Nov. 2, 1926. 1,605,216

A. T. CARTER

RELAY

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Fig. 1.

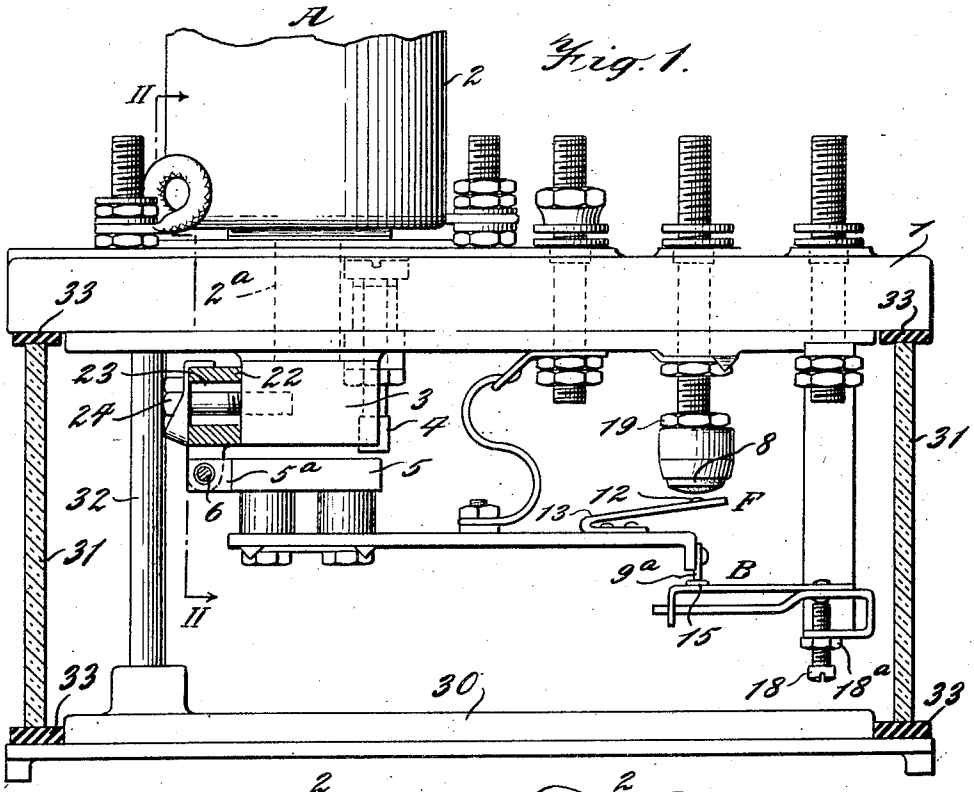
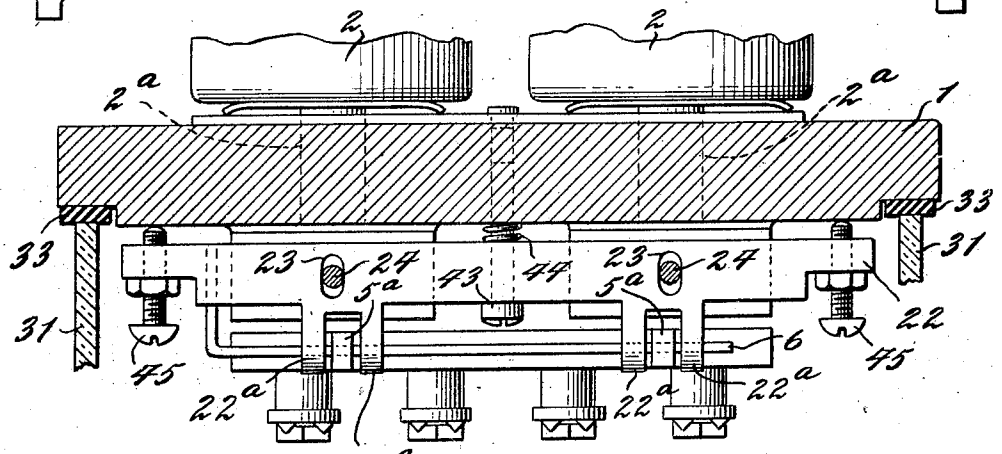


Fig. 2.



Inventor
Ainslie T. Carter
By Fred E. Lamm.
His Attorney

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UNITED STATES PATENT OFFICE.

AINSLIE T. CARTER, OF ALBANY, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL RAILWAY SIGNAL COMPANY, A CORPORATION OF NEW YORK.

RELAY.

Application filed November 14, 1922. Serial No. 600,909.

My invention relates to relays and particularly to relays for controlling the operation of railway signaling devices. One object of my invention is the provision of a relay characterized by high efficiency of operation and permanence of calibration. I will describe one form of relay embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawing Fig. 1 is a vertical sectional view showing one form of relay embodying my invention. Fig. 2 is a vertical sectional view on the line II—II of Fig. 1, showing one form of structure embodying my invention for adjustably mounting the relay armature with relation to the pole pieces of the electromagnet.

Similar reference characters refer to similar parts in each of the views.

Referring first to Fig. 1, the relay comprises a top plate 1 of insulating material such as porcelain, a bottom plate 30, usually of metal, and glass side walls 31, separated from the plates by gaskets 33. The top and bottom plates are spaced by the side walls and by corner posts which are not shown in the drawing, and are held together by screws 32, one only of which is shown in the drawing.

Mounted in the top plate 1 is an electromagnet, designated as a whole by the reference character A, and comprising, as usual, two windings 2, 2 surrounding cores 2^a, 2^a, which cores project through the top plate 1 and terminate in pole pieces 3, 3 resting against the underside of the top plate. The electromagnet A controls an armature 5 which is pivotally mounted at 6 in the manner hereinafter explained, and this armature in turn through contact fingers or arms F controls a plurality of front contacts 8 and a plurality of back contacts B. In the drawings I have shown only one front and one back contact and one finger or arm F, but in accordance with usual practice there will ordinarily be a number of such contacts each behind the other as viewed in Fig. 1.

The armature 5 is pivotally attached to the pole pieces 3 on an axis 6. The structure by which this is accomplished is as follows: A supporting bracket 22 (see Figs. 1 and 2) is attached to pole pieces 3 by means of screws 24 which pass through vertically elongated slots 23 in the bracket and which enter threaded holes in the pole pieces. This bracket is provided with two pairs of downwardly projecting ears 22^a which carry a trunnion 6 one end of which is anchored in the bracket itself, as shown in Fig. 2. The rear edge of the armature 5 is provided with wings 5^a which project between the two ears of each pair 22^a and which wings are perforated to receive the pivot trunnion 6. It will be seen, therefore, that the vertical position of the pivotal axis of the armature 5 may be adjusted by shifting the bracket 22 vertically within the limits of the slots 23. To accomplish this adjustment three adjusting screws are provided one of which, 43, passes through the middle of the bracket and enters a threaded hole in the top plate 1. Surrounding this screw is a coiled spring 44 which presses against the top plate and against the bracket and so forces the bracket to follow this screw as the screw is released. The other two screws 45 pass through threaded holes at the ends of the bracket 22 and bear against the underside of the top plate one. These last two screws serve the double purpose of adjusting the air gap for length and also adjusting the parallelism of the air gap between the armature and the under faces of the pole piece 3, both of which are accomplished by the micrometer adjustment afforded by the screws 43 and 45. After the desired adjustment of the bracket 22 has been accomplished this bracket is locked in position by tightening the screws 24.

It will be noted that the trunnion 6 on which the armature is mounted is a rod one end of which is bent over and sprung into a suitable hole in the bracket 22. This trunnion 6 is preferably a piece of phosphor bronze spring rod stock.

I have found from experience that if a constant minimum air gap is maintained between the front edge of the armature and the pole pieces, it is possible to improve the operating characteristics of the relay; to be more specific it is possible to reduce the amount of current necessary to close the armature against its front stop. For this reason I have located the front stop 4 very close to the front edge of the armature. This makes it necessary to provide for adjustment between the rear edge of the armature and the pole pieces, and this is of course, provided

by the vertical adjustment of bracket 22 as explained hereinbefore.

It will be seen from the foregoing that when the relay is de-energized the contact tip 12 is separated from the contact member 8, and the parts occupy the positions in which they are shown in Fig. 1. When the relay becomes energized, however, armature 5 swings upwardly until stopped by engagement with the front stop 4 so that the contact tip 12 is brought into engagement with the contact member 8.

It is customary practice in assembling relays of this kind to so proportion the parts that the contact 12—8 is closed while the armature is travelling through the last 7/1000″ measured at its front air gap, i. e. measured at the right hand edge of the armature as viewed in Fig. 1. During this travel of the armature the contact pressure developed between members 12 and 8 should be approximately 1½ oz. The procedure of assembling the relay and adjusting for this desired pressure may be as follows: The armature 5, with all parts carried thereby, are assembled before being placed in the relay, and a pressure of 1½ oz. is exerted on the contact tip 12. The armature 5 with the parts attached thereto, is then mounted in the relay and a spacer 7/1000″ thick is inserted between the front stop 4 and the front edge of the armature. The back air gap is then adjusted by vertical adjustment of bracket 22 for the opening which corresponds to the desired drop-away current value of the magnet, and after this setting has been obtained the bracket 22 is locked in position by tightening the screws 24 with the spacer still in place. The carbon button 8 is then brought down to just touch the contact tip 12, when the armature is closed against the spacer, and button 8 is then locked in place by means of the locknut 19. It will be seen that if the spacer is now removed and the armature is closed against the front stop 4 the same contact pressure will be developed between the members 12 and 8 as was created between these members at the time that the spring 13 was adjusted. In other words, the contact pressure will be 1½ oz. It will also be seen that when the armature 5 has dropped away 7/1000″ from the front stop 4 the contact tip 12 will be just leaving the carbon button 8. The condition will be such that the drop-away current will be the same as that which was observed when the back air gap was adjusted before the carbon button had been placed in adjusted position.

It now remains to adjust the relay for the desired opening between contact 9ª and contact 15 of Fig. 1. This adjustment is made by inserting a spacer, such as referred to, of 7/1000″ of an inch in thickness, between the front stop 4 and the front edge of the armature and then energizing the coils 2—2, with sufficient current to hold the armature against the said spacer, when by turning the screw 18 the desired contact opening may be obtained. Screw 18 is locked in adjusted position by means of the nut 18ª and the circuit controller structure is then in final adjustment.

The structure for the pivotal mounting of armature 5, eliminates certain troubles which have been experienced in the past, such as binding of the armature in its pivot pins. The construction which I have shown and described makes it necessary for the parts to be of proper size and shape, as otherwise they cannot be assembled. The trunnion 6 passes through six holes, four of which are in the bracket 22 and the other two of which are in the armature wing 5ª. These holes must be in alignment or the trunnion 6 will not enter them. It will also be noted that this construction guarantees end play of the armature, this being obtained in the milling operation on bracket 22 and armature 5. That is to say, it is a simple machining operation in a gang milling machine to provide the proper clearances between the ears 22ª of each pair on the bracket and the armature wing 5ª which projects between these ears. Briefly, then, this trunnion construction insured both the proper end play of the armature and also the proper trunnion radial clearance. Furthermore it is very easy to remove, inspect, and replace the armature, and the structure is very cheap to manufacture as compared with past practice.

I have found from experience that when a relay is constructed in accordance with my invention the working current is remarkably low, and the pick-up and release current values can be made substantially the same throughout a wide range of working currents.

Although I have herein shown and described only one form of relay embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A relay comprising a magnet having pole pieces, a bracket carried by said pole pieces and capable of adjustment in a plane parallel with the cores of said magnet, a trunnion rod fixed against endwise movement in said bracket by having its end engaging a pocket in said bracket, and an armature pivotally mounted on said rod and controlled by said magnet.

2. A relay comprising a magnet having pole-pieces, a bracket carried by said pole-pieces and having two pairs of projecting ears, an armature controlled by said magnet

and having two wings located between the two ears of each of said pairs, and a rod anchored in said bracket and passing through said ears and wings.

3. A relay comprising a magnet having pole-pieces, a bracket carried by said pole pieces and capable of adjustment in a plane parallel with the cores of said magnet and having two pairs of projecting ears, an armature controlled by said magnet and having two wings located between the two ears of each said pairs, and a rod anchored in said bracket and passing through said ears and wings.

4. A relay comprising a magnet having vertically disposed pole pieces, a bracket adjacent said pole pieces having vertically disposed slots therein, screws passing through said slots and engaging said pole pieces for securely clamping said bracket to said pole pieces, an armature pivotally mounted in said bracket and controlled by said magnet, and micrometric means for adjusting said bracket and said armature relative to said pole pieces.

5. A relay comprising a magnet having pole pieces, a bracket carrying a pivotally mounted armature extending across said pole pieces and controlled by said magnet, and means for adjustably mounting said bracket on said pole pieces comprising, spring means constantly urging said bracket in one direction relative to said pole pieces, micrometrically adjustable means for limiting the movement of said bracket under the influence of said spring means, and clamping means engaging said pole pieces for retaining said bracket in its adjusted position.

6. A relay comprising a magnet having pole pieces, a bracket carrying a pivotally mounted armature extending across said pole pieces and controlled by said magnet, and means for adjustably mounting said bracket on said pole pieces comprising, spring means constantly urging said bracket in one direction relative to said pole pieces, micrometrically adjustable means for limiting the movement of said bracket under the influence of said spring means, adjustable stop means carried by said bracket and engaging a member secured to said pole pieces for adjusting the angular position of said bracket and said armature relative to said pole pieces, and clamping means engaging said pole pieces for retaining said bracket in its adjusted position.

In testimony whereof I affix my signature.

AINSLIE T. CARTER.