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ELECTROMAGNETIC RELAYS AND METHODS OF MANUFACTURING

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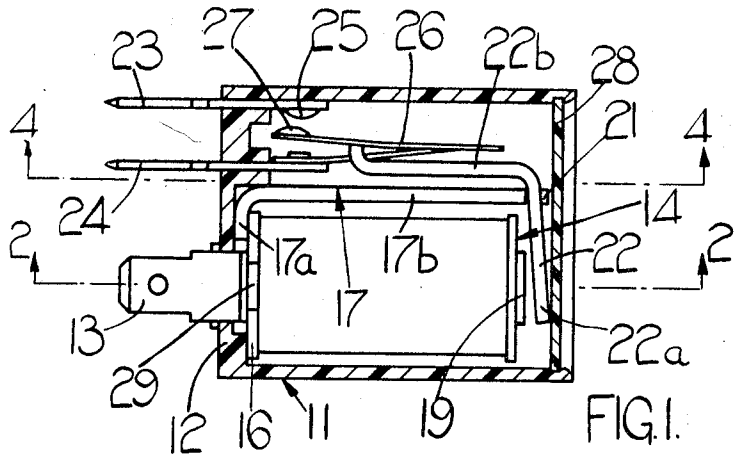


FIG. 1.

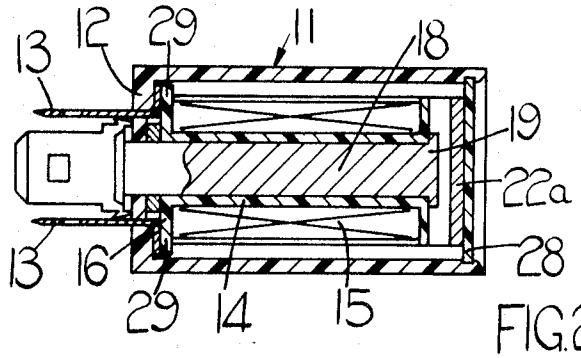


FIG. 2.

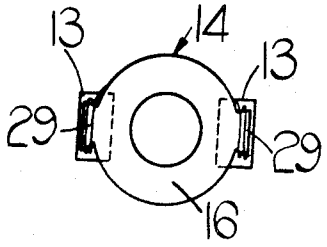


FIG. 3.

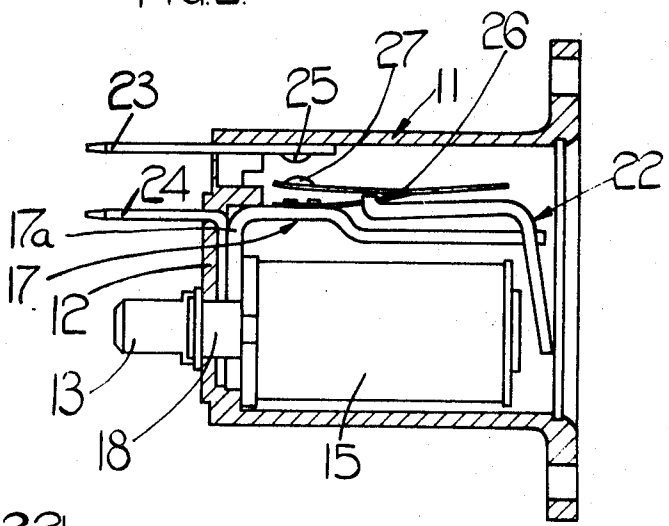


FIG. 5.

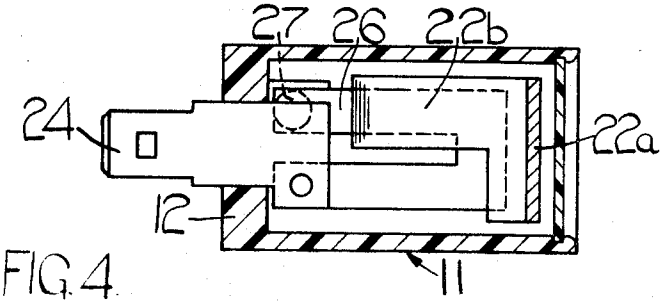


FIG. 4.

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ELECTROMAGNETIC RELAYS AND METHODS OF MANUFACTURING

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Int. Cl. H01h 45/02
U.S. Cl. 335—202 12 Claims

ABSTRACT OF THE DISCLOSURE

An electromagnetic relay and method of manufacturing said relay including the steps of inserting a pair of L-shaped terminal blades through respective slots in the base of a hollow casing, so that parts of the blades project from the exterior of the base where further parts of the blades lie in contact with the base. Inserting a hollow former having a solenoid winding wound thereon, into the casing so that one axial end of the former traps the further parts of the blades against the base. Inserting a solenoid pole piece having an enlarged end portion through the former and through a hole in the base so that the enlarged end portion of the pole piece engages the end of the former remote from the base, and finally deforming the end of the pole piece remote from the enlarged portion so that the deformed portion of the pole piece engages the outer surface of the base, so that the pole piece maintains the former and therefore the blades in position.

This invention relates to a method of manufacturing electro-magnetic relays.

A method according to the invention includes the steps of inserting a pair of L-shaped terminal blades through respective slots in the base of a hollow casing so that parts of the blades project from the exterior of the base of the casing while further parts of the blades lie parallel with and in contact with the inner surface of said base, inserting a hollow former, having a solenoid winding wound thereon, into the casing so that one axial end of the former traps said further parts of said blades against said base, inserting a solenoid pole piece, having an enlarged end portion, through said former and through a hole in said base so that said enlarged end portion of the pole piece engages the axial end of the former remote from said one end of the former, and deforming the end of said pole piece remote from said enlarged portion so that said deformed portion engages the outer surface of said base and said pole piece maintains the former and therefore said blades in position.

One example of the invention is illustrated in the accompanying drawings wherein FIG. 1 is a sectional view of an electromagnetic relay, FIG. 2 is a sectional view on the line 2—2 in FIG. 1, FIG. 3 is an end view of the former of the electromagnet of the relay shown in FIG. 1, FIG. 4 is a sectional view on the line 4—4 in FIG. 1, and FIG. 5 is a view similar to FIG. 1 of a modification.

Referring to FIGS. 1 to 4 of the drawings, the relay includes a hollow moulded synthetic resin box like casing **11** including a base **12**, the end of the casing **11** remote from the base **12** being open. A pair of L-shaped conductive terminal blades **13** are inserted through slots in the base **12** so that parts of the blades project from the external surface of the base **12** while further parts of the blades lie parallel to and in contact with the inner surface of the base **12**.

A hollow moulded synthetic resin former **14** having a solenoid winding **15** wound thereon is inserted into the

casing. One end wall **16** of the former **14** is formed with a pair of diametrically opposite, radial, outwardly directed, dovetail tags **29**. The ends of the winding **15** are wound around the tags **29** respectively, and the former is inserted into the casing **11** so that the tags **29** trap the ends of the windings against the blades **13** respectively, the winding **15** thereby being electrically connected to the blades **13**. In addition to trapping the ends of the windings **15** in contact with the blades **13**, the former **14** traps the blades **13** in position. Moreover the former also serves to trap an L-shaped support member **17** in position in the casing, one limb **17***a* of the member **17** being formed with a hole and being engaged between the former **14** and the base **12** while the other limb **17***b* of the member **17** extends parallel with the former **14**.

A cylindrical, metal pole piece **18** having an enlarged end portion **19** is inserted through the former **14**, through the hole in the limb **17***a* of the member **17** and through an aperture in the base **12** between the blades **13**. The portion **19** of the pole piece **18** engages the end of the former **14** remote from the base **12** and the other end of the pole piece **18** is then deformed to engage the outer surface of the base **12** so as to secure the former **14**, the member **17** and the blades **13** in position.

The free end of the limb **17***b* of member **17** is formed with a tongue **21** which extends through a slot in one limb **22***a* of a generally L-shaped armature **22** to support the armature **22** for pivotal movement relative to the member **17**. The limb **22***a* of the armature **22** extends generally parallel with the base **12** adjacent the portion **19** of the pole piece **18**, and the limb **22***b* of the armature **22** extends generally parallel with the former **14** towards the base **12**, the free end of the limb **22***b* being bent outwardly away from the former **14**.

Extending through the base **12** parallel to one another but spaced apart are a second pair of terminal blades **23**, **24**.

Secured to the blade **23**, within the casing, is a contact **25** and similarly secured to the blade **24** is the free end of one of the limbs of a generally U-shaped leaf spring **26**. The free end of the other limb of the spring **26** has secured thereto a contact **27** and the spring is so positioned that the spring can be flexed to move the contact **27** into and out of engagement with the contact **25**. The spring **26** is such that in its rest condition the contact **27** is spaced from the contact **25**. The outwardly turned portion of the limb **22***b* of the armature **22** engages the spring **26** and in the rest position of the spring **26**, the armature **22** is pivoted relative to the member **17** to a position wherein the limb **22***a* of the armature is spaced from the portion **19** of the pole piece **18** by a predetermined air gap.

In use the terminal blades **13** are electrically connected in a first circuit and the terminal blades **23**, **24** are connected in a second electrical circuit. Thus when the first circuit is completed the electromagnet defined by the winding **15** and the pole piece **18** is energised and the limb **22***a* of the armature **22** is drawn towards the portion **19** of the pole piece **18**. As the limb **22***a* of the armature **22** is caused to pivot relative to the member **17**, and the limb **22***b* of the armature flexes the spring **26** in a direction to close the contacts **25**, **27** and thereby complete the second circuit through the blades **23**, **24** and the spring **26**. Upon de-energisation of the electromagnet the armature **22** is returned to its original position and the second circuit is broken by the action of the spring **26**.

In use the open end of the casing **11** is closed by an insulating plate **28** which is engaged as a snap fit in the open end of the casing.

In the modification illustrated in FIG. 5, the spring **26** is physically and electrically connected to the member **17** and the terminal blade **24** is L-shaped. The terminal

blade **24** is held in position by trapping the inner portion thereof between the limb **17***a* of the member **17** and the base **12** of the casing. Thus the contact **27** is electrically connected to the terminal blade **24** through the spring **26** and part of the member **17**. Moreover, in a modification (not shown) of the relay shown in FIG. 5, one of the terminal blades **13** is dispersed with, and the respective end of the winding **15** is electrically connected to the limb **17***a* of the member **17**, the terminal blade **24** thus being common to the contact **27** and the winding **15**. In order to effect the electrical connection of said end of the winding **15** to the limb **17***a* of the member **17** the end of the winding is wound around the respective tag **29** as before, but is then positioned in contact with the end wall **16** of the former **14** so that when the relay is assembled said end of the winding engages the limb **17***a* of the member **17**.

It will be appreciated that although the relay described is a normally open relay, normally closed relays and change over relays can be manufactured in a similar manner.

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

1. A method of manufacturing an electromagnetic relay including the steps of inserting a pair of L-shaped terminal blades through respective slots in the base of a hollow casing so that parts of the blades project from the exterior of the base of the casing while further parts of the blades lie parallel with and in contact with the inner surface of said base, inserting a hollow former, having a solenoid winding wound thereon, into the casing so that one axial end of the former traps said further parts of said blades against said base, inserting a solenoid pole piece, having an enlarged end portion through said former and through a hole in said base so that said enlarged end portion of the pole piece engages the axial end of the former remote from said one end of the former, and deforming the end of said pole piece remote from said enlarged portion so that said deformed portion engages the outer surface of said base and said pole piece maintains the former and therefore said blades in position.

2. A method as claimed in claim **1** including the further step of inserting a generally L-shaped armature support member into the casing prior to the insertion into the casing of said former, so that one limb of the support member engages said base between said terminal blades, said one limb of the support member being formed with an aperture through which said pole piece subsequently extends, said one end of the former trapping said support member in position, and said pole piece serving to maintain the support member in position in addition to maintain the former and said blades in position.

3. A method as claimed in claim **1** wherein the ends of the solenoid winding extend over portions of the surface of the former presented to said further parts of the terminal blades, so that the step of inserting the former into the casing serves to engage said terminal blades with respective ends of the solenoid winding so that said solenoid winding is electrically connected to said terminal blades.

4. An electromagnetic relay comprising, a casing including a base, a pair of generally L-shaped terminal blades extending through said base with one limb of each of the blades extending parallel to and in contact with the inner surface of the base, a hollow former carrying a solenoid winding, one axial end of said former trapping said one limbs of said terminal blades in contact with said inner surface of the base, and a solenoid pole piece, said pole piece including an enlarged head which engages the end of said former remote from said one end thereof and said pole piece extending through said former and through said base between said terminal blades and being deformed to engage the outer surface of the base, so that said pole piece serves to retain said former, and

therefore said terminal blades in position relative to the casing.

5. An electromagnetic relay as claimed in claim **4** further including a generally L-shaped armature support member, one limb of said support member being trapped against the inner surface of the base by said one end of the former, and having therein an aperture through which said pole piece extends, and the other limb of said member extending within said casing generally at right angles to said base.

6. An electromagnetic relay as claimed in claim **4** wherein the ends of said solenoid winding extend over portions of the surface of said one end of the former presented to the base, said ends of the winding being trapped in engagement with said one limb of said terminal blades respectively so that said terminal blades are electrically connected to respective ends of the winding.

7. An electromagnetic relay as claimed in claim **6** wherein said base carries a further pair of terminal blades one of which carries a fixed contact and the other of which carries a movable contact, and including an armature movable in response to energisation of the solenoid winding, movement of said armature serving to move said movable contact relative to the fixed contact to make or break an electrical circuit between said further pair of terminal blades.

8. A relay as claimed in claim **7** wherein said movable contact is secured to one limb of a generally U-shaped conductive spring, the other limb of which is secured to said other terminal blade, said armature engaging said spring, and movement of said movable contact relative to said fixed contact being permitted by flexure of said spring.

9. A relay as claimed in claim **5** wherein said support member is conductive, thereby including a further pair of terminal blades supported by the base, one of said further terminal blades carrying a fixed contact and the other of said terminal blades being generally L-shaped, one limb of said other blade extending in contact with the inner surface of the base and being trapped in position by said former through the intermediary of said one limb of said armature support member, so that said other blade is electrically connected to said armature support member, a movable contact carried by and electrically connected to said armature support member, and an armature supported by said armature support member and movable in response to energisation of the solenoid winding, to move said movable contact into or out of engagement with said fixed contact to make or break a circuit between said further pair of terminal blades.

10. A relay as claimed in claim **9** wherein said movable contact is secured to one limb of a generally U-shaped conductive spring the other limb of which is secured to said armature support member, said armature engaging said one limb of the spring to move the movable contact.

11. An electromagnetic relay comprising, a casing, including a base, first and second, generally L-shaped, terminal blades extending through said base with one limb of each blade extending in contact with the inner surface of the base, a generally L-shaped conductive armature support positioned within the casing with one limb thereof in contact with said one limb of the second terminal blade, a hollow former carrying a solenoid winding, said one limb of the first and second terminal blades and the armature support member being trapped between the base and one axial end of the former, a solenoid pole piece including an enlarged head which engages the end of said former remote from said one end, said pole piece extending through said former, and the base end being deformed to engage the outer surface of the base, so that the pole piece serves to retain the former and therefore the terminal blades and the armature support in position relative to the casing, a third

terminal blade extending through the base, and electrically connected to a fixed contact within the casing, a movable contact carried by and electrically connected to the armature support member, and an armature supported by the armature support member, the ends of said solenoid winding being electrically connected to said first and second terminal blades, and the arrangement being such that upon energisation of the solenoid winding the armature is moved relative to the casing to move the movable contact into or out of engagement with the fixed contact so as to make or break a circuit between said second and third terminal blades.

12. An electromagnetic relay as claimed in claim 11 wherein the ends of said solenoid winding are trapped by said former in contact with said one limb of said first terminal blade and said armature support member respectively, so that one end of the winding is electrically connected to the first terminal blade while the other end of the winding is electrically connected to the second terminal blade through said armature support member.

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