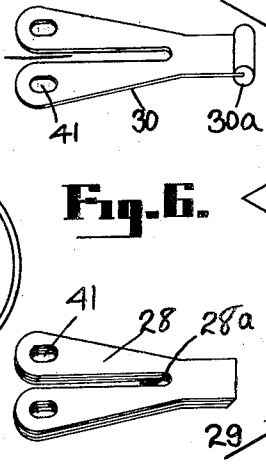
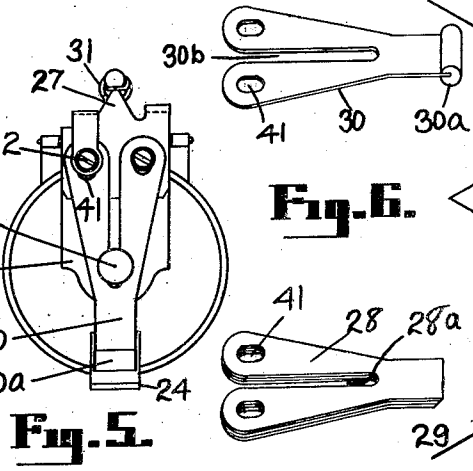
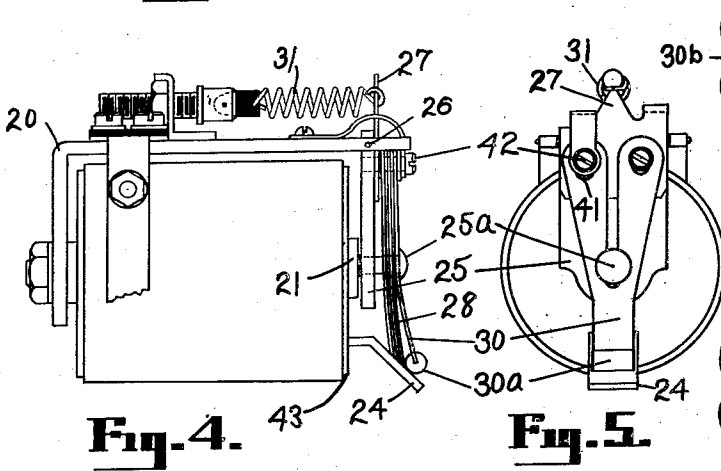
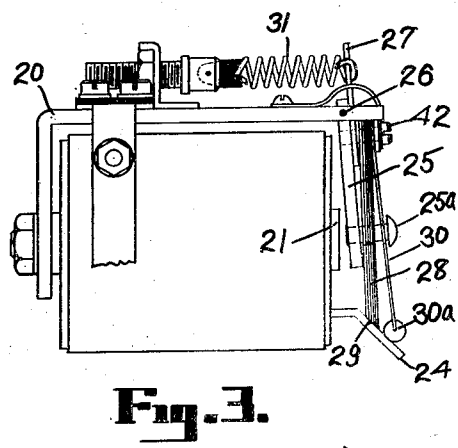
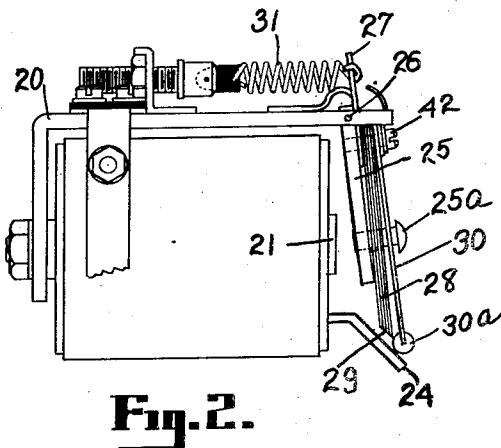
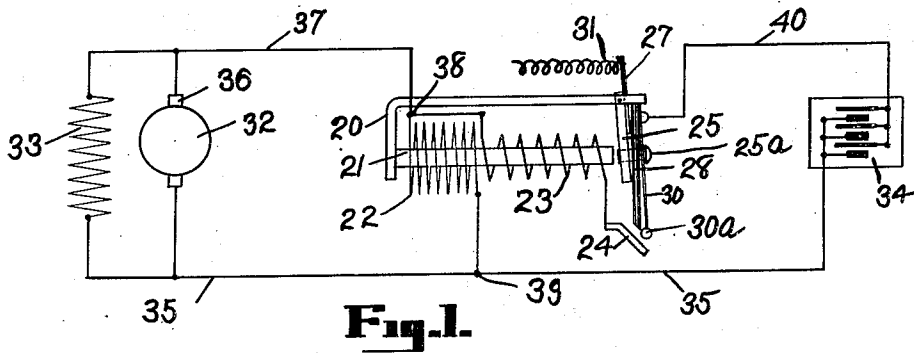


N. R. HAAS.
CUT-OUT RELAY.
APPLICATION FILED FEB. 4, 1918.

1,327,951.

Patented Jan. 13, 1920.



Witnesses
Warren Schmieding
Hector R. Riedel

Inventor
Nelson C. Haas
By New, Page, Cooper & Haynald
Attorneys

UNITED STATES PATENT OFFICE.

NELSON R. HAAS, OF DAYTON, OHIO, ASSIGNOR TO THE DAYTON ENGINEERING LABORATORIES COMPANY, A CORPORATION OF OHIO.

CUT-OUT RELAY.

1,327,951.

Specification of Letters Patent.

Patented Jan. 13, 1920.

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To all whom it may concern:

Be it known that I, NELSON R. HAAS, a citizen of the United States of America, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Cut-Out Relays, of which the following is a full, clear, and exact description.

This invention relates to improvements in cut-out relays, and more particularly to that type used in connection with automobile starting, lighting and ignition systems.

It is an object of the present invention to provide improved means whereby the electrical connection between certain coöperating contact elements forming a part of the apparatus is rendered more effective.

Further objects and advantages of the present invention will be apparent in the following description, reference being had to the accompanying drawings, wherein a preferred form of one embodiment of the present invention is clearly set forth.

In the drawings:—

Figure 1 is a diagrammatic view of the relay and its electrical connections.

Figs. 2, 3 and 4 are side views of the contact carrying end of the cut-out relay, which show the movable contact element in various positions. Some of the parts of these views have been broken away for the sake of clearness.

Figs. 5 and 6 are detail views of the relay of the movable contact element.

Referring to the drawings, there is shown a relay having a frame 20 which carries a core 21. This core supports a fine winding 22 and a heavy winding 23, the functions of which are fully described hereinafter. A stationary contact element 24 is rigidly secured to the relay in any suitable manner. An armature 25, fulcrumed on the frame at the point 26, supports a strip 27, and low resistance movable contact 28, and high resistance contact carrying element 30, said strip 27 and contacts 28 and 30 being secured thereon by means of screws 42. The low resistance contact 28 includes a plurality of strips or laminations 29, and the carrying element 30 may be constructed of spring steel or other similar material and has a resistance element 30^a secured at its outer extremity.

A headed pin 25^a extends through slot 30^b in contact 30 and slot 28^a in contact 28 and

is mounted upon armature 25. The purpose of this pin 25^a will be described later.

By referring to Figs. 2, 3 and 4, it can be clearly seen that the high resistance element 30^a projects beyond the extremities or contact face of the strips or laminations 29. This permits the high resistance element 30^a to come into contact with the stationary contact element 24, before any of the strips or laminations 29, of the contact element 28, as is clearly shown in Fig. 2.

A spring element 31 is secured to the one end of the strip 27, and tends to pull or force the armature 25 away from the core 21.

By referring to Fig. 1, the system is shown including a generator 32, having field windings 33, and connected to the storage battery 34, by means of the relay and line connection 35.

Now, when the generator starts to generate, current will first start to build up in the field 33. As soon as this building up effect has reached a determined point, current will flow from the brush 36, through wire 37, to the point 38, thence through the fine winding 22 of the relay, to the point 39, back to the generator via the wire 35.

When the core 21 has become energized sufficiently to attract the armature 25, the tension of the spring 31 is overcome, causing the movable contact elements 28 and 30^a to be brought into engagement with the stationary contact element 24 in the following manner.

First the high resistance element 30^a carried by the contact element 30 will be brought into engagement with the stationary contact element 24 (see Fig. 2). Further movement of the movable contact will bring the strips or laminations 29 into engagement with the stationary contact (see Fig. 3), at which time current will flow from the generator 32, through brush 36, wire 37, to the point 38, and thence through the heavy winding 23, across the stationary contact 24, movable contact 28, wire 40 to the battery 34, and back to the opposite side of the generator via the wire 35.

As the current in the generator is being built up to maximum, the armature 25 will be attracted by the relay magnet with a correspondingly increasing force. It is

highly desirable that the pressure between contact element 24, 28 and 30 be increased as the charging current increases in order to increase the effectiveness of the electrical connection made by said contact elements. The increased armature attraction is utilized to accomplish this result in the following manner: During the movements of the armature 25, as shown by Figs. 2 and 3, any bending of the contact elements 28 and 30 will take place about the ends thereof held fixed by screws 42. But when the armature is strongly attracted and brought into touching relation with the core 21, the head of pin 25^a will so cooperate with elements 28 and 30 that all bending thereof will take place between said pin 25^a and the free ends of said elements 28 and 30. This condition is clearly shown in Fig. 4. The pin 25^a automatically produces a shortening in the effective length of the movable contact elements 28 and 30 with the result that the pressure exerted upon the stationary contact 24 is greatly increased beyond that which would occur, were the bending of said movable elements to be permitted to take place about the fixed ends without any obstruction coming into engagement with said movable elements at some point intermediate their fixed and free ends. By this means the pressure between the movable and stationary contact elements is increased in proportion to the amount of current to be carried.

During the movement of the armature 25 there is a change in the bending rate of contacts 28 and 30. During the initial movement of the armature through the stages illustrated by Fig. 2 and Fig. 3, the contacts will bend at a substantially uniform rate about their ends fixed by screws 42. But during the final movement of armature 25, beginning with the instant when the head of pin 25^a comes into engagement with contacts 28 and 30 until the final stage is reached as illustrated in Fig. 4, the bending of said contacts with relation to the armature takes place at an increased rate. The term bending rate will be understood to mean the relation between the deflection of the laminated contact 28 per unit of free length of said contact to the movement of the armature. The free length of the laminated contact 28 will be understood to mean the distance from the free end of said contact to the point about which the contact bends. It will be understood from the foregoing description there is an abrupt change from one portion about which the laminated contact bends to an intermediate portion, hence it follows there must be an abrupt change in the bending rate. This abrupt change in the bending rate is necessary for successful operation of the device to which the present invention relates. During the

initial movement of the armature in which the bending of laminated contact 28 takes place at a slower rate, the contact 28 is in a more flexible state than during the final movement of the armature. Therefore during this initial movement of the armature the free ends of the laminated portions of contact 28 tend to scrape along the stationary contact 24, and, in doing so, remove any coating on said stationary contact 24 which would tend to prevent making a good electrical contact. Then during the final movement of the armature when the bending rate is increased in the manner described the contact 28 is less flexible than before, hence the attraction of the magnet upon the armature is more effective to produce an increased pressure between contacts 28 and 29. Therefore it will be seen that when the current to be carried is the greatest, the magnet will exercise the greatest attractive effect upon the armature to produce the greatest possible amount of contacting pressure between contacts 28 and 29 to carry this large amount of current.

It is desirable to have the contacts 28 remain in the more flexible state as long as possible in order that sufficient scraping action referred to may take place and tend to clean the contact 24. Then it is desirable to bring the contacts 28 and 29 together under pressure as soon as possible after this scraping action has taken place. To bring about these results it is necessary in devices of this character to permit the initial action of the laminated contact to take place with undiminished effect up to a certain point and then to suddenly change the bending action in order that the necessary pressure between the contacts may be promptly applied.

It will of course be understood that when the charging rate of the battery decreases, so that the core 21 is unable to hold the armature 25 in attracted position, the above described action of the relay reverses, that is, the strips or laminations 29 will first break engagement with the contact element 24, after which the high resistance element 30 will break away from the stationary contact, and owing to this decreased flow, on account of the relatively high resistance of the element 30^a, the sparking at this point will substantially be eliminated.

By reason of the head of pin 25^a engaging contact elements 28 and 30 in the manner described, thus requiring more force to produce the same deflection of the free ends of said elements than in the case where the bending of said elements is unobstructed, the potential energy stored in said elements 28 and 30, in position shown by Fig. 4, is correspondingly greater. Therefore when the magnetic attractive force is released, the bent contact elements 28 and 30 will co-

operate with spring 31 to produce a more quick separation of said contact from contact 24, thereby eliminating sparking and pitting to a large extent.

5 In order to compensate for different variation in the charging rate of the generator, the movable contact element 28 is provided with elongated slots 41, which are adapted to receive a screw 42 which clamps the movable contact element securely to the strip 27. Any variation or adjustment can be made by loosening said screws 42, and after proper adjustment has been obtained, said screws may again be tightened to clamp the movable element in the desired position.

15 While the form of mechanism herein shown and described constitutes a preferred form of embodiment of the invention, it is to be understood that other forms might be adopted all coming within the scope of the claims which follow.

What I claim is as follows:

1. In a device of the kind described, the combination with cooperating contacts for completing an electric circuit, one of the contact elements being flexible; of provisions normally maintaining the contacts apart; electro-magnetic means causing the contacts to come together under pressure; and a member actuated by the electro-magnetic means, cooperating with the flexible contact for causing an abrupt change in the bending operation of the flexible contact during the operation of electro-magnetic means.

35 2. In a device of the kind described, the combination with cooperating contacts for completing an electric circuit, one of the contacts being flexible; of provisions normally maintaining the contacts apart; electro-magnetic means causing the contacts to come together under pressure thereby causing the flexible contact to bend about a certain portion thereof during the initial bending operation; and a member actuated by the electro-magnetic means, cooperating with the flexible contact for abruptly causing bending to take place about a different portion thereof during the final bending operation.

50 3. In a device of the kind described the combination with cooperating contacts for completing an electric circuit, one of the contacts being flexible; of provisions normally maintaining the contacts apart; electro-magnetic means causing the contacts to come together under pressure, whereby the flexible contact will bend at a certain rate during the initial operation of the electro-magnetic means; and a member actuated by the electro-magnetic means and cooperating during the final operation of the electro-magnetic means with the flexible contact to produce an abruptly increased bending rate of the flexible contact with relation to the operation of the electro-magnetic means.

4. In a device of the kind described, the combination with cooperating contacts in an electric circuit, one of which is flexible and means normally holding the contacts apart; of a stationary support for one of the contacts; a movably mounted armature supporting the other contact; an electro-magnet cooperating with the armature, said magnet when energized causing the contacts to be brought together whereby the flexible contact is bent at a certain rate during the initial movement of the armature; and a member actuated by the armature during the final movement of the same, and cooperating with the flexible contact to produce an abruptly increased bending rate of the flexible contact with relation to the movement of the armature.

5. In a device of the kind described, the combination with cooperating contacts in an electric circuit, one of which is flexible and means normally holding the contacts apart; of a movably mounted armature carrying the flexible contact; an electro-magnet cooperating with the armature and causing the contacts to be brought together whereby the flexible contact is bent at a certain rate during the initial movement of the armature; and a member mounted on the armature, and having a portion thereof adapted to cooperate during the final movement of the armature with the flexible contact to produce an abruptly increased bending rate of the flexible contact with relation to the movement of the armature.

6. In a device of the kind described, the combination with cooperating contacts in an electric circuit, one of which is flexible and a spring for normally holding the contacts apart; of an armature upon which is mounted the flexible contact by securing the same at one end to the armature; an electro-magnet cooperating with the armature causing the free end of the flexible contact to touch the other contact with pressure whereby the flexible contact is bent at a certain rate during the initial movement of the armature; and a headed pin mounted on the armature having the head portion thereof adapted, during the final movement of the armature, to cooperate with the flexible contact to produce an abruptly increased bending rate of the flexible contact with relation to the movement of the armature.

7. In a device of the kind described, the combination with cooperating contacts in an electric circuit, one of which is flexible, and a spring for normally holding the contacts apart; of a pivotally mounted armature; and an electro-magnet cooperating with the armature; and means actuated by said armature to effect the engagement of said contacts and to cause initially the bending of the flexible contact about a certain point thereof, then abruptly causing the bending

of said flexible contact about a different portion thereof which is substantially removed from the first named portion.

8. In a device of the kind described, the
5 combination with an electro-magnet; of an armature coöperating with said magnet; relatively rigid and flexible contacts in an electric circuit, said flexible contact being secured at one end upon said armature, and
10 arranged to bend initially about said fixed end upon engagement of said flexible con-

tact with said rigid contact; and means operated by said armature for causing the bending of said flexible contact to take place abruptly about an intermediate portion of 15 said flexible contact.

In testimony whereof I affix my signature.

NELSON R. HAAS.

Witnesses:

WARREN SCHMIEDING,
IRVIN A. GREENWALD.