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RELAY ARMATURE

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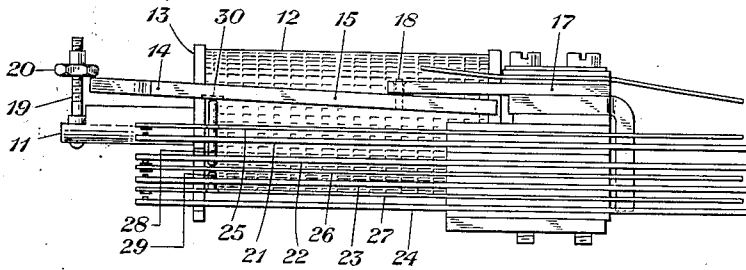


Fig. 1

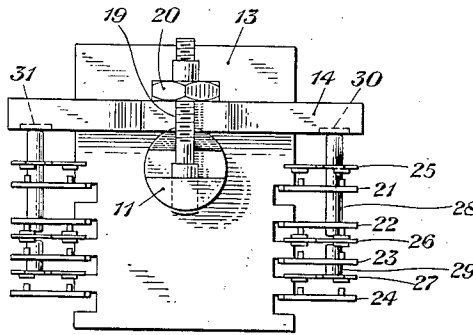


Fig. 2

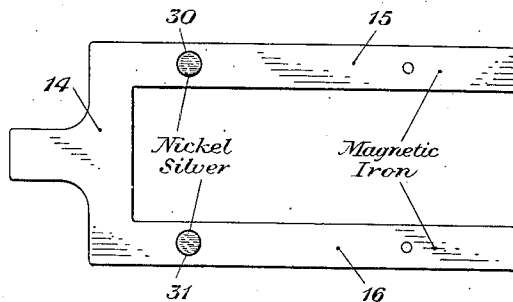


Fig. 3

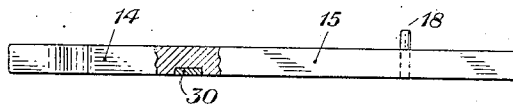


Fig. 4

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RELAY ARMATURE

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3 Claims. (Cl. 200—104)

This invention relates to relays, and more particularly to relay armatures.

In electrical systems in general, and particularly in telephone systems, it is of great importance that relays be so designed that they can be economically manufactured in large numbers. Also it is of increasing importance that the relays perform their operating functions with speed and reliability.

For most purposes the economy of manufacture is attained by composing the relay, in the main, of parts which can be satisfactorily produced by the punch press method. Among such parts is the armature.

The armature, however, as a movable part of the relay, must function in its relation with other parts so as to produce reliable and accurately timed operation of certain of those parts. In particular, as will be readily understood, its structure and operation must be such as to provide for the certain and accurately timed opening and closing of the relay contacts.

As is well known in the electrical arts, the opening or closing of the contacts of most relays in response to the energization of the electromagnet and the operation of the armature, or as a result of the deenergization of the electromagnet and the restoring action of the movable contact spring or springs, involves the interposition of one or more studs or rods of insulating material. The direct surface engagement is between armature and stud and stud and spring. The motion of the armature upon operation of the relay is transmitted to the movable springs through the studs, and likewise the restoring force exerted by these springs upon the release of the relay is also transmitted to the armature through the studs.

It is the principal object of this invention to provide a relay armature which can be economically manufactured and at the same time will, in operation, reliably produce the accurate and constant positioning of relay parts, such as the studs and the associated contact springs.

In general, this object is attained by the provision in the portion of the armature designed to make operative engagement with the stud, or other relay part, of a smooth metallic insert.

The above-stated object and feature of the invention, as well as other objects, features and advantages thereof, will be clearly understood from the following detailed description of one desirable embodiment of the invention, which description is to be read with reference to the accompanying drawing.

It is proposed to describe the invention as applied in one desirable form to a relay of the so-called "flat type." It will be understood, however, that the invention is applicable to any re-

lay which includes an armature as one of its operating parts.

In the drawing:

Fig. 1 is a view in side elevation of a relay of the above-indicated type which includes an armature embodying the invention;

Fig. 2 is an enlarged end view of the relay of Fig. 1;

Fig. 3 is a slightly enlarged bottom view of the armature; and

Fig. 4 is a corresponding view of the armature in side elevation, with a portion broken away.

Like numerals of reference in the several figures of the drawing designate corresponding parts.

With reference to the details of the drawing, the electromagnet of the relay comprises the core 11 and the energizing coil 12 with its spool-heads, of which the front one is designated by the numeral 13.

The armature 14 is substantially U-shaped (as clearly shown in Fig. 3) with legs 15 and 16 designed to lie one on either side of the coil 12. Each armature leg is associated with the armature bracket 17 by means of a cylindrical projection such as 18 embossed on the leg. This feature and other features of a relay of the type under consideration are clearly disclosed in U. S. Patent 2,178,656 to Swenson. The pin 19 carried by the core 11 at its front end is screw-threaded to accommodate the back-stop nut 20, and pin and nut, as is well understood in the art, constitute an armature adjusting device.

Associated with each leg of the armature 14 is a contact spring assembly or pile-up which may provide any one of a large number of contact combinations. With reference to the assembly shown in Fig. 1 and at the right of Fig. 2, springs 21, 22, 23 and 24 are passive or stationary contact springs and are comparatively thick, while springs 25, 26 and 27 are active or movable contact springs and are comparatively thin. The movable springs are preferably bifurcated, as indicated in Fig. 2, and both passive and active springs are equipped with double contacts as a contribution to reliability of relay operation. It will be readily understood that the contact arrangement specifically disclosed serves the purpose of illustration and is not in itself a part of the invention.

Associated with the armature 14 and the springs of the assemblies are rods or studs, represented in the pile-up under detailed discussion by elements 28 and 29. These studs are of an insulating material, usually hard rubber. Stud 28 is carried by the active spring 25, passes through passive springs 21 and 22, is adapted to engage active spring 26 and is engaged at its upper end by the lower surface of armature leg 15. Stud 29 is carried by active spring 27, passes

through passive spring 23 and is adapted for engagement at its upper end with active spring 26. A similar arrangement of spring studs is provided for the oppositely positioned pile-up associated with armature leg 16. The particular arrangement of studs which is disclosed in detail is illustrative and in itself forms no part of the invention.

When the electromagnet is energized and armature 14 is drawn downward (with reference to Figs. 1 and 2) the bottom surface of each armature leg presses against the stud, such as 28 in the case of leg 15, and motion is imparted to the movable contact springs. For example, spring 25 is forced downward to close the contact between that spring and passive spring 21, to open the contact between passive spring 22 and active spring 26 and subsequently to close the contact between spring 26 and passive spring 23. Similarly, directly as the result of the movement of stud 29, the contact is closed between active spring 27 and passive spring 24.

When the winding of coil 12 is deenergized and the relay released, the restoring force exerted by the springs is transmitted through the studs to restore the normal contact conditions and to restore armature 14 to its normal unoperated position against the back-stop nut 20.

It is highly important that there be in the operation of the relay the closest approach which is feasible to accurate and constant positioning of the studs such as 28 and 29 in order that there may be reliable and accurately timed closing or opening of the relay contacts. Especially in the case of a "flat" relay, such as that disclosed, the degree of approach to accuracy and constancy of positioning leaves something to be desired. As indicated hereinabove, the armature, like other parts of the relay, is a punch press product inexpensively produced from sheets of suitable metal. The armature is usually of magnetic iron but may be of silicon steel, of a nickel-iron alloy, or of one of several other magnetic metal alloys. The surface of this inexpensively manufactured armature is comparatively rough and because of this roughness there are effects which may result in faulty operation. First, when a spring such as 25 is disturbed—either by the operation of the relay or as a result of handling of the relay in the course of maintenance work—it may assume a position which will throw the stud carried by it, such as stud 28, out of its normal position perpendicular to the long axis of the armature; and, because of the roughness of the armature surface, the stud may not slide back into normal position. Thus the spring may remain sufficiently out of position to prevent, or to produce inaccurately timed, contact operation. Second, the roughness of the armature surface tends to wear the stud excessively, and the reduction of the length of the stud may result in inadequate or improperly timed spring action.

The problem presented by these effects is solved by the applicant as follows: In the surface region of the armature which engages or is designed to engage a stud such as 28, there is embedded a smooth metallic insert of limited surface area. Thus, in the case of armature leg 15, insert 30 is provided in the leg portion adapted to engage the top of stud 28. Similarly, insert 31 is provided in the corresponding portion of armature leg 16 for surface engagement with the opposite spring stud. This insert is preferably a punching from a thin sheet of nickel-silver,

Commercially rolled nickel-silver sheet is sufficiently smooth so that no additional operation of polishing is required. Among other suitable metals are stainless steel and phosphor-bronze.

The important consideration is that the surface of the metal insert be smooth. The insert is embedded in the appropriate portion of the armature to give a smooth stud-engaging surface which is substantially flush with the surrounding armature surface and is preferably of greater area than the end of the stud which is engaged.

In manufacturing the improved armature of the invention a punching from a thin sheet of nickel-silver, for example—of a thickness, say, of .005 inch—may be spot-welded to the armature leg at one or more points on the edge of the punching and then subjected to pressure which drives the punching into the armature until it is flush or very slightly over-flush with the adjacent armature surface. While the electrowelding and force-fit method of embedding the smooth metallic insert is highly satisfactory, it will be understood that other suitable methods of manufacture may be employed. Likewise it will be understood that the shape, thickness and composition of the insert material may be varied to suit the needs of any particular case.

The improved armature of the invention has the advantages that the effects described hereinbefore are minimized, or at least materially reduced: the smooth surface of the insert facilitates the sliding back of the stud 28 into its normal position after disturbance, and the wearing of the stud is much reduced, with the consequent avoidance of excessive reduction of the length of the stud. These advantages can be attained without sacrificing the advantage of economy of manufacture.

While the invention has been disclosed in a specific embodiment for the purpose of illustration, it will be understood that it may be embodied in other and different forms within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In a relay including a movable spring and a movable stud for directly actuating said spring, an unfinished armature engaging said stud and adapted to impart motion thereto, said armature having embedded in its engaging portion a smooth metallic insert to prevent displacement of said stud.

2. In a relay, in association with a plurality of contact springs and a plurality of studs adapted to actuate said springs, an unfinished armature adapted for operative engagement with one of said studs at each of a plurality of armature surface regions and having embedded in each of the engaging regions a smooth metallic insert for preventing the displacement of the associated stud.

3. In a relay, in association with an electromagnet, two contact spring assemblies and two studs for actuating said spring assemblies, a substantially U-shaped unfinished armature adapted to be operated by said electromagnet and to make with each of its legs operating engagement with one of said studs, said armature having embedded in each of its legs in the engaging portion thereof a smooth metallic insert for preventing a displacement of the associated stud from its normal position.

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