

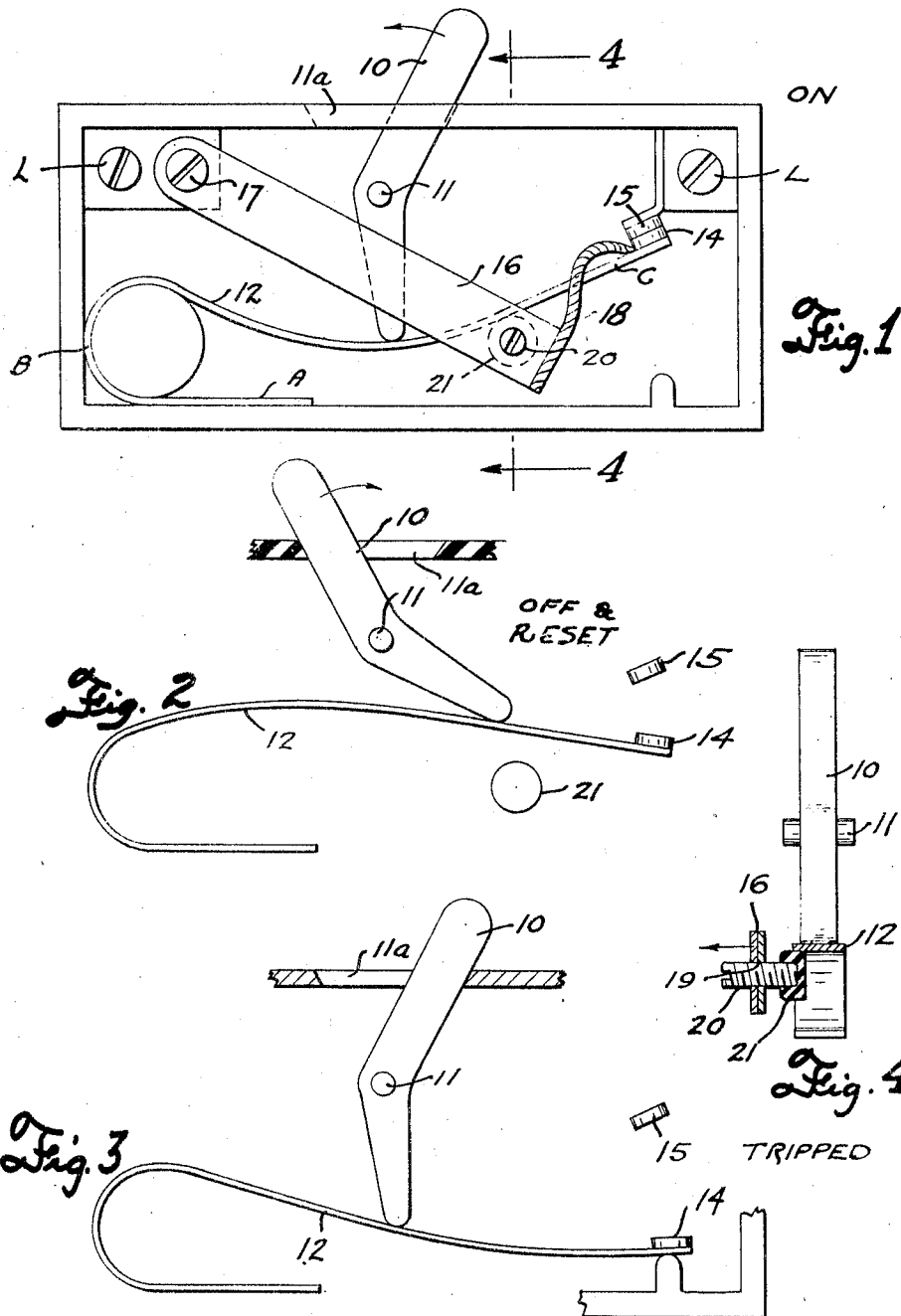
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SWITCH

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SWITCH

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9 Claims. (Cl. 200—116)

This application relates to switches arranged for manual operation to and from circuit closed and circuit open positions and also arranged to move to open circuit position automatically on the arising of a circuit abnormality, such as overload, and to reset itself automatically in open circuit position.

The principal object of the present invention is to provide automatic switches of the character above described which are extremely simple of operation and manufacture and at the same time efficient of operation.

For an understanding of the operation of the switches of this application, reference should be had to the appended drawing showing a preferred embodiment of the same. In the drawing—

Fig. 1 shows one embodiment, with the switch in circuit closed position;

Fig. 2 shows the switch as if moved manually to the circuit open position; this position is also a reset position;

Fig. 3 shows the switch as if moved automatically by a circuit abnormality such as overload to circuit open position;

Fig. 4 is an enlarged section on line 4—4 of Fig. 1.

The switch shown in Figs. 1-4 comprises a handle 10 pivotally mounted at 11 on the case or frame of the switch and arranged to ride in a slot thereof at 11a and to have its lower end overlap a part of a J-shaped flat leaf spring member generally referenced 12, and anchored at A to the frame or case of the switch, by being disposed thereon without being positively fixed thereto. The portion B of the spring member next adjacent the anchored part A is retroverted or bowed as indicated and is referred to herein as a spring and terminates in an elongated extension C on whose end is a movable contact 14 adapted to make with a stationary contact 15. Portion C is in effect an operating arm, with portion B a biasing spring therefor. Connecting the movable contact 14 to the end of a bimetal element 16 which is anchored to the frame or case at 17 is a flexible conductor 18. When the switch is in closed circuit position, a connection is established between the binding posts L—L connected to the stationary contact 15 and to the anchor at 17 through parts 14, 18 and 16.

Threaded into a tapered hole 19 of the bimetal element 16 is a screw 20 whose shank is shown as enclosed within a button 21 of insulating material such as heat resisting glass or the like.

The screw 20 and button 21 are so located with

respect to the arm C that when the parts are in their normal position the button 21 is in alignment with and under the arm C. It will be understood that the metals of the bimetal part 16 are so arranged that on the arising of a circuit abnormality such as overload the bimetal part warps, due to temperature change, in a direction transverse of the screw 20 and away from arm C and handle 10 in a manner to cause the insulating button 21 to go out of alignment with and out from under arm C.

The operation of the switch is as follows: When the parts are in circuit closed position, Fig. 1, the spring B is flexed by virtue of the pressure placed on arm C by the handle 10. The arm C is a lever or arm fulcrumed on the button 21, with the contact end biased towards the stationary contact by virtue of the pressure placed upon the opposite end of the arm C by the handle. When the handle is moved counterclockwise to the open circuit position as shown in Fig. 2, the pressure placed upon the arm C by the handle is relieved and the spring B is then left free to move the arm to the condition shown in Fig. 2, around the handle in the position of Fig. 2 as a pivot, and which condition is one wherein the movable contact 14 is remote from the stationary contact 15.

It will be observed that when the parts are in closed circuit position, the line of pressure of handle 10 on arm C is substantially perpendicular to the arm at the pressure point, whereas on open circuit this is not true.

It will also be observed that in closed circuit arm C engages button 21 whereas in open circuit it is clear of button 21 by a suitable distance.

If it is desired to close the switch after it is in its open circuit position, the handle 10 is returned to the position of Fig. 1 from the position of Fig. 2 and in so returning presses down upon one end of the arm C so as to cause such arm to fulcrum about the button 21 and cause the contact end of the arm to move towards and against the stationary contact.

In the event the switch is in closed circuit position and a circuit abnormality, such as overload, arises, the bimetal element 16 warps so that its button 21 passes out of alignment with the arm. Under such circumstances the spring B will spontaneously flex and move the arm C out of its closed circuit position to the position of Fig. 3 and thus open the circuit. Due to the lack of a positive connection between the arm C and the handle, such movement of the arm C can be free of the handle which is a trip free char-

acteristic so desirable in switches of this character.

If and when the handle 10 is released, after the arm is in the position of Fig. 3, assuming it had been held, or, if the handle were not held during tripping, the spring thereafter moves the handle to the position of Fig. 2, and at the same time moves the arm to the position of Fig. 2, which is the reset position. This action takes place because that angle between the handle and arm which is to the left of the handle and below its pivot is an acute angle. Thereafter the bimetal element warps back to the position of Fig. 2 with button 21 being returned into alignment with the arm.

It will be observed that the spring B has an inherent tendency to cause the arm C to move towards the stationary contact 15. This tendency is prevented by the handle. Removal of the fulcrum 21 on overload causes contact separation because of the pressure of the spring B on the arm C to rock it about the handle but immediately thereafter the inherent tendency of the spring B to cause arm C to approach the stationary contact causes the handle to slide into "off" position and causes the arm C to return to the reset position of Fig. 2 where the parts are reset.

Thereafter fulcrum 21 returns itself automatically so that if the handle is moved to the "on" position the arm C will once more rock about the fulcrum as a pivot.

For tripping a compound action of the arm C takes place.

The first action is a biasing of the arm C to the position of Fig. 3. The second action is a biasing of the arm to shift the handle and move the parts into the position of Fig. 2 where the action terminates.

It will be observed that there is no prolonged interval between the first action of the spring to move the parts to Fig. 3 and the second action of the spring to move them to Fig. 2. The second action follows the first immediately upon the completion of the first action.

Now having described the switch hereof and the mode of operation, reference will be had to the claims which follow for a determination of the invention.

I claim:

1. An automatic switch comprising a stationary contact, a spring member having an anchorage and a contact operating portion, a handle engaging the spring member between its anchorage and its contact operating portion, and a movable fulcrum for engaging the spring member between the point where it is engaged by the handle in "on" position and its contact operating portion, the spring member having an inherent tendency first to bias its contact operating portion, when the fulcrum is removed, about the point where it is engaged by the handle, when the latter is in "on" position, so that its contact operating portion moves away from the stationary contact, and then to bias itself as a whole about its anchorage, when the fulcrum is not in engagement with the spring member, and the handle is in "on" position, to move the handle towards and into the "off" position and to move the contact operating portion towards but not against the stationary contact.

2. An automatic switch comprising a stationary contact, a spring member having an anchorage and a contact operating portion, a handle engaging the spring member between its anchorage and

its contact operating portion, and a movable fulcrum for engaging the spring member between the point where it is engaged by the handle in "on" position and its contact operating portion, the spring member having an inherent tendency first to bias its contact operating portion, when the fulcrum is removed, about the point where it is engaged by the handle, when the latter is in "on" position, so that its contact operating portion moves away from the stationary contact, and then to bias itself as a whole about its anchorage, when the fulcrum is not in engagement with the spring member, and the handle is in "on" position, to move the handle towards and into the "off" position and to move the contact operating portion towards but not against the stationary contact, and circuit current responsive means for moving the fulcrum away from the spring member on a circuit abnormality.

3. An automatic switch comprising a stationary contact, a spring member having an anchorage and a contact operating portion, a handle engaging the spring member between its anchorage and its contact operating portion and arranged to be movable along the spring member from its "on" position to its "off" position, these being between the anchorage and the contact operating portion, the "on" position being nearer the anchorage and the "off" position being nearer the contact operating portion, and a fulcrum for engaging the spring member between the point where it is engaged by the handle in "on" position and its contact operating portion, part of the spring member moving like a lever about the fulcrum on movement of the handle, movement of the handle from "on" to "off" rocking such spring part on the fulcrum for contact separation, and vice versa.

4. An automatic switch comprising a stationary contact, a spring member having an anchorage and a contact operating portion, a handle engaging the spring member between its anchorage and its contact operating portion and arranged to be movable along the spring member from its "on" position to its "off" position, these being between the anchorage and the contact operating portion, the "on" position being nearer the anchorage and the "off" position being nearer the contact operating portion, and a movable fulcrum for engaging the spring member between the point where it is engaged by the handle in "on" position and its contact operating portion, the spring member having an inherent tendency first to bias its contact operating portion, when the fulcrum is removed, about the point where it is engaged by the handle, when the latter is in "on" position, so that its contact operating portion moves away from the stationary contact, and then to bias itself as a whole about its anchorage, when the fulcrum is not in engagement with the spring member, and the handle is in "on" position, to move the handle towards and into the "off" position and to move the contact operating portion towards but not against the stationary contact, part of the spring member moving like a lever about the fulcrum on movement of the handle, movement of the handle from "on" to "off" rocking such spring part on the fulcrum for contact separation, and vice versa.

5. An automatic switch comprising a stationary contact, a spring member having an anchorage and a contact operating portion, a handle engaging the spring member between its anchorage and its contact operating portion and arranged to be movable along the spring member

from its "on" position to its "off" position, these being between the anchorage and the contact operating portion, the "on" position being nearer the anchorage and the "off" position being nearer the contact operating portion, and a movable fulcrum for engaging the spring member between the point where it is engaged by the handle in "on" position and its contact operating portion, the spring member having an inherent tendency first to bias its contact operating portion, when the fulcrum is removed, about the point where it is engaged by the handle, when the latter is in "on" position, so that its contact operating portion moves away from the stationary contact, and then to bias itself as a whole about its anchorage, when the fulcrum is not in engagement with the spring member, and the handle is in "on" position, to move the handle towards and into the "off" position and to move the contact operating portion towards but not against the stationary contact, and circuit current responsive means for moving the fulcrum away from the spring member on a circuit abnormality, part of the spring member moving like a lever about the fulcrum on movement of the handle, movement of the handle from "on" to "off" rocking such spring part on the fulcrum for contact separation, and vice versa.

6. An automatic switch having a handle for manual operation, a resilient circuit controlling operating member positioned for manipulation by said handle and arranged to have a normal tendency to move towards closed circuit position and a circuit responsive element having a part normally holding said member against movement out of closed circuit position and arranged to move automatically on a circuit abnormality and thus free said member for movement, said element part fulcruming the member which may be moved as a lever thereon by the handle, with the fulcrum point being between the handle engaged point and the contact operating point of the member, the member, the handle, and the part being so arranged that when the part is in member holding position and the handle is in closed circuit position, the handle causes at least a part of the member to fulcrum about the part and remain in closed circuit position, with an inherent tendency to resist movement out of closed circuit position, but when the part moves out of member holding position, the member automatically moves out of closed circuit position due to the pressure of the handle thereon.

7. An automatic switch having a handle for manual operation, a resilient circuit controlling operating member positioned for manipulation by said handle and arranged to have a normal tendency to move towards closed circuit position and a circuit responsive element having a part normally holding said member against movement out of closed circuit position and arranged to move automatically on a circuit abnormality and thus free said member for movement, said element part fulcruming the member which may be moved as a lever thereon by the handle, with the fulcrum point being between the handle engaged point and the contact operating point of the member, the member, the handle, and the part being so arranged that when the part is in member holding position and the handle is in closed circuit position, the handle causes at least a part of the member to fulcrum about the part and remain in closed circuit position, with an inherent tendency to resist movement out of closed

circuit position, but when the part moves out of member holding position, the member automatically moves out of closed circuit position due to the pressure of the handle thereon, and thereafter causes the handle to move out of its closed circuit position and into an open circuit position and also moves itself towards closed circuit position but into an open circuit position, where it remains, restrained against further movement towards closed circuit position by the handle, then held stationary in open circuit position.

8. A manually operable switch arranged to open the circuit automatically in the event of an overload comprising a stationary contact, an operating arm, a spring for biasing said arm and operatively connected to it at one point thereof, a movable handle arranged to engage said arm at one point wherein it holds the arm on a movable circuit responsive fulcrum as a pivot, so that a movable contact engages the stationary contact, and also arranged to engage the arm at another point wherein it holds the arm with the movable contact separated from the stationary contact, with movement of the handle from the position wherein it engages the arm at the first point to the position wherein it engages the arm at the second point permitting contact separation, and with return movement causing contact engagement, said movable circuit responsive fulcrum engaging the arm at a fourth point thereof, said movable contact being operatively connected to the arm at a fifth point thereof, the five said points ranging along the arm in the order given, with the parts being so constructed and arranged that when the handle moves from its first position to its second, the spring rocks the arm about the handle as a pivot to cause contact separation, and when the fulcrum moves from the arm, the spring rocks the arm about the handle, then in its first position, to cause contact separation.

9. A manually operable switch arranged to open the circuit automatically in the event of an overload comprising a stationary contact, an operating arm, a spring for biasing said arm and operatively connected to it at one point thereof, a movable handle arranged to engage said arm at one point wherein it holds the arm on a movable circuit responsive fulcrum as a pivot, so that a movable contact engages the stationary contact, and also arranged to engage the arm at another point wherein it holds the arm with the movable contact separated from the stationary contact, with movement of the handle from the position wherein it engages the arm at the first point to the position wherein it engages the arm at the second point permitting contact separation, and with return movement causing contact engagement, said movable circuit responsive fulcrum engaging the arm at a fourth point thereof, said movable contact being operatively connected to the arm at a fifth point thereof, the five said points ranging along the arm in the order given, with the parts being so constructed and arranged that when the handle moves from its first position to its second, the spring rocks the arm about the handle as a pivot to cause contact separation, and when the fulcrum moves from the arm, the spring rocks the arm about the handle, then in its first position, to cause contact separation, and then moves the arm to move and hold the handle to its second position.

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