

C. J. KLEIN.
SNAP SWITCH.
APPLICATION FILED MAY 11, 1909.

985,421.

Patented Feb. 28, 1911.

Fig. 1

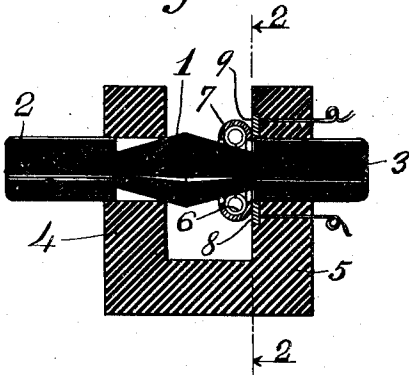


Fig. 2

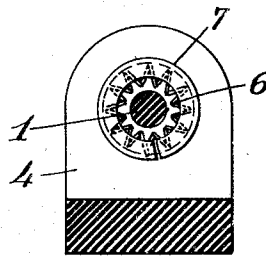


Fig. 3

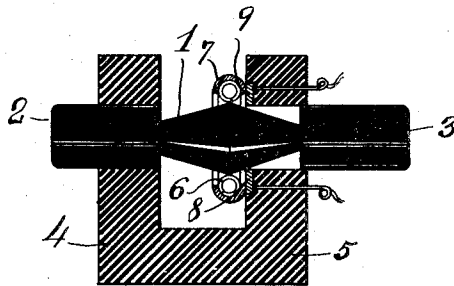


Fig. 4

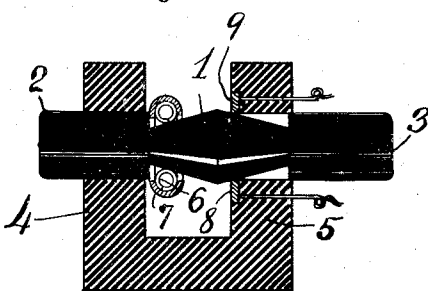
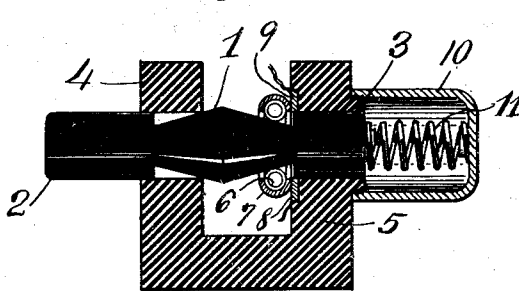


Fig. 5



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES J. KLEIN, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE CUTLER-HAMMER MFG. CO., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

SNAP-SWITCH.

985,421.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Continuation of application Serial No. 391,550, filed September 6, 1907. This application filed May 11, 1909. Serial No. 495,242.

To all whom it may concern:

Be it known that I, CHARLES J. KLEIN, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Snap-Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in electric switches.

It has for an object to provide improved means for operating the switch contacts which will enhance the efficiency of the switch as a whole.

It has for a further object to provide a structure which will be compact and efficient, and especially appropriate for certain types of switches, particularly for snap switches in which a quick break or quick make and break is desired.

While certain features of my invention are particularly appropriate for electric switches, the same may be applied in other relations and certain claims herein are intended to cover said features broadly.

In order to illustrate my invention more particularly, I have shown in the accompanying drawings certain features thereof in simplified form.

My invention may, of course, be embodied in various different forms and may be applied to switches of different types.

This application is a continuation of and a substitute for my prior application, Serial No. 391,550, filed September 6, 1907. Various species of the generic invention covered by this application are shown, described and claimed in other applications filed by me and identified as follows: Serial No. 393,793, filed September 20, 1907, renewal Serial No. 574,685, filed July 30, 1910. Serial No. 393,794, filed September 20, 1907, renewal Serial No. 588,784, filed October 22, 1910. Serial No. 416,933, filed February 20, 1908, renewal Serial No. 588,785, filed October 22, 1910. Serial No. 416,934, filed February 20, 1908, renewal Serial No. 588,786, filed October 22, 1910.

In the drawings accompanying this specification like parts have been given the same reference numeral in the several views.

Figure 1 is a sectional side elevation of a

simple form of switch in its closed position. Fig. 2 is a sectional end elevation on the line 2—2 of Fig. 1 looking in the direction of the arrows. Fig. 3 is a sectional side elevation similar to Fig. 1 showing the parts in the position in which the switch is about to open. Fig. 4 is a view similar to Figs. 1 and 3 showing the parts in position in which the switch has opened. Fig. 5 is a sectional side elevation showing a somewhat modified form of the switch.

I provide a cam member 1, which, in the structure shown in the accompanying drawing, is in the form of a double frustum or wedge, the frustums being arranged base to base, so that the cam has an enlarged central portion from which tapering faces extend inwardly toward the longitudinal axis of the cam member. In other words, the cam may be said to be in the form of a double wedge, in which the wedges are arranged base to base. The cam may, of course, assume various forms which will be the equivalent of that shown and will perform the same function. The ends of the cam are provided with operating buttons by means of which the cam may be moved in one direction or the other.

Any suitable supporting structure may be provided. For the purpose of illustration, I have shown two upright guides 4, 5 through which extend the buttons 2, 3. These guides may be formed by the walls of a suitable casing.

The cam is engaged by the helical spring 6. The periphery of the helices of the spring are directly engaged by an operating member, which, in the best embodiment of the invention, takes the form of a cam. In accordance with the invention, the helical spring engages a cam member and in the particular embodiment of the invention illustrated, the helical spring is shown in the form of a ring which entirely surrounds the cam member.

The cam and spring are so arranged and coact in such a manner, that by reason of their construction and the pressure between them, a bodily movement of one along the engaging surface of the other is secured, which movement takes place at an accelerated speed and independently of the push button or other operating means. In the form of the invention illustrated, the cam is

5 moved to secure a predetermined relation with respect to the spring and then the spring moves automatically and independently of the cam and of the operating push button so as to actuate the contacts, to make or break the circuit. This movement of the spring takes place in a similar path and in a reversed direction to the movement of the cam. It is thus impossible to stop the snap action of the make or break of the circuit by holding the push button.

10 Suitable means are provided for controlling the contacts of the electric circuit through the action of the helical spring whereby said circuit may be made and broken. In the best embodiment of the invention, I provide a separate contact member which, in the form illustrated includes a ring 7. It will be seen that over the helical spring extends a ring 7 which is preferably of curved cross-section and is split so that it may be spread to allow the helical spring to expand. This ring forms a movable switch contact which is adapted to bridge the stationary switch contacts 8 and 9 mounted upon the guide 5. Of course, the switch contacts may assume various forms and be arranged in different ways. The construction and arrangement of these contacts shown in the drawing has been selected merely for the purpose of a simple illustration of the application of my invention.

15 The guides in addition to supporting the cam, form stops to limit the bodily movement of the helical spring. In the form of the invention illustrated, the guides also limit the movement of the cam. Of course, any suitable form of stops may be provided for this purpose.

20 In Fig. 1 the switch contacts are shown in closed position and the cam member stands to the left of the helical spring. If now the cam member be moved toward the right, the right-hand cone will pass into the helical spring and spread it, as shown in Fig. 3, the helical spring bearing against its right-hand guide or stop 5. When the right-hand cone passes through the spring and the left-hand cone comes into engagement with said spring the pressure of the spring bearing upon the left-hand cone will cause the spring to slide quickly over said left-hand cone to the left, away from the right-hand stop until it reaches the position illustrated in Fig. 4. The switch contacts are thus quickly separated and the switch is opened.

25 If the parts be in the position shown in Fig. 4, the switch may be closed by moving the cam toward the left. The helical spring will bear against the left-hand guide or stop 4 and the left hand cone will pass into the same and spread it. When the right-hand cone comes into engagement with the spring the pressure of the spring upon the right-hand cone will cause it to slide quickly over

the same to the right until it engages the right-hand stop, thereby causing the movable contact 7 to quickly engage the stationary contacts 8 and 9 and close the switch.

30 The switch contacts may be of various forms, and associated with the operating elements of the structure in various ways. As hereinbefore stated, the structure that is shown in the drawing has been selected as a simple illustration of the general features of my invention. In practice, my invention may be embodied in many suitable forms.

35 The movement of the cam member 1 may be accomplished by hand, or the switch may be used in connection with various mechanical devices to automatically open and close a circuit.

40 One very common type of an automatically operated switch is a door switch. In Fig. 5 I have illustrated such a switch to which my invention is applied. In this figure the parts which correspond to those in Figs. 1 to 4, have been given the same reference numeral with the exponent prime, as, for instance, 1', 2'.

45 To the guide 5' is attached a tubular member 10 in which is arranged a spring 11 which is interposed between the button 3' and the outer end of the tubular member. The spring urges the cam member to its left-hand position in which position the switch is closed. When the switch is applied for use in connection with a door, it may be so arranged that the door may engage the button 2' and force the cam member to the right against the tension of the spring when the door is closed, thereby opening the switch. When the door is open the cam member is released and the spring forces it to the left, thereby closing the switch. Of course this form of switch may be applied in various relations.

50 The structure which my invention provides produces a switch which is simple and compact in construction, and efficient and durable in service, and in which there is a quick make and break between the contacts.

55 As has been previously said, the drawings in this application merely depict a simple form of my invention for the purpose of convenient illustration.

60 From the disclosure that I have made herein many different forms of switch may be devised to embody my invention. The drawings and foregoing description should therefore be construed not in a limiting sense but simply as illustrative of one of various embodiments of my invention.

65 What I claim is:

1. In an electric switch in combination, a cam, operating means, a spring directly engaging said cam, said spring and cam being movable relatively to cause coaction one with the other whereby one of said parts is caused to move bodily relatively to the other

at an accelerated speed independently of said operating means, and a switch contact associated with said spring and actuated thereby.

5 2. In an electric switch, in combination, a cam, operating means, a spring directly engaging said cam, said spring and cam being movable relatively to cause coaction one with the other whereby one of said parts is
10 caused to move bodily relatively to the other at an accelerated speed in a similar path by the movement of said cam at a predetermined point in its travel independently of said operating means, and a switch contact
15 associated with said resilient member and actuated thereby.

3. In an electric switch, in combination, a cam, operating means, a spring directly engaging and carried by said cam, said cam and spring being movable relatively to cause
20 coaction one with the other whereby one of said parts is caused to move bodily relatively to the other at an accelerated speed independently of said operating means, and
25 a switch contact associated with said spring and actuated thereby.

4. In an electric switch, in combination, operating means comprising a movable member having oppositely inclined conical
30 surfaces on either side of a line transverse in the axis thereof, and a spring operatively engaged by said inclined conical surfaces, caused to move bodily by the movement of
35 said first named member, and means whereby said spring and movable member are adapted to control an electric circuit.

5. In an electric switch, in combination, a cam, operating means, a spring directly engaging said cam, said spring and cam being
40 movable relatively to cause coaction one with the other whereby one of said parts is caused to move bodily relatively to the other at an accelerated speed in a similar path in a reversed direction independently of said
45 operating means, and a switch contact associated with the spring and cam and actuated thereby.

6. In an electric switch, in combination, operating means comprising two members
50 having the same linear motion, one of said members comprising a body provided with a plurality of operative relatively angular disposed facial portions grouped about a central axis of said body and the other of
55 said members being a spring arranged to be directly and operatively engaged with said facial portions in such arrangement that one of said members is caused to move bodily relatively to the other at an accelerated
60 speed independently of said operating means, and a switch contact associated with the members and actuated thereby.

7. In an electric switch, in combination, operating means comprising two members
65 having the same linear motion, one of said

members comprising a body of varying transverse sectional areas and provided with a plurality of operative relatively angularly disposed facial portions grouped about a central axis of said body and the other of
70 said members being a spring arranged to be directly and operatively engaged with said facial portions in such arrangement that one of said members is caused to move bodily
75 relatively to the other at an accelerated speed independently of said operating means, and a switch contact associated with the members and actuated thereby.

8. In an electric switch, in combination, operating means comprising two members
80 having the same linear motion, one of said members comprising a body provided with a plurality of operative relatively angularly disposed smooth facial portions grouped about a central axis of said body and the
85 other of said members being a spring arranged to be directly and operatively engaged with said smooth facial portions in such arrangement that one of said members is caused to move bodily relatively to the
90 other at an accelerated speed independently of said operating means and a switch contact associated with the members and actuated thereby.

9. In an electric switch, in combination, a
95 helical spring, a movable cam member engaged thereby, said cam member having a tapering face which may be brought into engagement with said helical spring to cause
100 said spring to move bodily over said tapering face, and means whereby said parts are adapted to control an electric circuit.

10. In an electric switch, in combination, a helical spring, a cam member having a tapering face, said cam member being movable
105 to bring said tapering face into engagement with said helical spring, whereby said helical spring will engage said tapering face, and cause bodily movement of one of said elements, and means whereby said parts are
110 adapted to control an electric circuit.

11. In an electric switch, in combination, a cam member having a conical portion, a helical spring circumferentially engaging
115 said cam, said cam being movable to bring said conical portion into engagement with said spring and cause bodily movement thereof relatively to said cam member, and means whereby said parts are adapted to
120 control an electric circuit.

12. In an electric switch, in combination, a cam member having two oppositely inwardly tapering portions, and a helical spring engaging therewith and caused to
125 move bodily relatively thereto, stops for limiting bodily movement of said spring, and means whereby said parts are adapted to control an electric circuit.

13. In an electric switch, in combination, a cam member in the form of a double frus- 130

tum positioned base to base, a helical spring engaging said cam member and caused to move bodily relatively thereto, and means whereby said parts are adapted to control an electric circuit.

14. In an electric switch, in combination, a cam having an operating portion of decreasing longitudinal cross section with a curved surface transverse to the axis thereof, a spring operatively engaging the curved surface of said cam and adapted to be caused to move bodily relatively thereto when in engagement with said operating portion thereof, and means whereby said parts are adapted to control an electric circuit.

15. In an electric switch, in combination, a longitudinally movable cam having an enlarged central portion with inclined surfaces on opposite sides thereof, a bodily movable spring yieldingly and directly engaging said cam whereby said cam may be moved relatively to said spring to cause an independent and accelerated movement of said spring, and means whereby said parts are adapted to control an electric circuit.

16. In an electric switch, in combination, operating means comprising a movable operating member having oppositely inclined conical surfaces, a spring directly engaging the conical surface of said operating member, said operating member being movable relatively to said spring whereby said spring partakes of bodily movement caused by coaction of said resilient member and the inclined surfaces, and means whereby said parts are adapted to control an electric circuit.

17. In an electric switch, in combination, operating means comprising a movable operating member having oppositely inclined conical surfaces, a spring directly engaging the conical surface of said operating member, said operating member being movable to transfer said spring from engagement with one of said surfaces to the other whereby said spring partakes of bodily movement caused by a coaction of said spring and the inclined conical surfaces, and means whereby said parts are adapted to control an electric circuit.

18. In an electric switch, in combination, an operating member having oppositely inclined conical surfaces on opposite sides of its center, a spring directly engaging and lying around said operating member, stops limiting bodily movement of said spring, said operating member being movable and so constructed as to pass its center through said spring to cause said spring to move bodily at an accelerated movement independently of the movement of said operating member, and means whereby said parts are adapted to control an electric circuit.

19. In an electric switch, in combination, a cam having oppositely inclined faces on

opposite sides of its center, a spring engaging therewith, said cam being adapted to be moved relatively thereto to bring one or the other of said faces into engagement with said spring to cause it to move upon said face at an accelerated speed, and means whereby said parts are adapted to control an electric circuit.

20. In an electric switch, in combination, a cam member having oppositely inwardly tapering portions, a helical spring engaging therewith, and caused to move bodily relatively thereto, and switch contacts associated with said parts and actuated thereby.

21. In an electric switch, in combination, a cam member in the form of a double frustum, a helical spring engaging therewith, means for limiting bodily movement of said spring and guiding said cam, and means whereby said parts are adapted to control an electric circuit.

22. In an electric switch, in combination, an operating cam member in the form of a double frustum with the frustums positioned base to base, a helical spring engaging therewith, means for limiting bodily movement of said helical spring, and means for actuating said cam member and switch contacts actuated by coaction between said cam member and said spring.

23. In an electric switch, in combination, a helical spring, a movable cam member engaged thereby, said cam member having a tapering face which may be brought into engagement with said helical spring to cause said spring to move bodily over said tapering face, and switch contacts associated with said elements and actuated thereby.

24. In an electric switch, in combination, a helical spring, a cam member having a tapering face, said cam member being movable to bring said tapering face into engagement with said helical spring, whereby said helical spring will engage said tapering face and cause bodily movement of one of said elements, and switch contacts associated with said elements and actuated thereby.

25. In an electric switch, in combination, a cam member having a conical portion, a helical spring circumferentially engaging said cam, said cam being movable to bring said conical portion into engagement with said spring, and cause a bodily movement thereof relatively to said cam, and switch contacts actuated by coaction between said cam member and said spring.

26. In an electric switch, in combination, a cam having two oppositely inwardly tapering portions, and a helical spring engaging therewith, and caused to move bodily relatively thereto, switch contacts associated with said parts and actuated thereby, and stops for limiting bodily movement of said spring.

27. In an electric switch, in combination,

a cam member in the form of a double frustum, positioned base to base, a helical spring engaging said cam member, and caused to move bodily relatively thereto, and switch contacts actuated by coaction between said cam member and said spring.

28. In an electric snap switch, the combination of a cam, a spring directly engaging said cam, operating means, said cam and spring coacting so that the pressure between them causes a quick bodily movement of one along the engaging surface of the other independently of the operating means, and means whereby said cam and spring by said bodily movement are adapted to control an electric circuit.

29. In an electric snap switch, the combination of a push button, a cam actuated thereby, a spring directly engaging said cam, said cam and spring coacting so that the pressure between them causes a quick bodily movement of one along the engaging surface of the other independently of the push button, and means whereby said cam and spring by said bodily movement are adapted to control an electric circuit, when said push button is actuated.

30. In an electric snap switch, a base, a double end push button projecting through each side of the base so as to be pushed from either side, said button having a cam portion, a spring directly engaging said cam portion, and a movable contact, the parts being so arranged and coacting that when said push button is pushed back and forth an accelerated movement is given to said contact independently of said push button.

31. In an electric snap switch, the combination of a push button, said push button having a portion carrying the cam, a spring directly engaging said cam, said cam and spring coacting so that the pressure between them causes a quick bodily movement of one along the engaging surface of the other, means whereby said cam and spring by said bodily movement are adapted to control an electric circuit, when said push button is actuated, and supporting guides for said push button adapted by contact with the faces of the cam to limit the movement of the push button.

32. In an electric snap switch, a base, a double end push button, projecting through each side of the base so as to be pushed from either side, said button carrying a cam portion, a spring directly engaging said cam portion, said spring having a portion which is bodily movable with relation to and along the engaging surface of the cam and a movable contact, the parts being so arranged and coacting that said cam and spring cooperate when said push button is pushed back and forth so that said contact is given an accelerated movement independently of said push button.

33. In an electric snap switch, the combination of a cam, a spring directly engaging therewith, switch contacts connected to one of said parts, means for moving one of said parts with relation to the other, so as to place said spring under tension and to secure a predetermined relation between said cam and spring, said cam and spring after said predetermined relation has been established, actuating said switch contacts independently of the means for moving one of the parts.

34. In a mechanical movement, the combination of a cam, a spring directly engaging said cam, an operated part, connections between said operated part and one of said members, means for moving one of said members with relation to the other so as to secure a predetermined relation between the cam and spring, said cam and spring actuating said operated part, after said predetermined relation has been established independently of the means for moving one of said members.

35. In a mechanical movement, the combination of a cam, said cam having an inclined face, a bodily movable spring directly engaging said cam, means for moving said cam to a predetermined position with relation to said spring, means whereby said cam and spring coact to cause said spring to partake of a quick bodily movement over the inclined surface of said cam independently of the means for moving the cam and after the predetermined position has been established and a part to be moved mechanically connected with said spring and actuated thereby.

36. In an electric snap switch, the combination of a cam, a tension spring directly engaging said cam, one of said parts being movable along the engaging surface of the other, operating means, said cam and spring coacting so that the pressure between them causes a quick movement of one along the engaging surface of the other independently of the operating means, and means whereby said cam and spring by said movement are adapted to control an electric circuit.

37. In an electric snap switch, the combination of a cam, a coiled tension spring directly engaging said cam, operating means, said cam and spring coacting so that the pressure between them causes a quick movement of one along the engaging surface of the other, independently of the operating means, and means whereby said cam and spring, by said movement, are adapted to control an electric current.

38. In an electric snap switch, the combination of a cam having two conical portions arranged base to base, a ring consisting of a helical spring directly engaging and circumferentially encircling said cam, the normal diameter of said ring being less than

that of the base of said conical portion of
said cam, stationary switch contacts, a push
button, said spring being bodily movable
along the face of said cam and adapted to
5 control the make and break of an electric
circuit to which said contacts are connected.

39. In a snap switch, the combination of
stationary contacts, a cam having two op-
positely tapering portions, said portions
10 being arranged base to base, a helical spring
ring directly engaging and surrounding said
cam and moving bodily relatively thereto,

and means for moving said spring along
said cam, said spring being adapted to make
and break an electric circuit to which said 15
contacts are connected.

In witness whereof, I have hereunto sub-
scribed my name in the presence of two
witnesses.

CHARLES J. KLEIN.

Witnesses:

A. C. MAAGE,

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