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R. A. FRYKLUND

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ELECTRICAL SWITCH

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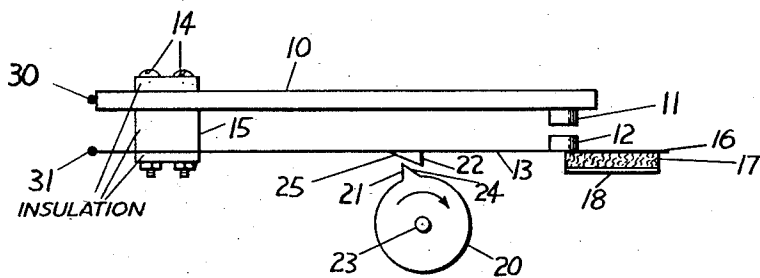


FIG. 1

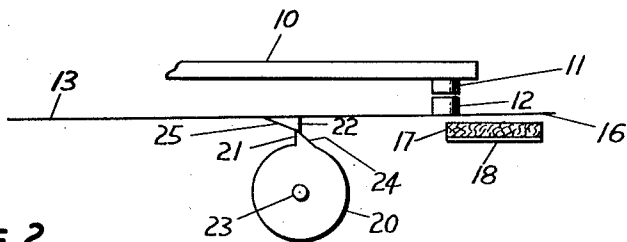


FIG. 2

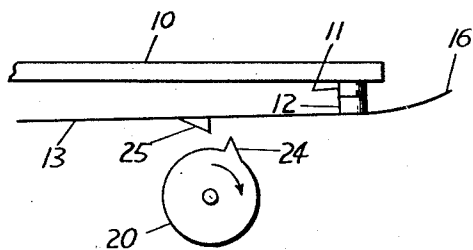


FIG. 3

INVENTOR
ROBERT A. FRYKLUND
BY *Elmer J. Jones*
ATTORNEY

UNITED STATES PATENT OFFICE

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ELECTRICAL SWITCH

Robert A. Fryklund, Somerville, Mass., assignor
to Raytheon Manufacturing Company, a corporation of Delaware

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6 Claims. (Cl. 200—30)

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This invention relates to electrical switches, and in particular to an improved momentary contact type switch.

It is an object of this invention to devise a momentary contact type switch which provides a single short and positive electrical contact when operated, without vibration or chatter.

It is another object to provide such a switch wherein the make stroke of a movable contact is fast and sharp and the return stroke is completely damped.

It is another object to provide such a switch which can be repeatedly operated with great rapidity to provide a series of short, positive electrical circuit-closing operations, and a further object to provide that said closing operations may be evenly spaced.

It is another object to provide a switch wherein electrical contact is made by a bouncing contact of one contact element with the other.

Other and further objects of the invention will become apparent from the detailed description of an embodiment thereof that follows. The description refers to the accompanying drawing wherein:

Fig. 1 illustrates diagrammatically a switch in accordance with the invention;

Fig. 2 illustrates a feature of the switch of Fig. 1; and

Fig. 3 illustrates the operation of the switch of Fig. 1.

Referring now to Fig. 1, the switch illustrated has a rigid and relatively massive backing member 10, of electrically conductive material, on one end of which one of the switch contacts 11 is mounted. This contact may be called the fixed contact. The second switch contact 12 is mounted near one end 16 of an electrically conductive flexible blade 13 which is fastened at the other end to the free end of the backing member 10 by bolts 14 or the like, but separated therefrom by an insulating spacer 15. Electrical connections (not shown) are made to the switch at terminals 30 and 31, on the backing member 10 and the blade 13, respectively. The thickness of the spacer 15 is such that the two contacts 11 and 12 are normally separated when the switch is at rest. The second contact 12 moves toward the fixed contact 11 when the switch is operated, and may therefore be called the movable contact. The material of the blade 13 extends beyond the movable contact 12 at said one end 16 for a purpose to be hereinafter described.

A soft inelastic pad 17 of felt or the like, suitable for absorbing an impact, is disposed adja-

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cent the blade 13 on the other side thereof from the movable contact 12, near or at the free end 16 thereof, the disposition being such that when the switch is in the rest position the free end 16 portion just touches the pad, as shown in Fig. 1. The pad is mounted on a rigid support 18, which is fixedly mounted with respect to the backing member 10. For example, the backing member 10 and support 18 may be mounted on the same base (not shown), as is readily apparent to those skilled in the art to which the invention relates.

A rotatable cam 20 operates the switch. The cam rotates in a clockwise direction about its center 23, which is fixed in position with relation to the backing member 10 and the other fixed parts of the switch. The cam is provided with a cam lobe 21 which has a gradual slope on its forward side 24 and falls off sharply on its trailing side. A cam follower 22 is mounted on the side of the blade 13 opposite the movable contact 12, intermediate the fixed end and the free end 16 thereof. The follower has a gradually sloped side 25 toward the fixed end, and falls off sharply at the other side. The cam 20 is so disposed that the forward side 24 of the cam lobe 21 makes contact with and slides along the sloped side 25 of the follower 22, thereby urging the blade 13 and movable contact 12 toward the fixed contact 11. Referring to Fig. 2, it will be seen that the dimensions of the parts of the switch are such that if the cam 20 is rotated slowly in the normal or clockwise direction until the cam lobe 21 has pushed the cam follower 22 as far as possible the contacts 11 and 12 will not touch each other.

The switch is operated by rotating the cam 20 at a sufficiently high rate to throw or cast the movable contact 12 onto the fixed contact 11 so that the movable contact will impinge on the fixed contact and bounce off it as a ball bounces off a wall. This action may be termed "ballistic." To this end, the cam lobe 21 must move by the cam follower 22 fast enough so that it quickly pushes the follower toward the backing member 10. This action provides a sudden force on the intermediate portion of the blade 13 about the fixed end thereof as a fulcrum. The free end 16 and the movable contact 12 are then hurled at a high rate of speed toward the fixed contact 11. The contacts come together with great force, making a strong, positive electrical contact. The contacts are resilient, however, and the movable contact 12 bounces off the fixed contact 11, so that the separation is very quick,

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and sparking, which occurs most easily when two contacts are slowly separated, is greatly minimized. By this time, the cam, which it will be remembered is rotating at a high rate, has rotated far enough so that the cam lobe 21 is no longer adjacent the cam follower 22, and the free end 16 of the blade 13 comes in contact with the pad 17. The pad is soft, and inelastic, so that the motion of the blade is completely damped, and ceases.

The movable contact 12 does not bounce away from the pad 17 toward the fixed contact 11. The switch makes a single circuit-closing contact, and does not make another such contact until again operated by the rotating cam. The circuit-closing contacts made by the switch occur in a uniform sequence when the cam 20 is rotated at a constant rate of rotational speed. The duration of the circuit-closing contact can be regulated by adding additional mass (not shown) to the free end 16 of the blade 13. The additional mass will provide a certain amount of added inertia which will have to be overcome in stopping and in reversing the direction of motion of the movable contact 12 before the contacts can be separated by the aforementioned bouncing action.

Many other variations and modifications of the invention will occur to those skilled in the art. Accordingly it is intended that the claims that follow shall not be limited by the details of the embodiment described herein, but only by the prior art.

What is claimed is:

1. A momentary contact electrical switch comprising a fixed contact, an inelastic pad fixedly disposed with relation thereto, a movable contact disposed between said fixed contact and said pad, and means for casting said movable contact at said fixed contact, said means comprising a cyclically operable actuator arranged to move at all times in a path which is fixed with relation to said fixed contact, and physically dimensioned to be able while moving in said path to urge said movable contact toward said fixed contact but not into contact therewith, and means to cause said actuator to move in said path with rapidity and thereby to cast said movable contact upon said fixed contact, said actuator dimensions providing at all times while in said path sufficient room for said movable contact to bounce back from said fixed contact.

2. A momentary contact electrical switch comprising a fixed contact, an inelastic pad fixedly disposed with relation thereto, a movable contact disposed between said fixed contact and said pad, means for casting said movable contact at said fixed contact, said means comprising a cyclically operable actuator arranged to move at all times in a path which is fixed with relation to said fixed contact, and physically dimensioned to be able while moving in said path to urge said movable contact toward said fixed contact but not into contact therewith, and means to cause said actuator to move in said path with rapidity and thereby to cast said movable contact upon said fixed contact, said actuator dimensions providing at all times while in said path sufficient room for said movable contact to bounce back from said fixed contact, and a relatively massive backing member in contact with said fixed contact on the side thereof away from said movable contact.

3. A momentary contact electrical switch comprising a fixed contact, an inelastic pad fixedly disposed with relation thereto, a movable contact

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disposed between said fixed contact and said pad, a rotatable cam having a cam lobe thereon disposed near said movable contact, a cam follower associated with said movable contact, said cam being dimensioned to provide that upon being very slowly rotated said lobe pushes said follower and with it said movable contact toward said fixed contact in a path directed substantially from said pad to said fixed contact, but is not able to bring or hold said contacts in physical contact with each other, and means rapidly to rotate said cam at a rate which provides that said cam follower is rapidly accelerated and casts said movable contact upon said fixed contact, the physical contact between the contacts occurring when said cam follower is separated from said cam.

4. A momentary contact electrical switch comprising a fixed contact, an inelastic pad fixedly mounted with relation thereto, a flexible arm, said arm being supported at one end and carrying a movable contact on the portion at the other end thereof, said portion being disposed between said fixed contact and said pad, with said movable contact confronting said fixed contact, and means for quickly and momentarily urging the intermediate portion of said arm in a direction tending to carry said movable contact to said fixed contact, said means comprising a cyclically operable actuator arranged to move at all times in a path which is fixed with relation to said fixed contact, and physically dimensioned to be able while moving in said path to urge said movable contact toward said fixed contact but not into contact therewith, and means to cause said actuator to move in said path with rapidity and thereby to cast said movable contact upon said fixed contact, said actuator dimensions providing at all times while in said path sufficient room for said movable contact to bounce back from said fixed contact.

5. A momentary contact electrical switch comprising a fixed contact, an inelastic pad fixedly mounted with relation thereto, a flexible arm, said arm being supported at one end and carrying a movable contact on the portion at the other end thereof, said portion being disposed between said fixed contact and said pad, with said movable contact confronting said fixed contact, and means for quickly and momentarily urging the intermediate portion of said arm in a direction tending to carry said movable contact to said fixed contact, said means comprising a cyclically operable actuator arranged to move at all times in a path which is fixed with relation to said fixed contact, and physically dimensioned to be able while moving in said path to urge said movable contact toward said fixed contact but not into contact therewith, and means to cause said actuator to move in said path with rapidity and thereby to cast said movable contact upon said fixed contact, said actuator dimensions providing at all times while in said path sufficient room for said movable contact to bounce back from said fixed contact and a relatively massive backing member in contact with said fixed contact on the side thereof away from said movable contact.

6. A momentary contact electrical switch comprising a fixed contact, an inelastic pad fixedly mounted with relation thereto, a flexible arm, said arm being supported at one end and carrying a movable contact on the portion at the other end thereof, said portion being disposed between said fixed contact and said pad, with said movable contact confronting said fixed contact, a rotatable

ble cam having a cam lobe thereon disposed near the intermediate portion of said arm on the side thereof opposite said movable contact, a cam follower projection mounted on said arm in said intermediate portion on said side, said cam being positioned so that when slowly rotated it pushes said follower only far enough to bring said contacts near each other without touching, and means rapidly to rotate said cam and thereby to cast said movable contact upon said fixed contact, 10 whereby said movable contact is cast upon but not squeezed against said fixed contact.

ROBERT A. FRYKLUND.

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