May 6, 1941. H. J. HAMMERLY 2,240,770

ELECTRIC SWITCH

Filed Feb. 26, 1938

Fig. 1.

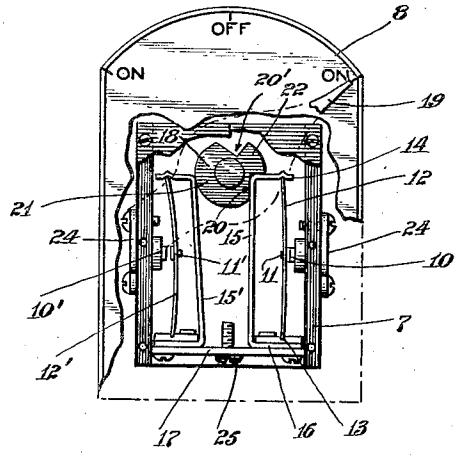


Fig. 2.

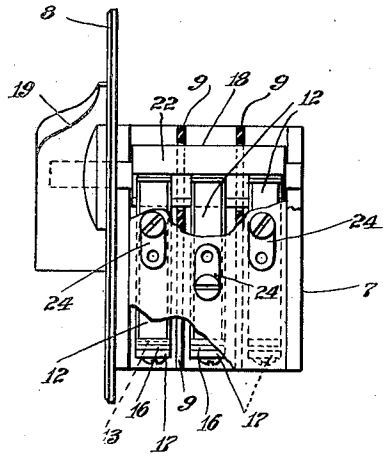


Fig. 3.

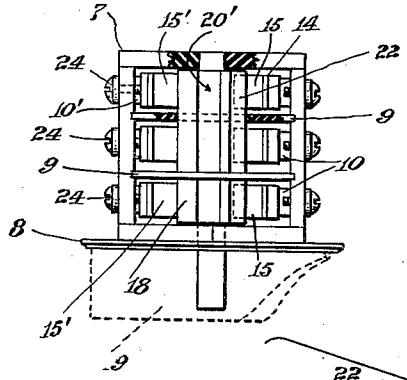


Fig. 4.

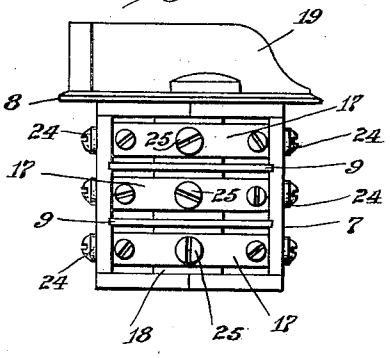


Fig. 5.

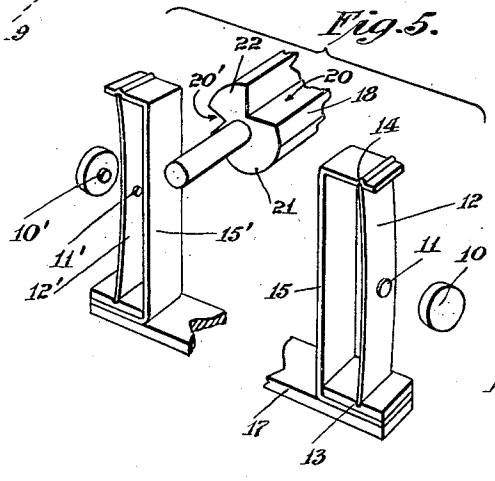
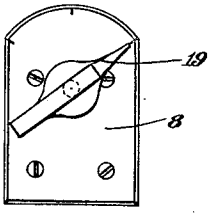


Fig. 6.



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ELECTRIC SWITCH

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Application February 26, 1938, Serial No. 192,681

8 Claims. (Cl. 200—67)

My invention relates particularly to quick make and quick break or snap action switches.

One object is to provide a very simple but reliable structure of few parts.

Another object is to provide a switch with a minimum number of bearings, joints or movable parts.

Another object is to provide a device which can be used for reversing circuits principally for machine tool control.

Another object is to provide a construction which can be used as a double-throw switch.

Another object is to provide a form of construction which can be readily embodied in a single pole or in a multipolar switch.

I accordingly utilize the properties of a buckling spring actuated by a cam device mounted in a suitable housing or box-like casing.

Fig. 1 is a front view of one form of switch embodying my invention, parts of the housing being broken away to show the interior. This shows a duplex type with two switch units actuated by a single cam. One unit is shown in a closed circuit position and the other in an open circuit position.

Fig. 2 is a side view with parts broken away to show the interior. This shows three switch units in the single housing.

Fig. 3 is a top plan view and partial section.

Fig. 4 is a bottom view.

Fig. 5 is an exploded perspective view of two switch units and a fragment of an actuating cam.

Fig. 6 is a front view on a somewhat smaller scale showing the actuating handle and indicating pointer.

The housing or casing 7 may be made of a number of parts of molded insulation suitably secured together and provided with a face plate 8. This housing is divided by means of partitions 9 into separate compartments for the various pairs of switch units.

Each switch unit has a stationary contact 10 carried for example by a wall of the housing and a movable contact 11 carried by a buckling spring switch member 12. One end of the spring 12 may be held stationary in a groove or notch 13 and the other end may be held in a groove in one end 14 of the operating bar or spring arm 15. This spring 12 is normally bowed slightly as shown in Fig. 1.

This spring arm 15 in the form shown is bowed or U-shaped and has one end 16 secured to a base plate or connector 17 which is mounted in one end of the housing 7.

The cam member 18 is mounted in the housing so that it can be turned back and forth and has a handle 19 with indicating positions. The companion switch unit has a stationary contact 10', a movable contact 11', a buckling spring switch member 12' and a spring arm 15'.

The cam member 18 is mounted between the movable ends of the spring arms 15 and 15' and serves, in this instance, to actuate the three pairs of switch units. The cam has a recess 20 into which the movable end of the spring arm 15 extends when the parts of the right hand unit are in the closed circuit or "On" position. The projection 21 serves to hold the parts of the left hand unit in the open circuit or "Off" position.

When the cam is turned counter-clockwise (as viewed in Fig. 1), the projection 21 moves the upper end of the spring arm 15 toward the right carrying with it the upper end of the buckling-spring 12. When this passes the center line, the spring 12 suddenly reverses its position and separates contacts 10 and 11 and thus opens the circuit with a snap action.

If the counter-clockwise movement of the cam member 18 is then stopped in the intermediate position with the contacts 10 and 11 separated, contacts 10' and 11' will also still remain separated and thus both sides of the circuit will be opened or "Off" but, if the counter-clockwise movement of the cam member is continued, the upper end of the spring arm 15', under its own initial bias or because of the force of the bowed spring 12 acting thereon, or both, will drop into the recess 20' and the spring 12' will buckle in the reverse direction similar to the position of spring 12 in Fig. 1 and close the circuit of the left hand switch unit with a snap action and thus the circuit will be closed at the left hand switch. The buckling of the spring 12' in this reverse direction is principally caused as follows: When the spring arm 15' under its own bias drops into the recess 20', the distance is increased between the recesses in which the ends of the spring 12' are disposed. This permits the spring 12' to move towards a straight position, and to a point where the bias in the spring snaps it across the center line so that the contact 11' abuts the contact 10'.

Obviously the cam member 18 may be turned from the intermediate position, either to the right or the left to open or close the circuit to reverse the circuit as desired.

Obviously also, the spring contact controlling portions of the cam member 18 may be so designed as to practically, if not fully, omit the intermediate position and accomplish the necessary

opening of one circuit and simultaneously close the other, or vice versa, in order to reverse the circuit.

The projection 22 of the cam member coacts with the movable ends of the spring arms 15 and 15' to limit the turning movement of the cam member as will be seen in Fig. 1.

Each of the stationary contacts of the switch units is provided with an external circuit terminal such as 24 and each of the connectors or base plates 17 is provided with a circuit terminal such as 25. It will of course be understood that the ends of the housing may be closed in any suitable manner.

The path of the closed or "On" circuit in each pole will be as shown in Fig. 1, i. e. from binding screw or terminal 25, through connector plate 17, through buckling spring 12, through contacts 10 and 11 to terminal 24 and to the load. When used as a reversing switch, the line wires will be secured to terminal 25 and the respective load wires will be secured to the terminals 24, 24 as shown at the right and left hand sides in Fig. 1.

It will be noted that the cam member 18 is the only pivoted part in the entire construction of this switch and this member is operated only manually and by means of a relatively large handle thus eliminating any possibility of sticking or failure to operate of any of the moving parts.

Attention is called to the fact that by reason of the peculiar mounting of the buckling spring and the arm which is connected to the movable end of the spring there is a slight sliding or tilting motion of the movable contact against the stationary contact just as the actuating pressure is applied by the movement of the arm. This tends to keep the surfaces of the contacts clean and prevents them from sticking together. In this respect the construction is an important improvement over those buckling spring switches which lack this action.

The marking on the face plate 8 of the switch will of course be such as to indicate the circuit condition created by the switch when the knob or handle 19 is in the indicated position—for instance if the contacts are connected for reversing action the words might be "Forward"—"Stop"—"Reverse." In the case of a double throw switch the marking would naturally be "On"—"Off"—"On".

Obviously, changes can be made in the structure shown without departing from the invention. For example, by a simple change the switches can be made to make contact instead of break contact when the spring arms 15 and 15' are actuated by the cam 18 or some other means.

I claim:

1. In an electric switch, an operating bar, means for supporting one end of the bar and means for moving its other end, the movable end of said operating bar being under a spring force in one direction to move it transversely of its length, a buckling spring connected to the operating bar at one end and fixed at its other and substantially parallel thereto, an abutment for the buckling spring disposed between the ends thereof, said buckling spring being in a bowed position with respect to said abutment when said movable bar is in normal position, movement of said operating bar in a direction opposed to said spring force moving the swinging end of the buckling spring toward the other end and decreasing the distance between the ends of said buckling spring so as to snap said buckling spring across its center line, and movement of said operating bar in the other direction under action of said spring force moving the swinging end of the buckling spring away from the other end and increasing the distance between the ends of said buckling spring to return said buckling spring to its normal position.

2. In an electric switch, a normally bowed buckling spring, means for supporting said buckling spring at each end thereof, an abutment for the buckling spring disposed between the ends thereof, at least one of said supporting means for the buckling spring being movable, the movable supporting means having a normal position and an operative position, said buckling spring being bowed towards said abutment when said movable supporting means is in normal position, said movable supporting means being under a spring force tending to retain it in normal position, means for moving said movable supporting means in a direction opposed to said spring force and normal to the plane of the abutment so as to decrease the distance between the ends of said buckling spring to snap said buckling spring across its center line, movement of said movable supporting means in the other direction under the action of said spring force increasing the distance between the ends of the buckling spring to return said buckling spring to its normal position.

3. In an electric switch, an operating bar, means for supporting one end of the bar and means for moving its other end, the movable end of said operating bar being under a spring force in one direction, a normally bowed buckling spring connected to the operating bar at one end and fixed at its other, a contact carried by said buckling spring, an abutment for the buckling spring disposed between the ends thereof and forming a stationary contact, said buckling spring being in a bowed position with the contacts in engagement when said movable bar is in normal position, and means for moving said operating bar in a direction opposed to said spring force in a direction normal to the plane of the abutment to decrease the distance between the ends of said buckling spring to snap the buckling spring across its center line, return movement of the operating bar under said spring force increasing the distance between the ends of said buckling spring to snap the buckling spring across its center line to its normal position in which said contacts are in abutment.

4. In an electric switch, an operating bar, means for supporting one end of the bar and means for moving its other end, the movable end of said operating bar being under a spring force in one direction, a buckling spring connected to the operating bar at one end and fixed at its other, a contact carried by said buckling spring, an abutment for the buckling spring disposed between the ends thereof and forming a stationary contact, said buckling spring being in a bowed position with the contacts in engagement when said movable bar is in normal position, and means for moving one end of said operating bar transversely to the plane of the stationary contact and in a direction opposed to said spring force to decrease the distance between the ends of said buckling spring and snap the buckling spring across its center line, return movement of the operating bar under said spring force increasing the distance between the ends of said buckling spring to snap the buckling spring

across its center line to its normal position in which said contacts are in abutment, the contact on said buckling spring being slidable with respect to the stationary contact in the act of breaking from said stationary contact.

5. A switch having a stationary contact, a normally bowed buckling spring having a contact carried thereby adapted to engage said stationary contact in one position, said spring being fixed at one end and movable at the other, a discrete operating spring substantially fixed at one of its ends adjacent the fixed end of the buckling spring and L-shaped and connected at its other end to the movable end of said buckling spring, said operating spring being under a spring force in one direction to move one end transversely of the general plane of the contact, the center of said buckling spring being normally bowed away from the central part of said operating spring with the contacts in engagement, and means for moving the movable end of said operating spring and the connected end of the buckling spring in a direction opposed to said spring force and transversely of the plane of the contacts to decrease the distance between the ends of the buckling spring to snap said spring across its center line, return movement of the operating spring under said spring force increasing the distance between the ends of said buckling spring to snap said buckling spring across its center line to its first position in which said contacts are in abutment.

6. A snap switch having a notched base member, an arm secured at one end adjacent said base member and having its opposite end movable and extending substantially transversely of the length of the main part of the arm and provided with a notch, said notches facing each other, a buckling spring having its ends positioned in the notches of the base and the movable end of the arm respectively, and normally bowed with respect to said arm in one circuit position, an abutment opposite the approximate center of the spring to receive the engagement of the central part of the bowed buckling spring, said arm being under spring force to move its movable end transversely of the buckling spring in one direction, and means for moving the movable end of said arm transversely and in a direction opposite to said spring force and decreasing the distance between said notches to snap the buckling spring across its center line to the other circuit position, return movement of the movable end of said arm under said spring force increasing the distance between said notches to snap the buckling spring across its center line to the first circuit position.

7. In an electric switch, an abutment, a normally bowed buckling spring strip supported at its opposite ends and normally biased at its central portion toward said abutment, a stationary support for one end of the spring strip, a movable support for the opposite end of the spring strip and means for moving the movable support transversely and in a direction inclined relative to the length of the spring strip and decreasing the distance between the supports and causing said spring strip to snap away from said abutment when moving the movable support in a direction toward the abutment and increasing the distance between the supports when moving the movable support away from said abutment and permitting the buckling spring to snap over to the abutment.

8. In an electric switch, an abutment, a normally bowed buckling spring strip supported at its opposite ends and normally biased at its central portion toward said abutment, a stationary support for one end of the spring strip, a movable support for the opposite end of the spring strip including a spring arm biased away from said abutment for moving the movable support in a direction inclined relative to the length of the spring strip and decreasing the distance between the supports and causing said spring strip to snap away from said abutment when moving the movable support in a direction toward the abutment and means for moving the movable support in a direction inclined relative to the length of the spring strip and increasing the distance between the supports when moving the movable support away from said abutment and permitting the buckling spring to snap over to the abutment.

HERMAN J. HAMMERLY.