April 22, 1924. 1,491,346

E. W. GENT

RELAY

Filed Dec. 22, 1919

Fig. 1.

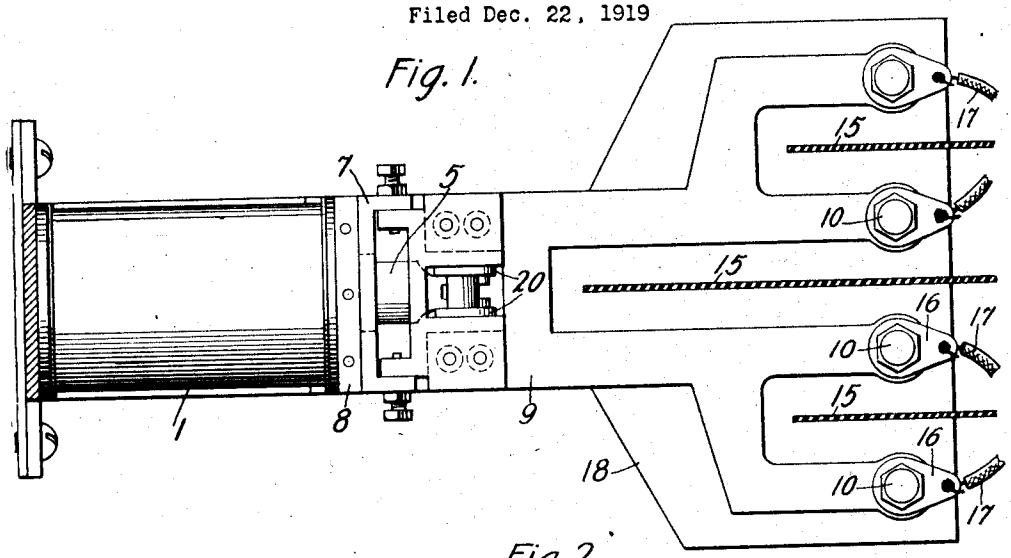


Fig. 2.

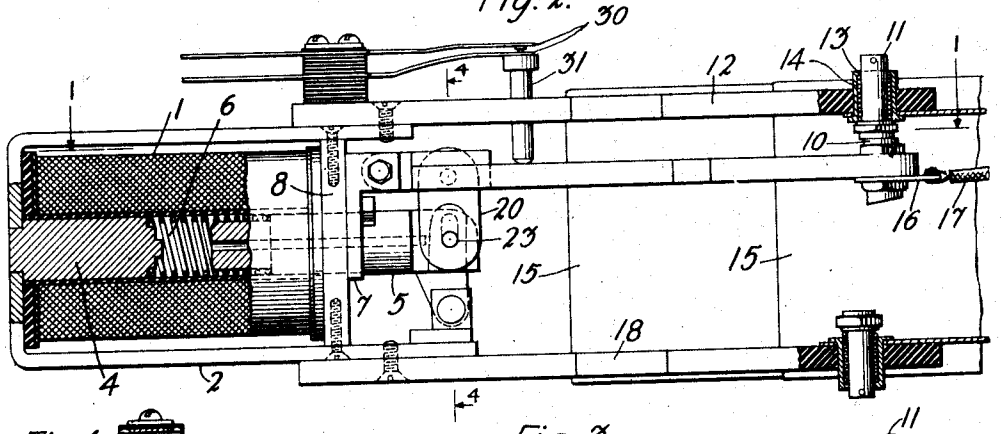


Fig. 4.

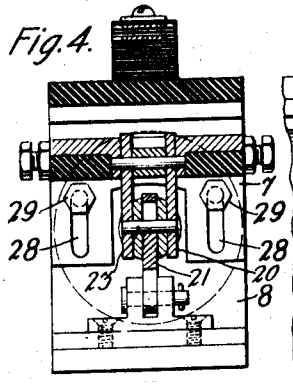
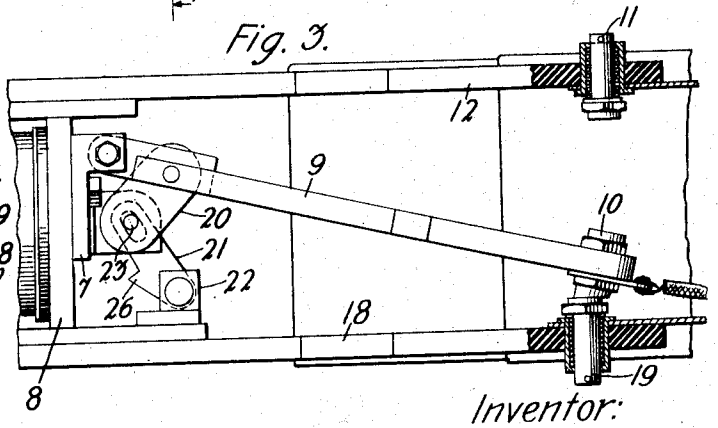


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDGAR W. GENT, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

RELAY.

Application filed December 22, 1919. Serial No. 346,642.

To all whom it may concern:

Be it known that I, EDGAR W. GENT, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Relays, of which the following is a full, clear, concise, and exact description.

This invention relates to high potential relays.

The object of the invention is to provide a device of the general type indicated which will possess a certainty and positiveness of operation particularly adapting it for use in remote control apparatus in which current of very high voltage is employed, and which can be operated at high speed without an accompanying rebound and chattering action at the contacts or a binding of relatively movable parts.

The invention consists generally in an electromagnet of the solenoid type, the plunger or core of which has a link connection with a switch arm pivoted at one end of the coil and arranged to co-operate with contact members which are of a spring-cushioned plunger type, designed to prevent a chattering action of the switch arm on the contacts. To assist in this function and also prevent the spring pressure of the contact members from being transmitted through the switch arm to cause the plunger core of the solenoid to bind in its slideway, a toggle construction of the link connection is provided which is utilized to lock the plunger in a position aligned with the positions it will assume in its path of travel. A suitable rest or shoulder on one of the link members serves to prevent the overthrowing of the toggle joint to a point beyond the substantially aligned locking position of the links in their inoperative condition.

In the drawing, Figure 1 is a horizontal sectional view of a solenoid relay embodying the invention and taken along the lines 1—1 of Figure 2; Figure 2 is a side elevation of the device in its inoperative condition; Figure 3 is a view similar to Figure 2 showing a portion of the device in its operative position; and Figure 4 is a transverse vertical section of the device taken along the line 4—4 of Figure 2.

Referring to the drawing, there is shown at 1 an electromagnet of the solenoid type mounted on an enclosing framework 2 of magnetic material which supports a fixed core member 4 extending part way into the solenoid. A movable core or plunger 5 is arranged to slide longitudinally in the other end of the coil, and a spring 6 serves to force the plunger outwardly to its inoperative position when the coil is not energized. Pivoted to a plate 7 adjustably mounted on the front coil-supporting member 8 of the framework is a switch arm 9 formed of any suitable insulating material and extending forwardly to a safe distance from the coil where the contact engaging members 10 carried thereby can engage the corresponding circuit terminal contacts 11 carried by the insulating member 12.

The contact members 11 are of the plunger type and are mounted in seats 13 in which compression springs 14 act as cushions or buffer members to absorb the impact of the swinging switch arm 9 and prevent a rebound and chattering action thereof and to insure closure of all contacts irrespective of any slight misalignment of the contacts.

The switch arm 9 is shown as provided with four branches having the corresponding contact engaging members 10 and suitable partitions or shields 15 which serve to provide compartments and insure a complete electrical separation of the contacts from each other. Terminal pieces 16 carried by the contact-engaging members 10 can be connected in any desired arrangement by conductors extending in a bowed formation around the forward edges of the intervening partitions 15 as at 17. A plate 18 corresponding to the member 12 is located as shown and both members 12 and 18 are provided with suitable slots in which the vertical partitions 15 are held. The lower member 18 is also provided with a set of spring contact pieces 19 which may serve as circuit terminal members or merely as stops for the switch arm, as may be found desirable.

An operative connection between the switch arm 9 and the plunger core 5 of the solenoid consists of a pair of links 20 pivoted at opposite ends to the respective members. Another link member 21 is pivoted to the forked stud 22 attached to the framework and forms a toggle construction with the links 20 already referred to. The link 21 is provided with a slot in which the pin 23 serving as the pivotal connection between the links 20 and plunger 5 can play. In the

mutually aligned positions of the toggle link members 20 and 21 shown in Figure 2 of the drawing, the pin 23 rests on the bottom of the slot in the link 21 and thus serves to support the outer end of the solenoid core 5 in a perfectly aligned position with relation to its path of movement into the coil. Not only is the core locked in a position to prevent a binding action that would otherwise be exerted by the pressure of its springs 14 through the contact plungers 11, but the switch arm 9 is held in firm engagement with the plunger contacts and thus chattering and arcing at the contacts is prevented.

It will be seen that upon the energization of the solenoid 1 the plunger core 5 causes the switch arm 9 to make a rapid swing through an arc sufficient to create a very substantial air gap and produce an effective break, as indicated in Figure 3 of the drawing. An equally rapid return of the arm to the normal position shown in Figure 2 can be effected for certain purposes by the action of the spring 6 on the plunger 5 by providing for the automatic breaking of the energizing circuit of the coil 1.

Upon the upward swinging of the arm 9 from the position shown in Figure 3 to that shown in Figure 2 the link members 20 and 21 are brought into vertical alignment as shown and are prevented from moving to the right and beyond the aligned position by the presence of a shoulder or stop 26 found on the link 21. In Figure 2 the arm is in normal engagement with the contacts 11 and the springs 14 are shown under slight compression but because of the aligned position of the links 20 and 21 no lateral binding action of the plunger 5 in its slideway can be formed. It will be noted that a vertical adjustment of the switch arm supporting plate 7 is provided by the slots 28—28 and the hexagonal headed screws 29—29 thus facilitating the proper adjustment of the related parts.

Under certain conditions it is desirable to also control the operation of a low potential circuit by the operation of the switching arm. For this purpose a plurality of contact springs 30—30 may be mounted in the member 12 as shown in Figure 2 and their operation brought about by means of the insulating stud 31, the lower end of which bears against the switch arm 9.

What is claimed is:

1. A high potential relay comprising: a solenoid magnet, a plunger core for said magnet, a circuit-controlling arm comprising an electrical contact, a link forming an operative connection between said arm and said plunger, a second link pivoted at one end to the framework of said relay and at the other end to the plunger and forming with the first-named link a toggle construction, said toggle links being arranged to assume an aligned locking position in the extended position of said plunger to hold said plunger in a position aligned with its path of travel.

2. A high potential relay comprising: an electromagnet, a switch arm comprising an electrical contact, a toggle link connection between said arm and the armature of said electromagnet, said toggle being arranged to assume a locking position, and means included in said toggle to prevent lateral movement of the armature.

3. A high potential relay comprising an electromagnet, an armature therefor, a switch-controlling arm, resiliently mounted contacts engaged thereby, a link member pivotally mounted to said armature and said arm, a second link member pivotally mounted at one end to the relay framework and having its other end connected to the armature by a pin and slot connection, said link members being in alignment and on opposite sides of the armature in the normal position of the armature, and means included in one of said link members to take up the pressure exerted by the resilient contact members upon the arm when said armature is in its normal position.

4. A high potential relay comprising: a solenoid magnet, a plunger armature therefor, a circuit-controlling arm pivoted at one end to the relay framework adjacent the magnet and extending away from said magnet in a direction substantially parallel to the axis thereof, a link connecting said arm at a point adjacent the pivoted end with the corresponding end of the plunger of said magnet, a second link pivoted to the relay framework and having a pin-and-slot connection with the end of the plunger, said second link being arranged to form a toggle construction with the first-named link, said link being arranged to form an aligned locking position in the extended position of said plunger to thereby lock said arm in the corresponding position and prevent the plunger from binding in its slideway.

5. A high potential relay comprising: a solenoid magnet, a plunger core therefor, a spring tending to move said core to an outwardly-extended position, a circuit-controlling arm comprising an electrical contact, a link forming an operative connection between said arm and plunger, a second link pivoted at one end to the framework of said relay and at the other end to the plunger and forming with the first-named link a toggle construction, said toggle links being arranged to assume an aligned locking position in the extended position of said plunger, and means carried by one of said links to prevent the outward movement of said links beyond the aligned position.

6. A high potential relay comprising a solenoid magnet, a plunger armature there-

for, a circuit controlling arm pivoted at one end to the relay framework and extending away from said magnet in a direction substantially parallel to the axis thereof, a toggle link connecting said arm directly to the plunger armature and arranged to lock the plunger in its extended position, resilient contact members engaged by the circuit controlling arm, and means carried by the toggle link to prevnt binding of the plunger in its slideway due to transverse pressure exerted by the contact members when the plunger is in its extended position.

In witness whereof, I hereunto subscribe my name this 19th day of December A. D., 1919.

EDGAR W. GENT.