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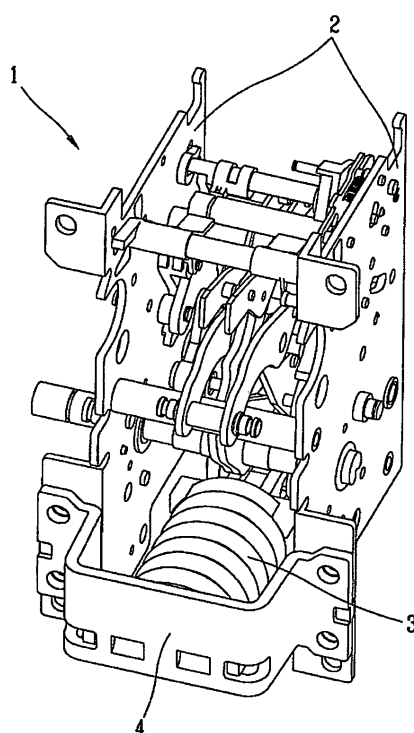
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(54) **Closing spring assembly of switching mechanism for air circuit breaker**

(57) Disclosed is a closing spring assembly of a switching mechanism (1) for an air circuit breaker which is capable of being produced with low cost by a general pressing process, and of supporting a load caused by an elastic energy of the closing spring, comprising: a closing spring (3), a first spring seat member (7), a second spring seat plate (6), a spring guide pin (5) having both end portions connected to the first spring seat member (7) and the second spring seat plate (6), and installed to penetrate the closing spring so as to guide and support the closing spring, and a supporting bracket (4) for supporting the second spring seat plate (6) of the closing spring (3) to be rotatable within a limited angle.

FIG. 1



Description

BACKGROUND

1. Field of the Invention

[0001] The present invention relates to a closing spring assembly of a switching mechanism for an air circuit breaker, and more particularly, to a closing spring assembly of a switching mechanism for an air circuit breaker which is capable of being simply produced with low cost.

2. Background of the Invention

[0002] An air circuit breaker is a kind of low voltage circuit breaker, and generally includes a switching mechanism, a cradle supporting the switching mechanism and having a terminal connected to an external power source and a loadside conducting circuit, and a controller (so called 'an Over Current Relay') that is an electrical apparatus generating controlling signals which drive the switching mechanism to a breakage position in other words off position when occurring an over current by monitoring the current on the conducting circuit.

[0003] The present invention relates to a closing spring assembly charging an elastic energy for contacting the movable contactor with a fixed contactor or providing a driving force which drives a movable contactor to a closing position by discharging the charged elastic energy, in the switching mechanism of the air circuit breaker.

[0004] Such closing spring assembly includes one spring seat connected to the switching mechanism and supporting one end portion of a closing spring, the another spring seat supporting the other end portion of the closing spring, and the closing spring. And, in a related art, at least one of spring seats is produced by a molding process using a metallic die due to its complicated shape.

[0005] The spring seat is formed of a metallic material in order to tolerate a storing elastic energy, but above fabrication method using the metallic die is not easy to be performed and increases in its production cost.

SUMMARY

[0006] The present inventors recognized the drawbacks of the related art described above. Based upon such recognition, the following features have been conceived.

[0007] Therefore, it is an object of the present invention to provide a closing spring assembly of a switching mechanism for an air circuit breaker which is capable of being simply produced with low cost.

[0008] The present invention is directed to providing a closing spring assembly of a switching mechanism for an air circuit breaker comprising:

- at least one closing spring;
- a first spring seat member connected to the switching

mechanism and for supporting one end portion of the closing spring;

a second spring seat plate for supporting the other end portion of the closing spring, and having a front surface supporting the other end portion of the closing spring and a rear surface at an opposite side thereof, which are formed by pressing, respectively; a spring guide pin having both end portions connected to the first spring seat member and the second spring seat plate, and installed to penetrate the closing spring so as to guide and support the closing spring; and

a supporting bracket for supporting the second spring seat plate of the closing spring of the switching mechanism to be rotatable within a limited angle.

[0009] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiment of the invention and together with the description serve to explain the principles of the invention.

[0011] In the drawings:

Figure 1 is a perspective view showing an entire structure of a switching mechanism for an air circuit breaker including a closing spring assembly in accordance with the present invention;

Figure 2 is a perspective view showing an assembled state of a second spring seat plate and a spring guide pin in the closing spring assembly of the switching mechanism for the air circuit breaker in accordance with the present invention;

Figure 3 is a perspective view for describing a detailed configuration of the second spring seat plate in the closing spring assembly of the switching mechanism for the air circuit breaker in accordance with the present invention;

Figure 4 is a perspective view showing an assembled state of a closing spring, a spring guide pin, a first spring seat and the second spring seat plate in the closing spring assembly of the switching mechanism for the air circuit breaker in accordance with the present invention;

Figure 5 is a perspective view showing a front surface of a supporting bracket in the closing spring assembly of the switching mechanism for the air circuit breaker in accordance with the present invention; and

Figure 6 is a perspective view showing a rear surface

of the supporting bracket in the closing spring assembly of the switching mechanism for the air circuit breaker in accordance with the present invention.

DETAILED DESCRIPTION

[0012] Hereinafter, description will be given in detail of the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Referring to the drawings, like numerals indicate like elements and the same reference numerals appearing in more than one drawing figures refer to the same elements.

[0013] As shown in Figures 1, a switching mechanism 1 of the air circuit breaker in accordance with the present invention is installed between a pair of side plates 2, and having a lower portion provided with a closing spring 3 providing a driving force for performing a closing operation of the switching mechanism and a supporting bracket 4.

[0014] Meanwhile, referring to Figures 2 to 4, a closing spring assembly installed at the lower portion of the switching mechanism 1 in accordance with the present invention will be described as follows. The closing spring assembly in accordance with the present invention, as shown in Figure 4, includes at least one closing spring 3, wherein the closing spring 3 may be configured with a spring having a small diameter and another spring having a larger diameter for receiving the spring having the small diameter therein so as to increase an elastic driving force of the closing spring 3.

[0015] As shown in Figure 4, a first spring seat member 7 included in the closing spring assembly in accordance with the present invention has one surface having, e.g., four protrusions, so as to support the one end portion of the closing spring 3 not to be separated. Also, the first spring seat member 7 has the other surface with opposite to the above surface, wherein the other surface is provided with a connection portion connected to the switching mechanism, and provides the driving force for closing by receiving the driving force for charging the closing spring 3 or discharging the charged elastic energy.

[0016] The second spring seat plate 6 included in the closing spring assembly in accordance with the present invention, as shown in Figures 3 and 4, has a front surface supporting the other end portion of the closing spring 3 and a rear surface at the opposite side thereof, wherein the front and rear surfaces are formed by a pressing. That is, as shown in Figure 3, a plurality of protrusions 6a, 6b at the front surface and the rear surface are respectively formed to be respectively protruded towards the front surface and the rear surface by pressing a metallic plate formed of e.g., a steel material, which is cut to be flat. In Figure 3, an insertion hole (reference numeral not given) of the second spring seat plate 6 also may be formed by a punching.

[0017] A spring guide pin 5 included in the closing spring assembly in accordance with the present invention

has both end portions connected to the first spring seat member 7 and the second spring seat plate 6, and is installed to penetrate the closing spring 3 so as to guide and support the closing spring 3. That is, under a state that the closing spring 3 is installed at circumference of the spring guide pin 5, one end portion of the spring guide pin 5 is inserted into a support recess portion (not shown) formed at the first spring seat member 7 to be supported, and the other end portion thereof is extended by passing through the insertion hole of the second spring seat plate 6 and compressed by the pressing so as to couple the spring guide pin 5 with the second spring seat plate 6.

[0018] A supporting bracket 4 included in the closing spring assembly in accordance with the present invention supports the second spring seat plate 6 of the closing spring 3 of the switching mechanism 1 to be rotatable within a limited angle.

[0019] That is, the pair of protrusions 6b is provided on the rear surface of the second spring seat plate 6 for being supported by the supporting bracket 4, and the supporting bracket 4, as shown in Figure 5, is provided with protrusion inserting holes 4b for inserting the protrusions 6b therinto. Here, the reason that the second spring seat plate 6 should be rotatable within the limited angle is that force may be applied to have an inclined angle, not applied horizontally, when the elastic energy is charged by the switching mechanism 1 or the elastic energy is provided by the closing spring 3. The rotation of the second spring seat plate 6 denotes the rotation in a vertical direction, not in a horizontal direction. And, the angle of the rotation is limited by a vertical height of the protrusion inserting hole 4b.

[0020] Meanwhile, in Figure 5 or Figure 6, the supporting bracket 4 is provided with protrusions 4a having curved surfaces for guiding the second spring seat plate 6 to be rotated within the limited angle.

[0021] Referring to Figures 2 through 6, a fabrication method of the closing spring assembly of the switching mechanism for the air circuit breaker in accordance with the present invention will be described as follows.

[0022] First, a steel plate having an oval shape is prepared, and plane cutout portions are formed to form six protrusions spaced to each other with a predetermined distance by the pressing.

[0023] The front surface and the rear surface of the steel plate is respectively pressed at the same time so that two central cut-out portions are toward the rear surface and the rest four cut-out portions are toward the front surface among the cut-out portions at both sides of the steel plate. Accordingly, as shown in Figure 3, an unfinished work of the second spring seat plate 6 is obtained. And, the central portion of the unfinished work is punched so as to form the insertion hole.

[0024] And then, as shown in Figure 4, the first spring seat member 7 having one surface provided with a protrusion supporting portion for preventing the spring from being separated and a spring guide pin supporting recess portion at the center thereof, and the other surface pro-

vided with a connecting recess connected to the switching mechanism 1 is prepared.

[0025] Hereafter, one end portion of the spring guide pin 5 is inserted into the spring guide pin supporting recess portion of the first spring seat member 7 to be supported, and the other end portion of the spring guide pin 5 is inserted into the insertion hole of the second spring seat plate 6 under the state that the closing spring 3 is installed at the circumference of the spring guide pin 5.

[0026] And then, the other end portion of the spring guide pin 5 passed through the insertion hole of the second spring seat plate 6 is compressed by the pressing so that the second spring seat plate 6 and the spring guide pin 5 are tightly coupled.

[0027] And then, the protrusion 6b of the second spring seat plate 6 is inserted into the protrusion inserting hole 4b of the supporting bracket 4 to be supported, accordingly the production of the closing spring assembly in accordance with the present invention is completed.

[0028] As aforementioned, the closing spring assembly of the switching mechanism for the air circuit breaker in accordance with the present invention can be simply produced with low cost because the production of the spring seat and the coupling of the spring guide pin and the spring seat can be simply performed with the low cost by pressing.

[0029] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

[0030] As the present inventive features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

1. A closing spring assembly of a switching mechanism for an air circuit breaker comprising:

at least one closing spring;
a first spring seat member connected to the switching mechanism and for supporting one

end portion of the closing spring;

a second spring seat plate for supporting the other end portion of the closing spring, and having a front surface supporting the other end portion of the closing spring and a rear surface at an opposite side thereof, which are formed by pressing, respectively;

a spring guide pin having both end portions connected to the first spring seat member and the second spring seat plate respectively, and installed to penetrate the closing spring so as to guide and support the closing spring; and
a supporting bracket for supporting the second spring seat plate of the closing spring of the switching mechanism to be rotatable within a limited angle.

2. The closing spring assembly of claim 1, wherein the second spring seat plate is provided with a plurality of protrusions formed on the front surface so as to prevent the other end portion of the closing spring from being separated.
3. The closing spring assembly of claim 1, wherein the second spring seat plate is provided with a pair of protrusions formed on the rear surface so as to be supported by the supporting bracket, wherein the supporting bracket is provided with a protrusion inserting hole portion so as for the protrusions to be inserted thereinto.
4. The closing spring assembly of claim 1, wherein the second spring seat plate is provided with an insertion hole portion for inserting one end portion of the spring guide pin thereinto.
5. The closing spring assembly of claim 1, wherein the supporting bracket is provided with protrusions having curved surfaces for guiding the second spring seat plate to be rotated within a limited angle.

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FIG. 1

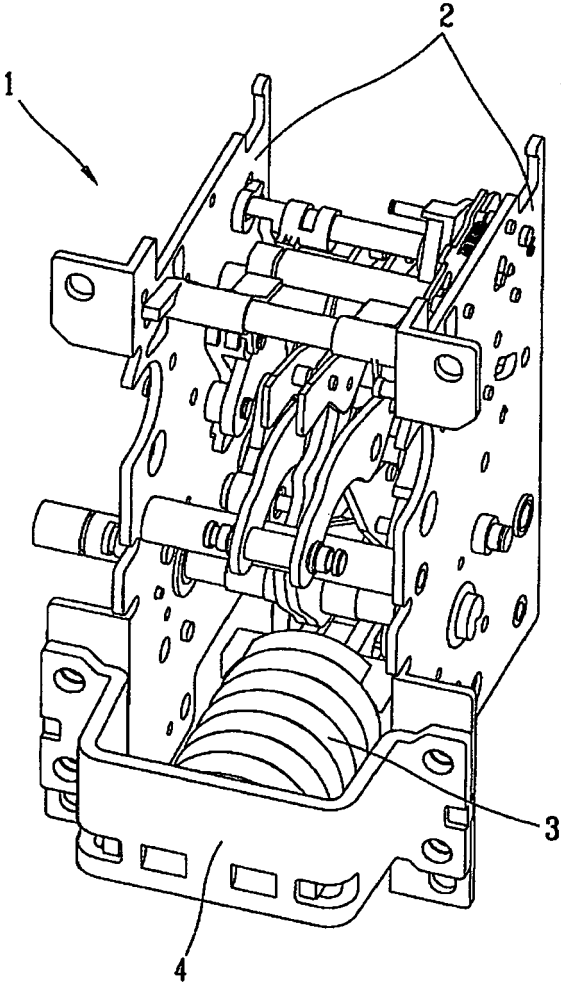


FIG. 2

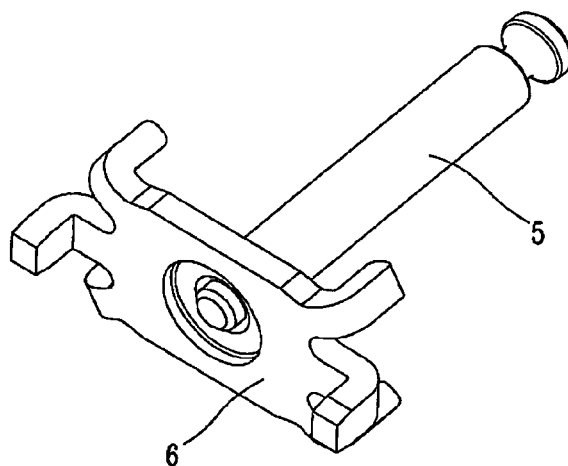


FIG. 3

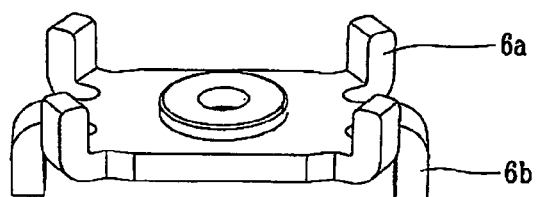


FIG. 4

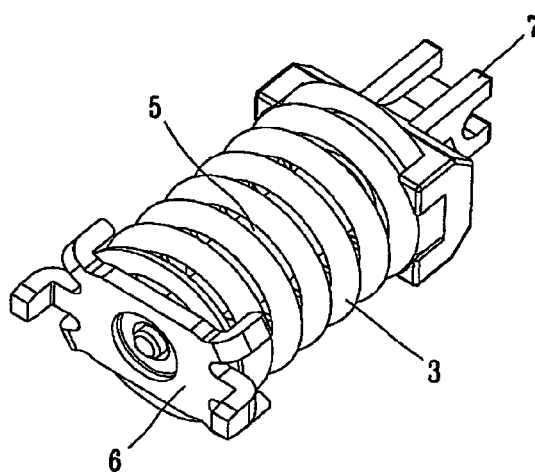


FIG. 5

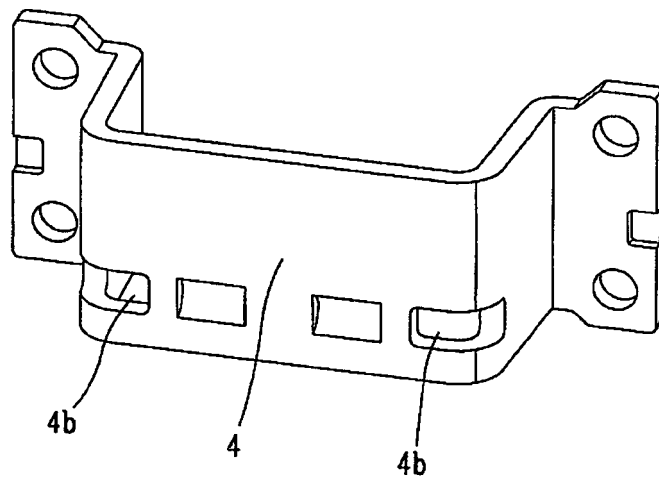


FIG. 6

