May 15, 1934. T. REYMAN 1,958,713

RELAY

Filed April 11, 1931

Fig.1.

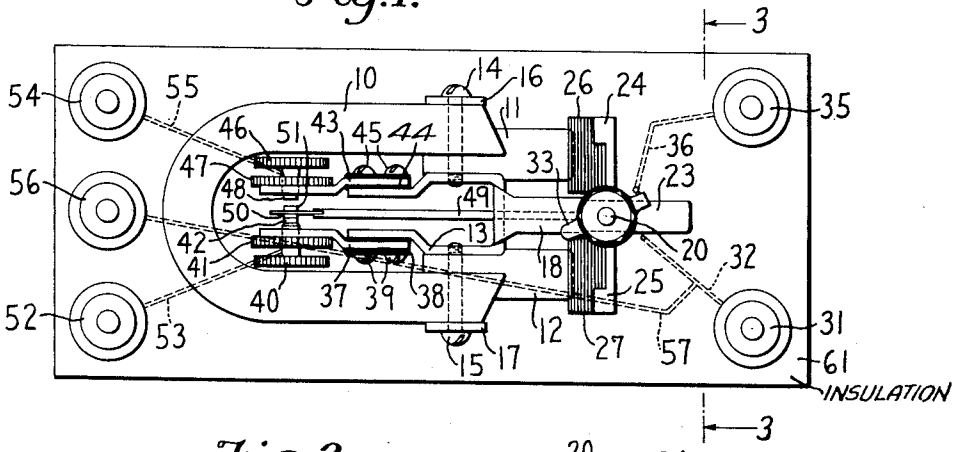


Fig.2.

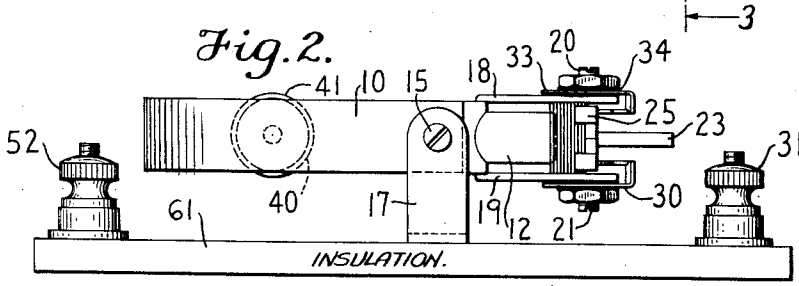


Fig.3.

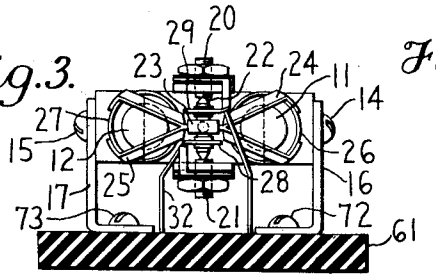
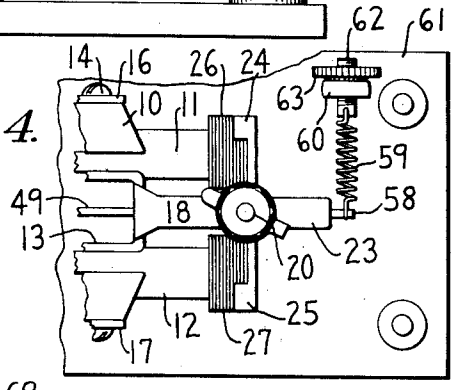


Fig.4.



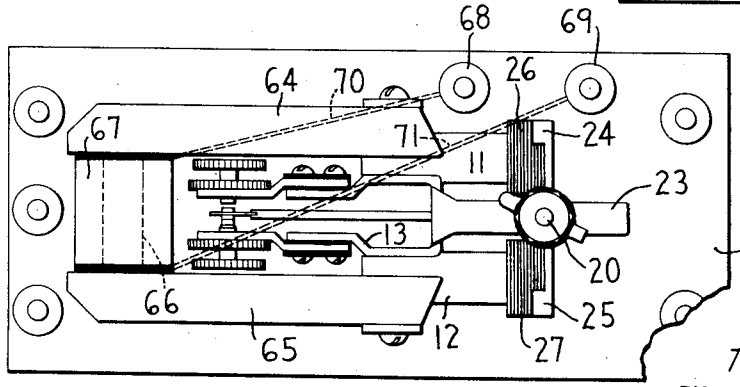


Fig.5.

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RELAY

Theodore Reyman, New York, N. Y.

Application April 11, 1931, Serial No. 529,481

13 Claims. (Cl. 200—110)

This invention relates to improvements in sensitive relays, and has for an object the provision of a relay adapted to be operated by very minute currents.

Another object is the provision, in a relay, of moving coils carried by an armature in such manner that a small movement of the coils causes greater movement of contact points carried on the opposite end of the armature.

A further object of the invention is the provision, in a relay, of a constant magneto motive force acting on the coils thereof.

Still another object is the provision, in a relay, of an electromagneto motive force, which may be made any desired value, adapted to act upon the coils thereof.

A still further object is to provide, in a two-way relay, tension against the operation thereof and means for adjusting the same.

Referring to the drawing:

Figure 1 is a plan view of one embodiment of the invention;

Figure 2 is an elevation of the device shown in Figure 1;

Figure 3 is a view partly in section along the line 3—3 of Figure 1;

Figure 4 is a fragmentary view showing one method of applying tension to the armature of a relay such as shown in Figure 1; and

Figure 5 is a plan view showing another embodiment of the invention wherein an electromagneto motive force is employed.

A permanent magnet 10 has shoes 11 and 12 secured to the pole pieces thereof. These shoes are preferably made of round material. A bracket 13 is mounted adjacent to shoes 11 and 12 and the bracket and shoes are firmly secured to the magnet by screws 14 and 15. These screws also secure the magnet to the supports 16 and 17.

The bracket 13 has two arms 18 and 19 extending beyond the ends of the pole shoes 11 and 12 and carrying adjustable pivot screws 20 and 21. A pivot shaft 22 supported by the screws 20 and 21 carries a movable armature 23. This armature carries brackets 24 and 25, preferably of very light material, and coils or solenoids 26 and 27 are secured to the brackets 24 and 25.

The pivot shaft 22 carries spiral springs 28 and 29, the latter of which is insulated from the shaft 22. These spiral springs are preferably of phosphor bronze or some other highly conductive material.

A lever 30 supported by the pivot screw 21 is provided for adjusting the tension of the spring 28 and also serves as a conductor for supplying current to the spring 28. This lever is connected to a binding post 31 by wire 32. A lever 33 carried by the screw 20 is insulated therefrom by insulating washers 34 and connected to the spiral spring 29, which serves to adjust the tension thereof and also to conduct current thereto. This lever 33 is connected to binding post 35 by wire 36.

The solenoids 26 and 27 are so connected to the springs 28 and 29 that the polarities, when current flows therethrough, are the same on the ends adjacent to the shoes 11 and 12. For example, assuming that the shoe 11 has a "north" polarity, the adjacent end of the solenoid 26 would also have a "north" polarity, and the shoe 12 would have a "south" polarity and the adjacent end of the solenoid 27 would have a "north" polarity. When current flows the solenoid 26, having a "north" pole adjacent to the shoe 11 which also has a "north" polarity, is repelled thereby and moves away from the shoe 11, and the solenoid 27, having a "north" polarity on its end adjacent to the shoe 12 which has a "south" polarity, is attracted thereby and moves toward the shoe 12.

The bracket 13 carries an arm 37 which is insulated therefrom by insulation 38 and secured thereto by screws 39. This arm carries in its outer end a contact screw 40 which may be adjusted and locked in any desired position by lock nut 41. A suitable contact 42 is provided on the end of the screw 40.

A similar arm 43 is carried by the opposite arm of the bracket 13 and is insulated therefrom by insulation 44 and secured thereto by screws 45. This arm carries in its outer end a contact screw 46 which may be adjusted and locked in any desired position by a lock nut 47. A suitable contact 48 is provided on the end of the screw 46.

The armature 23 has an extension 49, preferably of reduced dimension, which carries in its outer end the contact points 50 and 51 which are adapted to make contact with the points 42 and 48 respectively.

The arm 37 is connected to a binding post 52 by a conductor 53, the arm 43 is connected to a binding post 54 by a conductor 55 and the armature is connected to binding post 56 via the spring 28, the lever 30, wire 32 and the conductor 57.

In figure 1 the contact point 50 is shown in contact with the point 42 and when current

is sent through the solenoids 26 and 27 via the binding posts 31 and 35, the solenoid 26 is repelled by the shoe 11 and the solenoid 27 is attracted by the shoe 12, causing the armature to swing in a clock-wise direction thereby breaking the contact between points 50 and 42 and making the point 51 contact with the point 48, thus establishing a circuit across the terminals or binding posts 54, 56. As soon as current ceases to flow through the solenoids 26 and 27 the armature moves back to a normal position and contact is again established between the points 50 and 42.

This method of carrying solenoids on the armature and having them co-act against and with an independent magnetic field, and the fact that the contact points are a substantial distance from the pivots, produces a relay which is very sensitive to minute currents and very little movement of the solenoids produces a substantial movement of the end of the armature carrying the contact points.

Where it is desired to carry larger currents through the contact points and where a larger current is available to operate the relay, an extension 58 may be provided on the armature and a spring 59 may be attached thereto and adjustment may be provided by means of a post 60 supported on a base 61 having a screw 62, connected to the opposite end of the spring 59, and a thumb nut 63 which may be turned to the right to tighten the spring or to the left to loosen the spring.

The relay shown in Figure 5 is the same as the one shown in Figure 1, except that an electromagnet is provided instead of a permanent magnet. The electromagnet has legs 64 and 65 with a yoke 66 therebetween. A winding 67 is provided on the yoke 66 and is connected to the terminals 68, 69, by conductors 70 and 71 respectively. The shoes 11 and 12 and the bracket 13 are mounted on the legs 64 and 65 in the same manner as described above.

This last form of relay may have some advantages in certain applications because the strength of the magnetic field may be varied or fixed at any desired value.

While the center terminal 56 is shown connected to the conductor 32, which connects to one side of the solenoid, it may be desirable in some cases to isolate the actuating circuit from the external circuit. In such cases the spiral spring 28 may be insulated from the shaft 22 and a third spiral spring mounted on the shaft 22 and connected thereto, with its other end directly connected to the terminal 56.

The supports 16 and 17 may be secured to the base 61 by any suitable means, such as the screws 72, 73.

The relay herein disclosed is very sensitive and is capable of operating on very small values of current. With some types of photo cells this relay may be operated directly and without the use of amplification, and although sensitive to small currents the relay is very rugged and strong mechanically.

Many modifications in the device may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a device of the character described, a magnet for providing a magnetic field having two poles, an armature, a pair of solenoids carried by said armature and located near said poles, and a means for causing the ends of the solenoids adjacent to said poles to assume a like polarity.

2. In a device of the character described, a magnet for providing a magnetic field having two poles, a pivoted armature, a pair of solenoids carried by said armature and located near said poles, and means for causing the ends of the solenoids adjacent to said poles to assume a like polarity whereby one of said solenoids is attracted by the pole adjacent thereto and the other solenoid is repelled by its adjacent pole.

3. In a device of the character described. a magnet for providing a magnetic field having two poles, a pivoted armature, a pair of solenoids carried by said armature and located near said poles, a contact point carried by said armature, a second contact point adapted to be contacted by said first point, and means for causing the ends of the solenoids adjacent to said poles to assume a like polarity whereby one of said solenoids is attracted by the pole adjacent thereto and the other solenoid is repelled by its adjacent pole whereby said armature is moved and said points make contact with each other.

4. In a relay, a base, a field magnet mounted on said base having pole shoes, an armature, a pivot shaft supporting said armature, solenoids on the armature encircling said pole shoes, said solenoids adapted to be energized by current passing therethrough in such direction that one of the solenoids assumes a like polarity to that of the shoe which it encircles, and the other solenoid assumes a polarity opposite to that of the shoe which it encircles, contact points on opposite sides of said armature, two fixed contact points adapted to be engaged by said first contact points, and springs on said shaft adapted to hold said armature in such position that one pair of said contacts is normally closed.

5. In a relay, a base, a field magnet mounted on said base having pole shoes, an armature, a pivot shaft supporting said armature, solenoids on the armature partly encircling said pole shoes, said solenoids adapted to be energized by current in a direction such that one of said solenoids assumes a like polarity to that of the shoe which it partly encircles whereby it is repelled by said shoe and the other solenoid assumes an opposite polarity to that of the shoe which it partly encircles whereby said last solenoid is attracted by said last shoe, contact points on opposite sides of said armature, two fixed contact points adapted to alternately engage said first contact points, springs on said shaft adapted to hold said armature in such position that one pair of said contacts is normally closed, electrical connections between inner ends of said springs and said solenoids, and connections from the outer ends of said springs to terminals mounted on said base.

6. In a relay, a base, a field magnet mounted on said base having pole shoes, an armature, a bracket, a pivot shaft supported in said bracket carrying said armature, solenoids on the armature partly encircling said pole shoes, contact points on opposite sides of said armature, two fixed contact points adapted to alternately make contact with said first points, electrical connections from said solenoids to terminals on said base, and electrical connections between said armature and said fixed contacts to binding posts on said base.

7. A relay comprising in combination, a base, an electro-magnet mounted on said base having pole shoes, an armature, a bracket, a pivot shaft supported in said bracket carrying said armature, solenoids on the armature encircling said pole shoes, contact points on opposite sides of said armature, two fixed contact points adapted to alternately make contact with said first points, electrical connections from said solenoids to terminals on said base, and electrical connections between said armature and said fixed contacts to binding posts on said base.

8. In a device of the character described, a magnet for providing a magnetic field having two poles, an armature, a pair of brackets carried by said armature and located near said poles, a pair of solenoids carried by said brackets having their center lines substantially concentric with the center lines of said poles, and means for causing the ends of the solenoids adjacent to said poles to assume a like polarity.

9. In a device of the character described, a magnet for providing a magnetic field having two poles, a pivoted armature, a pair of brackets carried by said armature and located near said poles, a pair of solenoids carried by said brackets, a contact point carried by said armature, a second contact point adapted to be contacted by said first point, and means for causing the ends of the solenoids adjacent to said poles to assume a like polarity whereby one of said solenoids is attracted by the pole adjacent thereto and the other solenoids is repelled by its adjacent pole whereby said armature is moved and said points make contact with each other.

10. In a relay, a base, a field magnet mounted on said base having pole shoes, an armature, a pivot shaft supporting said armature, solenoids on the armature partly encircling said pole shoes, contact points on opposite sides of said armature, two fixed contact points adapted to alternately engage said first contact points, two springs on said shaft electrically insulated therefrom and adapted to hold said armature in such position that one pair of said contacts is normally closed, electrical connections between inner ends of said springs and said solenoids so arranged that when current passes therethrough one of the solenoids is adapted to assume a like polarity to that of the shoe it partly encircles and the other solenoid is adapted to assume a polarity opposite to that of the shoe it partly encircles, and a third spring on said shaft for leading current to the contact points on said armature.

11. In a device of the character described having a field magnet with pole shoes, an armature comprising a pivot shaft, a pair of solenoids carried by said shaft each adapted to cooperate with one of said shoes, springs insulatedly secured to said shaft and so connected to said solenoids that they assume a like polarity, and a contact arm carried by said shaft and adapted to be actuated by the solenoids.

12. In a device of the character described having a field magnet with pole shoes, an armature comprising a pivot shaft, a pair of solenoids carried by said shaft each adapted to cooperate with one of said shoes, springs insulatedly secured to said shaft and so connected to said solenoids that they assume a like polarity, and a contact arm carried by the shaft and disposed parallel to the axes of said solenoids and adapted to be actuated thereby.

13. A device as claimed in claim 12, in which the pivoted shaft is provided with a plurality of springs insulatedly supported thereon, some of said springs being connected in circuit with said solenoids and others of said springs being connected in circuit with said contact arm.

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