April 13, 1937. J. CARTON 2,076,879

RADIAL FIELD RELAY

Filed Feb. 25, 1935

FIG. 1

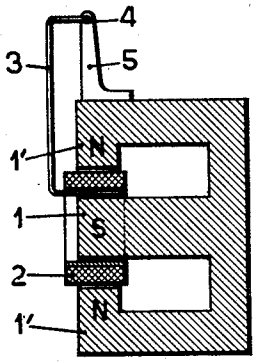


FIG. 5

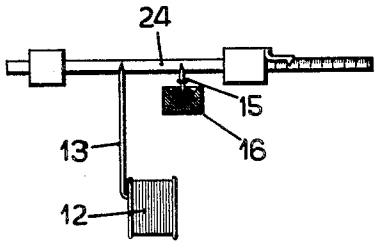


FIG. 2

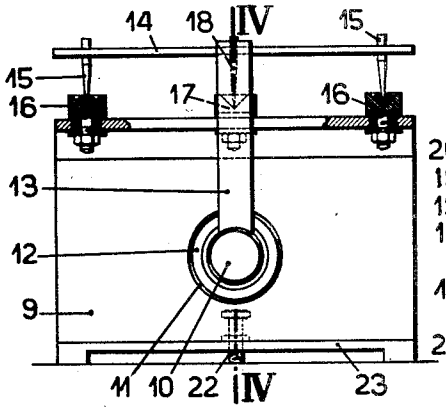


FIG. 4

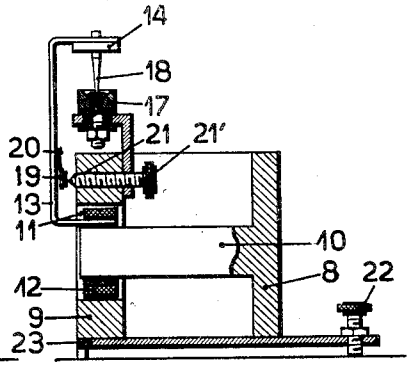


FIG. 3

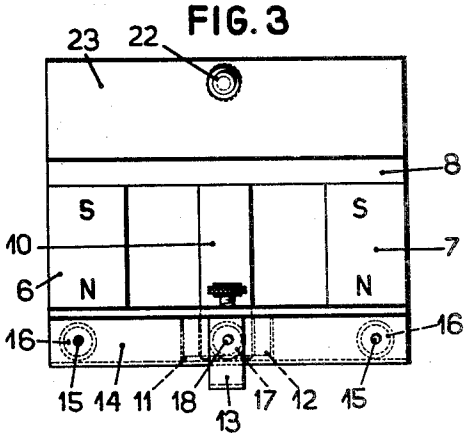
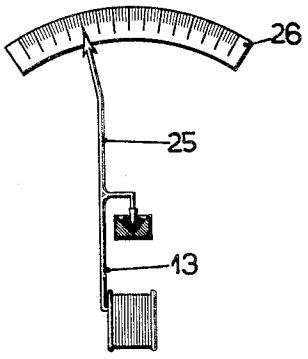


FIG. 6



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RADIAL FIELD RELAY

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3 Claims. (Cl. 200—110)

The sensitive relays known up to the present are usually apparatuses which are derived from measuring instruments comprising, for instance, a moving frame (coil) mounted on pivots and rotating in a field; an indicating pointer, solid with the frame, supports the moving contact-maker member which co-operates with the fixed contact-maker member. The lack of sensitiveness and the absence of reliability in the operation of these conventional types of relays are due, in particular, to the fact:

That two sides, out of four, of the frame-shaped coil are alone submitted to the excitation field;

That there is always a certain amount of play in the pivots and that, however small this may be, it is very detrimental;

That if the contact-making members are positioned sufficiently far from the rotational axis of the moving gear, considerable travel of the moving contact-making member is obtained, but the pressure of the contact is so reduced that it is insufficient to ensure clean making or breaking of the contact;

That if the contact-making members are positioned close to the rotational axis of the moving gear, and appreciable contact pressure is obtained, but the travel of the moving contact-making part assumes a value of the same order as the play of the pivots which also results in uncertainty in the operation of the contact.

The object of the present invention is a new relay of extreme sensitiveness comprising a circular coil positioned in an intense field or in proximity to said field, in such a manner that the turns of the coil are intersected by the lines of force of said field and are equally active, said coil being suspended freely but without any play.

In the attached drawing a few forms of embodiment of the relay which forms the subject matter of the invention have been shown as examples in diagram form:

Figure 1 is a diagram of a median section showing the fundamental arrangement of the new relay;

Figure 2 is a front view of an example of an embodiment of the relay;

Figure 3 is a plan view of Figure 2;

Figure 4 is a section according to line IV—IV of Figure 2;

Figure 5 is a variant of an embodiment of the moving gear making it possible to use the relay as a measuring instrument;

Figure 6 is another variant of an embodiment of the aforementioned gear.

According to the fundamental diagram in Figure 1, the new relay is provided with an assembly producing a magnetic field, said assembly being constituted by a system of magnets presenting one pole piece (S, for instance) at the extremity of a central cylindrical core 1, which extremity penetrates into a suitable aperture provided in a plate shaped pole piece 1' carrying the other pole of the system (N, for instance), in such a manner as to set up an intense field in the annular space or gap separating parts 1 and 1'. Within the aforesaid annular space, a coil 2 fixed to an oscillating suspension 3 pivotally mounted at 4 on a suitable bracket 5, solid with the aforesaid system of magnets, is capable of moving freely.

In the absence of any current in coil 2, said coil comes to rest, under the action of gravity, in a medium position in the annular gap, as soon as it is traversed by a direct current travelling in one direction or in the other, said coil 2 moves in one direction or the other and its travel, over a short distance, may be considered as parallel to the axis of core 1.

In the example of an embodiment of a sensitive relay shown in Figures 2, 3 and 4, the apparatus comprises two magnets 6 and 7 assembled in parallel between two soft-iron cheeks 8 and 9. Rear plate 8 supports a core 10 which passes concentrically through a hole 11 provided in front cheek 9, the extremity of aforesaid core positioning itself flush with the front surface of said cheek, by means of which arrangement a very intense field is obtained in annular space 11 separating core 10 from cheek 9.

Within annular space 11 is positioned a coil 12 capable of moving freely therein, said coil 12 being solid with an insulating suspension plaquette 13 anchored at its top portion, to an insulating cross piece 14 provided with two suspension needle-points (or knife edges) 15. Said needle-points (or knife edges) rest in the bottom of cups 16. Said cups are capable of containing a drop of quicksilver and serve to lead the current to the moving coil. The current might just as readily be led from the fixed portion of the apparatus to the moving gear by means of spirals, small coils, etc.

Under the action of gravity, the moving gear comes to rest in a certain position in which coil 12 is positioned in the field set up by inducting assembly 6—7—8—9—10.

The relay also comprises a third electric connection between the fixed portion and the moving gear, said connection being constituted by a third cup 17 containing quicksilver into which

dips a needle-point 18 electrically connected to contacting stud 19 mounted on an elastic blade 20. One extremity of the blade is positioned on plate 13, either by a spiral or a small coil, etc. The contact stud 19 makes contact with a terminal supported by the fixed frame, fixed contact stud 21 being positioned at the end of a screw 21' making it possible to adjust its position, said screw passing through front cheek 9, at a suitable point.

An adjusting screw 22, positioned at the rear part of base 23 of the apparatus makes it possible to adjust the optimum location of the moving gear relatively to the stationary portion of the relay and, consequently, the gap between contact parts 19 and 21 of said relay.

The relay being positioned as shown in Figure 4, if a suitably directioned current is switched into coil 12, said current being led to cups 16, the closing of contact 19—21 can be obtained.

If, on the contrary, contact 19—21 is closed, it will be sufficient to switch through coil 12, a suitably directioned current (travelling in the opposite direction to that considered above) in order to obtain the opening of contact 19—21.

In both cases, under the action of gravity, the moving gear returns to its original position of equilibrium, or normal location, as soon as the current is switched off from the coil in the moving gear.

The utilization of several contact members obviously makes it possible to transform the cut-out relay into a current reverser relay, etc.

In order to damp the movement of the moving gear of the relay, a copper disk of greater or lesser thickness may be positioned on the front face of coil 12, the eddy currents set up in said disk ensuring the more or less energetic braking of said moving gear which can be rendered absolutely dead-beat if desired.

The relay which forms the subject matter of the present invention can also be arranged so as to serve as a measuring instrument.

In the example illustrated in Figure 5, plaquette 13, supporting coil 12, is solid with a beam 24 pivoting about knife edges (or needle points) 15 resting in cups 16, it being possible to hook weights on to said beam or to cause moving weights to slide along it, the value of said weights, or their position in relation to knife edges 17 being capable of representing either intensities or tensions.

In an embodiment, forming another variant, as illustrated in Figure 6, plaquette 13 may be provided with a pointer extension 25 moving in front of a scale 26.

If desired, the needle-point and cup suspension system may be replaced by other suspension systems, for instance by elastic blades similar to those employed for the suspension of clock pendulums.

Finally, the relay may be completed by one or more counter springs, adjustable or not, intended to return the moving gear to a predetermined location. Moreover, said springs (or spirals) may be those which serve as leads for the current to the moving gear.

It is to be understood that the device hereinabove described and illustrated in the attached drawing is given as an indication but that the invention is not so limited and that various changes in the forms and details of said device may be made within the scope of the following claims.

What I claim is:

1. A sensitive relay, comprising a permanent magnet constructed so as to create an annular excitation field, a coil mounted to swing in said field in the manner of a pendulum, and means for suspending said coil in said field, the said coil and the said suspension means being secured together to form a single, movable unit, the said suspension means causing the unit to hang so that the position of equilibrium of the unit is that which the latter assumes under the action of gravity.

2. A sensitive relay, comprising a control circuit, a permanent magnet constructed so as to create an annular excitation field, a coil mounted to swing in said field in the manner of a pendulum, means for suspending said coil in said field, the said coil and suspension means being secured together to form a single, movable unit, needle points on said suspension means, and cups connected to the said control circuit, and containing quicksilver adapted to receive the said needle points.

3. A sensitive relay, comprising a control circuit, a permanent magnet constructed so as to create an annular excitation field, a coil mounted to swing in said field in the manner of a pendulum, means for suspending said coil in said field, the said coil and suspension means being secured together to form a single, movable unit, needle points on said suspension means, and cups connected to the said control circuit, and containing quicksilver adapted to receive the said needle points, the said control circuit comprising a fixed contact member and a movable contact member, an elastic element disposed on said suspension means, to which element the said contact member is fast, an additional needle point on said suspension means to which needle point the said movable contact member is electrically connected, and an additional cup mounted in line with the first-mentioned cups and containing quicksilver adapted to receive the said additional needle point.

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