Oct. 1, 1929. H. D. JAMES ET AL 1,729,876

CONTROL APPARATUS

Filed Oct. 24, 1922

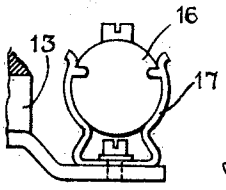


Fig. 4.

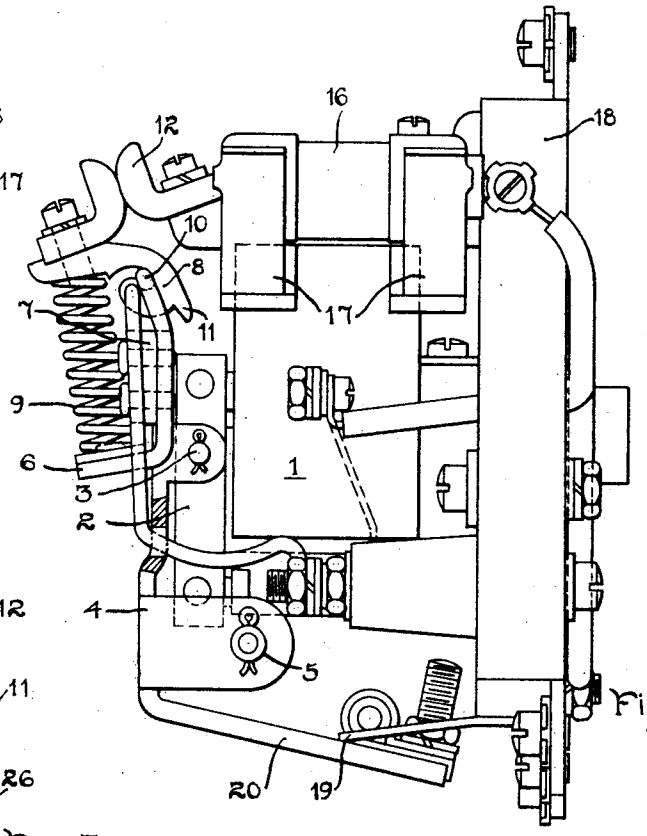


Fig. 1.

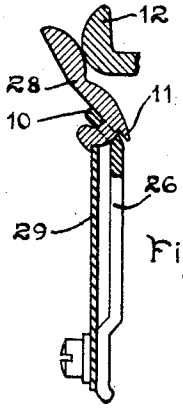
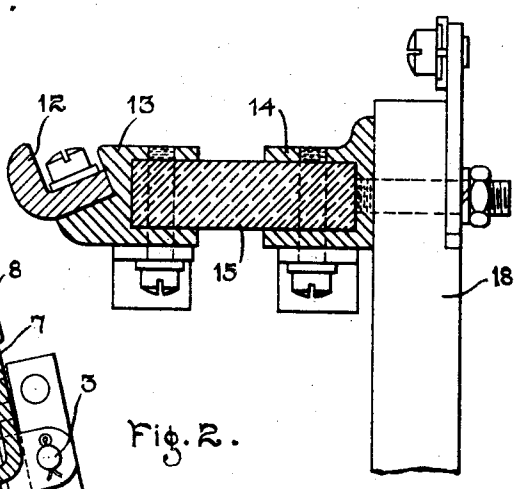


Fig. 3.



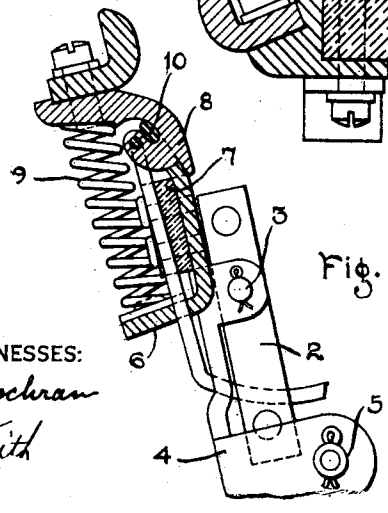


Fig. 2.

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UNITED STATES PATENT OFFICE

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CONTROL APPARATUS

Application filed October 24, 1922. Serial No. 596,624.

Our invention relates to switching apparatus and it has particular relation to electromagnetic switches that are employed for starting alternating-current motors.

The object of our invention is to produce a simple and effective switch with overload and no-voltage protection.

According to the present invention, we provide an alternating-current electromagnetic switch with any desired number of pairs of contact-members. The switch-magnet is assembled from laminations in the customary manner, and the armature and movable contact-supporting members are formed from steel punchings. The movable contact member is pivotally mounted upon a bearing disposed in the end of the supporting member and is maintained in proper position by means of a contact spring. The arrangement of contact members is such as to eliminate the necessity for bearing and cotter pins and, therefore, is of material advantage. The contact members may be easily removed and adjusted.

A suitable structure for supporting the stationary contact member also supports a thermal overload relay unit. This unit is mounted in spring clips so that it may be conveniently adjusted and replaced in accordance with the varying load requirements. It will be recognized that a switch of this character is desirable for use with motors that may be thrown directly on the line. While affording protection against sustained overload, the thermal unit provides an inherent time element, so that the current peaks during the starting period will not interrupt the motor circuit, as may happen when fuses are employed, unless the latter are of greater capacity than is proper for protection during normal operation.

In the accompanying drawings,

Figure 1 is a view, in elevation, of one form of apparatus embodying our invention,

Fig. 2 is a view, partially in section, illustrating the arrangement of the switch contact members,

Fig. 3 is a view representing a modification of certain parts illustrated in Fig. 2, and

Fig. 4 is an end view of one of the thermal relays with its spring-clip mounting.

Referring particularly to Fig. 1, our starting switch is provided with an electromagnet having a coil 1, and a pivotally mounted armature 2 that is supported from a bearing 3. The bearing 3 is supported, in turn, by a contact-carrying member or punching 4, which rotates upon a bearing 5. Any desired number of movable contact-supporting members or punchings 6 may be carried by the contact-carrying member or punching 4, when suitably spaced along an insulating bar 7. One end of the punching 6 is slotted to accommodate the bearing portion of a movable contact member 8. (See Fig. 2.) A contact spring 9, disposed between the contact support 6 and the contact member 8, maintains the contact member in proper position against its bearing 10. The movement of the contact member 8 is controlled by a projection or stop 11 which engages the member 6 when the switch is in its open position.

A stationary contact member 12 is supported on a structure comprising contact blocks 13 and 14 which are separated by means of a suitable insulating member 15 (Fig. 2). A thermal overload relay 16 is preferably mounted in phosphor-bronze spring clips 17, which are respectively connected to the contact blocks 13 and 14. The thermal relays 16 may be of any suitable design, the details of which form no part of our present invention. They are, however, preferably of the cartridge type, similar in appearance to an ordinary fuse.

The entire switch is mounted upon an insulating base 18 and may be enclosed in a dust-proof cabinet (not shown). Interlock contact members 19 may be actuated by the movement of the tail-piece 20 of the switch in a well-known manner, in connection with various control circuit-combinations.

The switch may be actuated to its closed position, as illustrated in Fig. 1, by means of the operating coil 1, a circuit for which is commonly provided by means of "start and stop" push buttons. Contact member 8 engages member 12 with a rolling motion usual in switches of the contactor type. The

interlock contact members 19 preferably constitute parts of a holding-circuit, of a familiar character, for maintaining the switch in its closed position. The operation of the thermal overload relay 16, which is connected directly in the main switch circuit, will effect the opening of the switch in the event that an overload occurs of sufficient duration to otherwise cause injury to the motor or apparatus controlled thereby.

Upon the opening of the switch, the holding circuit through the interlock 19 becomes inoperative, and, in order to again close the switch, it is necessary to actuate the starting push button or such other device as may be employed in connection with various types of well-known control systems, to which our invention is applicable.

Although we have illustrated only one pair of contact members, other duplicate pairs may be mounted as described. The contact spring 9 is easily removable and the contact member 8 is thereupon released for renewal or adjustment. The omission of cotter pins in connection with the movable contact bearing 10 is a distinct advantage. Such pins are frequently lost or drop out during normal operation of the switch, causing no little inconvenience and occasional interruption of service. The overload-relay units 16 may be removed and replaced without the use of tools and the switch may, therefore, be readily employed for operating various motors and other devices at different current ratings.

In Fig. 3, we have illustrated another form of our switch contact device in which contact-supporting member 26, movable contact member 28 and contact spring 29 correspond, in function, respectively, to the parts 6, 8 and 9 of Fig. 1. The movable contact member 28 is made in one piece and the flat contact spring 29, which is preferably of phosphor bronze, is of sufficient capacity to act as a current-carrying conductor, or shunt, for the contact member 28. Other modifications may readily occur to one skilled in the art.

We claim as our invention:

1. A switch comprising a movable contact carrying member formed of a steel punching, a bearing slot formed in one end thereof, a movable contact member having a hook-shaped bearing member for engaging said slot, a spring support formed from said contact-carrying member, and a spring mounted on said support to maintain said hook-shaped member in an operative position.

2. A switch comprising a contact-carrying member formed of a metal punching having a bearing slot cut transversely in its end portion, a rolling contact member having a hook-shaped member for engaging in said bearing slot and a single means, comprising a contact spring, for maintaining said contact member in operative rotatable relation to said bearing, and a main bearing portion punched from said contact-carrying member.

In testimony whereof, we have hereunto subscribed our names this 11th day of October, 1922.

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