Oct. 30, 1934. J. B. VACHRIS ET AL 1,978,729

ELECTROMAGNETIC DEVICE

Filed June 13, 1931

Fig. 1.

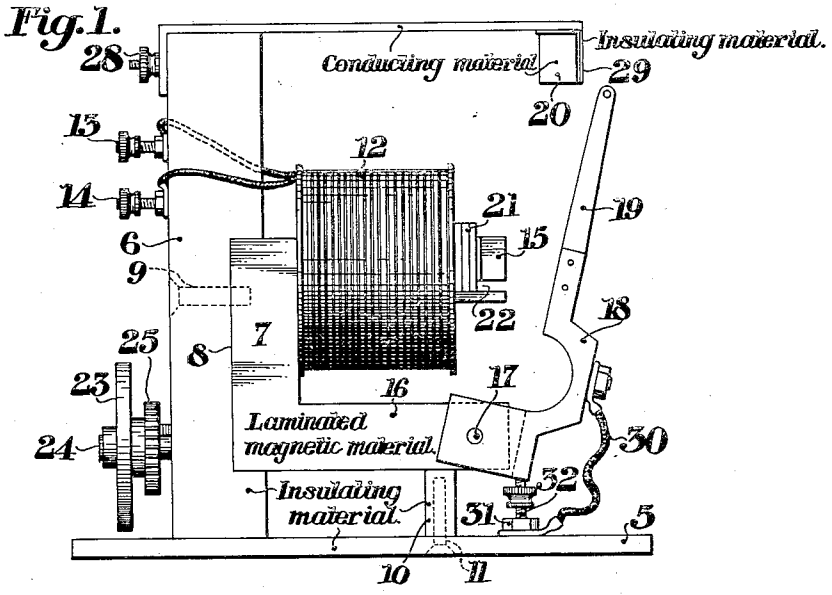


Fig. 2.

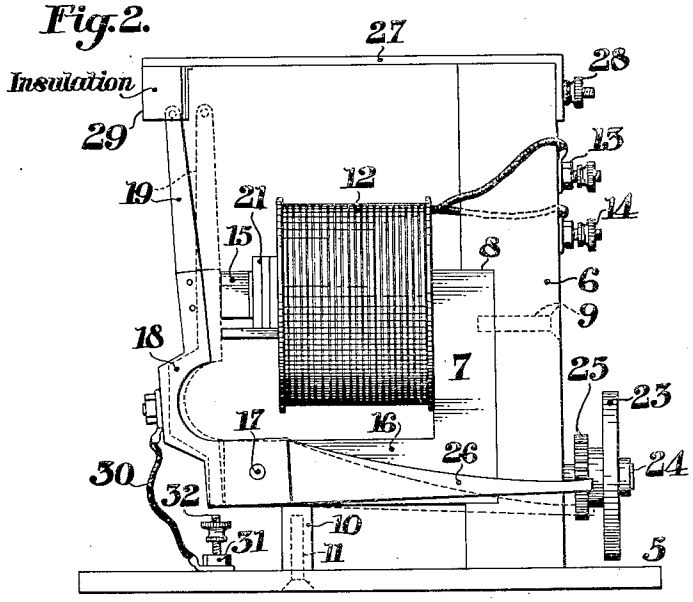


Fig. 3.

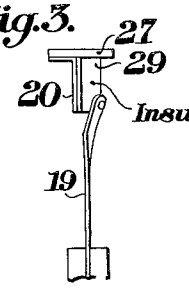
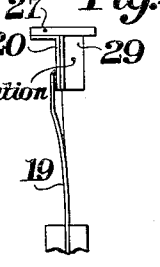


Fig. 4.



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UNITED STATES PATENT OFFICE

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ELECTROMAGNETIC DEVICE

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3 Claims. (Cl. 200—97)

This invention relates to electromagnetic devices and more particularly to electromagnetic devices wherein the contacts of the device are held closed for a predetermined interval.

At the present time, electromagnetic devices include those in which the make contacts of the device are held closed only during the time that the device is energized. Another type of such device is arranged to release or open its break contacts slowly, and is commonly known as a slow-releasing relay. The third type of device is arranged so that when the device is energized it is sluggish in closing its make contacts. The present device is of that type in which the device is sluggish in opening its make contacts but holds these contacts closed for a predetermined interval.

The main feature of the invention resides in the provision of an electromagnetic device in which the contactors thereof make a fleeting contact of a predetermined duration and after this contact is completed, the device quickly restores its armature to normal position. A further feature of the invention relates to an electromagnetic device including inertia mechanism which is effective during a certain portion of the release of the device to maintain a fleeting contact of predetermined duration, the period of which is determined by the inertia mechanism. These and other features of the invention will appear from the detailed description and pending claims.

Referring to the drawing, Fig. 1 is an elevational view of one side of the device; Fig. 2 is a similar view of the reverse side of the device showing in full and in dotted lines the armature and regulating device in two different positions; and Figs. 3 and 4 are detail views of two different positions of the fixed contact and armature contact of the device.

Referring especially to Figs. 1 and 2, 5 designates a base of insulating material to which there is attached an upright 6 also of insulating material. A core 7 formed of U-shaped laminations, is fastened in a cut-out portion 8 in the upright 6 by means of a screw 9; while the free end of the lower leg 16 of the core is supported on a hollow post 10 of insulating material through which a screw 11 passes to hold the core 7 and the post 10 in fixed relation to the base. The upper leg 15 of the core is surrounded by a solenoid 12, the two ends of which are connected to terminals 13 and 14. It will be understood, of course, that these terminals 13 and 14 are intended to be connected to a source of energizing current. The free end of the leg 15 of the core is slotted, as shown at 22, so that copper washers 21 may be fastened on this leg, as shown, to give the effect of a shaded pole magnet. On the free end of the lower leg 16 of the core, there is pivoted at 17 an armature 18, which has relatively large mass so that it possesses considerable inherent inertia. At the upper end of the armature 18, there is attached a flexible contact blade 19, biased toward the left as shown in Fig. 3, and adapted to cooperate with the fixed contact 20, as will be further pointed out.

An inertia disk or wheel 23 is mounted to rotate freely on a horizontal shaft or post 24 secured in the upright 6 near one end of leg 16. On the disk 23 there is fastened a ratchet wheel 25 by means of which the inertia disk may be driven. As shown in Fig. 2, the armature 18 is provided with a flexible blade or pawl 26 engaging the ratchet wheel 25 and serving to drive the same.

On the top of the upright 6, there is secured a strip 27 of conducting material, terminating at one end in a terminal contact 28 provided with a threaded nut by which a conductor may be connected thereto. The other end of the conducting strip 27 terminates in a contact 20 of conducting material having its flat surface inclined with respect to the vertical axis of the device. The reverse side of the conducting contact 20 is covered with a sheet of insulating material 29 for a purpose to be described. A flexible conductor 30 electrically connects the armature 18 to a terminal 31 on the base by which a circuit conductor may be connected thereto. It will be noted that the pin 32 of this terminal serves as a stop to limit the movement of the armature in one direction.

In operation, an energizing current is supplied from the commercial source over conductors (not shown) through the terminals 13 and 14 to the solenoid winding 12. This winding energizes the core 7 and causes the armature 18 to move until its upper part engages the end of the leg 15 of the core. In moving to this position the flexible contact blade 19 as best shown in Fig. 3 rides over the sheet of insulating material so that a break point in the circuit to be controlled, is not closed at this time, but when it is moved to its extreme operated position, its bias causes it to engage the conducting contact 20 on its return movement. As the armature moves to the position shown in dotted lines in Fig. 2, the free end of the pawl 26 rides over the teeth on the ratchet wheel 25. Usually there is sufficient friction so that this movement does not cause the inertia disk 23 to rotate, but even if it does,

such rotation is of no effect. When the circuit through the solenoid winding 12 is interrupted the armature sluggishly returns to the position shown in Fig. 1, due to the fact that in returning to its normal position the free end of the pawl 26 engages the teeth of the ratchet wheel 25 causing the inertia disk 23 to rotate. This disk, therefore, acts as a brake on the return movement of the armature, the pawl 26 and the ratchet wheel 25 being so designed that they remain in engagement to rotate the disk 23 almost as long as the contact blade 19 is in engagement with the fixed contact 20. However, just before these contacts are out of engagement, the pawl 26 disengages the ratchet wheel 25 so that the armature 18 due to its own weight quickly returns to its normal position as limited by the pin 32 of the terminal, thereby reducing the tendency of these contacts to form an arc.

It will thus be understood that the flexible contact blade 19 makes a passing or fleeting engagement with the fixed contact 20, the duration of which is determined by the inertia of disk 23. By such an arrangement, it is possible to control the duration of the engagement of the contacts 19 and 20 and thereby control the duration of closure of a control circuit, within rather wide limits so that various switching devices may be controlled even though they require a longer period of energization than can be effected through a momentary closure of an energizing circuit.

What we claim is:

1. In an electromagnetic device, an electromagnet, a pivoted armature mounted in position to be attracted by said electromagnet, a fixed contactor provided with a non-conducting portion on one side and a conducting portion on the other side, and a flexible contactor mounted on said armature, said flexible contactor being arranged to engage said non-conducting portion while moving in one direction and engaging said conducting portion while moving in the other direction.

2. An electromagnetic device comprising an energizing winding, a core therefor, an armature mounted for attraction to said core upon energization of said winding, a fixed contactor, a movable contactor actuated by said armature for movement into engagement with said fixed contactor, a rotary inertia device comprising a massive member provided with a ratchet wheel mounted for rotation on an axis parallel to the principal axis of said core, and a pawl mounted on said armature and engaging said ratchet to rotate said member during that portion of the return movement of said armature that said movable contactor is engaging said fixed contactor.

3. An electromagnetic device comprising an energizing winding, a core therefor, an armature mounted for attraction to said core upon energization of said winding, a fixed contactor provided with a conducting portion inclined to the principal axis of said core, a piece of non-conductng material mounted on one side of said conducting portion, a flexible contactor actuated by said armature in its movement toward said core for engaging said non-conducting material and in its reverse movement to engage said conducting portion, a rotary inertia member provided with a ratchet wheel mounted for rotation on an axis parallel to the principal axis of said core, and a pawl mounted on said armature and co-operating with said ratchet wheel during that portion of the return movement of said armature, that said flexible contactor is engaging said conducting portion.

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