

Description

This invention relates to a relay comprising:

a base block having a supporting stud protruding centrally from a recess portion of said base block;
 an H-shaped armature block including a pair of armatures mounted in parallel and a coupling member, comprising at least one permanent magnet, for coupling said armatures with each other, said coupling member having a hole at the center thereof, and the H-shaped armature block being rotatably mounted on said base block by engagement of said stud in said hole; and

an approximately U-shaped core having a winding and two magnetic pole legs, said core being so mounted that faces of said magnetic pole legs oppose said armatures.

In a prior art polarized electromagnetic relay comprising an electromagnet unit and a contact spring mechanism having a base block, the electromagnet unit is comprised of a core, a pair of armatures combined by synthetic resin, a pair of electromagnets incorporated into the armatures, and cards fixed to the ends of the armatures for driving the contact spring mechanism, and a separator between the core and the armatures, so that the armatures are rotatable with respect to the core and therefore with respect to the base block (see: Unexamined Japanese Patent Publication No. 53-122752). This prior art relay will be later explained in detail.

In the above-mentioned prior art relay, since the armatures are located above the core, the thickness of the electromagnet unit cannot be reduced. Both the core and the armatures are relatively thick. Also, due to the presence of the separator between the core and the armatures, effective use can not be made of the space within the electromagnet unit, and further, a large number of components is required for the electromagnet unit. Thus, the prior art electromagnet unit, and therefore the prior art relay, is large and costly to manufacture.

DE-C- 3 520 773 describes a relay of the kind defined hereinbefore at the beginning in which a substantially H-shaped armature block is mounted for pivotal movement about a central pin and includes two pole plates (the armatures) extending parallel to each other, and a permanent magnet interposed between the pole plates. The permanent magnet and the pole plates are held together by a shell of plastics material. The ends of the pole plates face each other, with one pair of ends at each end of the H-shaped block. The body of a substantially U-shaped yoke (the core) is disposed between the armature block and a base block. The upwardly projecting legs of the yoke are disposed between the pole plates so that each pair of ends of the pole plates has a respective leg interposed.

An object of the present invention is to provide a

polarized electromagnetic relay which is small and of low cost.

According to the present invention, a relay of the kind defined hereinbefore at the beginning is characterized in that the ends of the magnetic pole legs are fixed to the base block between the armatures.

In an embodiment of the present invention, the core and the armatures are superimposed, and thus the thickness of the relay is reduced. Also, the separator becomes unnecessary and the permanent magnet is incorporated in the armature block, and thus the number of components is reduced. This contributes to a reduction in both scale and cost.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more clearly understood from the description as set forth below with reference to the accompanying drawings, wherein:

Fig. 1 is an exploded, perspective view illustrating a prior art electromagnetic relay;

Fig. 2 is an exploded, perspective view schematically illustrating a first embodiment of the polarized electromagnetic relay according to the present invention;

Fig. 3A is a plan view of the core of Fig. 2 where a bending operation is not carried out;

Fig. 3B is a front view of the core of Fig. 3A;

Fig. 3C is a front view of the core of Fig. 2 where a bending operation is carried out;

Figs. 4A, 4B, and 4C are perspective views explaining the operation of the relay of Fig. 2;

Fig. 5A is a plan view illustrating a completely assembled state of the relay of Fig. 2;

Fig. 5B is a front view of the relay of Fig. 5A;

Fig. 6 is an exploded, perspective view illustrating a second embodiment of the polarized electromagnetic relay according to the present invention;

Fig. 7A is a plan view illustrating a completely assembled state of the relay of Fig. 6; and

Fig. 7B is a front view of the relay of Fig. 7A.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First, a prior art polarized electromagnetic relay will be explained with reference to Fig. 1 (See: Unexamined Japanese Patent Publication No. 53-122752).

In Fig. 1, reference A designates an electromagnet unit, and B designates a contact spring mechanism. The electromagnet unit A is comprised of an armature block 1, cards 2 and 2', a separator 3, and a core 4.

The armature block 1 is comprised of two armatures 11 and 12 mounted in parallel and coupled by a coupling member 13 made of synthetic resin. Perma-

nent magnets 14 and 15 are provided between the two armatures 11 and 12, i.e., the armature block 1 is constructed by insert molding. Also, provided at the center of the coupling member 13 is a hole 13a.

The cards 2 and 2' are of an approximately U-shape and are molded from a synthetic resin. Provided inside of the cards 2 and 2' are grooves 21, 22, 21', and 22' into which the slim sides of the armatures 11 and 12 are press-fitted. In this case, the step portions 11a, 12a, 11b, and 12b of the armatures 11 and 12 abut the faces of the cards 2 and 2', and thus the cards 2 and 2' are accurately positioned at the armatures 11 and 12.

Also, a stud 31a protrudes from the center of the separator 3, and thus the armature block 1 is rotatably mounted on the separator 3 by inserting the stud 31a thereof into the hole 13a of the armature block 1.

The core 4 is wound by a winding 41, and has two magnetic pole legs 42 and 42'. The separator 3 is mounted between the two magnetic pole legs 42 and 42', and as a result, the faces of the magnetic pole legs 42 and 42' oppose the armatures 11 and 12.

The contact spring mechanism B is comprised of a base block 5 providing a recess portion 51, four movable contact springs 61, 62, 63, and 64 having movable contacts 61a, 62a, 63a, and 64a, respectively, and four stationary contacts 71, 72, 73, and 74 which oppose the movable contacts 61a, 62a, 63a, and 64a, respectively. Also, the ends of the movable contact springs 61, 62, 63, and 64 are fixed to terminal bases 81, 82, 83, 84, respectively.

The core 4 is mounted on the recess portion 51 of the base block 5.

In the relay of Fig. 1, when the winding 41 is excited or non-excited, the armature block 1 associated with the cards 2 and 2' is rotated with respect to the stud 31a of the separator 3, and therefore, a side protrusion 23 or 24 of the card 2 and a side protrusion 23' or 24' of the card 2' push against the movable contact spring 61 or 62 and the movable contact spring 63 or 64, and thus switching, i.e., opening and closing, of the contacts is carried out.

As explained above, in the relay of Fig. 1, since the armature block 1 is located above the core 4, the thickness of the relay cannot be reduced. Also, due to the presence of the separator 3, effective use can not be made of the space within the relay, and further, a large number of components is required.

In Fig. 2, which illustrates a first embodiment of the present invention, reference numeral 100 designates an approximately U-shaped core having two magnetic pole legs 101 and 102 on both sides thereof. The winding (not shown) is wound on the body of the core 100. Reference numeral 200 designates an H-shaped armature block having a pair of armatures 201 and 202 mounted in parallel and a coupling member 203 which couples the armatures 201 and 202 with each other. The coupling member 203 is formed

by a permanent magnet. Also, provided at the center of the coupling member 203 is a hole 203a. Reference numeral 300 designates a base block made of synthetic resin. Also, a supporting stud 302 protrudes from a center of a recess portion 301 of the base block 300. The base block 300 is provided with winding terminals 303 and 303', stationary spring terminals 304 and 304', movable spring terminals 305 and 305', stationary spring terminals 306 and 306', and redundancy terminals 307 and 307'.

The H-shaped armature block 200 is rotatably mounted on the base block 300 by inserting the supporting stud 302 thereof into the hole 203a of the coupling member 203 of the H-shaped armature block 200. Also, the U-shaped core 100 is mounted on the base block 300 by fixing the lower sides of the magnetic pole legs 101 and 102 to the base block 300. In this case, the magnetic pole legs 101 and 102 are interposed between the two armatures 201 and 202, so that the faces 101a and 102a oppose the armatures 201 and 202.

The manufacture of the core 100 of Fig. 2 will be explained with reference to Figs. 3A, 3B, and 3C. The core 100 is manufactured by using a press operation considered suitable for mass production, and accordingly, contributes to a lowering of the manufacturing cost. As illustrated in Figs. 3A and 3B, which are a plan view and a front view, respectively, an iron plate is stamped by a press operation. Reference numerals 103 and 104 designate positioning holes when the core 100 is fixed to the base block 300, and reference numerals 105 designate a portion to which a lead piece of the winding terminal 303 is fixed. The magnetic pole legs 101 and 102 are bent to thereby obtain the core 100 as illustrated in Fig. 3C.

The magnetic circuit of the relay according to the present invention will be explained with reference to Figs. 4A, 4B, and 4C, which show an assembled state of the U-shaped core 100 and the H-shaped armature block 200.

In Fig. 4A, a winding 106 wound on the core 100 is not excited, and in this case, a magnetic circuit is formed by only the permanent magnet 203. That is, a magnetic flux ϕ_1 generated from the permanent magnet 203 flows through a path: the N-pole of the permanent magnet 203 $\rightarrow$ the armature 201 $\rightarrow$ the core 100 $\rightarrow$ the armature 202 $\rightarrow$ S-pole of the permanent magnet 203. As a result, one end of each of the armatures 201 and 202 is in contact with the magnetic pole face 101a or 102a.

In Fig. 4B, when the winding 106 is excited by supplying a current I thereto, to generate a magnetic flux ϕ_2 opposite to the magnetic flux ϕ_1 by the permanent magnet 203 in the core 100, the magnetic flux ϕ_2 flows through a path: the core 100 $\rightarrow$ the armature 201 $\rightarrow$ the core 100, and through a path: the core 100 $\rightarrow$ the armature 202 $\rightarrow$ the core 100. In this case, the magnetic flux ϕ_2 from the armature 202 to the core

100 is opposed by the magnetic flux $\phi 1$ generated from the permanent magnet 203, to generate a repulsion force between the core 100 and the armature 202. On the other hand, the magnetic flux $\phi 2$ from the armature 201 to the core 100 is superimposed on the magnetic flux $\phi 1$ generated from the permanent magnet 203 to generate an attraction between the core 100 and the armature 201. Thus, a repulsion force is generated in a diagonal direction with respect to the hole 203a, and an attraction force is generated in another diagonal direction with respect to the hole 203a. Therefore, the entire armature block 200 is rotated, and as a result, a state as illustrated in Fig. 4C prevails.

In Fig. 4C, the winding 106 is again non-excited by shutting off the current I supplied thereto. In this case, a magnetic flux $\phi 1'$ is generated from the permanent magnet 203.

The relay as illustrated in Fig. 2 is completely assembled as illustrated in Figs. 5A and 5B. In Figs. 5A and 5B, reference numerals 501 and 504 designate stationary contacts connected to the stationary spring terminals 304, 304', 306, and 306', respectively, and reference numerals 505 and 506 designate lead pieces which are connected to the winding terminals 303 and 303', respectively. The lead pieces 505 and 506 are fixed to a supporting member 507 made of synthetic resin by insert molding and, as a result, the lead pieces 505 and 506 are connected to the terminals of the winding 106 (see Figs. 4A to 4C) at the positions of the core 100 as indicated by reference numerals 105 in Fig. 3B.

Also, in the contact spring mechanism of Figs. 5A and 5B, movable contact springs 508 and 509 are mounted on the armatures 201 and 202 through supporting members 510 and 511 made of synthetic resin, and thus a switching between the stationary contacts and the movable contacts is carried out. Further, the movable contact springs 508 and 509 are coupled to the movable spring terminals 305 and 305' through conductive members 512 and 513. In this case, the length of the conductive members 512 and 513 must be increased to reduce the stiffness thereof. Note that the conductive members 512 and 513 are mounted as one body with the movable contact springs 508 and 509, respectively, and therefore, the manufacture of the conductive members 512 and 513 requires the use of a bending process.

In Fig. 6, which illustrates a second embodiment of the present invention, driving cards 601 and 602 are provided instead of the supporting members 510 and 511 of Figs. 5A and 5B, and the armatures 201 and 202, and the movable contact springs 508 and 509 are modified.

Tonque pieces 201a (202a) are formed at the armature 201 (202), is a portion 508a provided at the center bottom of the movable contact spring 508 (509) for welding the coupling portion 508b to the

movable spring terminal 305 (305'). The movable contact spring 508 (509) is fixed to the upper portion 305a (305'a) of the movable spring terminal 305 (305') which is insert-molded to the base block 300.

The driving card 601 (602) has penetration holes 601a (602a) into which the tonque pieces 201a (202a) are slidably inserted, and a portion 601b (602b) which is fitted to the upper center portion of the movable contact spring 508 (509). Accordingly, the armature 201 (202) is combined with the movable contact spring 508 (509) by the driving card 601 (602), using an adhesive. Note that it is possible for the driving card 601 (602) to slidably support the movable contact spring 508 (509).

All of the components of Fig. 6 are assembled to obtain the relay as illustrated in Figs. 7A and 7B.

Namely, in the movable connect spring mechanism of the first embodiment, since the movable contact springs 508 and 509 are fixed via the supporting members 510 and 511 to the armatures 201 and 202, and are rotated with respect to the supporting stud 302, the amount of sliding contact between the contacts is large, thus increasing the wear of the contacts. Contrary to this, in the second embodiment, when the armatures 201 and 202 are rotated with respect to the supporting stud 302, the armatures 201 and 202 move along the penetration holes 601a and 602a of the driving cards 601 and 602 and the driving cards are rotated at the center of the movable contact springs 508 and 509. Therefore, the movable contact springs 508 and 509 are also rotated in the same way as the driving cards to open/close the contacts, and as a result, the amount of sliding contact between the contacts is very small.

As explained above, the polarized electromagnetic relay according to the present invention can be made small in size at a low cost, since the relay according to the present invention is thin and the number of components thereof is small, compared with the prior art.

Claims

1. A relay comprising:

a base block (300) having a supporting stud (302) protruding centrally from a recess portion (301) of said base block;

an H-shaped armature block (200) including a pair of armatures (201, 202) mounted in parallel and a coupling member (203), comprising at least one permanent magnet, for coupling said armatures (201, 202) with each other, said coupling member (203) having a hole (203a) at the center thereof, and the H-shaped armature block (200) being rotatably mounted on said base block (300) by engagement of said stud (302) in said hole (203a); and

100 is opposed by the magnetic flux ϕ_1 generated from the permanent magnet 203, to generate a repulsion force between the core 100 and the armature 202. On the other hand, the magnetic flux ϕ_2 from the armature 201 to the core 100 is superimposed on the magnetic flux ϕ_1 generated from the permanent magnet 203 to generate an attraction between the core 100 and the armature 201. Thus, a repulsion force is generated in a diagonal direction with respect to the hole 203a, and an attraction force is generated in another diagonal direction with respect to the hole 203a. Therefore, the entire armature block 200 is rotated, and as a result, a state as illustrated in Fig. 4C prevails.

In Fig. 4C, the winding 106 is again non-excited by shutting off the current I supplied thereto. In this case, a magnetic flux ϕ_1' is generated from the permanent magnet 203.

The relay as illustrated in Fig. 2 is completely assembled as illustrated in Figs. 5A and 5B. In Figs. 5A and 5B, reference numerals 501 and 504 designate stationary contacts connected to the stationary spring terminals 304, 304', 306, and 306', respectively, and reference numerals 505 and 506 designate lead pieces which are connected to the winding terminals 303 and 303', respectively. The lead pieces 505 and 506 are fixed to a supporting member 507 made of synthetic resin by insert molding and, as a result, the lead pieces 505 and 506 are connected to the terminals of the winding 106 (see Figs. 4A to 4C) at the positions of the core 100 as indicated by reference numerals 105 in Fig. 3B.

Also, in the contact spring mechanism of Figs. 5A and 5B, movable contact springs 508 and 509 are mounted on the armatures 201 and 202 through supporting members 510 and 511 made of synthetic resin, and thus a switching between the stationary contacts and the movable contacts is carried out. Further, the movable contact springs 508 and 509 are coupled to the movable spring terminals 305 and 305' through conductive members 512 and 513. In this case, the length of the conductive members 512 and 513 must be increased to reduce the stiffness thereof. Note that the conductive members 512 and 513 are mounted as one body with the movable contact springs 508 and 509, respectively, and therefore, the manufacture of the conductive members 512 and 513 requires the use of a bending process.

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movable spring terminal 305 (305'). The movable contact spring 508 (509) is fixed to the upper portion 305a (305'a) of the movable spring terminal 305 (305') which is insert-molded to the base block 300.

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As explained above, the polarized electromagnetic relay according to the present invention can be made small in size at a low cost, since the relay according to the present invention is thin and the number of components thereof is small, compared with the prior art.

Claims

1. A relay comprising:

a base block (300) having a supporting stud (302) protruding centrally from a recess portion (301) of said base block;

an H-shaped armature block (200) including a pair of armatures (201,202) mounted in parallel and a coupling member (203), comprising at least one permanent magnet, for coupling said armatures (201,202) with each other, said coupling member (203) having a hole (203a) at the center thereof, and the H-shaped armature block (200) being rotatably mounted on said base block (300) by engagement of said stud (302) in said hole (203a); and





- an approximately U-shaped core (100) having a winding (106) and two magnetic pole legs (101,102), said core being so mounted that faces of said magnetic pole legs (101,102) oppose said armatures (201,202), characterised in that the ends of the magnetic pole legs (101,102) are fixed to the base block (300) between the armatures (201,202).
2. A relay according to claim 1, characterised by a pair of movable contact springs (508,509); and a pair of driving cards (601,602) for coupling the movable contact springs (508,509) with the armatures (201,202), respectively.
 3. A relay according to claim 2, characterised in that the driving cards (601,602) are slidably coupled with the armatures (201,202), respectively.
 4. A relay according to claim 2, characterised in that the driving cards are slidably coupled with said movable contact springs, respectively.
 5. A relay according to claim 1, characterised in that the core (100) is made by stamping an iron plate by a press process.
 6. A relay according to claim 1, characterised in that the magnetic pole legs (101,102) are perpendicular to a body of said core (100).
2. Relais nach Anspruch 1, **gekennzeichnet** durch ein Paar von beweglichen Kontaktfedern (508, 509) und ein Paar von Antriebskarten (601, 602) zum Verbinden der beweglichen Kontaktfedern (508, 509) jeweils mit den Ankern (201, 202).
 3. Relais nach Anspruch 2, dadurch **gekennzeichnet**, daß die Antriebskarten (601, 602) gleitbar mit den jeweiligen Ankern (201, 202) verbunden sind.
 4. Relais nach Anspruch 2, dadurch **gekennzeichnet**, daß die Antriebskarten gleitbar mit den jeweiligen beweglichen Kontaktfedern verbunden sind.
 5. Relais nach Anspruch 1, dadurch **gekennzeichnet**, daß der Kern (100) durch Pressen einer Eisenplatte im Wege eines Preßvorgangs hergestellt ist.
 6. Relais nach Anspruch 1, dadurch **gekennzeichnet**, daß die Magnetpolschenkel (101, 102) senkrecht zum Körper des Kerns (100) stehen.

Patentansprüche

1. Relais mit
 - einem Sockel (300) mit einem Tragansatz (302), der mittig von einem Aussparungsbereich (301) des Sockels hervorsticht,
 - einem H-förmigen Ankerblock (200) mit zwei parallel zueinander montierten Ankern (201, 202) sowie einem Verbindungselement (203), das mindestens einen Permanentmagneten zum Verbinden der Anker (201, 202) miteinander aufweist, wobei das Verbindungselement (203) ein Loch (203a) in dessen Mitte aufweist und der H-förmige Ankerblock (200) drehbar auf dem Sockel (300) montiert ist, durch Eingriff des Tragansatzes (302) in das Loch (203a), und
 - einem annähernd U-förmigen Kern (100) mit einer Wicklung (106) und zwei Magnetpolschenkeln (101, 102), wobei der Kern so montiert ist, daß Außenflächen der Magnetpolschenkel (101, 102) den Ankern (201, 202) gegenüberstehen,
 - dadurch **gekennzeichnet**,
 - daß Enden der Magnetpolschenkel (101, 102) am Sockel (300) zwischen den Ankern (201, 202) befestigt sind.

Revendications

1. Relais comprenant :
 - un bloc de base (300) possédant un goujon support (302) qui fait saillie en position centrale sur une partie creusée (301) dudit bloc de base ;
 - un bloc d'armatures (200) en forme de H, comprenant deux armatures (201, 202) montées en parallèle et un élément d'accouplement (203) comprenant au moins un aimant permanent, servant à accoupler lesdites armatures (201, 202) l'une à l'autre, ledit élément d'accouplement (203) présentant un trou (203a) en son centre, et le bloc d'armatures (200) en forme de H étant monté rotatif sur ledit bloc de base (300) par l'engagement dudit goujon (302) dans ledit trou (203a) ; et
 - un noyau (100) à peu près en forme de U ayant un enroulement (106) et deux branches polaires magnétiques (101, 102), ledit noyau étant monté de manière que les faces desdites branches polaires magnétiques (101, 102) soient disposées face auxdites armatures (201, 202), caractérisé en ce que les extrémités des branches polaires magnétiques (101, 102) sont fixées au bloc de base (300) entre les armatures (201,



202).

2. Relais selon la revendication 1, caractérisé par
deux ressorts de contact mobiles (508, 509) et
deux cartes d'entraînement (601, 602) 5
servant à accoupler respectivement les ressorts
de contact mobiles (508, 509) aux armatures
(201, 202).
3. Relais selon la revendication 2, caractérisé en ce 10
que les cartes d'entraînement (601, 602) sont
respectivement accouplées à coulissement aux
armatures (201, 202).
4. Relais selon la revendication 2, caractérisé en ce 15
que les cartes d'entraînement sont respective-
ment accouplées à coulissement auxdits res-
sorts de contact mobiles.
5. Relais selon la revendication 1, caractérisé en ce 20
que le noyau (100) est fabriqué par découpage
d'une plaque de fer par un procédé à la presse.
6. Relais selon la revendication 1, caractérisé en ce 25
que les branches polaires magnétiques (101,
102) sont perpendiculaires au corps dudit noyau
(100).

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