An electro-magnetic relay in which relay contacts are defined by co-operating plunger and fixed abutment both of which terminate within an energising coil of the relay. The relay plunger which may be spring biassed and which defines the moving contact of the relay may be arranged to be moved into contact engagement with the fixed abutment which defines the fixed contact of the relay in response to the effective energisation of the energising coil.

4 Claims, 3 Drawing Figures
Fig. 1.

Fig. 2.

Fig. 3.
This invention relates to electro-magnetic relays and is directed to a small, relatively low-cost reliable construction of such relay which is especially suitable for automotive applications.

According to the present invention there is provided an electro-magnetic relay comprising an energising coil and co-operating relay contacts arranged to be actuated in response to the energisation of said coil, at least one of said contacts forming part of a movable magnetic plunger member which terminates within said energising coil.

In carrying out the present invention both the relay contacts may form part of movable magnetic plunger members which may be spring biased so that the two contacts are moved together against the biasing spring force in response to the energisation of the coil and are restored to their normal positions by the biasing spring force when the coil is de-energised.

The biasing springs for the contact plunger members may comprise spring strips which also serve as current-carrying members of the relay.

The energising coil of the relay may be provided with a surrounding magnetic screen which also serves to provide the return magnetic flux path of the relay.

By way of example the present invention will now be described with reference to the accompanying drawings, in which,

FIG. 1 is a perspective view of an electro-magnetic relay according to the invention with part of the relay cut away;

FIG. 2 is a cross-sectional view taken along the line A—A in FIG. 1; and

FIG. 3 is an end view of the relay of FIGS. 1 and 2.

Referring to the drawing, the relay comprises an energising coil 1 wound on an insulating bobbin 2. The contacts of the relay are defined by opposed contact surfaces 3 and 4 of tungsten for example which are provided on respective plunger members 5 and 6 of magnetic material. These plunger members are provided with relatively large flanged ends 7 and 8 to which L-shaped springs strips 9 and 10 of springy metal (e.g. phosphor bronze) are attached, by rivetting. These strips 9 and 10 which are secured, as by rivetting, to an insulating base (e.g. printed circuit) structure 11 of the relay serve to spring bias the plunger members 5 and 6 to the position shown in FIG. 2 as well as serving as current-carrying members in series with the relay contacts 3 and 4.

In operation of the relay the energisation of the energising coil 1 causes the two plunger member 5 and 6 to move further into the coil so that the contacts 3 and 4 close. This movement of the plunger members is against the biasing spring force exerted by the spring strips 9 and 10 the free ends of which are permitted to move in grooves 13 and 14 of the coil bobbin 2. The return path for the magnetic flux is through a curved magnetic screen member 15 which, as can best be seen in FIG. 3, passes around the coil and is held in position by tags 16 and 17 which pass through the insulating base structure 11.

As will readily be appreciated from the foregoing description of one form of relay according to the invention construction is extremely simple and cheap to provide involving very few parts and, moreover, it is extremely reliable. It is accordingly very useful in automobile and other automotive applications.

What we claim is:

1. An electromagnetic relay comprising:
   a base;
   a hollow bobbin mounted on said base;
   an energising coil wound on said hollow bobbin;
   a pair of flat-faced spring strips mounted on said base;
   a pair of electrically conductive plungers in axial alignment within said hollow bobbin adapted to move into abutting contact with each other in response to magnetic force generated by energization of said energising coil and comprising contact means on the adjacent ends thereof and flange means on the remote ends thereof comprising flat engaging surfaces presented toward the flat faces of said spring strips, said spring strips electrically and mechanically engaging said flange engaging surfaces with the flat faces of said spring strips in intimate engagement with the flat engaging surfaces of said flange means thereby electrically and mechanically connecting said plungers to said spring strips so that said plungers are biased by said spring strips in a direction opposite to the direction of plunger movement resulting from energization of said energizing coil; and
   terminals mounted on said base for conducting electric current to and away from the electromagnetic relay.

2. The electromagnetic relay of claim 1 including spring seats positioned in said bobbin having said spring strips mounted therein.

3. The electromagnetic relay of claim 1 further including a channel-like magnetic screen mounted on said base surrounding said energizing coil which magnetic screen is open at both ends thereof and positioned about said energizing coil with said open ends adjacent said plunger flange members so that the magnetic flux path through the ends of the relay is solely through the plunger member.

4. An electromagnetic relay comprising:
   a hollow bobbin comprising spring seats in the ends thereof;
   an energizing coil wound on said bobbin;
   a pair of current carrying plunger members positioned to move axially within said hollow bobbin into and out of abutting contact with each other in response to energization of said energizing coil, each plunger comprising on one end an electrically conductive flange member and on the other end an electrically conductive contact surface electrically connecting each of said plunger members to said other plunger member when abutting contact between said pair of plungers is effected to cause contact between said plunger contact surfaces; a pair of electric current carrying spring strips electrically connecting to said plunger flange members and mounted in said spring seats to bias said plunger members in a direction opposite to the direction of the axial movement caused by energization of said energizing coil; and
   terminals mounted on said base for conducting electric current to and away from the electromagnetic relay.

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