

[54] **BOBBIN ASSEMBLY FOR RELAY**

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[58] Field of Search 335/276, 297, 128,
335/245, 132, 246, 250, 281; 336/198

[56] **References Cited**

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[57]

ABSTRACT

A bobbin assembly in an electric relay, the bobbin having a pair of flanges and with one of the flanges having an associated cap which at least partially encloses the end of the bobbin and which serves as a seating surface for an iron core, the cap having windows formed therein to provide access for a staking tool so that the core is held captive within the bobbin prior to assembly in the relay. The outer end of the core carries a shading ring which is held in registered position by an embossment. The cap is clamped between the core and the frame of the relay to provide a magnetic gap thereby to reduce the level of residual flux when the relay coil is de-energized.

4 Claims, 6 Drawing Figures

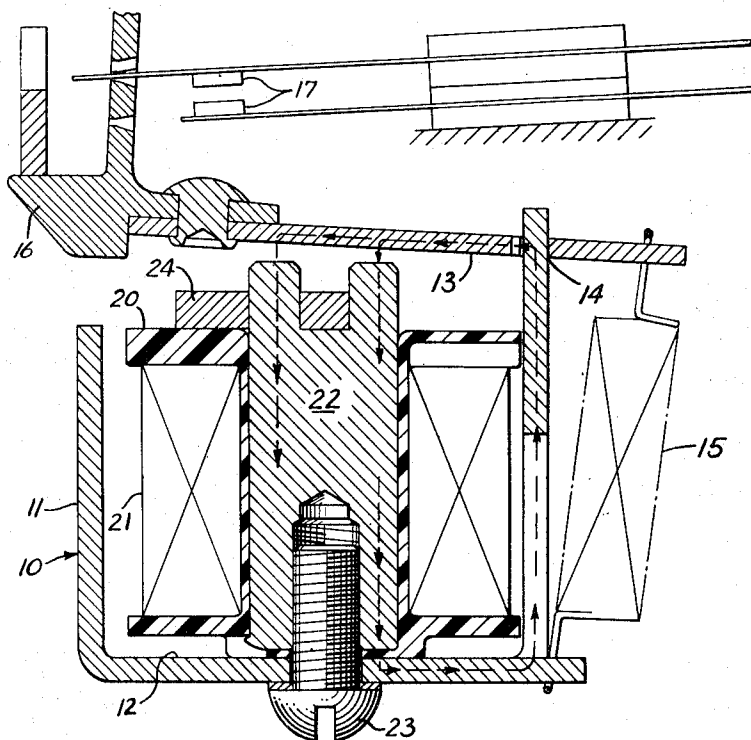


FIG. 1

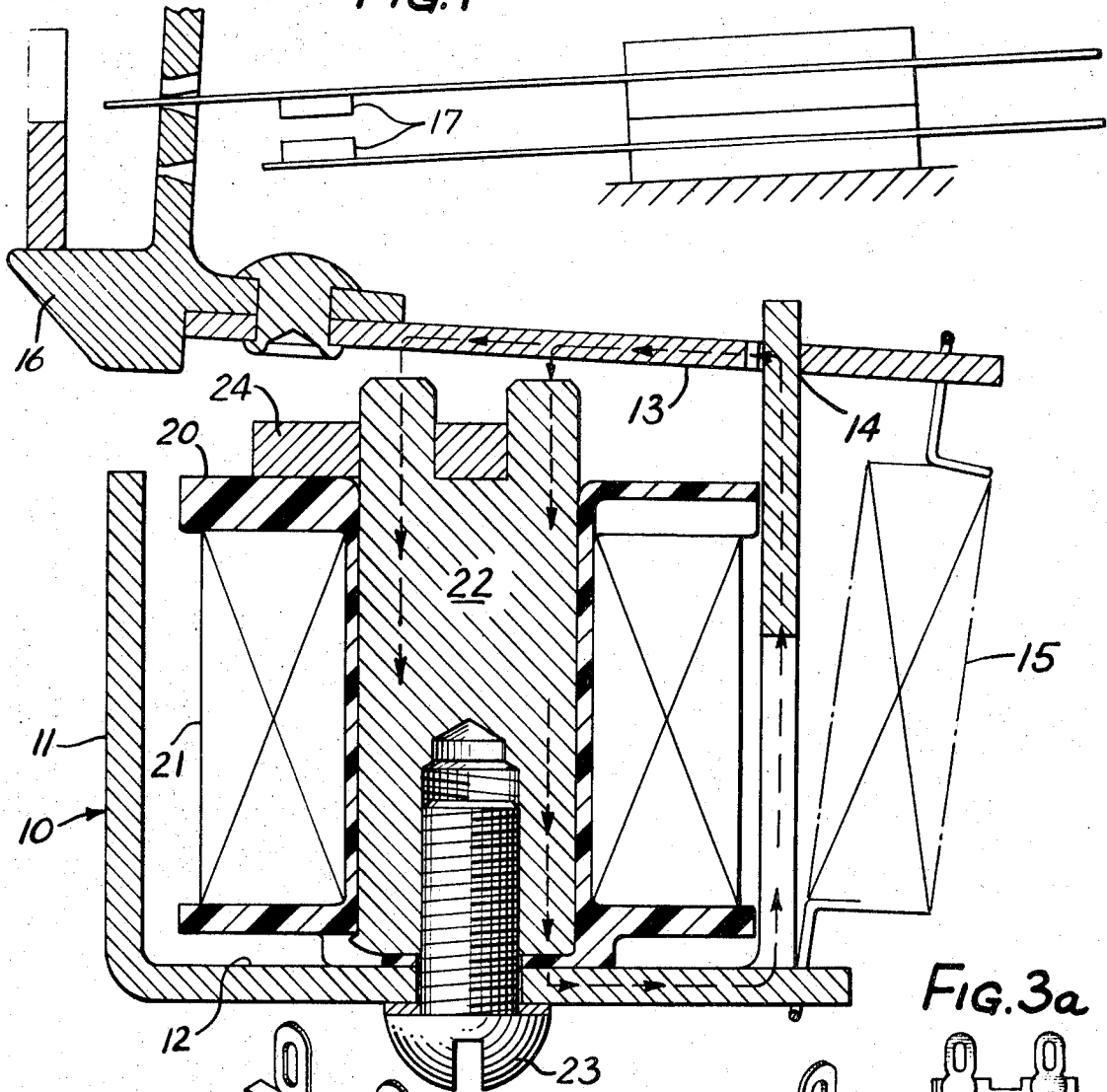


FIG. 2

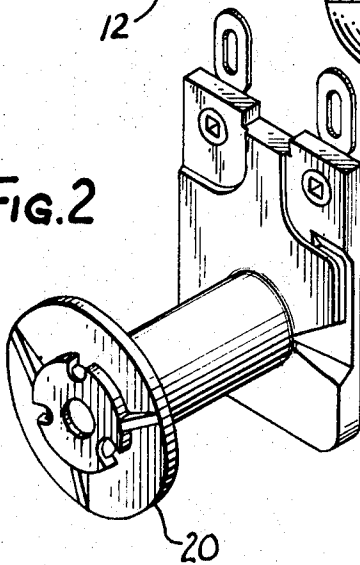


FIG. 3

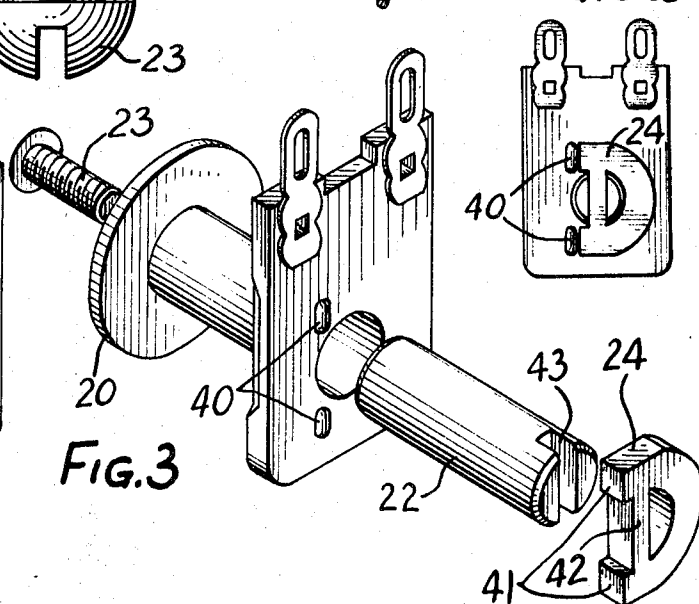


FIG. 3a

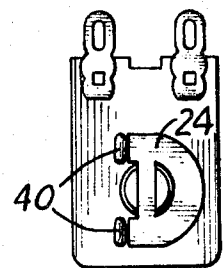


FIG. 4

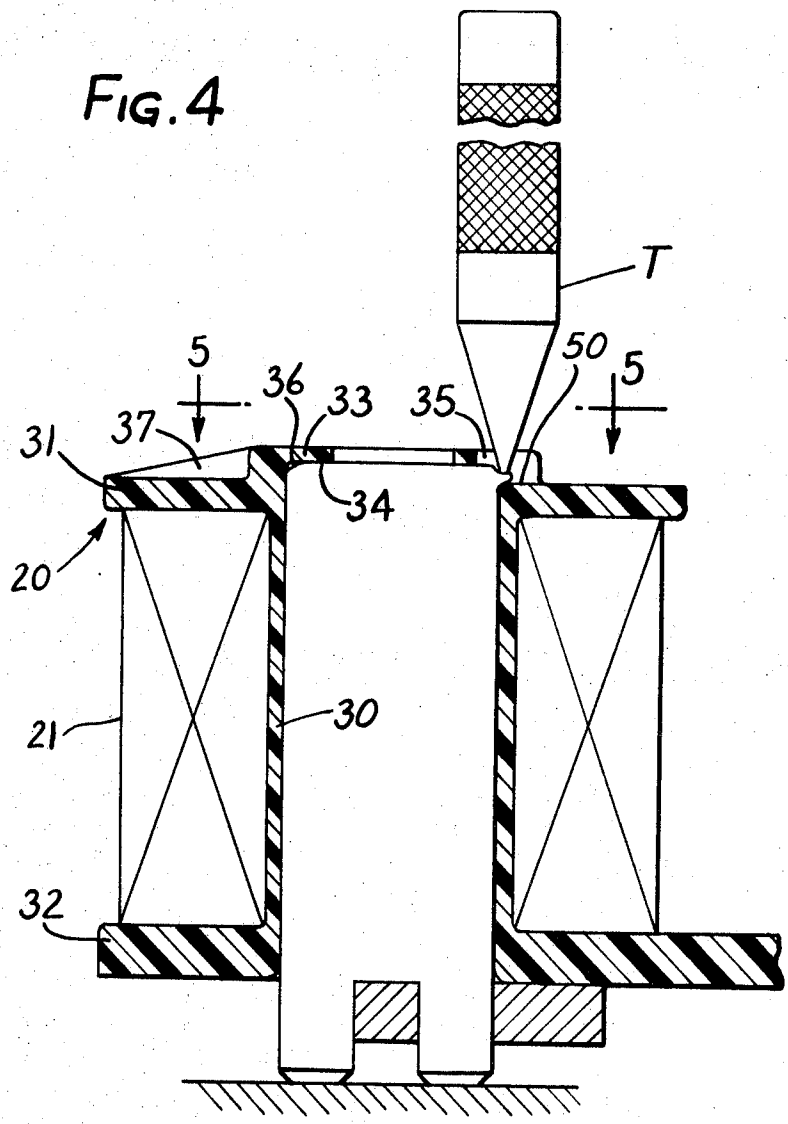
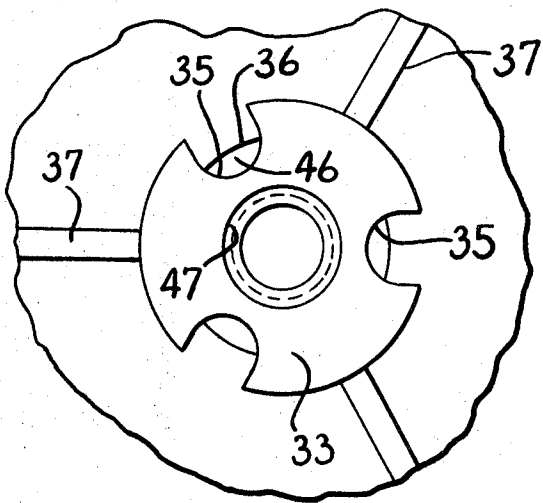


FIG. 5



BOBBIN ASSEMBLY FOR RELAY

It is an object of the present invention to provide a bobbin assembly for a relay which establishes the desired gap in the magnetic structure and which permits preassembly of bobbin, coil and core, all properly integrated with one another, for handling as a unit during final assembly of the relay.

It is a more specific object to provide a bobbin assembly in which the core is telescoped endwise into seated position in the hollow of the bobbin and in which the core is staked in place. In one of the aspects of the invention it is an object to provide a bottoming cap as an integral part of a molded bobbin in which windows are provided in the cap for access of a staking tool.

Generally stated, it is an object of the invention to provide a molded bobbin which includes features which facilitate assembly and operation but which may be molded at substantially the same cost as conventional bobbins.

Other features and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings which:

FIG. 1 is a cross sectional view of a relay employing the present invention.

FIG. 2 is an isometric view of the bobbin used in FIG. 1.

FIG. 3 is an isometric view of the bobbin looking from the opposite direction and with core and shading ring shown in exploded position.

FIG. 3a is an end view of the bobbin following assembly.

FIG. 4 shows the staking operation.

FIG. 5 is a fragmentary view looking along the line 5-5 in FIG. 4 showing the windows and staking positions.

While the invention has been described in connection with a preferred embodiment, it will be understood that we do not intend to be limited to the particular embodiment shown but intend, on the contrary, to cover the various alternative and equivalent constructions included within the spirit and scope of the appended claims.

Turning now to FIG. 1 there is disclosed a relay 10 having a frame 11 of magnetic material which, in the present embodiment, is of U-shape defining a magnetic seat 12 and having a rockable armature 13 which is arranged opposite the seat. The armature is pivoted at 14 and is restored by means of a spring 15, a suitable stop, not shown, being provided for establishing a normal armature position. While the invention is not concerned with any particular contact structure, it will be understood that the armature has an extension or bracket 16 for control of a pair of contacts 17.

Mounted within the relay frame is a bobbin 20 upon which is wound an annular coil 21 and within which is telescoped an iron core 22, the core being held in place by a screw 23 which engages one end of it. In the case of a relay intended for use with alternating current a shading coil 24 is provided at the outer end of the core and in a position adjacent the armature.

In accordance with the present invention the bobbin assembly includes a bobbin having a hollow cylindrical portion with integral end flanges, the end flange which is adjacent the frame being provided with an integral cap which at least partly encloses the hollow of the bobbin, the cap having an internal seating surface for

seating the presented end of the iron core and the cap being provided with at least one window providing access to the edge of the core so that the edge of the core may be upset or "staked" over the flange to hold the core in place within the bobbin. Further in accordance with the invention the opposite flange is provided with an embossment which registers with the shading ring incident to seating the core in place to insure proper register between the core and bobbin prior to staking the two together.

Thus, referring to the drawings the bobbin 20 has a cylindrical portion 30 having flanges 31, 32. The flange 31 has an integral cap 33 which extends beyond the flange 31 and which provides an internal seating surface 34. The cap includes one or more windows 35 which provide access to the outer edge 36 of the core. The cap is preferably reinforced with respect to the flange by means of radial reinforcing ribs 37.

Integrally formed on the opposite flange is an embossment 40 which may be in the form of two spaced protuberances mating with surfaces 41 on the shading ring 24 which, as will be noted, is of D-shape. The shading ring has a cross piece 42 which is received in a slot 43 formed in the outer end of the core, the elements 42, 43 being so dimensioned as to provide a press fit.

In putting together the bobbin assembly, the core 22, with shading ring installed, is inserted into the hollow of the bobbin and rotated until the shading ring registers with the embossment. The assembly is then placed, inverted, upon a suitable anvil as shown in FIG. 4 and a staking tool, indicated at T, is inserted through one or more of the windows 35. The staking tool is planted just inside of the edge 36 of the core and in a staking position indicated at 46. The resulting upsetting of the soft iron of the core over the adjacent edge of the flange 31 serves to retain the core securely captive so that the bobbin assembly consisting of bobbin, coil and core may thereafter be handled as a unit incident to final assembly of the relay. Maintaining the core captive, moreover, insures that the condition of register between the core and its shading ring is maintained until the core is finally clamped, with respect to the relay frame, in its permanent position.

In order to insure register between the assembly and the relay frame, one flange of the bobbin is preferably of rectangular outline, with at least one of the edges thereof mating with the frame as shown in FIG. 1 so as to be nonrotatable. All that is necessary to secure the bobbin assembly in place is to drop the assembly into position and to screw in the screw 23 from the opposite side of the frame. Clearance for the screw is provided by a central opening 47 in the cap which registers with an aligned opening provided in the seating surface 12 of the frame. Turning the screw tight clamps the core in the direction of the magnetic seating surface 12 with the thickness of the cap 33 being interposed between the two members. This thickness, which may be on the order of 0.020 inch in a practical case, provides a magnetic gap which adds sufficient reluctance to the magnetic loop circuit including frame armature and core so that residual magnetism, when the coil is de-energized, is reduced to a minimum resulting in prompt freeing of the armature to move to its normal retracted position (FIG. 1). Since the bobbin thus provides its own magnetic gap, the relay characteristics are accurately predetermined to provide a high degree of reliability. The present relay is to be contrasted with prior relays which

have sometimes employed a separate nonmagnetic washer and which have involved the risk that the washer may be inadvertently omitted from the construction or that a washer of improper thickness might be used. This is, indeed, a difficult matter to check since any such washer is hidden between the bobbin and the frame, and is relatively thin, making its presence or absence difficult to check.

In addition to the advantages of the present structure in the magnetic circuit, the assembly provides a high degree of convenience and economy in manufacture since the wound bobbin and core may be preassembled on a production line basis, with the only subsequent operation being the addition of the armature and its spring and the screwing of the bobbin assembly into place. Not only is the number of parts which need be handled in the final assembly operation minimized but standard bobbin assemblies may be produced which are usable in different models and styles of relays, for example, relays having different contact configurations.

Because of the simplicity of the integral cap and the small amount of additional material required, improved bobbins may be molded at a cost which is, as a practical matter, no greater than the cost of molding bobbins which do not have the improved features.

In the above discussion emphasis has been placed upon a preferred form of the present invention in which the cap is extended axially beyond the adjacent flange, being supported with respect to the latter by the reinforcing ribs 37. It will be apparent to one skilled in the art that, if desired, the reinforcing ribs may be omitted and the space around the cap may be filled in resulting in a flange of greater thickness. If this is done, then the upsetting of the metal of the core will not, strictly speaking, be over the "end" of the flange but will be over a reference surface such as that indicated at 50 (FIG. 4) which is provided within the flange. Such alternative is obviously included within the scope of the present invention and the surface 50 may, in such event, be considered the "end" of the flange.

The bobbin may be molded of any plastic having suitable mechanical characteristics, nylon and delrin each providing bobbins of high quality, but less expensive plastics may be used, if desired, within the scope of the invention.

The term "screw means" as used herein is intended to be a general term to cover a threaded member engaged with, or presented by, the core for the purpose of clamping the core endwise against the frame.

What I claim is:

1. In an electric relay construction the combination comprising a magnetic frame providing a seat and a rockable armature opposed to the seat, a plastic bobbin having a hollow cylindrical portion and integral end flanges and wound with an annular coil, a cylindrical iron core telescoped into the bobbin, one flange of the bobbin having an integral cap for bottomed engagement of the inserted end of the core, and screw means penetrating the frame and the cap for clamping the core against the seat on the frame with the cap interposed between the two providing a magnetic gap

thereby to avoid residual magnetism for freeing of the armature promptly when the coil is de-energized.

2. In an AC relay construction the combination comprising a rectangular magnetic frame providing a seat and a rockable armature opposed to the seat, a bobbin of molded plastic material having a hollow cylindrical portion and integral end flanges and wound with an annular coil, the flanges being of rectangular shape dimensioned to fit in the frame, one of the flanges having an integral cap at least partially enclosing one end of the bobbin and the other flange having an integral embossment thereon, a cylindrical iron core dimensioned to telescope into the bobbin and having a shading coil at its outer end for registering with the embossment, and screw means projecting through the seat and through the cap for engagement with the iron core for clamping the iron core to the seat with the cap interposed between for reduction of residual magnetism when the coil is de-energized.

3. In an electric relay construction a magnetic frame providing a seat and having a rockable armature opposed to the seat, a bobbin and core assembly, said bobbin and core assembly including a bobbin made of plastic material having a hollow cylindrical portion and integral end flanges and wound with an annular coil, one of the end flanges having an integral cap which at least partially encloses one end of the bobbin, the bobbin assembly including a cylindrical iron core telescoped into the bobbin and in bottomed seating engagement with the cap, the cap having at least one window formed therein exposing the edge of the core to provide access thereto, the exposed edge of the core being peened over the adjacent flange for holding the core seated in the bobbin until the bobbin assembly is secured in the frame, and screw means at the seated end of the core and projecting through the cap and the frame for clamping the core against the seat with the cap interposed between for reduction of residual magnetism when the coil is de-energized.

4. As an article of manufacture, a bobbin assembly for an AC relay, the bobbin assembly including a bobbin of molded plastic material having a hollow cylindrical portion and integral end flanges and wound with an annular coil, one of the end flanges having an embossment and the other end flange having an integral cap which at least partially encloses the hollow of the bobbin at one end to define an internal seating surface, an iron core having a shading ring at its outer end extending laterally therefrom for registering engagement with the embossment and screw means at its inner end, the seating surface within the cap being axially spaced from the end of the adjacent flange and the core being so dimensioned that its inner end extends into the cap and slightly beyond the adjacent flange, the extending portion being peened over the adjacent flange thereby to maintain the core in assembled position within the bobbin for subsequent handling of the assembly as an integral unit, the cap having at least one window therein providing access for a peening tool to the region of the joint between the end of the core and the adjacent flange as well as access to the screw means.

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