Feb. 12, 1935. H. C. NETTE 1,991,113

ELECTROMAGNETIC SWITCH

Filed March 30, 1932

Fig. 2

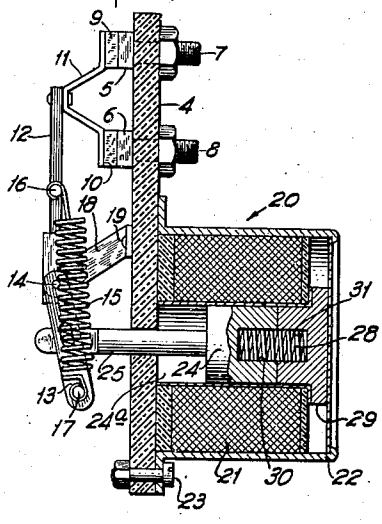
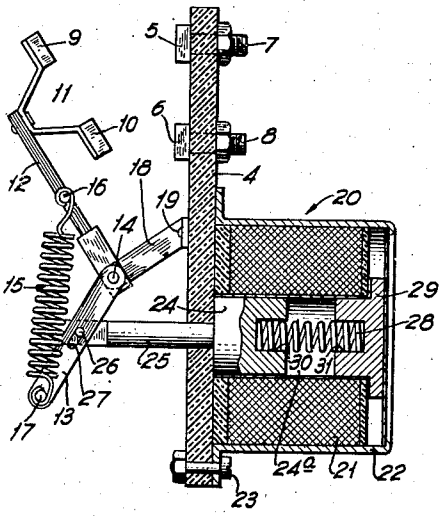


Fig. 3



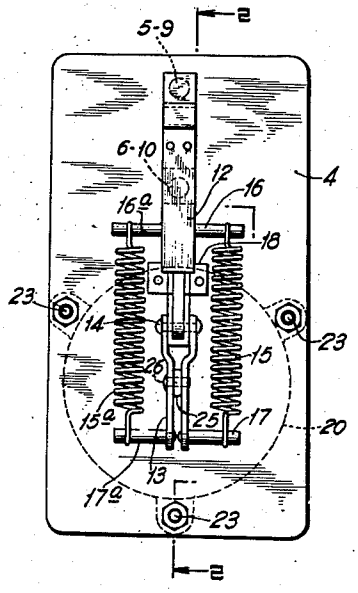


Fig. 1

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ELECTROMAGNETIC SWITCH

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1 Claim. (Cl. 200—67)

The present invention relates to electrical switches and more particularly to electro-magnetically operated remote control switches.

Heretofore, in switches of the above type, various structures have been employed using toggle mechanisms to operate the movable contacts of the switch in order to get a snap action in the closing and opening of the switch, the contacts being closed by the electro-magnetic attraction of a vertically arranged plunger or armature of the solenoid operating the lever of the toggle mechanism against the tension of a spring, and upon de-energization of the solenoid the plunger was operated by the force of gravity to again actuate the toggle mechanism for opening the switch with a snap action. Such devices, however, required that they be mounted in one specific position, namely, with the plunger of the solenoid in a vertical position so that it could be actuated by gravity to operate the toggle mechanism. Such types, although suitable for switchboard mounting, are not suitable in installations where the device is subjected to various motions whereby its position may be any other than vertical.

Accordingly one of the objects of the present invention is to provide a novel and improved structure of an electro-magnetically operated toggle switch which will operate efficiently when mounted in any position.

Another object is to provide in an electromagnetic toggle switch novel means whereby the toggle mechanism is effectively actuated to operate the switch upon de-energization of the solenoid of the switch regardless of the position of the solenoid.

Still another object is to provide in an electromagnetic switch, a novel and improved structure involving relatively few parts thereby making it possible to manufacture the switch economically in large quantities without detracting from the operating efficiency thereof.

The above and other objects and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description which follows, taken together with the accompanying drawing wherein one embodiment of the invention is illustrated. It is to be expressly understood, however, that the drawing is for the purpose of illustration and description only and is not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claim.

In the drawing, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a front elevation of one form of switching device embodying the present invention;

Fig. 2 is a sectional elevation taken on line 2—2 of Fig. 1 showing the switch in its closed position; and

Fig. 3 is a similar view of the switch structure shown in Fig. 2 when the switch is in its open position.

The foregoing objects are obtained in accordance with a feature of the invention by the provision of a spring controlled solenoid which insures a positive operation of the toggle mechanism when the solenoid is de-energized and safeguards against accidental disturbance of the toggle mechanism when the switch is in its open position.

A switching mechanism embodying the present invention comprises essentially a pair of movable contacts carried by a switch arm and arranged to engage a pair of fixed contacts carried by an insulating base plate or support through the operation of a toggle mechanism actuated by an electro-magnet or solenoid, the toggle mechanism being operatively connected to the armature or plunger of said electro-magnet or solenoid.

Referring to the drawing, the switching mechanism embodying the invention in the form shown, comprises a base plate or support 4, preferably of some suitable insulating material such as hard rubber or phenol-condensation product, upon which are mounted a pair of fixed contacts 5 and 6 of the switch and arranged to be connected to any suitable electrical circuit (not shown) by means of binding posts 7 and 8. The electrical circuit to which the fixed contacts 5 and 6 may be connected is arranged to be closed by a pair of movable contacts 9 and 10 through a conducting bridge member 11 carried by an insulating switch arm 12 which forms a part of the toggle mechanism for operating the switch. The other part of the toggle mechanism is constituted by a lever 13 which is connected together with the switch arm 12 on opposite sides of a pivot 14 by means of a pair of springs 15 and 15*a*. The opposite ends of the springs 15 and 15*a* are secured to pins 16, 16*a* and 17, 17*a*, carried by the switch arm 12 and lever 13, respectively. The pivotal connection 14 between the switch arm 12 and the lever 13 is formed by a bracket 18 secured to the base

plate or support 4 in any suitable manner as by means of rivets 19.

Means are provided for actuating the toggle mechanism to operate the switch arm 12 for closing the contacts 5, 9 and 6, 10, and in the form shown comprise an electro-magnet or solenoid 20 which includes a coil 21 mounted in a casing or cover 22 secured to the base plate or support 4 in any suitable manner, as by means of screws, one of which is shown at 23, and an armature 24 concentric with and arranged to be operated by the coil 21 within a chamber 24*a* upon energization of said coil 21. Secured to or formed integral with the armature which is in the form of a piston, is a rod 25 pivotally connected to the lever 13 by means of a pin 26 carried by said rod and operating in a slot 27 formed in the lever 13. It will now be apparent that upon energization of the coil 21 from any suitable force (not shown) controlled from a remote point, the armature 24 will be actuated by electro-magnetic attraction, to the right as viewed in Figs. 2 and 3, thereby pulling the lever 13 to the right to bring the spring 15 under tension, and as soon as the lever 13 and the switch arm 12 pass the position in which they are in alignment with the spring 15, the latter will rapidly actuate the switch arm 12 to bridge the contacts 5 and 6 by means of contacts 9 and 10 and the bridge member 11.

It will be apparent, however, that unless some means are provided for actuating the toggle mechanism upon de-energization of the solenoid 20 the switch will not open unless the armature or piston 24 is actuated by gravity, which may be possible only when the solenoid is in a vertical position but not possible when in the horizontal position shown in the drawing. To this end and in accordance with the invention, novel means are provided whereby upon de-energization of the solenoid 20 the toggle mechanism is effectively actuated to open the switch with a rapid snap action in substantially the same manner as when it is operated to its closed position. In the form shown said means comprise a coil spring 28 interposed between the armature 24 and a fixed member 29 and which is prevented from being dislodged by having a portion at either end thereof fitted within annular recesses 30 and 31 formed in the armature 24 and the member 29, respectively.

It will now be seen that upon energization of the solenoid 20 the toggle mechanism of the switch is actuated by operation of the armature 24 against the compression of the spring 28, the latter being wholly compressed within the recesses 30 and 31, and upon de-energization of the solenoid 20 the energy stored within the spring 28 causes the armature 24 to be operated in the opposite direction thereby actuating the toggle mechanism 12, 13 to open the contacts 5, 9 and 6, 10.

From the foregoing it will be apparent that there is provided a novel electro-magnetically operated switching mechanism embodying a toggle which may be operated no matter in what position the entire mechanism may be and it is, therefore, particularly suitable in aircraft installations where a switch cannot be mounted in any particular position since its position is subject to change with a change in the flying attitude of the craft, and hence at one instant the switch may be in a horizontal position and in the next instant may be in a vertical position or in any other in-between position.

Although only one embodiment of the invention has been illustrated and described other changes and modifications in the form and arrangement of parts, which will now appear to those skilled in the art, may be made without departing from the scope of the invention. Reference is, therefore, to be had to the appended claim for a definition of the limits of the invention.

What is claimed is:

An electric switch comprising a single insulating base plate, a support extending from one side of said plate and pivotally carrying a pair of oppositely extending arms, electrical contacts carried by one of the arms adapted to engage contacts on said base plate, pins on each of said arms extending oppositely and parallel to the pivotal axis of the arms, tension springs connected between the pins on either side of the arms and adapted to coact in toggle fashion with the said arms to move them both either toward the plate or away therefrom, operating means for closing said switch arranged behind said base plate, an operating rod associated with said operating means extending through the plate and connected by a pin and slot connection to the other pivotal arm, a spring associated with said operating means urging said rod in the opposite direction to open the switch upon release of said operating means, said rod having a shoulder adapted to engage the rear surface of said base plate and limit the movement thereof in one direction.

HENRY C. NETTE.