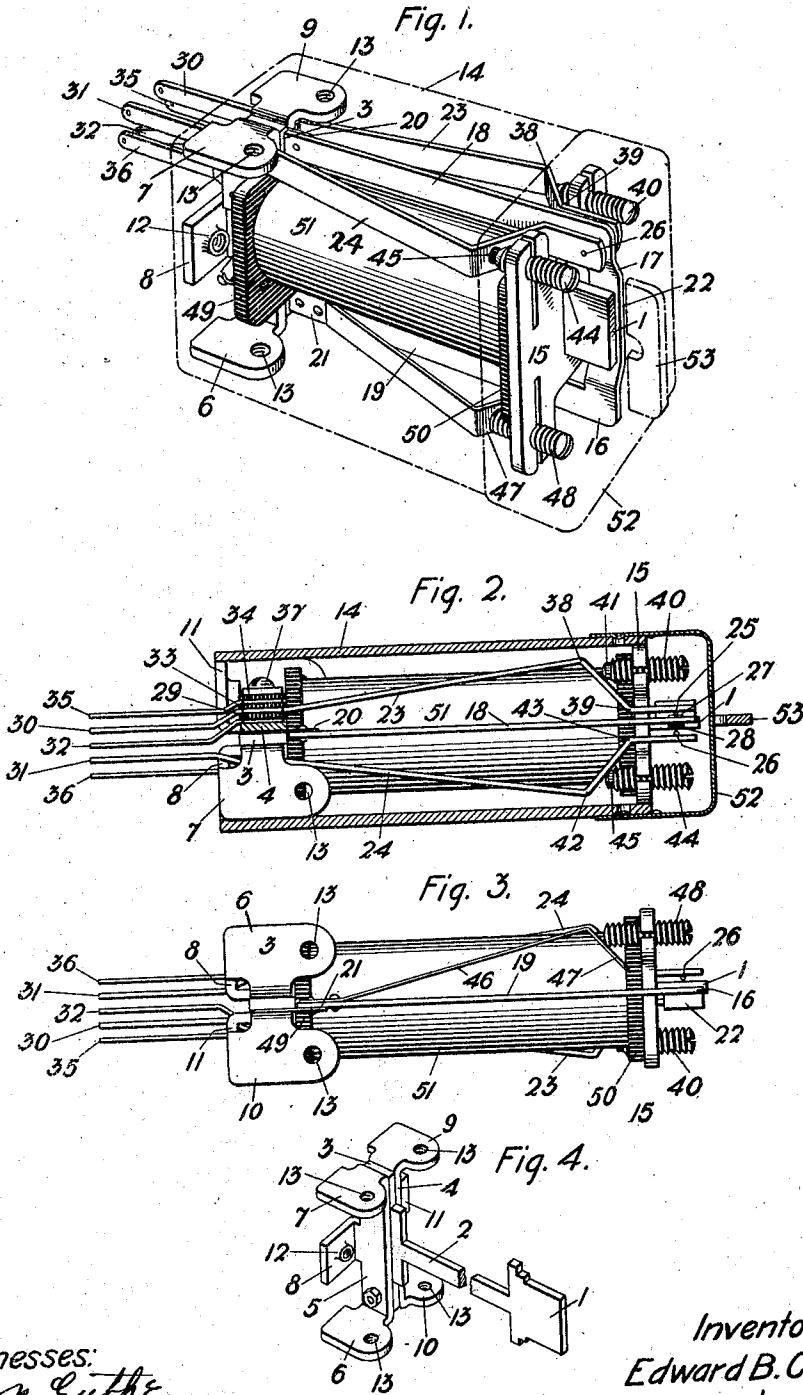


E. B. CRAFT.
RELAY.

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1,121,897.



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UNITED STATES PATENT OFFICE.

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RELAY.

1,121,897.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EDWARD B. CRAFT, a citizen of the United States, residing at Hackensack, in the county of Bergen and State of New Jersey, have invented a certain new and useful Improvement in Relays, of which the following is a full, clear, concise, and exact description.

This invention relates to an electromagnetic relay and has for its object the production of a relay of this type which is characterized by its simple and, at the same time, strong mechanical construction, its electrical efficiency and the ease with which the normal tendencies of some of the contact members are utilized to facilitate the adjustment. With these objects in view, the core of the relay is formed of a flat substantially T-shaped punching of magnetic material. Upon the longer branch or shank of the T-shaped piece the magnetizing coil is wound. The shorter or cross-piece serves as a supporting means for the entire relay structure, and in conjunction with a pair of additional punchings secured thereto provides means for supporting the armature, various contact springs and the inclosing casing. Carried by the outer end of the core piece is a plate mounted at right angles thereto, which plate serves as a support for adjusting screws, by means of which the contact springs and armature are easily adjusted. These screws extend forwardly from the plate and make it possible to adjust various parts of the relay from the front without removing the relay from its casing or detaching the relay from its support.

For a more complete understanding of the invention reference may be had to the accompanying drawing in which—

Figure 1 is a perspective view of a relay embodying the invention, the inclosing casing being shown in dotted lines; Fig. 2 is a top plan view, the inclosing case and part of one of the supporting lugs being cut away to more clearly show the arrangement of the contact springs; Fig. 3 is a bottom view with the casing removed; and Fig. 4 is a perspective view of the core and its supporting pieces.

The same reference numerals designate like parts in all of the figures.

Referring to the drawing, with particular reference to Fig. 4, the core piece is shown as a substantially T-shaped punch-

ing of magnetic material, preferably silicon steel, comprising a shank portion 2, a cross-piece 3 and an enlarged portion 1 which serves as a pole piece. Secured to the cross-piece 3 are two similar sheet metal punchings 4 and 5. The punching 5 is provided with a plurality of ears 6, 7 and 8 bent at right angles thereto, the ears 6 and 7 being disposed in parallel planes, and the ear 8 being disposed in a plane at right angles to ears 6 and 7. The punching 4 is provided with three ears 9, 10 and 11 corresponding to the ears 6, 7 and 8. The ears 8 and 11 are provided with an embossed projection 12 provided with an interiorly threaded aperture as shown in Fig. 1. These threaded apertures in combination with suitable screws, provide means for mounting the core and relay parts carried thereby upon the usual relay rack. The ears 6, 7, 9 and 10 are provided with apertures 13 which register with corresponding apertures in the casing 14, and in conjunction with suitable screws, provide means for securing the ears 6, 7, 9 and 10 to the casing 14. Mounted upon the shank 2 of the core near the outer extremity thereof and at the rear of the pole piece 1, is a support in the form of a plate 15. This plate is mounted at right angles to the core and its periphery is embraced by the casing 14 so that the plate 15 serves as a spacing member and prevents relative movement between the core piece and the casing. As the casing is attached at its rear end to the cross-piece 3 of the core through the agency of the punchings 4 and 5, and the front end of the casing engages the plate 15, the casing acts to stiffen the entire structure and to reinforce the core piece against bending stresses. The casing 14 is made of either magnetic or non-magnetic material, and also serves as a shield to protect the relay from outside magnetic influences which are likely to cause cross-talk when a number of relays are mounted in close proximity. The armature 16 is formed from a substantially U-shaped punching of magnetic material, comprising a yoke piece 17 and two backwardly extending arms 18 and 19. The two extremities of the arms 18 and 19 are secured to resilient sheet metal arms 20 and 21. These arms 20 and 21 project from and are integral with a yoke piece, not shown, which is clamped between the cross-piece 3 of the core and the punching

4, thus providing a resilient support for the armature. The yoke piece 16 of the armature is provided with an offset portion 22 and by virtue of such offset portion and the shape of the armature, such armature lies substantially in the plane of the core piece. The core piece in conjunction with the armature forms the magnetic circuit of the relay.

10 Mounted upon the punchings 4 and 5, respectively, and insulated therefrom, are two forwardly extending contact springs 23 and 24 which, due to their resiliency and conformation, tend to separate. These contact springs are located one on each side of the armature 16, which is arranged to vibrate between them. Carried by the outer end of the contact springs 23 and 24 are two contact points 25 and 26 which cooperate 15 with two contact points 27 and 28 carried by the outer end of the armature, the arrangement being such that when the contact between points 25 and 27 is made, the contact between points 26 and 28 is broken. 20 These relatively fixed contacts 25 and 26, because of the tension in springs 23 and 24, tend to recede from their companion movable contacts 27 and 28, such tendency being utilized to regulate their fixed position as hereinafter explained.

As shown in Fig. 1, the contact springs 23 and 24 as well as the arms 18 and 19, of the armature project forwardly through cut out portions of the plate 15. Strips of insulating material indicated as 29 serve to 35 insulate the contact springs from the punching 4 and from the armature 16 mounted thereon. Extending backwardly from the contact springs 23 and 24 are two terminals 40 30 and 31 which may be, and preferably are, integral with such contact springs, although they may be clamped or otherwise conductively connected therewith. Clamped between the insulating strip 29 above referred to and the punching 4, is a backwardly extending terminal 32, which is conductively 45 connected to the armature through the punching 4. Superposed upon the terminal 30 is a strip of insulating material 33 and clamped between such strip of insulating material and a similar strip 34 is a terminal 50 35. A similar terminal 36 is secured below the terminal 31 and is suitably insulated therefrom. A screw 37 passes through the insulating strip 34, terminal 35, insulating strip 33, terminal 30, insulating strip 29, terminal 32, punching 4, sheet metal strip 20, the cross-piece 3, punching 5 and terminals 31 and 36, and serves to secure all 60 such parts to the cross-piece 3. As the terminals 30 and 31 are a part of the contact springs 23 and 24, the screw 37 also serves to secure such contact springs to the core. The contact spring 23, as shown in Figs. 65 1 and 2, is divided into three sections by

means of two reverse bends 38 and 39. That portion of the contact spring 23 which projects forward of the bend 39 is substantially parallel with the core piece; that portion which is included between the bends 38 and 39 is obliquely inclined from the plane of the core piece; and that portion which extends to the rear of the bend 38 is inclined in the opposite direction toward the core. That part of the contact spring which is 75 included between the bends 38 and 39 forms an incline or cam surface with which an adjusting screw 40 cooperates. Adjusting screw 40 is provided, on its inner end, with an insulating point 41 which serves as an 80 abutment for the contact spring 23 whose resiliency causes the cam surface thereof to be firmly pressed against the point 41. The contact spring 23 is thus firmly held by the screw 40 against both its own resiliency 85 and the force exerted by the movable contact 27, thereby insuring a satisfactory pressure between the contact points. It is also readily apparent that when the adjusting screw 40 is screwed in, the outer end of 90 the contact spring is moved, against the force of its normal tension, in the opposite direction toward the core.

The contact spring 24 is bent in a similar manner to the contact spring 23 and the 95 portion of such contact spring included between the bends 42 and 43 cooperates with an adjusting screw 44 in the same manner as the similar portion of the contact spring 23 cooperates with the adjusting screw 40. 100 The adjusting screw 44 is also provided with an insulating point 45. These adjusting screws 44 and 45 are fitted into the plate 15 and project forwardly out of the casing 14 so that they may be manipulated from 105 the front and the contact springs adjusted without removing the casing 14. The armature 16 is maintained in its normal position away from the pole piece by means of a tensioning spring 46. This spring is attached at one end to the arm 19 of the armature and at its other end is provided with a bent portion 47, which cooperates 110 with an adjusting screw 48 by means of which the tension on the armature may be adjusted. The adjusting screw 48 is also 115 mounted on the plate 15 and extends forwardly out of the casing 14 so that it may be easily adjusted without removing the casing. Mounted adjacent the cross-piece 3 120 and the plate 15 are two insulating heads 49 and 50. These insulating heads are mounted at right angles to the core and in conjunction with the shank 2 of such core form a spool about which the magnetizing coil 51 is wound. The ends of the winding of the coil 51 are brought out 125 and are connected to the terminals 35 and 36. In order to protect the relay structure from dust, a cover 52 for the casing 14, 130

is provided, which cover is provided with a handle portion 53 to facilitate its removal.

In the operation of the relay above described, the passage of current through the core 51, causes the transverse portion 17 of the armature to be attracted by the forwardly projecting pole piece 1 so that the forward or free portion of the armature is drawn down against the pole piece 1, the contact piece 28 being brought into contact with the contact 26 carried by the contact spring 24, and the contact between the contact points 25 and 27 being broken, whereby certain circuit changes are effected.

It will be noted that the magnetizing circuit formed by the core and the U-shaped armature, is substantially a closed circuit except for the normal air-gap between the pole piece 1 and the transverse portion 17 of the armature. By reason of this the relay is extremely sensitive and operates efficiently on a current of low voltage.

Because of the fact that the relay hereinbefore described is constructed of comparatively few and simple parts it may be readily assembled, and being formed of metal punchings it is simple and cheap to manufacture.

The relay is also entirely inclosed in a

metallic casing which shields it from outside magnetic influences, and by virtue of the arrangement of the various adjusting screws, the adjustment of the contact springs and of the tension of the armature may be effected by merely removing the cap 52 and without disturbing the casing or the mounting of the relay.

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

A relay comprising a core, an energizing coil thereon, a movable armature, a movable contact actuated thereby, a relatively fixed contact tensioned to tend to recede from said movable contact and having an inclined portion, a support carried by said core, and adjustable means carried by said support engaging the inclined portion of said fixed contact to hold said fixed contact against both its own resiliency and the force exerted by said movable contact.

In witness whereof, I hereunto subscribe my name this 19th day of September A. D., 1913.

EDWARD B. CRAFT.

Witnesses:

ALICE HAZLEY,
EDNA D. MAGURK.