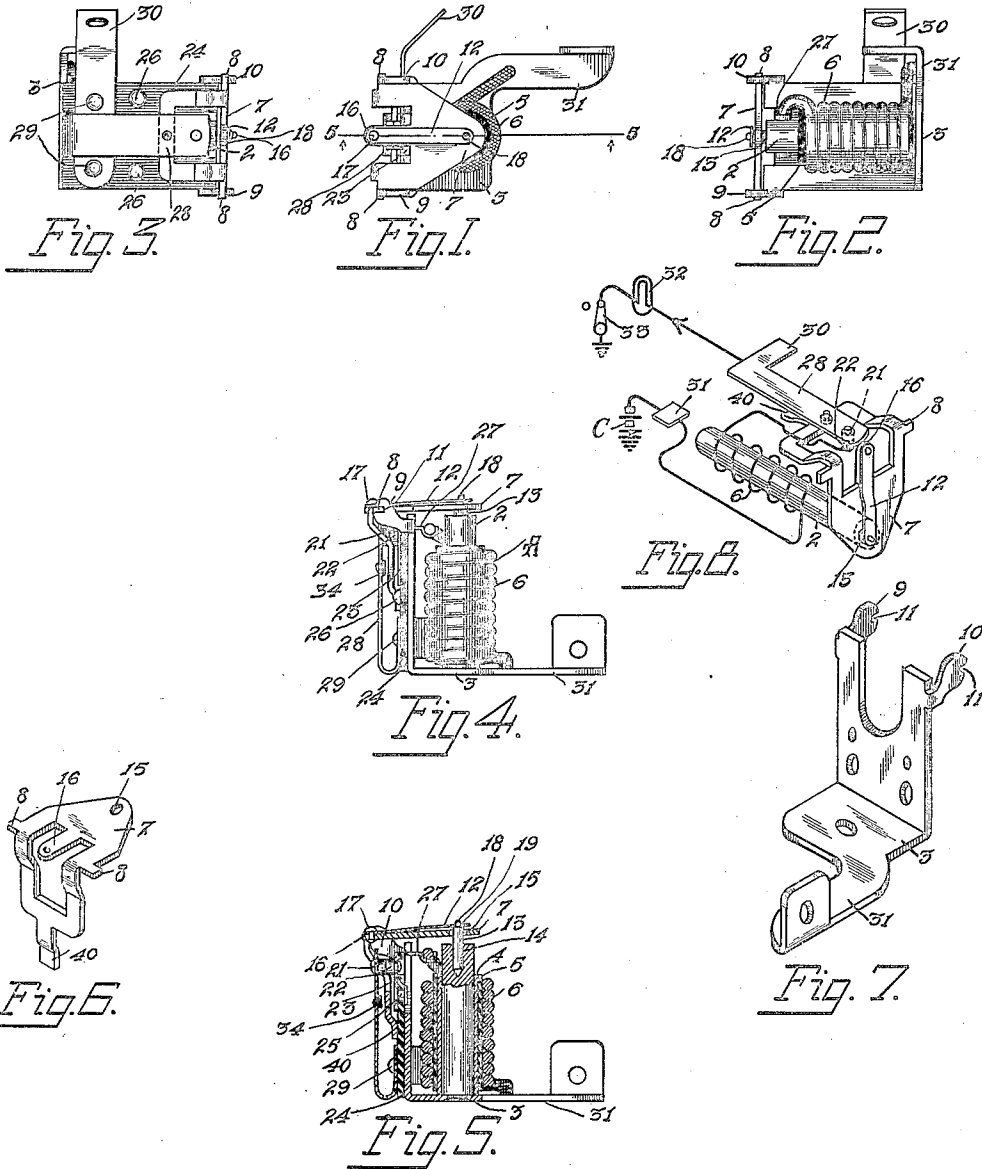


W. KAISLING.  
CIRCUIT BREAKER RELAY.  
APPLICATION FILED SEPT. 19, 1917.

1,378,869.

Patented May 24, 1921.



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# UNITED STATES PATENT OFFICE.

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## CIRCUIT-BREAKER RELAY.

1,378,869.

Specification of Letters Patent.

Patented May 24, 1921.

Original application filed June 6, 1917, Serial No. 173,084. Divided and this application filed September 19, 1917. Serial No. 192,050.

### *To all whom it may concern:*

Be it known that I, WILLIAM KAISLING, a citizen of the United States of America, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Circuit-Breaker Relays, of which the following is a specification.

My invention relates to relays, and has to do more particularly with relays of the circuit breaker type, and to relays of that type in which a normally tensioned armature is provided which is adapted to be actuated by an abnormal flow of current through the electromagnet, whereby a contact connected to said circuit is operated to affect the electromagnet so as to cause a vibration of its armature and contact. However, it is to be understood that my relay may be used for various other purposes, such as an ordinary telephone relay, etc., and is not limited in its use to a circuit breaker relay.

An object of my invention is to provide an improved and simple device of the above character which is most positive in its operation, but simple in construction and adjustment. My invention is adapted for use in connection with battery circuits in general, and is particularly useful in connection with the battery circuits on automobiles. This application is a division of my application, Serial No. 173,084, filed June 6, 1917, for an automobile switch.

A feature of my invention is the novel means for supporting the removable armature without the aid of screws or pivot pins. This and other features of my novel relay structure, together with certain advantages of construction and operation, will be more fully described in the following specification.

For a better understanding of my invention, reference may be had to the accompanying drawing in which I have illustrated the preferred embodiment of my invention, the parts being shown in their normal position, the like parts in the several views being indicated by like reference characters, and in which:

Figure 1 is a plan view of the preferred form of my invention;

Fig. 2 is a right side view of Fig. 1;

Fig. 3 is a left side view of Fig. 1;

Fig. 4 is a front view of Fig. 1;

Fig. 5 is a sectional view along the line 5-5 of Fig. 1;

Fig. 6 is a perspective view of the removable armature;

Fig. 7 is a perspective view of the heel iron which includes the supporting means for the removal of the armature, and

Fig. 8 illustrates diagrammatically the relay connected in circuit.

Referring now more in detail to my invention as illustrated, it comprises an electromagnet A which comprises a suitable core 2, which core is fastened to a heel iron 3. A copper sleeve 4 is slipped over the core 2, and a sleeve of insulating material 5 is in turn slipped over the copper sleeve 4. A winding 6, suitable for carrying the maximum current to which the relay may be exposed, is wound around the sleeve 5 and forms the energizing winding for the said relay. The copper sleeve 4 makes the relay slow acting, that is, it makes the core 2 slow to release its armature 7 after having the energizing circuit of its winding 6 broken. The insulating sleeve 5 serves as an insulator between the winding 6 and the copper sleeve 4. The relay is provided with a removable armature 7 which has projections 8 by which the said armature 7 is supported, as will be described.

The heel iron 3 is provided with a pair of outwardly turned armature supporting ears 9 and 10, the said ears 9 and 10 being provided with slots 11 of a size to receive the projections 8 of the armature 7 to pivotally support the armature in place. A pin 13 and a pivotally secured spring 12 are provided to hold the said armature 7 in its pivoted position. The pin 13 fits into a suitable opening 14 in the core 2 of the relay and extends up through an opening 15 in the armature 7. The leaf spring 12 has one end fastened to the tongue projection 16 of the armature 7 by means of the rivet 17. The end of the pin 13 which extends through the opening 15 of the armature 7 has a reduced portion 18, and the free end of the leaf spring 12 is provided with an orifice 19 of a size to fit the reduced portion 18 of the pin 13. The spring 12 and pin 13 pivotally support the armature 7 in the slots 11 of the ears 9 and 10, and in addition, the leaf spring 12 holds the armature 7 normally under spring tension and also prevents the

pin 13 from displacement from its position in core 2.

The armature 7 of the relay is adapted to remain at normal as long as a normal flow of current passes through the winding 6, but, should an abnormal flow of current pass through the winding 6, the relay immediately energizes sufficiently to open its contacts 21 and 22. The armature 7 is under spring tension to overcome the magnetism set up in the core 2 of the relay by the normal flow of current which passes through the winding 6. In circuit breaker relays of this type, more or less trouble has been experienced with adjusting the relay armature to secure proper tension to perform its functions, and I provide the above-described novel spring arrangement so that an adjustment of the armature may be made by simply lifting the leaf spring 12 from the pin 13 and turning it to the right or left about its rivet 17 and then putting in or taking out tension of spring 12 until the proper spring adjustment of the armature is obtained. The spring is then turned back to its place and the orifice 19 slipped over the pin 13.

In order to provide a proper air gap between the armature 7 and the core 2 of the relay, all that is necessary is to remove the armature from its supporting ears 9 and 10 and to bend the portion 40 of said armature 7 the required amount to secure the desired adjustment. To remove the armature from the relay, it is only necessary to raise the spring 12, turn it to either side and remove the pin 13 from the core of the magnet and then the armature may be removed by sliding the extensions 8 of the armature 7 out of the bearing slots 11 of the ears 9 and 10.

As will appear from Fig. 8, I preferably connect the winding 6 and contact springs in series with a source of power C. The contact springs comprise a pair of normally closed contacts 21 and 22. The contact 22 is attached to a contact plate 23, which plate 23 is suitably fastened to a plate 24 of suitable insulating material, by means of a rivet 25. The said plate 24 is suitably fastened to the heel iron 3 by means of rivets 26. The plate 23 has an angular extension 27 which connects to one terminal of the winding 6 of the relay. A yielding contact spring 28 is provided for supporting the contact 21, the said spring 28 being fastened to the plate of insulating material 24 by means of rivets 29. The spring 28 has an extension 30 which serves as a terminal for the spring 28. The heel iron 3 is provided with an extension 31 which serves as a terminal for the winding 6.

In Fig. 8, I have illustrated the preferred method of connecting the relay in circuit with a source of current C, the source of current C being shown connected to the terminal 31 and extending through the mag-

netic winding 6 and contacts 21 and 22 of the relay, through the spring 28 to the terminal 30, from which point it may extend through one or more circuits, a circuit being shown through the lamp 32 and switch 33 to ground. The tension of the spring 12 is preferably adjusted so that the normal operating supply of current through the winding 6 is not sufficient to cause the armature 7 to open contacts 21 and 22, although it may move off normal. Furthermore, I have found that by providing an air gap between the buffer 34 (which buffer is suitably fastened to the contact spring 28) and the arm 40 of the armature 7, sufficient to allow a slight movement of the armature 7 without interrupting the contacts 21 and 22, any slight increase above the normal current flow or jarring of armature 7 will not cause an operation of the relay to break its circuit. Thus, when using the relay in connection with lighting and ignition circuits on an automobile, a slight increase of normal operating current or jarring of the armature 7 will not interrupt the contacts 21 and 22. Should the circuit become grounded or short-circuited through a low resistance path, the armature 7 is readily attracted against the tension of the springs 12 and 28, thus interrupting the circuit of winding 6 and permitting armature 7 to retract to again close the operating circuit of coil 6 through the contacts 21 and 22. When the armature retracts, the circuit through the winding is immediately closed due to the closing of contacts 21 and 22, thus bringing about another attraction of the armature 7. The momentary holding of armature 7 after the circuit has been interrupted, due to the slow release construction, prevents a waste of current. If the relay is of the quick acting type, the rapid opening and closing of the contacts 21 and 22, due to the abnormal current flow, would cause an undue waste of current and a general heating of the apparatus, but with a more slow vibration, due to the relay's construction, a saving of current is brought about until the said short-circuit can be remedied by the operator of the car. As long as the abnormal current flow is continued, the armature 7 is, of course, vibrated, such vibration being indicated to the operator by the fluctuation of the lamps or by the audible signal produced by the vibration of the armature itself.

From the foregoing, it will be apparent that although the armature may be moved slightly by jarring or a slight flow of current without interrupting the contacts 21 and 22 to cause an indicating operation of the relay, it is only when an abnormal flow of current is produced that the armature 7 is attracted sufficiently to interrupt its contacts 21 and 22.

In illustrating my invention, I have chosen an embodiment worked out for commercial purposes, but it will be obvious to those skilled in the art that minor changes may be made without departing from the spirit of my invention, and I, therefore, do not desire to be limited to the exact structure shown but aim to cover all such changes and modifications which come within the spirit and scope of the appended claims.

What I claim as new, and desire to secure by United States Letters Patent is:

1. In a relay structure, the combination with a heel iron and an armature carried thereby, backwardly projecting integrally formed ears for said heel iron, slots cut in said ears adapted to receive projecting portions of said armature to pivotally support the same, a pin extending through an orifice in said armature into the core of said relay for use in maintaining said armature in its pivoted position, and a member attached to said armature for maintaining said pin in position.
2. A relay of the class described including a heel iron provided with dependent ears, orifices cut in said ears, an armature provided with projecting means adapted to fit into said orifices to pivotally support said armature in position, a pin passing through the said armature for maintaining the same in its pivoted position, and a spring firmly secured at its one end to said armature and having its free end provided with an orifice to receive said pin.
3. A relay structure including an electromagnet provided with a core, an angular heel iron secured to said core having one limb thereof extending parallel thereto, a pair of projecting ears for said heel iron provided with slots, an angular armature provided with protruding portions adapted to fit into said slot to fulcrum said armature on said heel iron, one arm of said angular armature extending across and in front of the core of said electromagnet, an orifice cut in the portion of said armature lying immediately adjacent the core of said electromagnet, a pin extending through said orifice into an orifice cut in said core, and a spring for holding said pin in position.
4. A relay structure including a heel iron, an electromagnet provided with a core secured to said heel iron, a terminal contact secured to said heel iron, and a winding on said core having its one terminal connected to said heel iron and its other terminal connected to said terminal contact.
5. A relay structure including an electromagnet provided with a core, an angular heel iron secured to said core having one limb thereof extending parallel thereto, a pair of projecting ears for said heel iron provided with slots, an angular armature provided with protruding portions adapted

to fit into said slot to fulcrum said armature on said heel iron, one arm of said angular armature extending across and in front of the core of said electromagnet, an orifice cut in the portion of said armature lying immediately adjacent the core of said electromagnet, a pin extending through said orifice into an orifice cut in said core, and a spring attached to said armature for holding said pin in said core and for providing means for maintaining said armature in its normal position.

6. A relay structure of the class described including a heel iron, an electromagnet provided with a core fastened to said heel iron, a strip of insulating material fastened to said heel iron, a stationary contact supported by said strip of insulation, a winding for said electromagnet having its terminals connected to said heel iron and stationary contact respectively, and a movable contact for engagement with said stationary contact.

7. A relay structure including an electromagnet provided with a core, an angular heel iron secured to said core having one limb thereof extending parallel thereto, a pair of projecting ears for said heel iron provided with slots, an angular armature provided with protruding portions adapted to fit into said slot to fulcrum said armature on said heel iron, one arm of said angular armature extending across and in front of the core of said electromagnet, an orifice cut in the portion of said armature lying immediately adjacent the core of said electromagnet, a pin extending through said orifice into an orifice cut in said core, a spring attached to said armature provided with an orifice adapted to receive a reduced portion of said pin to hold said pin in said core and to maintain said armature in its normal position, and a pair of contacts supported by said heel iron adapted to be operated by said armature.

8. The combination with a magnet provided with a core, of an armature having two arms at an angle to each other, a heel iron for supporting said armature, one arm of said armature extending across and in front of the core of said magnet so as to be attracted thereby, the other arm extending back parallel to the core of the electromagnet, an orifice cut in said last arm, a stationary contact secured to said heel iron, a movable contact secured to a spring fastened to said heel iron and protruding through said orifice into engagement with said stationary contact, and a member extending through an orifice in said armature for use in maintaining said armature in position.

9. A relay of the class described provided with a core, a heel iron for said relay provided with projecting ears having slots, an armature adapted to fit into said slots, a spring having one end secured to said arma-

ture, a pin extending from the said core of said relay through an orifice in said armature and cooperating with the free end of said spring for maintaining said armature in said slots.

10. A relay of the class described provided with a core, a heel iron for said relay provided with projecting ears having slots, an armature adapted to fit into said slots, a spring having one end secured to said armature, a pin extending from the said core of said relay through an orifice in said armature and cooperating with the free end of said spring for maintaining said armature in normal position.

11. A relay of the class described including a heel iron provided with projecting ears having slots, an armature adapted to fit into said slots, a pin extending into the core of said relay, a spring attached to said armature for holding said pin in position and for maintaining said armature in its normal position.

12. A relay structure of the character described including a heel iron, ears for said heel iron provided with slots, an armature provided with projecting members adapted to fit into said slots to pivotally support the same, a pin extending through an orifice in said armature into the core of said relay, and a spring secured to said armature at its one end and having its other end resting on said pin for maintaining said armature in its pivoted position.

13. A relay structure including a heel iron, an electromagnet secured to said heel iron, an armature supported by said heel iron, a pin extending through an aperture in said armature into an orifice in the core of said electromagnet to maintain said armature in position, and a member for maintaining said pin in position.

14. A relay of the class described including an angular heel iron, an electromagnet provided with a core attached to said heel iron, an angular armature pivotally supported at one end of said heel iron, one arm of said armature extending across and in front of the core of said magnet so as to be

attracted thereby and the other arm extending back parallel to the core of the electromagnet, an aperture cut in said first arm, a pin extending through said aperture into an orifice in said core for maintaining said armature in position, and a spring secured to said armature for maintaining said pin in position.

15. A relay of the class described including an angular heel iron, an electromagnet provided with a core attached to said heel iron, an angular armature pivotally supported at one end of said heel iron, one arm of said armature extending across and in front of the core of said magnet so as to be attracted thereby and the other arm extending back parallel to the core of the electromagnet, an aperture cut in said first arm, a pin extending through said aperture into an orifice in said core for maintaining said armature in position, and a spring secured to said armature for maintaining said pin in position.

16. A relay of the character described including a heel iron, an electromagnet provided with a core secured to said heel iron, an angular armature pivotally supported by said heel iron, one arm of said armature extending across and in front of the core of said electromagnet, the other arm extending back parallel to the core of the electromagnet, an aperture cut in the first arm of said armature, a member extending through said aperture into the core of said electromagnet, and a spring secured to said armature adapted to engage said member to maintain said member in position and said armature in its normal position.

17. A relay structure of the character described including a heel iron, ears provided for said heel iron, an armature having members adapted to cooperate with said ears to pivotally support the armature in position, and a spring for maintaining said armature in position.

Signed my me at Chicago, in the county of Cook and State of Illinois, this 17th day of September, 1917.

WILLIAM KAISLING.