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ELECTROMAGNETIC RELAY

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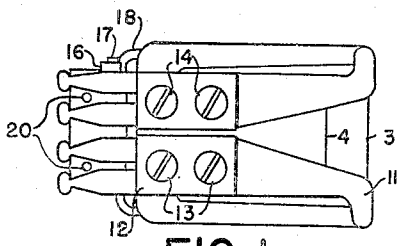


FIG. 1

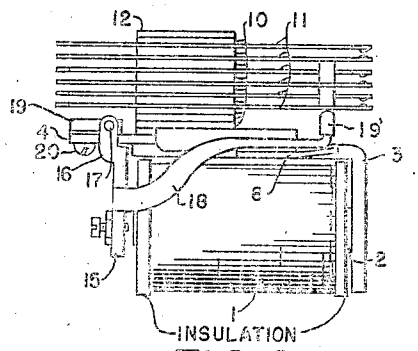


FIG. 2

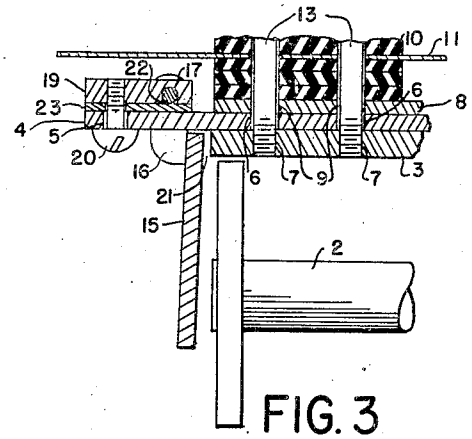


FIG. 3

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ELECTROMAGNETIC RELAY

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5 Claims. (Cl. 200—104)

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This invention relates in general to electromagnetic relays and more particularly to relays having armatures of the rotatable pin-bearing type.

Relays of the type to which this invention pertains conventionally comprise a magnet which is secured to the lower end of an L-shaped heelpiece to form a U, an armature pivotally secured to a yoke mounted on the heelpiece at the open end of the U, and a contact spring assembly mounted on the heelpiece and engaged by an arm extending from the aforesaid armature. Generally the contact springs are mounted in cantilever fashion at the lower end of the L-shaped heelpiece. Two sets of contact spring assemblies mounted on either side of the heelpiece are sometimes used with separate arms extending from the armature on either side of the heelpiece to engage the contact spring assemblies. In order to achieve a more compact design relays of this general type have been made with a single contact spring assembly mounted on one side of the armature yoke with the springs extending towards the lower end of the heelpiece and the other side of the yoke secured to the heelpiece as shown in Patent No. 2,281,687, granted March 25, 1942, to Ralph R. Fowler. Heretofore this type of relay was limited to a single contact spring assembly due to mechanical considerations with regard to ruggedness and ease of adjustment. This limitation is overcome in the present invention by a new and novel construction which permits two spring assemblies to be mounted at the armature end of the heelpiece and yet provides a rugged support for the armature bearing and also permits adjustment or replacement of the armature without disturbing the contact spring assemblies. The utility of the relay thus constructed is therefore greatly increased without any increase in overall dimensions.

It is an object of the present invention to provide a compact, rugged, and long wearing relay capable of controlling a multitude of circuits which is simple and economical to construct and is readily adjusted.

Other objects will become apparent upon a further examination of the specification taken in connection with the accompanying drawing in which:

Fig. 1 is a top view of an electromagnetic relay constructed and arranged in accordance with the present invention.

Fig. 2 is a side view of the relay as seen from the bottom of Fig. 1.

Fig. 3 is an enlarged cross-sectional view showing the arrangement for pivotally mounting the armature.

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The relay comprises a magnet 1 having an iron coil 2 secured to the L-shaped heelpiece 3 of magnetic iron by means of a flathead screw (not shown) extending through a countersunk hole in the heelpiece 3 and into a threaded hole in the iron core 2.

A non-magnetic plate 4 provided with two elongated holes, such as 5, and four holes, such as 6, is mounted on the heelpiece 3 with the holes 6 aligned with four threaded holes, such as 7, in the heelpiece 3. A backstop 8 is provided with two holes 9 and is placed on top of the plate 4 with the holes 9 aligned with holes 6.

A contact spring assembly comprising insulating members 10, contact springs 11, and clamping plate 12 is placed on top of the backstop 8 and the assembly of contact springs, backstop 8, and plate 4 is secured to the heelpiece 3 by flathead screws 13 passing through countersunk holes in the clamping plate 12, clearance holes in the spring insulators 10 and the contact springs 11, and holes 9 and 6 into threaded holes 7. A similar contact spring assembly is mounted on the other side of the heelpiece 3 and is secured by screws 14. A second backstop similar to 8 may or may not be mounted on the other side of the heelpiece depending on the particular combination of contact springs used. The backstop 8 may be formed as an extension of plate 4 to reduce the number of different parts required and to save material.

The armature 15 is provided with upturned ears 16 each having holes of the same diameter as the bearing pin 17. One end of bearing pin 17 is knurled and the other end is counterbored. The armature 15 is made of soft iron and is provided with two operating arms 18 and insulating bushings 19' for operating the contact springs 11. In assembling the armature 15 and the bearing pin 17 the counterbored end of the bearing pin 17 is passed through the holes in the upturned ears 16 of the armature 15 and the bearing pin is then driven in so that the knurling at one end of the pin firmly stakes it to the armature. The counterbored end of the bearing pin is then flared to further secure the pin to the armature.

The assembly of armature 15 and bearing pin 17 is rotatably secured to plate 4 by bearing block 19 which has a transverse U-shaped slot 22 milled therein to receive the bearing pin 17. A shim 23 made of nickel silver or Phosphor bronze is placed between the plate 4 and the bearing pin 17 and bearing block 19 to provide a better bearing sur-

face for the pin 17. The bearing block 19 is secured to the plate 4 by screws 20 passing through the elongated holes 5 in plate 4, clearance holes in the shim 20 and into threaded holes in the bearing block 19.

Having described the construction and assembly of the relay, the utility and purpose of the invention will be set forth to enable the same to be more fully understood and appreciated.

In order to prevent any relative motion between the individual contact springs 11 of the contact spring assembly due to distortion of the insulators 10 by moisture absorption or temperature changes it has been found necessary to clamp the contact spring assembly under heavy pressure. As a result it is practically impossible to remove or loosen the clamping screws 13 after assembly. It would be undesirable to loosen or remove the clamping screws 13 even if this could be done easily as the alignment of the contacts and the adjustment of the contact springs would be disturbed so as to require readjustment of the relay.

The air gap 21 must be accurately controlled in order to provide uniform operating characteristics for each relay when they are produced in quantity. The elongated holes 5 in the plate 4 permit adjustment of the bearing block 19 longitudinally on plate 4 so as to set the air gap 21 within the desired limits without disturbing the contact spring assembly.

The bearing which is provided for the armature bearing pin 17 by this construction is long wearing due to the large area of the bearing surface and furthermore it will retain a lubricant which may be used to reduce friction and also may be used to prevent corrosion of the bearing surfaces when the relay is exposed to abnormally humid or corrosive atmospheres.

It is thus apparent that the novel construction above described increases the number of circuits that may be controlled by the relay, provides for ready adjustment of the armature bearing relative to the heelpiece, permits replacement of the armature assembly or the bearing block without affecting other relay adjustments, and also increases the durability and life of the relay.

Having fully described the invention, what is considered new and is desired to secure by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In a relay including a magnet and a heelpiece secured thereto, an armature therefor including a bearing pin, a plurality of contact spring sets, a non-magnetic plate, means securing said contact spring sets and said plate to the armature end of said heelpiece with said plate adjacent said heelpiece and extending beyond the armature end thereof and with the free ends of said contact spring sets facing towards the other end of said heelpiece, the fixed portions of said contact spring sets being substantially flush with the armature end of said heelpiece and occupying substantially the entire width thereof, a bearing block having a slot therein to receive said bearing pin, and means securing said bearing block to said extending portion of said plate so as to rotatably secure said bearing pin in said slot and to position said armature in cooperating relationship with said magnet, heelpiece, and contact spring sets, said last means permitting replacement of said armature, or adjustment thereof relative to said magnet and heelpiece without disturbing said contact spring sets.

2. In a relay including a magnet and an L-shaped heelpiece secured thereto to form a U, an armature therefor including a bearing pin and having two parallel arms projecting at right angles from the armature, two contact spring sets, a non-magnetic plate, means securing said plate and said contact spring sets to said heelpiece at the open end of the U with said plate adjacent said heelpiece and extending beyond the end thereof and with said contact spring sets located on either side of said heelpiece with their free ends facing the closed end of the U, a bearing block having a slot therein to receive said bearing pin, and means securing said bearing block to said extending portion of said plate so as to rotatably secure the bearing pin of said armature in said slot with the projecting arms of said armature extending towards the closed end of the U on either side of said heelpiece to engage the free ends of said contact spring sets.

3. In a relay including a magnet and an L-shaped heelpiece secured thereto to form a U; an armature therefor including a bearing pin fixedly secured thereto at one end thereof and having parallel arms projecting therefrom on either side thereof; two contact spring assemblies each comprising a clamping plate, a plurality of contact springs, and a plurality of insulators separating said contact spring; a non-magnetic plate; screws passing through clearance holes in said contact spring assemblies and in said non-magnetic plate into threaded holes in said heelpiece so as to permanently secure said contact spring assemblies and said plate thereto at the open end of the U with said plate adjacent said heelpiece and extending beyond the end thereof and with said contact spring assemblies located on either side of said heelpiece with their free ends facing the closed end of the U, whereby a compact and efficient structure is obtained; a bearing block having a slot therein to receive said bearing pin; and screws passing through elongated holes in the extending portion of said plate into threaded holes in said bearing block so as to rotatably secure the bearing pin of said armature in said slot with the projecting arms of said armature extending towards the closed end of the U on either side of said heelpiece to engage the free ends of said contact springs; said last screws and elongated holes permitting replacement of said armature, or adjustment thereof relative to said heelpiece and said magnet, without disturbing said contact spring assemblies.

4. In a relay including a magnet and an L-shaped heelpiece secured thereto to form a U; an armature therefor including a bearing pin fixedly secured thereto at one end thereof and having parallel arms projecting at right angles therefrom on either side thereof; two contact spring assemblies each comprising a clamping plate, a plurality of contact springs, and a plurality of insulators separating said contact springs; a non-magnetic plate; screws passing through clearance holes in said contact spring assemblies and in said non-magnetic plate into threaded holes in said heelpiece so as to permanently secure said contact spring assemblies and said plate thereto at the open end of the U with said plate adjacent said heelpiece and extending beyond the end thereof and with said contact spring assemblies located on either side of said heelpiece with their free ends facing the closed end of the U; said assemblies being substantially flush with the end of said heelpiece and occupy-

ing substantially the entire width thereof; a bearing block having a slot therein to receive said bearing pin; and screws passing through elongated holes in the extending portion of said plate into threaded holes in said bearing block so as to rotatably secure the bearing pin of said armature in said slot with the projecting arms of said armature extending towards the closed end of the U on either side of said heelpiece to engage the free ends of said contact springs; said last screws and elongated holes permitting replacement of said armature, or adjustment thereof relative to said heelpiece and said magnet, without disturbing said contact spring assemblies.

5. In a relay including a magnet and an L-shaped heelpiece secured thereto to form a U; an armature therefor including a bearing pin fixedly secured thereto at one end thereof and having parallel arms projecting at right angles therefrom on either side thereof; two contact spring assemblies each comprising a clamping plate, a plurality of contact springs, and a plurality of insulators separating said contact springs; a non-magnetic plate; screws passing through clearance holes in said contact spring

assemblies and in said non-magnetic plate into threaded holes in said heelpiece so as to permanently secure said contact spring assemblies and said plate thereto at the open end of the U with said plate adjacent said heelpiece and extending beyond the end thereof and with said contact spring assemblies located on either side of said heelpiece with their free ends facing the closed end of the U; said assemblies being substantially flush with the end of said heelpiece and occupying substantially the entire width thereof; a bearing block having a slot therein to receive said bearing pin; and screw means securing said bearing block to the extending portion of said plate so as to rotatably secure the bearing pin of said armature in said slot with the projecting arms of said armature extending towards the closed end of the U on either side of said heelpiece to engage the free ends of said contact springs; said last screw means permitting replacement of said armature, or adjustment thereof relative to said heelpiece and said magnet, without disturbing said contact spring assemblies.

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