, a movable contact element adapted to engage said fixed contact element, said movable contact element consisting of a long resilient portion, a short resilient portion parallel thereto, and connected at one end to one end of the long resilient portion, means for holding said short portion at a point removed from said ends, and means for pivotally supporting said long member at a point removed from said ends, in such a manner that the long portion is curved, and operating means for said switch, secured to the end of said long leg adapted to move a part of said movable element laterally of the length thereof in either direction.

2. In a switch, a movable contact element comprising a contact member of U-shape having a long and short leg, means for rigidly supporting the end of said short leg, means for pivotally supporting the end of said long leg, said means being so positioned relative to one another, that said long leg is held in a bent postion, a fixed contact located at one side of said long leg and adapted to be engaged thereby, and operating means adapted to move a part of said movable contact element in either direction laterally of the length thereof.

3. In a switch having a movable contact element consisting of a resilient strip of metal of U-shape, having a long leg and a short leg, supporting lugs at the end of said long leg and at the end of said short leg, a support for said element having openings adapted to receive said lugs, said openings being so positioned relative to one another that when said strip is mounted therein, said short leg is placed under tension, said long leg is curved and the bend of said U is free to move laterally, operating means engaging said element and adapted to move the bend of said U laterally and a fixed contact adapted to be engaged by said movable contact element, and located at the side of said long leg intermediate ends thereof.

4. In a switch having a movable contact element consisting of a resilient strip of metal of U-shape, having a long leg and a short leg,

supporting lugs at the end of said long leg and at the end of said short leg, a support for said element having openings adapted to receive said lugs, said openings being so positioned relative to one another that when said strip is mounted therein, said short leg is placed under tension, said long leg is curved and the bend of said U is free to move laterally, means engaging said short leg for preventing lateral movement of a portion thereof adjacent its end, operating means engaging said element and adapted to move the bend of said U laterally and a fixed contact adapted to be engaged by said movable contact element, and located at the side of said long leg intermediate ends thereof.

5. In a switch having a movable contact element consisting of a resilient strip of metal of U-shape, having a long leg and a short leg, supporting lugs at the end of said long leg and at the end of said short leg, a support for said element having openings adapted to receive said lugs, said openings being so positioned relative to one another that when said strip is mounted therein, said short leg is placed under tension, said long leg is curved and the bend of said U is free to move laterally, means engaging said short leg for preventing lateral movement of a portion thereof adjacent its end, operating means engaging said element and adapted to move the bend of said U laterally and a laterally adjustable fixed contact adapted to be engaged by said movable contact element, and located at the side of said long leg intermediate ends thereof.

6. A switch comprising a fixed contact, a movable contact element, comprising a resilient strip, holding means engaging said strip at two points intermediate its length, said points being spaced apart less than the normal distance between said points when said strip is not so engaged, whereby said strip has a short section under tension and a long section under compression as it assumes a form having a general curvature in one direction, said strip having a portion extending beyond one of said points, an operating means engaging said extended portion for moving said portion so as to lessen said curvature, or to produce therein a curvature in the opposite direction, whereby said strip acting under the influence of internal forces set up therein, suddenly changes its general curvature to a general curvature in the opposite direction, and whereby said movable contact element suddenly makes or breaks contact with said fixed contact.

7. A switch comprising a fixed contact, a movable contact element in engagement with said fixed contact, and comprising a resilient strip, a pivotal support engaging said strip at a point along its length, means extending intermediate said strip and secured thereto at another point along its length, a fixed support for said means located between said points, said support being so located that said means is held under tension and said strip is bent in the one direction, and means for bending a portion of said strip in the opposite direction thereby said strip acting under the influence of internal forces set up therein, is suddenly moved out of engagement with said fixed contact.

8. In a switch, a movable contact element comprising a resilient contact member of U-shape, means for rigidly supporting the end of one of the legs of said U, means for pivotally supporting the end of the other leg of said U, said means being so positioned relative to one another that the said one leg is under tension and the said other leg is bent and the bend of said U is free to move laterally, a fixed contact located at one side of said resilient contact member and operating means adapted to move a part of said resilient contact member laterally of the length thereof.

9. In a switch, a fixed contact element, a movable contact element, contact operating means comprising a U-shape member, means for supporting said member near the ends of the legs of said U at points near to one another, said U extending outwardly from said supporting means and being held thereby so that the member is curved in one direction and means for bending a portion of said member in the opposite direction without causing a disengagement of said fixed and movable contact elements until said member acting under the influence of internal forces set up therein suddenly changes its curvature from said one direction to curvature in the opposite direction and engagement of the fixed and movable contact elements is suddenly broken.

10. In a switch, a fixed contact element, a movable contact element, contact operating means comprising a U-shape member, means for rigidly supporting one of the legs of said U near the end thereof and for pivotally supporting the other leg of said U near the end thereof, said U being held by said means so that said strip is curved in one direction and means for turning said last named leg about its pivotal support without causing disengagement of said fixed and movable contact elements until said member, acting under the influence of internal forces set up therein, suddenly changes its curvature from the said one direction to curvature in the opposite direction and engagement of said fixed and movable elements is suddenly broken.

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