

Description

The present invention relates to an electromagnetic relay having an electromagnet comprising a bobbin, a coil wound on said bobbin, a magnetic pole piece, a magnetic yoke, and an armature, wherein the bobbin has a central hole with guide grooves running axially, the yoke is substantially U-shaped with one leg longer than the other leg, one leg of the pole piece and the short leg of the yoke are inserted into the central hole of the bobbin along the guide grooves, another leg of the pole piece and the long leg of the yoke are in contact with one another outside the bobbin, one external surface of the pole piece and one external surface of the short leg of the yoke are aligned with each other to form a flat magnetic attraction surface, and the armature is inserted into the central hole of the bobbin. Such a relay is known from DE—A—1806324.

In general, the electromagnet of an electromagnetic relay consists of a bobbin, a coil, a fixed magnetic core, and a movable armature. The armature is adapted so as to be actuated upon excitation of the coil and this is attracted to the fixed magnetic core. Usually in such an electromagnet, the central portion of the U-shaped fixed magnetic core is inserted into the central hole of the bobbin and the two legs of the U-shaped core protrude outside the bobbin. The armature is also located outside the bobbin so as to bridge the two legs of the U-shaped core. Such a structure can be called an external armature-type structure. In such a structure there is a problem in that utilization of the magnetic flux generated is unsatisfactory. Usually, only 60% of the magnetic flux generated is utilized as the operative force of the electromagnet. Consequently, the electrical power supplied to the electromagnet cannot be satisfactorily utilized in the operation of the electromagnetic relay.

In the electromagnetic relay according to DE—A—1806324 the longitudinal section of the pole piece is a Z-shape, and the end portions of the outside legs of the pole piece and the yoke are welded together. The welding has to be carried out after the pole piece and the yoke have been assembled in the bobbin in their respective positions. Also, the Z-shape of the pole piece results in the relay occupying a space which is partly the result of the choice of this shape.

It is an object of the present invention to provide an efficient relay which is more compact, and easy to manufacture.

According to the present invention there is provided an electromagnetic relay of the type defined hereinbefore, characterised in that the cross-sectional size of the guide grooves is slightly less than the cross-sectional size of the inserted legs of the pole piece and yoke such that the said legs are inserted under pressure, the end portions of the said other leg of the pole piece and the long leg of the yoke have reduced thicknesses at which they overlap one another and make contact with one another so as to close a mag-

netic path at the outside central part of the length of the bobbin, the pole piece also being substantially U-shaped with one leg longer than the other leg, an L-shaped hinge spring is fixed at one end thereof to the armature, and the other end of the hinge spring is fixed to the yoke.

The size of the electromagnetic relay according to the present invention is, for example, 20 mm x 10 mm x 15 mm.

The invention will now be described in more detail, solely by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is an axial sectional view of an electromagnetic relay according to an embodiment of the present invention,

Fig. 2 is a cross-sectional view taken at line 11—11 of Fig. 1,

Figs. 3A and 3B are respectively side and cross-sectional views illustrating a process of assembling the electromagnet for the electromagnetic relay of Fig. 1, and

Fig. 4 is a fragmentary perspective view illustrating the structure of a magnetic pole piece and a magnetic yoke in accordance with a modified embodiment of the present invention.

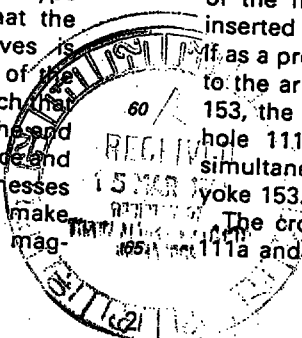
The electromagnetic relay of Figs. 1 and 2 comprises a bobbin 11 made of plastics material, a coil 12, an armature 13, a magnetic pole piece 151, a magnetic yoke 153, and a card 16, one end of the card 16 being coupled to the armature 14. The electromagnetic relay of Figs. 1 and 2 also comprises make-side fixed contact springs 21 and 22, a base block 38, movable contact springs 31 and 32, and break-side fixed contact springs 33 and 34. The movable contact spring 31 is fixed to a spring 35 while the movable contact spring 32 is fixed to a spring 36.

Figs. 3A and 3B illustrate the manner of inserting the magnetic pole piece 151, the magnetic yoke 153, and the armature 14 into an axial central hole 111 of the bobbin 11. As illustrated in Fig. 3B, the cross-section of the central hole 111 of the bobbin 11 has a rectangular shape and has enlarged portions 111a and 111b at the top. The enlarged portions 111a and 111b serve as guide grooves for the magnetic pole piece 151 and the magnetic yoke 153 which are to be inserted.

As illustrated in Fig. 3A, both the magnetic pole piece 151 and the magnetic yoke 153 are U-shaped. An L-shaped hinge spring 141 is fixed to the armature 14.

The magnetic pole piece 151 and the magnetic yoke 153 are inserted into the central hole 111 of the bobbin 11, being guided by the guide grooves 111a and 111b. Simultaneously with the insertion of the magnetic yoke 153, the armature 14 is inserted into the central hole 111 of the bobbin 11, as a preliminary step the hinge spring 141 fixed to the armature 14 is fixed to the magnetic yoke 153, the armature 14 is inserted into the central hole 111 of the bobbin 11 automatically and simultaneously with the insertion of the magnetic yoke 153.

The cross-sectional size of the guide grooves 111a and 111b is chosen to be slightly less than





the cross-sectional size of the short leg of the magnetic pole piece 151 and the short leg of the magnetic yoke 153. Hence, the short leg of the magnetic pole piece 151 and the short leg of the magnetic yoke 153 are inserted under pressure into the central hole 111 of the bobbin 11 so that tight coupling between the magnetic pole piece 151 and the magnetic yoke 153 and the bobbin 11 is ensured.

As one side leg of the U-shaped magnetic pole piece 151 and one side leg of the magnetic yoke 153 are inserted into the central hole 111 of bobbin 11, the other side leg of the U-shaped pole piece 151 and the other side leg of the magnetic yoke 153 are provided with end portions 151a and 153a, respectively, on the external side of the bobbin 11, which overlap and make contact with one another, thereby closing the magnetic path of the electromagnet.

When the magnetic pole piece 151, the upper corner angle p of which is selected so as to be slightly greater than 90° , and the magnetic yoke 153, the upper corner angle q of which is selected so as to be slightly less than 90° , are inserted, resilient forces are exerted at the end portions 151a and 153a in the state illustrated in Fig. 1 which ensure tight fitting together of the end portions 151 and 153a. Thus the long leg of the magnetic pole piece 151 and the long leg of the yoke 153 are laminated together outside the bobbin 11.

In the electromagnetic relay of Fig. 1, since the armature is located inside the bobbin, the magnetic flux generated by the coil current is effectively utilized to drive the armature with a relatively low loss of magnetic flux. Hence, the efficiency of the conversion of electrical power into a driving force is relatively high, and, accordingly, considerable driving force is obtained.

Also, since portions of the magnetic pole piece and the magnetic yoke and the armature are accommodated in the central hole of the bobbin, the size of the electromagnet is considerably reduced. Hence, a compact structure can be realized for an electromagnetic relay having reliable operating characteristics. Furthermore, the alignment of the external surface of the short leg of the magnetic pole piece and the external surface of the magnetic yoke to form a flat magnetic attraction surface is realized with high precision.

An example of a modified embodiment is illustrated in Fig. 4. In the structure of Fig. 4, projections 151m and 151n are provided on the side edge of the magnetic pole piece 151. The magnetic pole piece 151 and the magnetic yoke 153 are clamped together, a resilient binder element 17 having holes 17m and 17n embracing the clamped magnetic pole piece 151 and magnetic yoke 153. The projections 151m and 151n are fitted into holes 17m and 17n, respectively. The resilient force of the binder element 17 ensures tight coupling of the magnetic pole piece 151 and the magnetic yoke 153.

Claims

1. An electromagnetic relay having an electromagnet comprising a bobbin (11), a coil (12) wound on said bobbin (11), a magnetic pole piece (151), a magnetic yoke (153), and an armature (14), wherein the bobbin (11) has a central hole (111) with guide grooves (111a, 111b) running axially, the yoke (153) is substantially U-shaped with one leg longer than the other leg, one leg of the pole piece (151) and the short leg of the yoke (153) are inserted into the central hole (111) of the bobbin (11) along the guide grooves (111a, 111b), another leg of the pole piece (151) and the long leg of the yoke (153) are in contact with one another outside the bobbin (11), one external surface of the pole piece (151) and one external surface of the short leg of the yoke (153) are aligned with each other to form a flat magnetic attraction surface, and the armature (15) is inserted into the central hole (111) of the bobbin (11), characterized in that the cross-sectional size of the guide grooves (111a, 111b) is slightly less than the cross-sectional size of the inserted legs of the pole piece (151) and yoke (153) such that the said legs are inserted under pressure, the end portions of the said other leg of the pole piece (151) and the long leg of the yoke (153) have reduced thicknesses at which they overlap one another and make contact with one another so as to close a magnetic path at the outside central part of the length of the bobbin (11), the pole piece (151) also being substantially U-shaped with one leg longer than the other leg, an L-shaped hinge spring (141) is fixed at one end thereof to the armature (14), and the other end of the spring (141) is fixed to the yoke (153).

2. An electromagnetic relay according to claim 1, characterized in that the upper corner angle (p) of the magnetic pole piece (151) is selected so as to be slightly greater than 90° and the upper corner angle (q) of the magnetic yoke (153) is selected so as to be slightly less than 90° , whereby tight fitting of the long leg of the magnetic pole piece (151) and the long leg of the magnetic yoke (153) is ensured.

Patentansprüche

1. Elektromagnetisches Relais mit einem Elektromagneten umfassend einen Spulenkörper (11), eine auf den Spulenkörper (11) gewickelte Spule (12), ein magnetisches Polstück (151), ein magnetisches Joch (153) und einen Anker (14), bei dem der Spulenkörper (11) ein mit axial verlaufenden Führungsnuten (111a, 111b) versehenes zentrales Loch (111) aufweist, das Joch (153) im wesentlichen U-förmig mit einem längeren und einem kürzeren Schenkel ausgebildet ist, ein Schenkel des Polstücks (151) und der kurze Schenkel des Jochs (153) längs den Führungsnuten (111a, 111b) in das zentrale Loch (111) des Spulenkörpers (11) eingesetzt sind, ein anderer Schenkel des Polstücks (151) und der lange Schenkel des Jochs (153) außerhalb des Spulen-



the cross-sectional size of the short leg of the magnetic pole piece 151 and the short leg of the magnetic yoke 153. Hence, the short leg of the magnetic pole piece 151 and the short leg of the magnetic yoke 153 are inserted under pressure into the central hole 111 of the bobbin 11 so that tight coupling between the magnetic pole piece 151 and the magnetic yoke 153 and the bobbin 11 is ensured.

As one side leg of the U-shaped magnetic pole piece 151 and one side leg of the magnetic yoke 153 are inserted into the central hole 111 of bobbin 11, the other side leg of the U-shaped pole piece 151 and the other side leg of the magnetic yoke 153 are provided with end portions 151a and 153a, respectively, on the external side of the bobbin 11, which overlap and make contact with one another, thereby closing the magnetic path of the electromagnet.

When the magnetic pole piece 151, the upper corner angle p of which is selected so as to be slightly greater than 90° , and the magnetic yoke 153, the upper corner angle q of which is selected so as to be slightly less than 90° , are inserted, resilient forces are exerted at the end portions 151a and 153a in the state illustrated in Fig. 1 which ensure tight fitting together of the end portions 151 and 153a. Thus the long leg of the magnetic pole piece 151 and the long leg of the yoke 153 are laminated together outside the bobbin 11.

In the electromagnetic relay of Fig. 1, since the armature is located inside the bobbin, the magnetic flux generated by the coil current is effectively utilized to drive the armature with a relatively low loss of magnetic flux. Hence, the efficiency of the conversion of electrical power into a driving force is relatively high, and, accordingly, considerable driving force is obtained.

Also, since portions of the magnetic pole piece and the magnetic yoke and the armature are accommodated in the central hole of the bobbin, the size of the electromagnet is considerably reduced. Hence, a compact structure can be realized for an electromagnetic relay having reliable operating characteristics. Furthermore, the alignment of the external surface of the short leg of the magnetic pole piece and the external surface of the magnetic yoke to form a flat magnetic attraction surface is realized with high precision.

An example of a modified embodiment is illustrated in Fig. 4. In the structure of Fig. 4, projections 151m and 151n are provided on the side edge of the magnetic pole piece 151. The magnetic pole piece 151 and the magnetic yoke 153 are clamped together, a resilient binder element 17 having holes 17m and 17n embracing the clamped magnetic pole piece 151 and magnetic yoke 153. The projections 151m and 151n are fitted into holes 17m and 17n, respectively. The resilient force of the binder element ensures tight coupling of the magnetic pole piece 151 and the magnetic yoke 153.

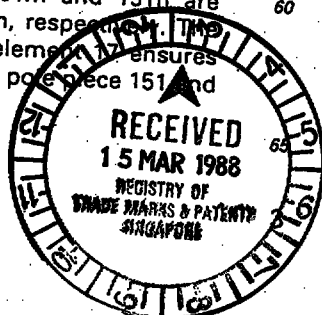
Claims

1. An electromagnetic relay having an electromagnet comprising a bobbin (11), a coil (12) wound on said bobbin (11), a magnetic pole piece (151), a magnetic yoke (153), and an armature (14), wherein the bobbin (11) has a central hole (111) with guide grooves (111a, 111b) running axially, the yoke (153) is substantially U-shaped with one leg longer than the other leg, one leg of the pole piece (151) and the short leg of the yoke (153) are inserted into the central hole (111) of the bobbin (11) along the guide grooves (111a, 111b), another leg of the pole piece (151) and the long leg of the yoke (153) are in contact with one another outside the bobbin (11), one external surface of the pole piece (151) and one external surface of the short leg of the yoke (153) are aligned with each other to form a flat magnetic attraction surface, and the armature (15) is inserted into the central hole (111) of the bobbin (11), characterized in that the cross-sectional size of the guide grooves (111a, 111b) is slightly less than the cross-sectional size of the inserted legs of the pole piece (151) and yoke (153) such that the said legs are inserted under pressure, the end portions of the said other leg of the pole piece (151) and the long leg of the yoke (153) have reduced thicknesses at which they overlap one another and make contact with one another so as to close a magnetic path at the outside central part of the length of the bobbin (11), the pole piece (151) also being substantially U-shaped with one leg longer than the other leg, an L-shaped hinge spring (141) is fixed at one end thereof to the armature (14), and the other end of the spring (141) is fixed to the yoke (153).

2. An electromagnetic relay according to claim 1, characterized in that the upper corner angle (p) of the magnetic pole piece (151) is selected so as to be slightly greater than 90° and the upper corner angle (q) of the magnetic yoke (153) is selected so as to be slightly less than 90° , whereby tight fitting of the long leg of the magnetic pole piece (151) and the long leg of the magnetic yoke (153) is ensured.

Patentansprüche

1. Elektromagnetisches Relais mit einem Elektromagneten umfassend einen Spulenkörper (11), eine auf den Spulenkörper (11) gewickelte Spule (12), ein magnetisches Polstück (151), ein magnetisches Joch (153) und einen Anker (14), bei dem der Spulenkörper (11) ein mit axial verlaufenden Führungsnuten (111a, 111b) versehenes zentrales Loch (111) aufweist, das Joch (153) im wesentlichen U-förmig mit einem längeren und einem kürzeren Schenkel ausgebildet ist, ein Schenkel des Polstücks (151) und der kurze Schenkel des Jochs (153) längs den Führungsnuten (111a, 111b) in das zentrale Loch (111) des Spulenkörpers (11) eingesetzt sind, ein anderer Schenkel des Polstücks (151) und der lange Schenkel des Jochs (153) außerhalb des Spulen-



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körpers (11) miteinander in Kontakt stehen, eine Außenfläche des Polstücks (151) und eine Außenfläche des kurzen Schenkels des Jochs (153) zur Bildung einer flachen magnetischen Anzugsfläche aufeinander ausgerichtet sind und der Anker (15) in das zentrale Loch (111) des Spulenkörpers (11) eingeführt ist, dadurch gekennzeichnet, daß die Querschnittsgröße der Führungsnuten (111a, 111b) etwas geringer als die Querschnittsgröße der eingeführten Schenkel des Polstücks (151) und des Jochs (153) ist, derart, daß diese Schenkel unter Druck eingeführt sind, die Endabschnitte des anderen Schenkels des Polstücks (151) und des langen Schenkels des Jochs (153) eine verringerte Dicke aufweisen, wo sie einander überlappen und miteinander in Kontakt stehen, um einen magnetischen Kreis außen im mittleren Teil der Länge des Spulenkörpers (11) zu schließen, das Polstück (151) ebenfalls im wesentlichen U-förmig mit einem längeren und einem kürzeren Schenkel ausgebildet ist, und eine L-förmige Gelenkfeder (141) mit ihrem einen Ende am Anker (14) und mit ihrem anderen Ende am Joch (153) befestigt ist.

2. Elektromagnetisches Relais nach Anspruch 1, dadurch gekennzeichnet, daß der Winkel (p) der oberen Ecke des magnetischen Polstücks (151) etwas größer als 90° bemessen ist und der Winkel (q) der oberen Ecke des magnetischen Jochs (153) etwas geringer als 90° bemessen ist, wodurch ein fester Sitz des langen Schenkels des magnetischen Polstücks (151) und des langen Schenkels des magnetischen Jochs (153) sichergestellt ist.

Revendications

1. Relais électromagnétique présentant un électroaimant comportant un bobineau (11), un bobinage (12) bobiné sur ledit bobineau (11), une pièce polaire magnétique (151), une culasse magnétique (153) et une armature (14), dans lequel le bobineau (11) présente un trou central (111) avec des rainures de guidage (111a, 111b) qui s'étendent axialement, la culasse (153) a

sensiblement la forme d'un U avec une jambe plus longue que l'autre jambe, l'une des jambes de la pièce polaire (151) et la jambe courte de la culasse (153) sont insérées dans le trou central (111) du bobineau (11) le long des rainures de guidage (111a, 111b), une autre jambe de la pièce polaire (151) et la jambe longue de la culasse (153) sont en contact l'une avec l'autre à l'extérieur du bobineau (11), l'une des surfaces extérieures de la pièce polaire (151) et l'une des surfaces extérieures de la jambe courte de la culasse (153) sont alignées l'une avec l'autre pour former une surface d'attraction magnétique plane, et l'armature (15) est insérée dans le trou central (111) du bobineau (11), caractérisé en ce que la dimension de section droite des rainures de guidage (111a, 111b) est légèrement inférieure à la dimension de section droite des jambes de la pièce polaire (151) et de la culasse (153) qui sont insérées, de façon telle que l'on insère lesdites jambes sous pression; en ce que les portions d'extrémité de ladite autre jambe de la pièce polaire (151) et de la jambe longue de la culasse (153) présentent des épaisseurs réduites par lesquelles elles se recouvrent l'une l'autre et viennent en contact l'une avec l'autre de façon à fermer un circuit magnétique à la portion centrale extérieure de la longueur du bobineau (11), la pièce polaire (151) ayant sensiblement aussi la forme d'un U avec l'une des jambes plus longues que l'autre jambe; en ce qu'un ressort faisant charnière en forme de L (141) est fixé par l'une de ses extrémités à l'armature (14); et en ce que l'autre extrémité du ressort (141) est fixée à la culasse (153).

2. Relais électromagnétique selon la revendication 1, caractérisé en ce que l'on choisit la valeur de l'angle supérieur (p) de la pièce polaire magnétique (151) légèrement supérieure à 90° et la valeur de l'angle supérieur (q) de la culasse magnétique (153) légèrement inférieure à 90°, ce qui assure un ajustement serré de la jambe longue de la pièce polaire magnétique (151) et de la jambe longue de la culasse magnétique (153).

