

Sept. 6, 1949.

D. MORRISON

2,481,141

ELECTRICAL SWITCH

Filed Nov. 20, 1948

Fig. 1

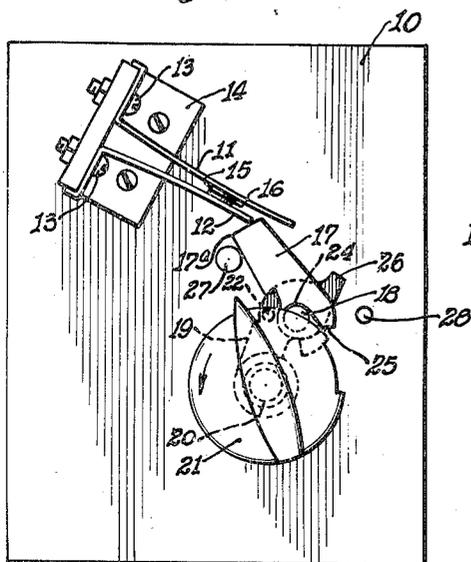


Fig. 2

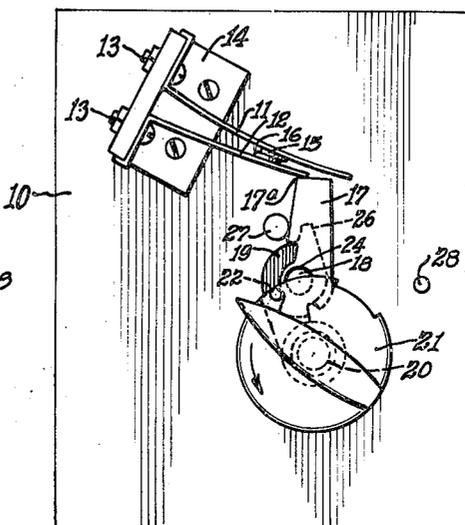


Fig. 3

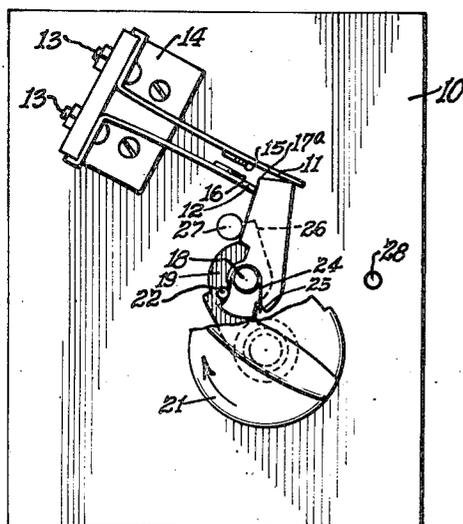


Fig. 4

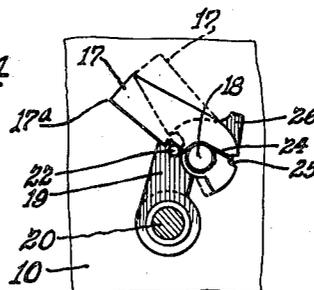


Fig. 5

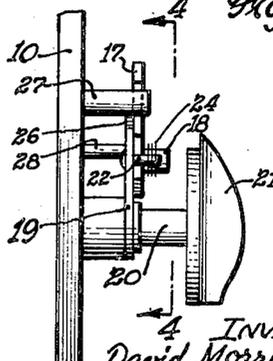
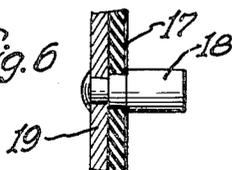


Fig. 6



INVENTOR
David Morrison
By Frank Schraeder
Attorney

UNITED STATES PATENT OFFICE

2,481,141

ELECTRICAL SWITCH

David Morrison, Manitowoc, Wis., assignor to
Paragon Electric Company, Two Rivers, Wis.,
a corporation of Wisconsin

Application November 20, 1948, Serial No. 61,205

7 Claims. (Cl. 200—73)

1

The present invention relates to electrical switches of the type employing two spring blades that cooperate with each other to make and break a circuit; and its object is to produce a simple and novel switch mechanism of this type that both opens and closes with a snap action.

A further object of the invention is to produce a switch mechanism that can be used for a great many different purposes and be adapted for either manual or automatic operation.

The various features of novelty whereby the present invention is characterized will hereinafter be pointed out with particularity in the claims, but, for a full understanding of the invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a front view of a closed switch embodying the present invention, provided with a finger piece for manual operation; Fig. 2 is a view similar to Fig. 1, showing the positions of the parts as the switch is about to open; Fig. 3 is a view similar to Figs. 1 and 2, showing the switch open; Fig. 4 is a section on line 4—4 of Fig. 5, showing the operating arm with the switch actuating dog in full and broken lines, respectively, in two different angular positions; Fig. 5 is a side view of the switch with the parts in the same positions as in Fig. 1; and Fig. 6 is a section through the dog and its carrier at the pivotal connection between the same.

Referring to the drawing, 10 represents a suitable support shown, for convenience, as being a small slab of insulating material. Overlying the support are two flat spring blades 11 and 12, each anchored to the support at one end, and standing on edge parallel to each other or, at least, extending in the same general direction. In the particular form illustrated, one end of each blade is fastened by a screw 13 to a bracket 14, also of insulating material; the bracket, in turn, being fastened to the support. Screws 13 may serve as the switch terminals.

The switch blades may be provided with contact pieces 15 and 16, respectively, for cooperation with each other. The blades are under initial stress so that the contact pieces are normally firmly pressed together, keeping the switch normally closed.

For the purpose of my invention, one of the switch blades, blade 11, is longer than the other or, at least, projects somewhat beyond the free end of the same. For operating the switch I provide an actuator that is pressed against the

2

outer side of the shorter blade 12, and caused to ride or wipe along the same until it passes beyond the free end of that blade. The pressure, while the actuator is in contact with the shorter blade, bends both blades laterally. Then, when the actuator abruptly releases the shorter blade, both blades snap back, but the longer blade merely drops against the actuator and then stops, while the other blade moves farther to open the switch. A like snap action is achieved through a subsequent switch-closing movement of the actuator.

The aforesaid actuator is a flat dog 17, standing on edge, that is connected by a pivot pin 18 to a swinging arm 19 fixed to and projecting radially from a shaft 20. The free end of the dog is cut off squarely, or, at least, there is one sharp corner 17^a at what may be termed the under edge of the dog. Shaft 20 stands at right angles to the plane of the support, at some distance from the switch and facing the short blade; the shaft being rotatable and being adapted to be turned by any suitable means, depending on the use to which the switch is to be put. In the arrangement shown, the shaft has on its outer end a finger piece 21 for manual operation.

As best shown in Fig. 4, dog 17 has only a limited angular movement, about 120°, relative to the arm that carries it; the same long edge of the dog striking a motion limiting element, in the form of a pin 22 on the arm, when the dog is turned as far as it will go in either direction. A torsion spring 24, surrounding a projecting part of pivot pin 18, anchored at one end on pin 22 and at the other end in a notch 25 in the tail of the dog, tends constantly to hold the dog against pin 22, namely in the full line position of Fig. 4. At this time the dog stands almost at right angles to the arm. Pivot pin 18 is located at some distance from the free end of arm 19, with that end terminating in a nose 26.

Projecting from the support, between the shaft 20 and the switch, and at a distance from the shaft substantially greater than the distance between the shaft and the pivot pin 18, is a stationary stop 27. This stationary stop is at the free end of the short switch blade 12 and is spaced apart from the outer or under side of that blade a distance no greater than the width of the free end of the actuating dog, although that dimension is not critical. What is important is that when the dog is in the idle position, as shown in full lines in Fig. 4, and not in engagement with stop 27, turning the shaft in the direction of the arrow in Fig. 1, causes the dog to strike on the

upper side of the stationary stop. The dog then rocks on and slides over this stop until its square end edge engages the end edge of the shorter switch blade, as shown in Fig. 1. Further movement of the shaft in the same direction merely causes the dog to rock on the stationary stop as a fulcrum, no further bodily advance of the dog being made; the dog gradually swinging into alignment with the arm instead of remaining almost at right angles thereto. This operation causes switch blade 12, and therefore blade 11 which is in engagement therewith, to be bent laterally and thus be placed under considerable stress. In Fig. 2 the switch-opening movement almost has been completed, the dog having been rocked, not only until aligned with the arm, but a little past center. The nose 26 on the arm is now near the stop so that the shaft can be turned only a little farther although far enough to cause the dog to slip off the end of blade 12; the sharp corner 17^a insuring a sharp, snap movement away from the cooperating blade. Since blade 11 has been held up only because supported by blade 12, it snaps down against the end of the dog immediately after blade is freed by the dog, as shown in Fig. 3. Although both switch blades had been deflected equally far by the dog, the latter stops blade 11 before it can recoil as far as does blade 12, so that a wide gap is created between the two pieces 15 and 16, leaving the switch wide open.

It will be seen that in Fig. 3, nose 26 on the arm is in engagement with the stationary stop, while the tail end of the dog engages pin 22 on the arm. Therefore the arm cannot swing farther in the direction that caused the switch to open and, since the dog has been shifted past center, the switch is positively held open.

To close the switch again, the finger piece must be turned in the opposite direction from that in which it moved to open the switch, namely in the clockwise direction as viewed in Fig. 3. Since spring 24, associated with the dog, is under considerable stress when the switch is open, this spring and blade 11 cooperate to hold the dog against the end edge of blade 12 as the arm begins its backward movement indicated by the arrow. Since the end of blade 12 now serves as a fulcrum for the dog, the backward or clockwise movement of the finger piece causes the dog to swing away from the stationary stop 27 and to be pulled lengthwise until the sharp corner 17^a reaches the extreme end of blade 12. During this movement blade 11 is pressing down on the opposite corner at the free end of the dog. Therefore, when the dog reaches the point where it can drop off the end of blade 12, blade 11 and spring 24 cooperate to drive the dog down against the stationary stop as shown in full lines in Fig. 4—the switch thus closing with a snap action.

It should be noted that in Fig. 1 the dog has been moved a little distance away from pin 22 on the arm; the position of the dog with respect to the arm being that shown in broken lines in Fig. 4. The arm and dog will not remain in the positions occupied in Fig. 1, upon release of the finger piece, because spring 24 is sufficiently strong to drive the arm back and allow the dog to engage pin 22 at the end of the switch-opening movement.

In order to limit the extent of permissible turning movement of the shaft and its finger piece through an angle not substantially greater than that required to open and close the switch, and avoid lost motion, a second stationary stop

may be provided for arresting backward movement of the dog-carrying arm immediately after the switch opens. In the arrangement shown, there is such a stationary stop 28 on the supporting member 10, in position to be engaged by the arm when the latter is swung back a little from its position in Fig. 1, with the dog still resting on stop 27, however.

It will thus be seen that I have produced a simple and novel switch mechanism wherein there is a snap action both in opening and in closing a circuit. It will furthermore be seen that only a small angular movement of the operating shaft is required to open or close the switch; a comparison of Figs. 1 and 3 showing that the finger needs travel through an angle of only about 45° to shift from a closed state to a wide open state. Therefore my improved mechanism lends itself admirably to use in many situations where the operation of a switch by turning a shaft through a small angle is advantageous or even essential.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact details thus illustrated and described, but intend to cover all forms and arrangements that come within the definitions of my invention constituting the appended claims.

I claim:

1. In combination, a normally closed switch having two spring blades extending in the same general direction and each anchored at one end and free at the other end, the free end of one blade projecting outwardly beyond the free end of the second blade, an actuating dog so placed that the second blade lies between the same and the first blade; said dog having three positions, namely an idle position, a position in which it engages the second blade and presses both blades laterally, and a third position wherein it is clear of the second blade and serves as a stop for the projecting end of the first blade; a swinging arm, a pivotal connection between one end of the dog and said arm, a spring tending constantly to keep the dog in the idle position when the dog is moved by the arm, and a stationary stop in position to be engaged by said dog and cause it to swing into its second and third positions when the arm is swung in one direction.

2. The combination set forth in claim 1, wherein the swinging arm is provided with a part that engages the stationary stop as the dog reaches its third position.

3. The combination set forth in claim 1, wherein the swinging arm is provided with a part that engages the stationary stop at the time that the dog reaches its third position, and the dog and the arm are on about the same radius with respect to the pivotal axis of the arm when both are in engagement with the stationary stop.

4. In combination, a normally closed switch having two spring blades extending in the same general direction and each anchored at one end and free at the other end, the free end of one blade projecting outwardly beyond the free end of the second blade, a stationary stop so positioned near the free end of and in spaced relation to the second blade that the latter lies between the same and the first blade; an arm mounted to swing into engagement with and away from said stop, a dog mounted at one end on the free end of said arm for movements between a normal position in which it extends laterally from said arm toward said stop and a

5

second position wherein it extends lengthwise of the arm and projects beyond the free end of the latter, and a spring tending constantly to hold the dog in its normal position; the parts being so proportioned that the dog rides on the stop, as the arm approaches the latter, and is gradually forced out of its normal position into its second position, with the free end of the dog first engaging the second blade, and pressing both blades laterally, and then passing beyond the free end of the second blade as the dog reaches its said second position.

5. In combination, a normally closed switch having two parallel spring blades each anchored at one end and free at the other end, the free end of one blade projecting outwardly beyond the free end of the second blade, a stationary stop so positioned near the free end of and in spaced relation to the second blade that the latter lies between the same and the first blade; an arm mounted to swing into engagement with and away from said stop, a dog mounted at one end on the free end of said arm for rocking movements between a normal position in which it extends laterally from said arm toward said stop and a second position wherein it extends lengthwise of the arm, slightly past center, and projects beyond the free end of the latter, and a spring tending constantly to hold the dog in its normal position; the distance between the axis about which the dog rocks and the pivotal axis of the arm being less than the distance between the latter axis and the stationary stop whereby, as the arm is swung toward the stop, the latter serves as a fulcrum on which the dog turns from one extreme position to the other.

6. In combination, a normally closed switch having two parallel spring blades each anchored at one end and free at the other end, the free end of one blade projecting outwardly beyond the free end of the second blade, an arm pivotally mounted at one side of the switch and facing the second blade, with its pivotal axis spaced apart from the switch a distance greater than the length of the arm, a stationary stop located between the said pivotal axis and the switch and in position to engage the arm near its free end when the arm is at one end of its angular movement, a dog pivoted at one end to the arm at a distance from the said pivotal axis substantially less than the distance between that axis and the stationary stop, an element on the arm to engage the dog and limit its swinging movement on the arm in one direction to a position in which the dog is crosswise of the arm with its free end in position to travel up over said stationary stop when the arm is swung toward the latter, a spring tending constantly to hold said dog against said limiting element, said dog having at its free end an edge to engage with the free end edge of the

6

second blade as it approaches the same and terminating in a sharp corner outwardly from the latter blade; the parts being so proportioned that when the arm is swung against the stationary stop the dog is caused to rock on the stop and press both switch blades farther away from the stop and then to wipe along the second blade and move on past the end edge at the free end of the latter to a point under the projecting end of the other blade.

7. In combination, a normally closed switch having two parallel spring blades each anchored at one end and free at the other end, the free end of one blade projecting outwardly beyond the free end of the second blade, an arm pivotally mounted at one side of the switch and facing the second blade, with its pivotal axis spaced apart from the switch a distance greater than the length of the arm, a stationary stop located between the said pivotal axis and the switch and in position to engage the arm near its free end when the arm is at one end of its angular movement, a dog pivoted at one end to the arm at a distance from the said pivotal axis substantially less than the distance between that axis and the stationary stop; an element on the arm to engage the dog and limit its swinging movements on the arm between a normal position, in which the dog is crosswise of the arm with its free end adapted to travel up over said stationary stop when the arm is swung toward the latter, and a second position, wherein the dog has been shifted into, and then a little beyond, alignment with the arm; a spring tending constantly to hold said dog in said normal position; said dog having at its free end an edge to engage with the free end edge of the second blade and terminating in a sharp corner outwardly from that blade; the parts being so proportioned that when the arm is swung toward the stationary stop the dog is caused to rock on the stop, press both switch blades farther away from the stop, and then slide along the second blade and off the free end of the latter so as to stand in its said second position under the projecting end of the other blade, as the arm moves into engagement with the stationary stop.

DAVID MORRISON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,102,639	Benjamin	July 7, 1914
1,320,879	Litter	Nov. 4, 1919
1,447,171	Benjamin et al.	Mar. 6, 1923
1,768,943	Taylor	July 1, 1930