Oct. 25, 1938. C. T. EVANS ET AL 2,134,179

ELECTRIC SWITCH

Filed June 13, 1935

Fig. 1

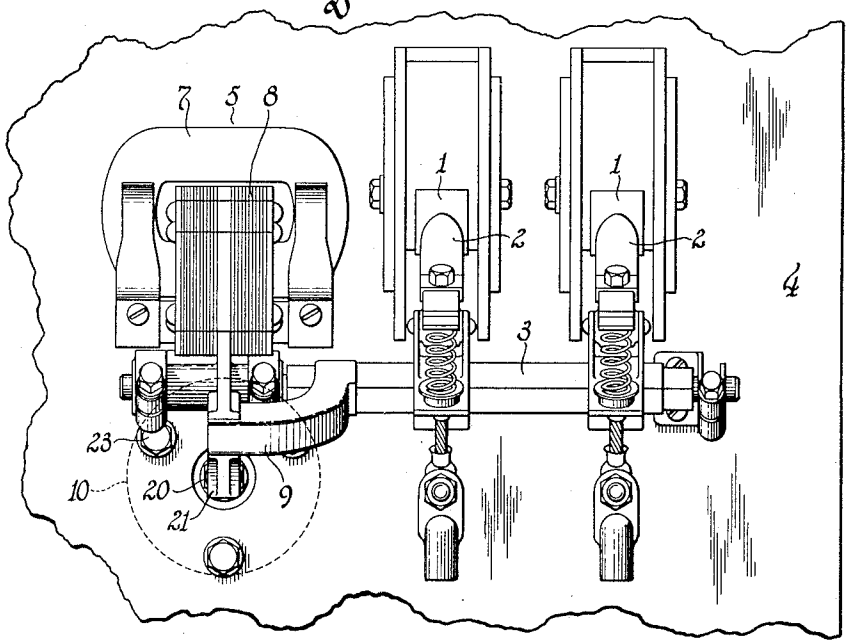


Fig. 2

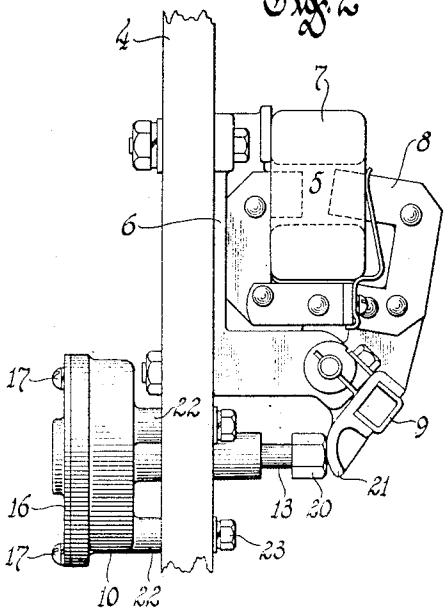
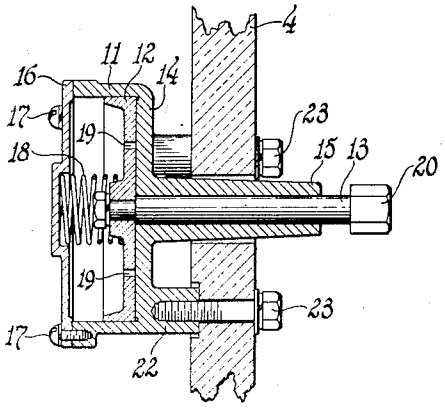


Fig. 3



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ELECTRIC SWITCH

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3 Claims. (Cl. 200—166)

This invention relates to electric switches, and while not limited thereto is particularly applicable to electromagnetically operated switches for use in welding control systems.

Control systems of various types, and particularly welding controllers, require electromagnetic control switches of relatively large current carrying capacity which are exceedingly quick acting and are responsive to an energizing current of relatively low value. Electromagnetic switches having a relatively small air gap tend to operate quickly in response to an energizing current of relatively low value but it is difficult to prevent switches of this character from reestablishing circuit when deenergized due to rebound of the movable parts out of open position.

The present invention has among its objects to provide an improved buffer device for switches of the aforesaid character which acts to frictionally dissipate the kinetic energy present in the switch parts when moved into open position to prevent rebound thereof out of such position.

Another object is to provide an improved buffer device of the aforesaid character which is simple and rugged in construction and positive and reliable in operation.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of modification without departing from the spirit and scope of the appended claims.

In the drawing,

Figure 1 is a front elevational view of an electromagnetically operated switch having a buffer embodying the invention associated therewith;

Fig. 2 is a side elevational view of the operating magnet and buffer shown in Fig. 1, and

Fig. 3 is an enlarged sectional view of said buffer.

Referring to Fig. 1, the switch shown therein is of a conventional type having cooperating stationary and movable contacts 1 and 2, the latter being mounted upon an insulated section of a rotatable shaft 3 carried by suitable bearings fixed to an insulating panel 4. Shaft 3 has an operating magnet 5 associated therewith, said magnet being provided with a magnet frame 6 secured to panel 4, a winding 7 mounted upon said frame, and a cooperating armature member 8 which is mounted upon shaft 3, or if desired upon a separate shaft, alined with shaft 3. Armature member 8 is operatively connected to shaft 3 by an arm 9 and upon energization of winding 7 said armature member is attracted inwardly from the position shown in Fig. 2 to effect engagement of the movable switch contacts 2 with the stationary contacts 1. Upon deenergization of winding 7, armature member 8 and the movable contacts carried by shaft 3 drop out and are arrested without rebound in open position by the buffer 10.

Buffer 10 includes a cylinder 11 which is of large diameter relative to its lentgh and a piston 12 movable within said cylinder and fixed to a piston pin 13. The front end of cylinder 11 is closed by a wall 14 having a forwardly extending projection 15 thereon which is drilled to receive the piston pin 13, and a cover 16 is secured to the rear face of said cylinder by screws 17 to provide a tight enclosure for the piston 12. Piston 12 has a flat front face and is biased to move forwardly into engagement with a flat face on the rear of wall 14 by a spring 18 held under compression between said piston and the cover 16. Said piston may have one or more drilled openings 19 therein the purpose of which will be hereinafter set forth, and the front end of piston pin 13 has a cap nut 20 threaded thereon to be engaged by a downwardly extending tail piece 21 on armature member 8.

The buffer is designed for mounting upon the rear of panel 4, and for this purpose the front wall 14 of cylinder 11 has a plurality of forwardly projecting lugs 22 thereon for engaging the rear face of said panel. Panel 4 is drilled to provide an opening for receiving projection 15 on cylinder 11 and said panel is also drilled to receive a plurality of securing screws 23 which are threaded into tapped openings in the lugs 22. It is, of course, apparent that the buffer may be modified to adapt the same for mounting upon the front face of panel 4 or upon the magnet frame 6.

The function and operation of the aforedescribed buffer will now be more fully set forth.

Normally piston 12 is held in engagement with the front wall 14 of cylinder 11 by spring 18 and outward movement of the armature member 8 and the switch parts associated therewith is limited by engagement of tail piece 21 with the front face of the cap nut 20 on piston pin 13. In practice spring 18 is so designed that the force exerted thereby is only slightly greater than is necessary to prevent movement of piston 12 out of normal position by the weight of the movable switch parts.

Upon energization of winding 5 armature member 8 is moved into its attracted position to effect engagement of the movable contacts 2 with stationary contacts 1 and the tail piece 21 on said armature member moves out of engagement with the cap nut 20 on piston pin 13. Upon deenergization of winding 7 armature member 8 and the movable switch parts associated therewith drop out to disengage the movable contacts 2 from stationary contacts 1 and immediately upon sufficient separation of said contacts to effect interruption of the circuit or circuits controlled thereby tail piece 21 moves into engagement with the front face of cap nut 20. The inertia of armature member 8 of the movable switch parts associated therewith then cause inward movement of piston 12 within cylinder 11 against the action of spring 18.

During inward movement of piston 12 within cylinder 11 the air in said cylinder is forced from the rear of piston 12 to the front thereof through the clearance between said piston and cylinder 11 and through the openings 19 in said piston. The piston 12 thus acts to retard outward movement of armature member 8 and the movable switch parts associated therewith to thereby frictionally dissipate part of the kinetic energy present in these parts upon engagement of tail piece 21 with cap nut 20, the remainder of the kinetic energy in these parts being stored in spring 18. In practice piston 12 is of such diameter that a slight clearance is provided between the same and cylinder 11 and the retarding effect of the buffer device is adjusted by providing one or more openings 19 in piston 12 so that said piston moves through a substantial part of its stroke under the action of the moving switch parts. Upon cessation of outward movement of the movable switch parts the energy stored in spring 18 acts to return piston 12 into engagement with the wall 14 of cylinder 11. During outward movement of piston 12 the energy stored in spring 18, due to opening of the switch, is frictionally dissipated by the passage of air from the front of said piston to the rear thereof and the movable switch parts are thus brought to rest in normal position without rebound. The switch can thus be provided with a relatively small air gap to render the same quick acting and responsive to an energizing current of relatively low value.

It should be noted in connection with the foregoing that the buffer device never interferes with closing movement of the switch and the switch is thus always responsive immediately upon energization of its operating winding. It should also be noted that the buffer is so arranged that there is substantialy no sliding movement of the tail piece 21 with respect to the cap nut 20 upon opening of the switch and the wear on these parts will thus be negligible.

What we claim as new and desire to secure by Letters Patent is:

1. The combination with a movable switch element biased to interrupt circuit, of a stop member normaly positioned to abut said switch member upon biased movement thereof into a given limit, said stop member being movable out of normal position to permit overtravel of said switch element beyond said limit and being biased towards normal position to effect return of said switch element to said limit, and a dash pot associated with said stop member for retarding movement thereof out of and into normal position, said dash pot including a stationary cylinder having an enclosing wall on one end thereof and a piston within said cylinder fixed to said stop member and normaly located adjacent said enclosing wall.

2. The combination with a movable switch element biased to interrupt circuit, of a stop member normally positioned to abut said switch member upon biased movement thereof into a given limit, said stop member being movable out of normal position to permit overtravel of said switch element beyond said limit and being biased towards normal position to effect return of said switch element to said limit and a dash pot associated with said stop member for retarding movement thereof out of and into normal position, said dash pot including a closed stationary cylinder of large diameter relative to its length and a piston within said cylinder fixed to said stop member and normaly located adjacent one of the end walls of said cylinder.

3. In an air break switch, cooperating stationary and movable contacts normally having only a relatively small air gap therebetween, an operating element for the latter of said contacts movable in one direction into a position to effect engagement of said contacts and biased for movement in a reverse direction to disengage said contacts and means for arresting said operating element without rebound upon biased movement thereof, said means including a yieldable stop engaged by said operating element upon normal disengagement of said contacts but permitting said operating element to continue its biased movement with consequent abnormal widening of the air gap between said contacts and thereafter returning said operating element for restoration of said normal air gap between said contacts, and said stop including means functioning during overtravel of said element and during return to such position to frictionally dissipate the kinetic energy stored in said operating element and to thereby prevent overtravel of said operating element upon its return movement.

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