Sept. 29, 1925. 1,555,130

D. J. McCARTHY

ELECTRICAL SWITCH

Filed March 6, 1922 2 Sheets-Sheet 1

Fig. 1.

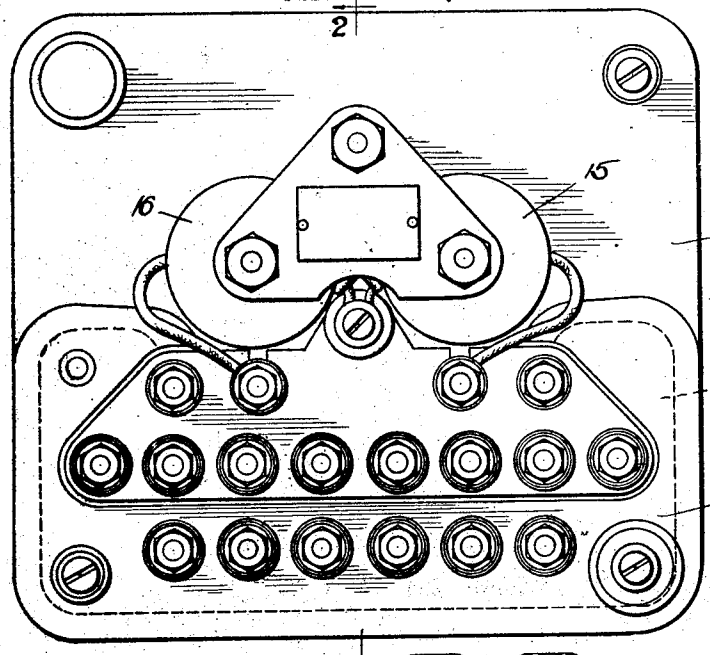
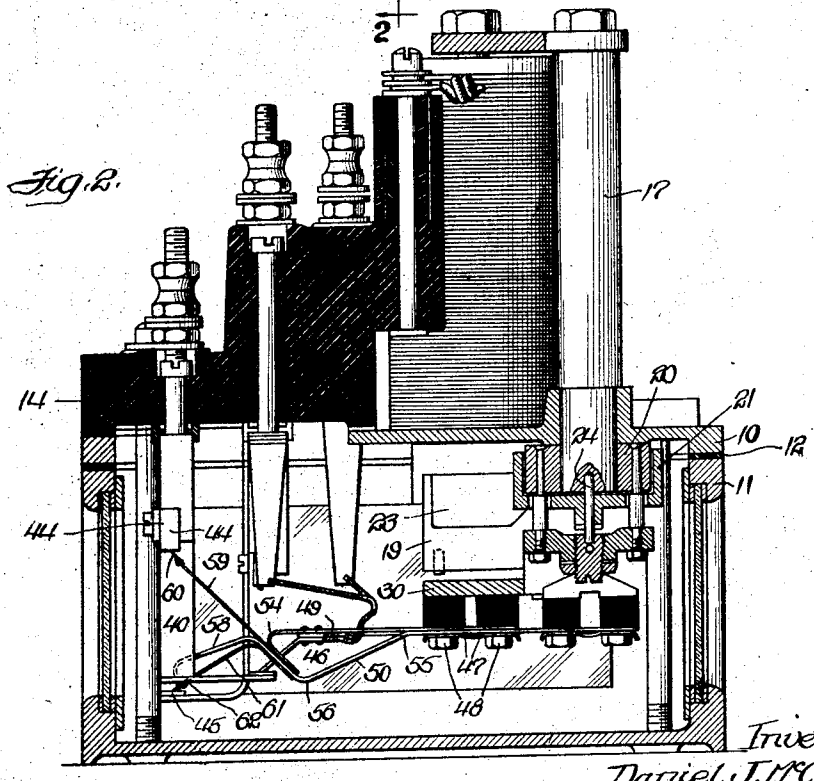


Fig. 2.



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Fig. 3.

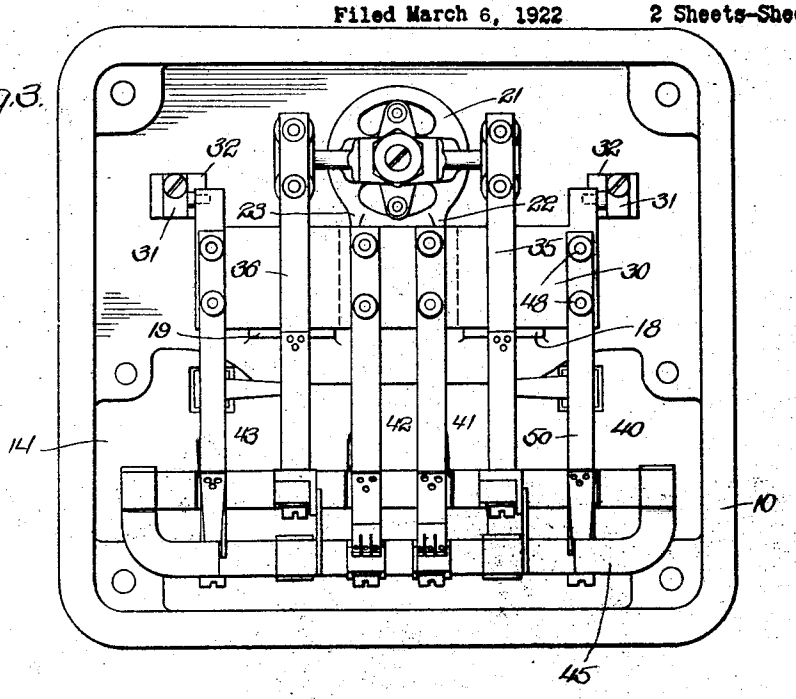


Fig. 4.

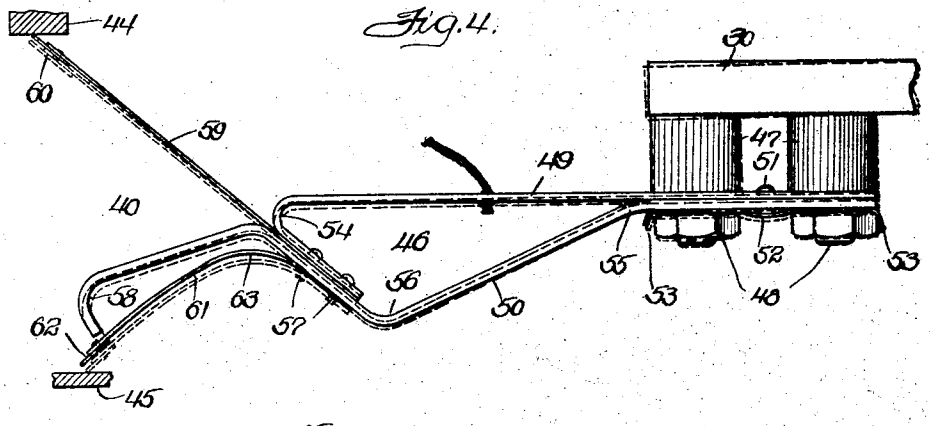
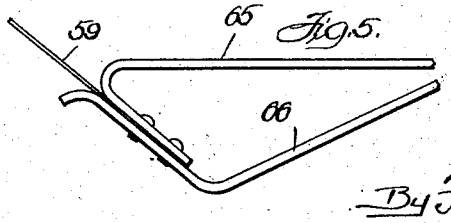


Fig. 5.



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Patented Sept. 29, 1925. 1,555,130

UNITED STATES PATENT OFFICE.

DANIEL J. McCARTHY, OF ELGIN, ILLINOIS, ASSIGNOR TO CHICAGO RAILWAY SIGNAL AND SUPPLY COMPANY, A CORPORATION OF ILLINOIS.

ELECTRICAL SWITCH.

Application filed March 6, 1922. Serial No. 541,438.

To all whom it may concern:

Be it known that I, DANIEL J. McCARTHY, a citizen of the United States, residing at Elgin, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Electrical Switches, of which the following is a specification.

This invention relates to electrical switches.

It may be incorporated in electrical apparatus of various kinds. A polarized relay, with which the switch has been successfully employed, is disclosed and claimed in my copending application Serial No. 385,178; filed May 29, 1920, of which this application is a continuation in part.

In the control of electrical circuits, reliability of operation is often of vital importance. Railway signalling, for example, where the signals and control apparatus are often in isolated locations and lives and valuable property are at stake, demands the most reliable operation under service conditions which are often extremely severe.

Polarized, and other types of relays, for controlling the circuits of railway signals have been used for years. Movable relay contacts of the so-called "leaf spring" and other types have been employed but they are subject to inherent defects which often render them unsatisfactory and dangerous. The contacts warp and bend under the influence of temperature changes, continual service and other causes. The resulting distortion, which may be permanent or more or less temporary and changeable, seriously affects the completion and interruption of the controlled circuits. False signals, with disastrous results, may follow.

One of the objects of this invention is to provide an improved electrical switch.

Another object is to provide an improved movable member for a circuit controlling switch.

Another object is to provide a switch wherein the liability of improper operation, due to distortion and other causes, will be reduced.

Another object is to provide a switch which is rugged, efficient, relatively light, and reliable.

Another object is to provide a switch especially adapted for severe service such as railway signalling and similar fields.

Other objects and advantages will hereinafter appear.

An embodiment of the invention incorporated in a railway signal polarized relay is illustrated in the accompanying drawings.

The views in the drawings are as follows:

Fig. 1 is a top plan of the relay.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a bottom plan of the relay with the lower section of the enclosing casing removed.

Fig. 4 is an enlarged side elevation of a trussed movable switch member, with front and back contacts, shown in its two extreme positions, and

Fig. 5 is a portion of a trussed movable switch member of a single front contact type.

The relay has a substantially hermetically sealed casing comprising two separable sections, an upper section 10 and a lower section 11. The upper section may be a metal plate sealed to the lower section by suitable packing 12. The upper section is provided with an opening 13 which is closed by an insulating terminal block 14 of porcelain or other suitable material. Plate 10 and block 14 support all of the electromechanical and contact elements of the relay.

A pair of electromagnets 15 and 16 and a permanent magnet 17 are mounted above plate 10. Electromagnets 15 and 16 are provided with pole pieces 18 and 19, respectively, located below plate 10. Permanent magnet 17 projects through, and is provided with, an enlarged cylindrical head 20 below plate 10.

The polarized armature of the relay has a cup shaped body 21 which fits over the end of head 20 and a pair of arms 22 and 23, respectively, located in proximity to pole pieces 18 and 19. The polarized armature is pivotally secured to permanent magnet 17 on a pivot pin 24. When electromagnets 15 and 16 are energized, arms 22 and 23 are attracted to one or the other pole piece 18 and 19, depending upon the direction of current, and the polarized armature is oscillated horizontally about pivot pin 24 in one direction or the other.

The relay also has a neutral armature 30, pivotally carried by bearing blocks 31 which are adjustably mounted on posts 32 project-

ing from plate 10. Neutral armature 30 is located slightly below the lower faces of pole pieces 18 and 19 and is attracted thereby and rocked upon its axis irrespective of the direction of current. The neutral armature is biased to initial position by gravity.

In the relay chosen for illustration, the polarized armature controls a pair of switches having movable contact levers 35 and 36 of the ordinary type, usually of relatively stiff metal. Instead of the ordinary type of lever, however, the improved construction hereinafter described, may be used. Each lever carries movable contacts, which cooperate with suitable fixed contacts to control electrical circuits associated therewith. The mechanical connections between the polarized armature and levers 35 and 36 is such that when the armature is moved about its pivot in one direction the outer end of lever 35 is elevated and the outer end of lever 36 is depressed. When the armature moves in the reverse direction the movements of levers 35 and 36 are likewise reversed. These mechanical connections are not shown in detail since their construction is not material to the invention set forth herein. The details of a suitable structure are disclosed in the aforesaid copending application Serial No. 385,178.

In the relay illustrated neutral armature 30 controls four switches 40, 41, 42 and 43. Each switch comprises a lever, carrying one or more movable contacts, and corresponding fixed contacts.

Since all of these switches may be of substantially the same construction, switch 40 has been illustrated to an enlarged scale in Fig. 4.

The structure chosen to illustrate the switch has an upper or "front" fixed contact 44 and a bottom or "back" fixed contact 45. Fixed contacts 44 and 45 are rigidly secured to terminal block 14 by suitable means. The active or engaging face of these fixed contacts may be of metal, carbon or other material suitable for the particular requirements to be met.

The movable contacts of the switch are carried by armature 30. Armature 30 has a trussed operating lever 46 insulatively secured thereto by suitable fiber spacing sleeves 47 and bolts 48. Lever 46 comprises two relatively rigid but light metallic strips 49 and 50. At their rear ends, strips 49 and 50 are securely fastened together by suitable means such as a rivet 51. Bolts 48 pass through holes in strips 49 and 50 to anchor the same to armature 30. A small metal strip 52, perforated for bolts 48 and having its outer ends 53 bent over to fit about the nuts of the bolts, may be used to lock the nuts of bolts 48 in position.

Strip 49 is given a partial reverse curve 54 near its outer end. This curve forms the outer end of strip 49 into a hook. Strip 50 is formed with a slight outward curve 55 close to the attachment to the armature and an inwardly directed curve 56 between its ends. The parallel outer portions of strips 49 and 50 are secured together by suitable means such as rivets 57. Beyond rivets 57, strip 50 is again bent outwardly and forced into a somewhat hook shaped stop 58 whose function will be hereinafter described. Strip 50 is thus formed into an arch whose opposite ends are rigidly secured to strip 49. The trussed lever provided by this construction may be made exceedingly rigid and strong even with relatively light material. It is not readily distorted either by external forces or internal stresses.

The front movable contact of the switch comprises a relatively flexible metallic strip or blade 59 whose rear end is clamped between strips 49 and 50 by rivets 57. The forward end of blades 59 may be equipped with a small wearing contact 60 suitably secured thereto. When the front movable contact is moved toward and against front fixed contact 44 the force of the armature is applied largely as a thrust longitudinally of blade 59. Contacts 44 and 60 are so related that they are brought into engagement before armature 30 completes its forward travel. Thus contact 60 is thrust against and along front fixed contact 44 with a wiping and scraping action. The engagement is firmly made because of the longitudinal application of the moving forces. The quality of the electrical interconnection is further insured by the scraping action of contact 60 over the surface of contact 44, this action serving to remove dirt, dust, and scales from the fixed contact.

The back movable contact comprises a relatively flexible metal strip or blade 61 tipped with a wearing contact 62. The rear end of blade 61 is secured to lever 46 by rivets 57 and is given a slight downward curve 63 normally to bias the forward end thereof away from the end of strip 58. When armature 30 is deenergized, contact 62 engages back fixed contact 45 before the armature reaches its initial position. Then as the armature movement continues stop 58 strikes blade 61 and presses contact 62 tightly against contact 45. A wiping and scraping action between contacts 62 and 45 results. The electrical connections to the movable switch member may be made by suitable flexible conductors.

The full lines of Fig. 4 show the switch with the front contact closed and the back contact open. The dotted lines show the switch in its other extreme position. The pressure between contacts 45 and 62 may be varied by slightly bending and thus changing the position of stop 58.

Fig. 5 shows a trussed switch lever ar-

ranged for only a front contact. The two truss forming strips 65 and 66 are substantially the same as previously described. Strip 66 is made shorter, however, as stop 58 is dispensed with.

Although different types of front and back movable contacts have been illustrated it will be understood that both contacts may be similar and of either type and that if only a front or a back contact is required either type may be associated with a trussed lever.

Having described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. A two-blade contact arm having two of its ends connected together for attachment to a pivotal support, the mid portions deflected from each other with their free terminal ends bent toward each other and connected together to form a truss; a contact-carrying blade connected to said terminal ends and means to rock the arm.

2. A two-blade contact arm having two of its ends connected together for attachment to a pivotal support, the mid portions deflected from each other with their free terminal ends bent toward each other to provide two parallel, overlapping ends; a plurality of contact-carrying members connected to the overlapping parts of the composite arm and means to rock the arm.

In testimony whereof I hereunto set my hand.

DANIEL J. McCARTHY.