

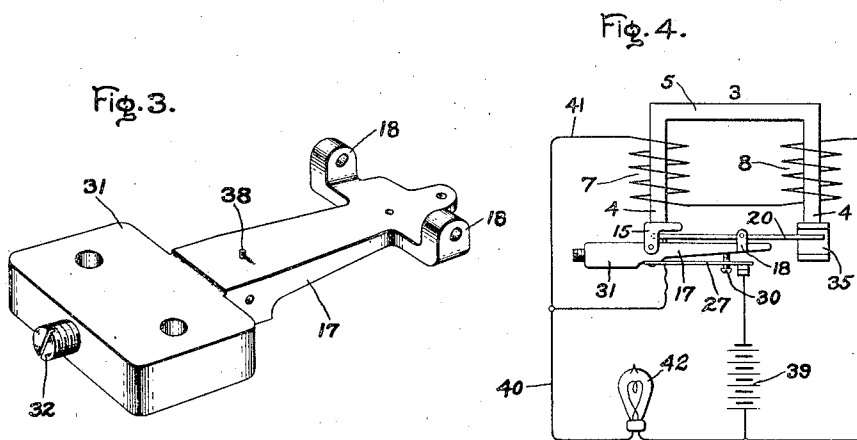
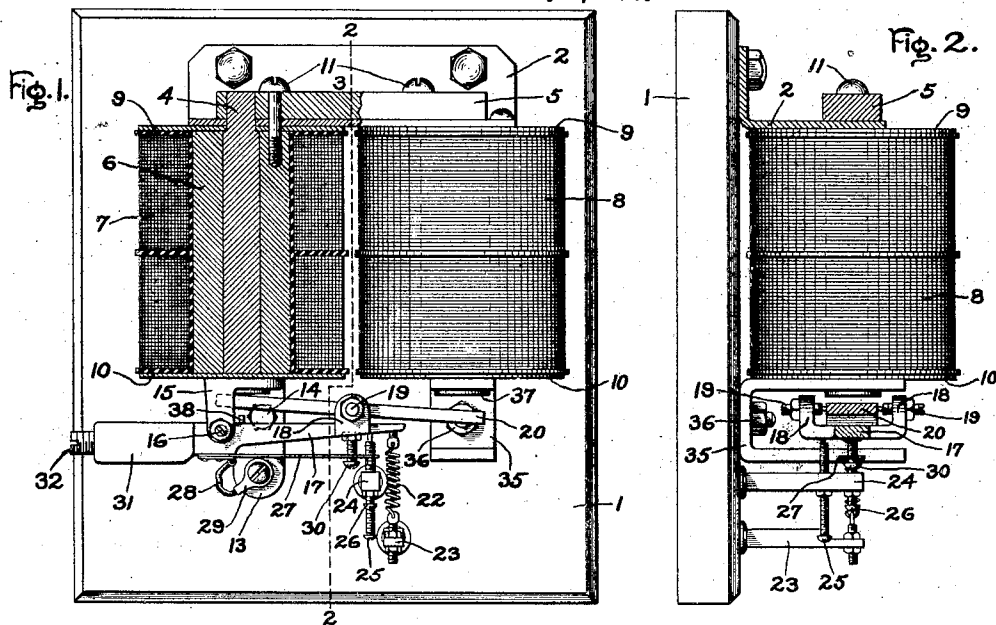
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1,532,045

A. H. DAVIS

LIGHT FLASHING RELAY

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Inventor:
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UNITED STATES PATENT OFFICE.

ARCHIBALD H. DAVIS, OF BUFFALO, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

LIGHT-FLASHING RELAY.

Application filed July 6, 1923. Serial No. 649,798.

To all whom it may concern:

Be it known that I, ARCHIBALD H. DAVIS, a citizen of the United States, residing at Buffalo, county of Erie, State of New York, have invented certain new and useful Improvements in Light-Flashing Relays, of which the following is a specification.

My invention relates to relays and particularly to that class of relays which are especially adapted for use in controlling the light flashes of electric flash light buoys where an uninterrupted automatic operation is required over extended periods of time.

An object of my invention is to provide an automatically operating relay which shall have a comparatively long period or cycle of operation. Another object is to provide a relay whose operation will not be materially affected by variations in position or by wave motions to which the buoy may be normally subjected. A further object is to provide an armature mounting for such a relay in which wear on the bearings will not appreciably affect the alinement of parts or the proper functioning of the relay.

My invention will be better understood by reference to the accompanying specification and drawing and its scope will be pointed out in the appended claims.

Fig. 1 is a plan partly in section of a device involving my invention;

Fig. 2 is a vertical section of the same taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of the armature supporting lever, and

Fig. 4 is a circuit diagram.

Referring now to the drawing, a base plate 1, which may be of slate, has secured to it an angle bracket 2 carrying an electromagnet. This magnet comprises a U-shaped core structure 3 formed of two parallel cores 4 joined together by a yoke 5. Each of the two cores shown is immediately surrounded by a comparatively thick sleeve 6 of good electrical conducting material, preferably copper, although several turns of heavy wire may be used if desired. Outside of these sleeves are the windings 7 and 8 which are suitably insulated both from the sleeves 6 and from the end plates 9 and 10 and which, if desired, may be subdivided in two parts as shown. Two screws 11 serve to bind the sleeves 6 to the yoke 5 and to angle bracket 2.

An angle bracket 13 of non-magnetic material by which the armature is supported fits over the end of one core 4 and is secured by means of a bolt 14 to the base plate and by another screw (not shown) to the adjacent sleeve 6. The bracket 13 has two similar depending ears 15, one being hidden by the other in Fig. 1, having pivots 16 which support the lever 17 also of non-magnetic material. This lever, shown by itself in Fig. 3, has at its right hand end two lugs or ears 18 through which extend the pivot pins 19 for the armature 20. The latter is a straight bar of soft iron and the pivot holes therein are located midway between the two ends and midway between the front and rear faces of the bar whereby the armature is at all times balanced. An adjustable retracting spring 22 is connected between the lever 17 and a post 23 mounted on the base. A second post 24 also mounted on the base, carries a stop screw 25 for engaging the lever 17 and limiting its movement in a direction away from the magnetic core 4. This same post 24 also carries a contact screw 26 which engages a contact on the free end of spring 27. The opposite end of this spring is secured to the lever 17 and for convenience in making an electrical connection thereto may be provided with a pig tail 28 and terminal 29. A small screw 30 carried by the lever 17 passes through and limits relative movement of the spring 27 in one direction. The left hand end of the lever 17 is greatly enlarged for the purpose of forming a counter weight 31 which shall balance the right hand end and the parts carried thereby about the axis of pivots 16 for all positions which the buoy may take. For adjusting the effective weight of this counterweight a screw 32 is threaded into the end thereof. The entire moving system being thus balanced about the axis of pivots 16, the position of the buoy in which the apparatus is installed or the complex movements thereof due to wave action has little or no effect on the functioning of the apparatus.

In order to effect a greater delay in the movement of the armature 20 after the circuit of the electromagnet has been closed, I provide a special pole piece for the right hand pole of the magnet. This pole piece 35 has a U-shaped form, its yoke portion being secured to the base by a screw and nut

36 and its two leg portions extending on opposite sides of the armature 20. The upper leg fits over and firmly engages the adjacent core 4 of the electromagnet while the lower leg is free and lies beneath the armature. The free end of each core 11 is covered by a thin layer 37 of non-magnetic material to prevent the armature from sticking thereto. A pin 38 projects from the lever 17 a sufficient distance to engage the armature should it, upon deenergization of the magnet, tend to stick against the right hand pole of the magnet.

By reference to Fig. 4 it will be seen that when the contacts controlled by the lever 17 are closed the battery 39 may supply current through one circuit 40 to illuminate the lamp 42, which is suitably mounted in the top of the buoy, not shown, and through another circuit 41 in shunt with the lamp circuit to energize the windings 7 and 8. As soon as these two circuits are closed the lamp is illuminated and the magnetic flux of the magnet begins building up. The sleeves 6 exert a strong retarding effect, both to the building up of the flux of the magnet when the circuit is closed and to the decay of the flux after the circuit is opened. A further delay in the operation of the armature in response to the closing of the circuit results from the effect of dividing the flux path at the right hand end of the armature 20 by means of the special pole piece 35. As the adjusting screw 25 is backed off, the open circuit position of the right hand end of the armature 20 approaches the middle of the space between the two legs of the pole piece 35 and obviously as this position is approached the flux more equally divides in the two paths forward and backward from the armature 20. The position of the armature may be so adjusted that the resultant pull on the right hand end thereof may not become sufficient to draw the armature toward the right hand pole-face spacer 37 until the flux of the magnet has reached its full and final value.

The armature having been pulled toward the magnetic cores 4 by the magnet will always come to rest against both spacers 37, which action will occur by reason of the pivotal connection between the armature and the lever 17 even though the pivots 16 become considerably worn. Upon separation of the contacts both the lamp circuit and the magnet circuit are broken; the lamp becomes extinguished and the windings deenergized. The flux of the magnet thereupon begins to decay at a rate governed by the cross sectional area and the conductivity of the sleeves 6. The time required for the flux to change from a maximum to a minimum is also a function of the difference between these values, and in order to take advantage of this fact the reluctance of the magnetic

circuit is made as low as practicable. At length the armature drops back under the influence of the spring 22 to the position illustrated by Fig. 1 when the lamp and magnet circuits are again closed and the cycle of operation is repeated. By suitably varying the several adjustments provided, the periods during which the lamp is illuminated and during which it is dark may be varied within comparatively wide limits. An example of what has been found to be a satisfactory cycle of operation for certain uses of this device is: duration of flash 0.25 to 0.6 of a second; duration of dark interval 1.5 to 3 seconds.

While I have described only one embodiment of my invention, I do not wish to be limited to the particular form shown and described as it will be apparent that many modifications therein may be made without departing from the scope of my invention as set forth in the appended claims.

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

1. A relay of the class described comprising an electro-magnet, an armature adapted to be attracted thereby, and means for delaying the attractive movement of said armature comprising a pole piece for said magnet having portions extending on opposite sides of said armature.

2. A relay of the class described comprising an electro-magnet, an armature movably mounted opposite the poles thereof, and means for delaying the attractive movement of said armature after the magnet is energized comprising a pole piece for the magnet having portions arranged to convey the flux to opposite sides of the armature.

3. A relay of the class described comprising a U-shaped electro-magnet, an armature therefor pivotally mounted opposite the poles thereof, means for resiliently holding said armature away from said magnet, and means for delaying the movement of said armature toward said electro-magnet after the circuit of the same has been closed comprising a U-shaped pole piece for one of the poles of said magnet having its legs extending on opposite sides of the corresponding end of the armature.

4. A relay comprising an electro-magnet, an armature therefor, a pivotally mounted member having a portion for supporting said armature and a counterweight portion, and means for pivoting said armature at substantially its center of gravity to said member, said counterweight being arranged to balance said armature, said pivoting means and said supporting portion irrespective of the position of said relay.

5. A relay comprising an electro-magnet, an armature therefor, a support, a lever pivoted thereto at a point intermediate its ends, and a pivotal connection between one arm

of said lever and said armature at substantially its center of gravity, the opposite arm of said lever forming a counterweight for the armature, the pivotal connection and the
5 first mentioned arm.

6. A relay comprising an electro-magnet, an armature therefor, a support for said armature, a lever pivoted at a point intermediate its ends to said support, a pair of
10 pivot points carried by one arm of said lever

and engaging said armature on substantially its transverse gravity axis, a stationary contact, a cooperating spring contact secured to said lever, a return spring connected to said arm of said lever, the opposite arm of said lever being enlarged to form a counterweight. 15

In witness whereof I have hereunto set my hand this third day of July, 1923.

ARCHIBALD H. DAVIS.