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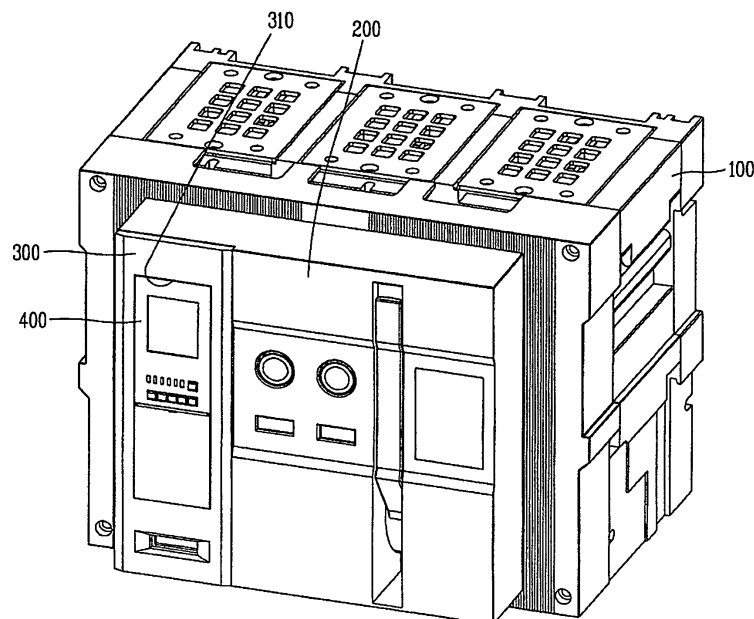
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(54) **Air circuit breaker having simple detachable structure for over current relay**

(57) Disclosed is an air circuit breaker having a simple detachable structure for an over current relay, comprising a main body, a main cover covering a front surface of the main body, a sub cover installed at one side of the

main cover and assembled to the main cover so as to be disassembled therefrom by being pushed up, and an over current relay installed at a rear side of the sub cover so as to be disassembled therefrom and that serves as a controller of the air circuit breaker.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air circuit breaker, more particularly, to an air circuit breaker having a simple detachable structure for an over current relay.

2. Description of the Related Art

[0002] An over current relay is a part of an electronic device, serving as a controller for an air circuit breaker. The over current relay serves to sense an abnormal current such as a short circuit current and an over current on a circuit and then generate an electric driving signal to a trip actuator triggering a switching mechanism so that the switching mechanism can be tripped in an air circuit breaker, to display an operation state of the air circuit breaker, and to communicate with an external monitoring device.

[0003] The over current relay is detached from the air circuit breaker when it is required to be replaced with a new one because its life is over, it is required to be checked due to an error generated while being operated, or it is required to be replaced with a multifunctional one. Here, even if the over current relay is checked, it is preferable that the over current relay should be disassembled for an inspector's safety.

[0004] Thus, in an air circuit breaker according to the related art, in order to detach an over current relay from the air circuit breaker, a front cover covering an almost entire front surface of the air circuit breaker should be detached from an air circuit breaker main body that is disposed at a rear side thereof. And, to this end, it is required to unscrew a plurality of connection screws, which causes inconvenience and wasting of time.

SUMMARY OF THE INVENTION

[0005] Therefore, the present invention is directed to providing an air circuit breaker having a simple detachable structure for an over current relay.

[0006] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided an air circuit breaker comprising: a main body; a main cover that covers a front surface of the main body; a sub cover installed at one side of the main cover and assembled to the main cover so as to be disassembled therefrom by being pushed up; and an over current relay installed at a rear side of the sub cover so as to be disassembled therefrom and that serves as a controller of the air circuit breaker.

[0007] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed descrip-

tion of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] 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 preferred embodiments of the invention and together with the description serve to explain the principles of the invention.

[0009] In the drawings:

FIG. 1 is a perspective view obliquely showing an air circuit breaker from an upper side thereof in accordance with the present invention;

FIG. 2 is a partial longitudinal section view showing that a main cover and a sub cover are connected to each other in the air circuit breaker in accordance with the present invention;

FIG. 3 is a partial longitudinal section view showing that the sub cover is being detached from the main cover in the air circuit breaker in accordance with the present invention;

FIG. 4 is a partial longitudinal section view showing that the sub cover is completely detached from the main cover in the air circuit breaker in accordance with the present invention;

FIG. 5 is a front view showing that the sub cover is excluded from the air circuit breaker in accordance with the present invention, and a partially enlarged section view showing a connection structure of a supporting base and an over current relay inside a two dotted chain line circle;

FIG. 6 is an entire longitudinal section view showing that the over current relay is assembled to the supporting base in the air circuit breaker in accordance with the present invention;

FIG. 7 is a view showing a state that the over current relay is detached from the supporting base in the air circuit breaker in accordance with the present invention;

FIG. 8 is a view showing a state that the over current relay is initially and slightly assembled to the supporting base or that the over current relay is almost disassembled from the supporting base; and

FIG. 9 is a view showing a state that the over current relay is almost assembled to the supporting base or that the over current relay is initially and slightly disassembled from the supporting base.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Description will now be given in detail of the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0011] First, it will be described with reference to FIG.

1. FIG. 1 is a perspective view obliquely showing an air circuit breaker from an upper side thereof in accordance with the present invention. In FIG. 1, the air circuit breaker in accordance with the present invention includes a main body 100, a main cover 200 covering a front surface of the main body 100, a sub cover 300 installed at one side of the main cover, and an over current relay 400 installed at a rear side of the sub cover 300 so as to be disassembled therefrom and serving as a controller of the air circuit breaker.

[0012] The main body 100 of the air circuit breaker includes one switching mechanism (not shown) for providing a switching driving force, movable contactors and fixed contactors (not shown) for multiple phases, a common switching shaft (not shown) for transferring the switching driving force of the switching mechanism to the multiple movable contactors at the same time, an arc extinguishing mechanism for extinguishing an arc generated while executing an operation for breaking a circuit, namely, a tripping operation, or the like.

[0013] The main cover 200 covers the front surface of the air circuit breaker and approximately has a square shape. The main cover 200 is formed of an electrically insulated resin. The main cover 200 has a front surface provided with a manipulation button (reference numeral not given) for switching on or off the air circuit breaker, a charging handle (reference numeral not given) for manually charging a closing spring, or the like. Thus, the main cover 200 is also called as a front surface manipulation portion.

[0014] The sub cover 300 is a member approximately having a rectangular shape, and is formed of an electrically insulated resin. The sub cover 300 is provided with an opening portion 310 allowing a front surface of an over current relay 400 to be exposed so that a user can approach the front surface of the over current relay 400. The sub cover 300 is installed at one side of the main cover 200, and assembled to the main cover 200 so as to be disassembled from the main cover 200 by being pushed up as shown in FIGS. 2 to 4.

[0015] Meanwhile, a connection structure of the sub cover 300 and the main cover 200 will be described with reference to FIGS. 2 to 5.

[0016] As shown in FIGS. 2 to 4, the sub cover 300 is provided with a hook portion 320 for preventing the sub cover 300 from being separated therefrom when it is assembled to the main cover 200.

[0017] As shown in FIGS. 2 to 4, the main cover 200 is provided with an insertion recess portion 220 corresponding to the hook portion 320 of the sub cover 300 so as to allow the hook portion 320 to be inserted thereinto. As shown in FIG. 5, the insertion recess portion 220 is implemented as a rectangular opening that is narrow and long in a length direction when being viewed from a front side. In the present invention, five insertion recess portions 220 are provided, preferably.

[0018] As shown in FIGS. 2 and 4, the hook portion 320 of the sub cover 300 is provided with an engaging

recess portion 321. And, the main cover 200 is provided with a protrusion 230 corresponding to the engaging recess portion 321 of the hook portion 320 thus to be engaged with the engaging recess portion 321. And, the hook portion 320 of the sub cover 300 is provided with an inclined surface 311 for smoothly sliding and pushing up the sub cover 300. And, the main cover 200 is also provided with an inclined surface 210a-1 corresponding to the inclined surface 311 of the hook portion 320.

[0019] In FIGS. 2 to 4, unexplained reference numeral 210a denotes an upper portion of the insertion recess portion 220 of the main cover 200, and 210b denotes a lower portion of the insertion recess portion 220 of the main cover 200.

[0020] Meanwhile, a configuration for supporting the over current relay in the air circuit breaker in accordance with the present invention will be described with reference to FIGS. 5 to 9.

[0021] The air circuit breaker in accordance with the present invention further includes a supporting base 500 fixedly installed at the main body 100 so as to support the over current relay 400 to be disassembled.

[0022] The supporting base 500 is provided with a guide rail 510 for guiding the over current relay 400 when it is assembled to and disassembled from the air circuit breaker. And, the over current relay 400 is provided with a guide shoe 410 corresponding to the guide rail 510. Alternately, it is possible to configure a modified embodiment such that the over current relay 400 is provided with the guide rail and the supporting base 500 is provided with the guide shoe.

[0023] Preferably, the guide rail 510 and the guide shoe 410 are horizontally formed so that the over current relay 400 can be pushed into the supporting base 500 or drawn out therefrom in a horizontal direction.

[0024] And, in order to fix the over current relay 400 in a state that it is pushed into the supporting base 500, it is preferable that the over current relay 400 is provided with fixing protrusions 420 at three positions, i.e., an upper portion and right and left side portions thereof. Here, the fixing protrusion 420 supports a position fixing screw S and is provided with a screw through hole (not shown) which the position fixing screw S can pass therethrough. Corresponding to the fixing protrusions 420 of the over current relay 400, the supporting base 500 is provided with screw connection portions 520 forwardly extended from the upper portion and the right and left side portions thereof and provided with screw holes therein, as shown in FIGS. 6 to 9.

[0025] Meanwhile, operation for disassembling and assembling the sub cover 300 from and to the main cover 200 in the air circuit breaker in accordance with the present invention will be described with reference to FIGS. 2 to 4.

[0026] First, operation for disassembling the sub cover 300 from the main cover 200 in a state that the sub cover 300 is assembled to the main cover 200 as shown in FIG. 2 will be described.

[0027] The sub cover 300 is pushed up with being held in a user's hand. Here, it is required to push up the sub cover 300 by a force strong enough for the engaging recess portion 321 of the hook portion 320 to get over the protrusion 230 of the main cover 200. Then, when the sub cover 300 is continuously pushed up with being held in the user's hand, the inclined surface 311 of the hook portion 320 and the inclined surface 210a-1 of the main cover 200 come into contact with each other and thus the sub cover 300 can be smoothly disassembled from the main cover 200, as shown in FIG. 3. And, a state that the hook portion 320 of the sub cover 300 is completely disassembled from the insertion recess portion 220 of the main cover 200 is shown in FIG. 4.

[0028] Operation for assembling the sub cover 300 to the main cover 200 can be implemented by reversing the disassembling operation, with reversing the drawings from FIG. 4 to FIG. 2 through FIG. 3.

[0029] The assembling operation will be described hereafter.

[0030] The sub cover 300 is held in the user's hand and the hook portion 320 of the sub cover 300 is pushed into the insertion recess portion 220 of the main cover 200. And the, the sub cover 300 is drawn down. Here, as shown in FIG. 3, the inclined surface 311 of the hook portion 320 and the inclined surface 210a-1 of the main cover 200 come into contact with each other and thus the hook portion 320 of the sub cover 300 can be smoothly inserted into the insertion recess portion 220 of the main cover 200. Here, it is required to draw the sub cover 300 down by a force strong enough for the engaging recess portion 321 of the hook portion 320 to get over and to be coupled to the protrusion 230 of the main cover 200. And then, when the sub cover 300 is continuously drawn down with being held by the user's hand, the sub cover 300 can be assembled to the main cover 200, as shown in FIG. 2.

[0031] Meanwhile, in order to execute maintenance and replacement of the over current relay 400, the operation for disassembling the sub cover 300 from the main cover 200 should precede. Here, according to the present invention, the sub cover 300 can be easily disassembled from the main cover 200 by only being pushed up.

[0032] Hereafter, operation for disassembling the over current relay 400 from the supporting base 500 or for assembling the over current relay 400 to the supporting base 500 in the state that the sub cover 300 is disassembled from the main cover 200 will be described with reference to FIGS. 5 to 9.

[0033] Operation for assembling the over current relay 400 to the supporting base 500 will be described. The assembling operation may be executed at the time of replacing the over current relay 400 or returning the over current relay 400 to its original position after checking the over current relay 400.

[0034] First, as shown in FIGS. 7 and 8, the guide shoe 410 of the over current relay 400 to be assembled is fitted into the guide rail 510 of the supporting base 500.

[0035] Next, the over current relay 400 is pushed into a receiving space in the supporting base 500 and the position fixing screws S are coupled through the fixing protrusions 420 of the over current relay 400 and the screw connection portions 520 of the supporting base 500, thus the over current relay 400 is fixed at the supporting base 500.

[0036] Operation for disassembling the over current relay 400 from the supporting base 500 will be described. The disassembling operation may be executed at the time of replacing or checking the over current relay 400.

[0037] The disassembling operation is executed by reversing the assembling operation. Thus, first, the position fixing screws S are unscrewed so as to release the over current relay 400 from the fixed state.

[0038] Next, the over current relay 400 is drawn out from the receiving space in the supporting base 500 thus to terminate the disassembling operation. Here, the guide shoe 410 of the over current relay 400 is guided along the guide rail 510 of the supporting base 500 so that the over current relay 400 can be smoothly disassembled from the supporting base 500.

[0039] As aforementioned, in the air circuit breaker having the simple detachable structure for the over current relay in accordance with the present invention, when assembling or disassembling the over current relay, it is not required to detach the main cover of the air circuit breaker from the main body thereof that is positioned at the rear side of the main cover, accordingly it is capable of simply assembling or disassembling the over current relay.

[0040] Further, in the air circuit breaker having the simple detachable structure for the over current relay in accordance with the present invention, it is capable of assembling or disassembling the over current relay to or from the main cover by only pushing up or drawing down the sub cover, accordingly an operational productivity can be drastically enhanced when replacing or checking the over current relay.

[0041] Further, in the air circuit breaker having the simple detachable structure for the over current relay in accordance with the present invention, when assembling and disassembling the over current relay to and from the supporting base, the guide rail and the guide shoe are provided so as to guide the moving over current relay. Accordingly, it is capable of simply and rapidly executing the assembling and disassembling operations of the over current relay.

[0042] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present disclosure. 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.

[0043] 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. An air circuit breaker comprising:

a main body 100;
 a main cover 200 that covers a front surface of the main body;
 a sub cover 300 installed at one side of the main cover and assembled to the main cover so as to be disassembled therefrom by being pushed up; and
 an over current relay 400 installed at a rear side of the sub cover so as to be disassembled therefrom and that serves as a controller of the air circuit breaker.

2. The air circuit breaker of claim 1, wherein the sub cover is provided with a hook portion 320 for preventing the sub cover from being separated therefrom when it is assembled to the main cover, and wherein the main cover 220 is provided with an insertion recess portion corresponding to the hook portion of the sub cover so as to allow the hook portion to be inserted thereinto.

3. The air circuit breaker of claim 2, wherein the hook portion of the sub cover is provided with an engaging recess portion 321, and wherein the main cover is provided with a protrusion 230 corresponding to the engaging recess portion of the hook portion thus to be engaged with the engaging recess portion.

4. The air circuit breaker of claim 1, further comprises a supporting base 500 fixedly installed at the main body that supports the over current relay to be disassembled.

5. The air circuit breaker of claim 1 or 4, wherein the supporting base is provided with a guide rail 510 for guiding the over current relay when it is assembled to and disassembled from the air circuit breaker, and wherein the over current relay is provided with a guide shoe 410 corresponding to the guide rail.

6. The air circuit breaker of claim 5, wherein the guide rail and the guide shoe are horizontally formed so that the over current relay can be pushed into the supporting base or drawn out therefrom in a horizontal direction.

7. The air circuit breaker of claim 2, wherein the hook portion of the sub cover is provided with an inclined surface 311 for smoothly sliding and pushing up the sub cover, and wherein the main cover is also provided with an inclined surface 210a-1 corresponding to the inclined surface of the hook portion.

FIG. 1

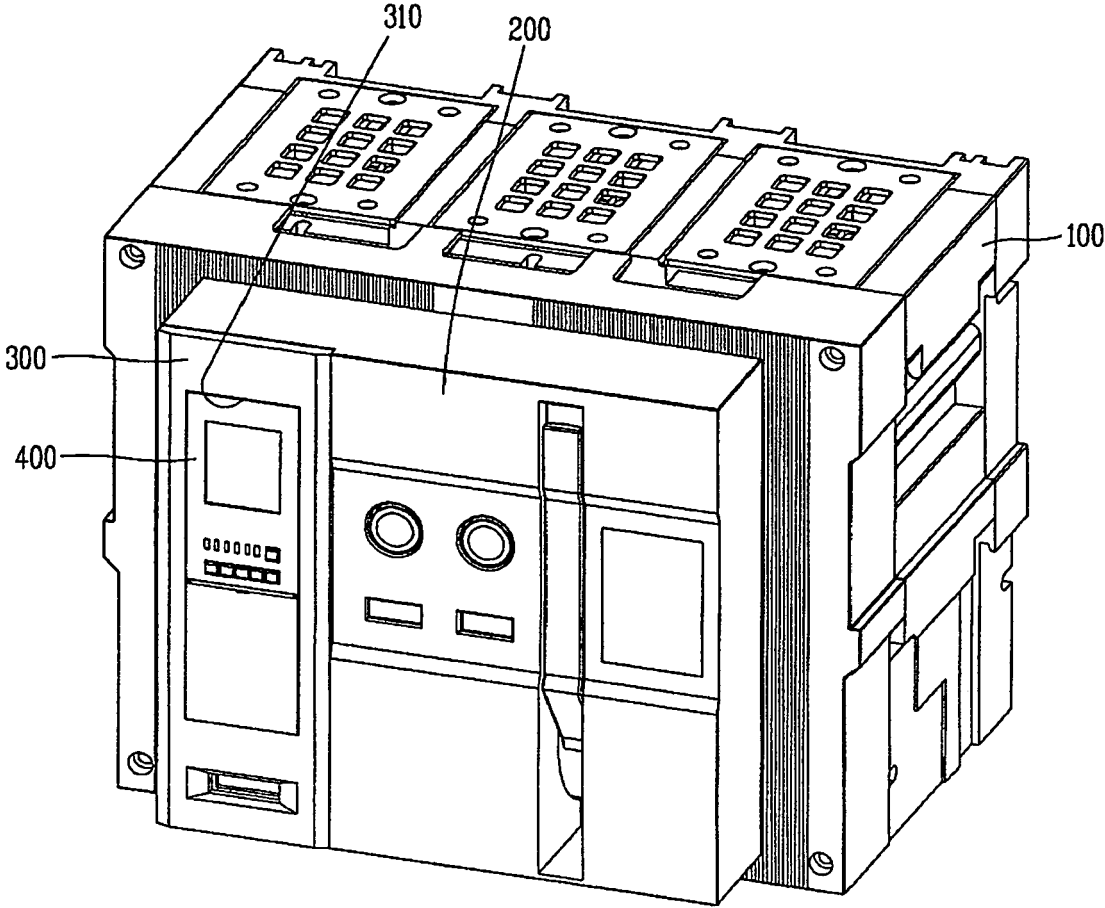


FIG. 2

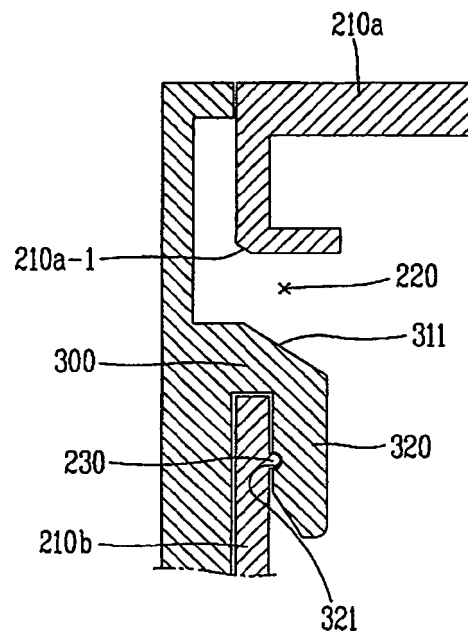


FIG. 3

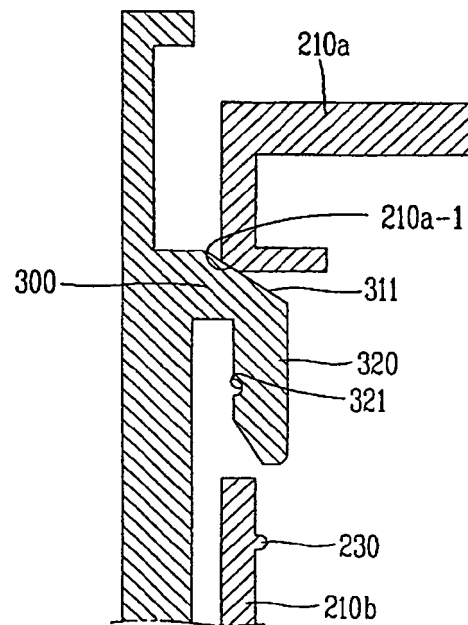


FIG. 4

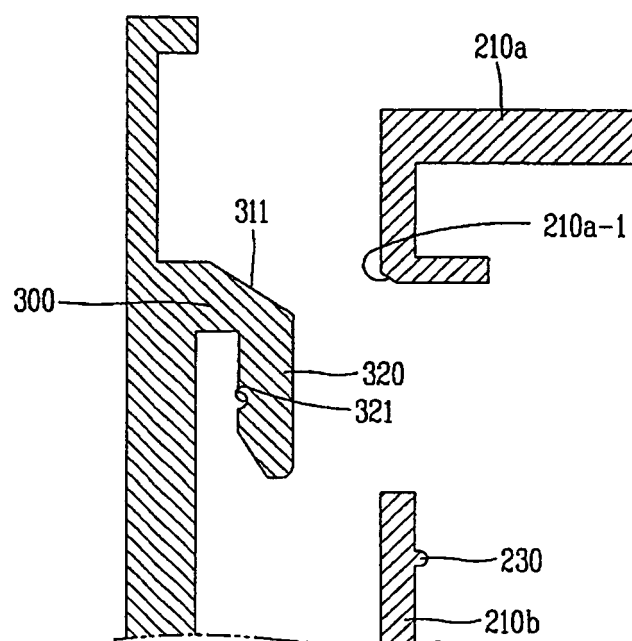


FIG. 5

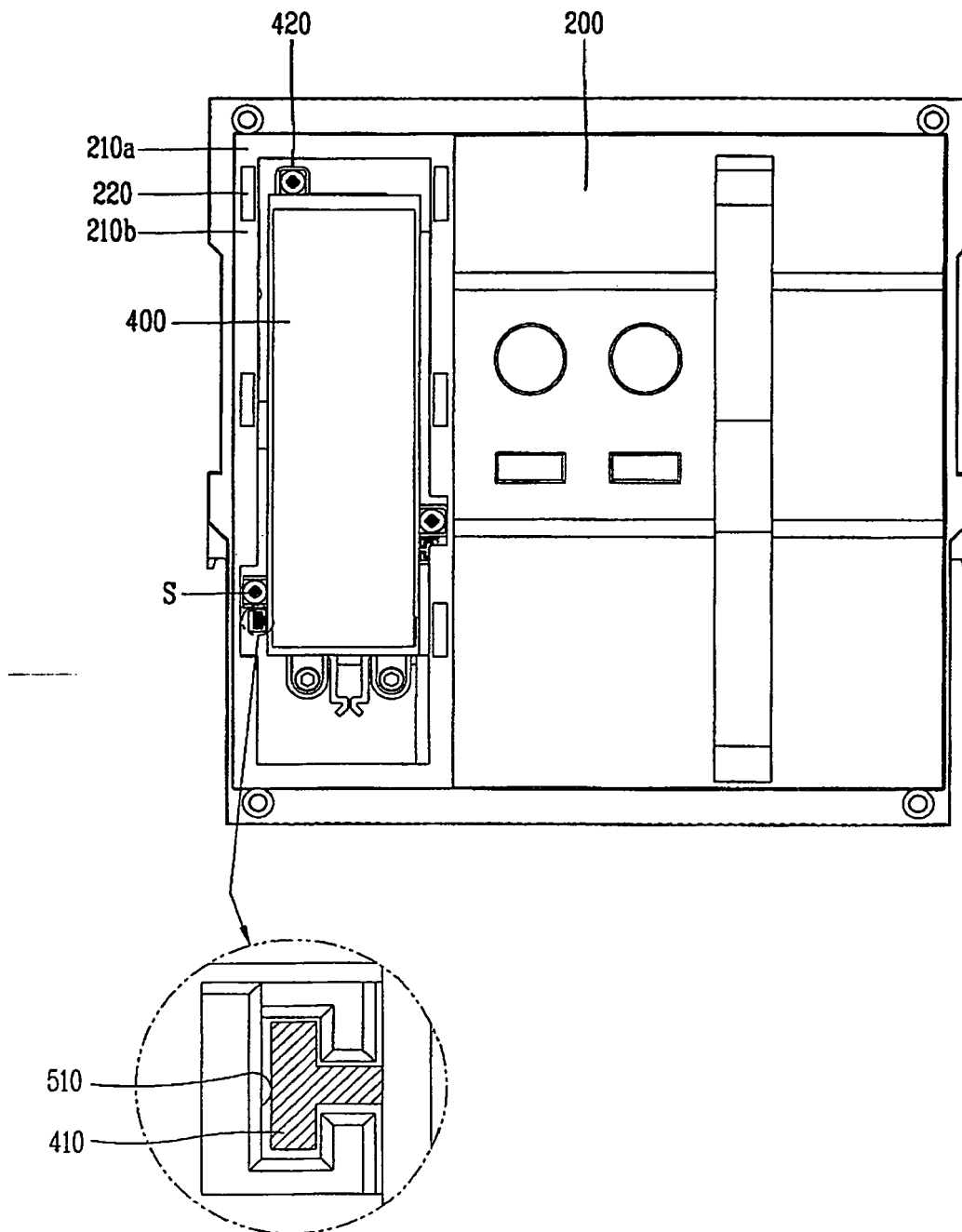


FIG. 6

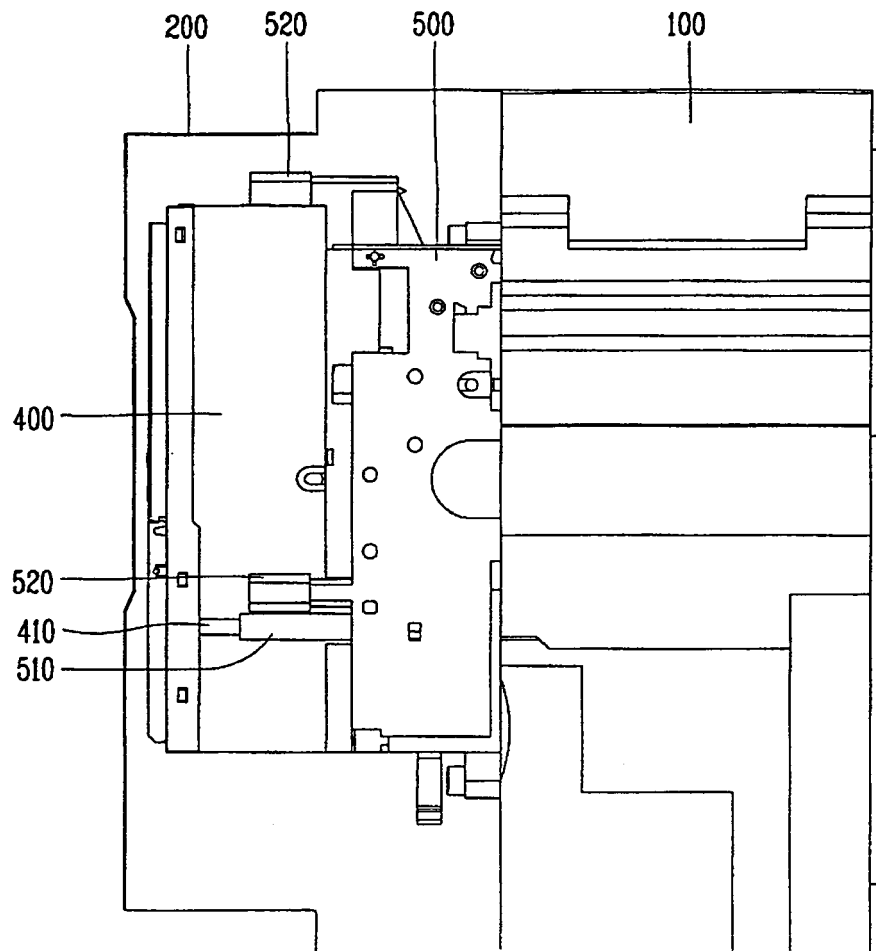


FIG. 7

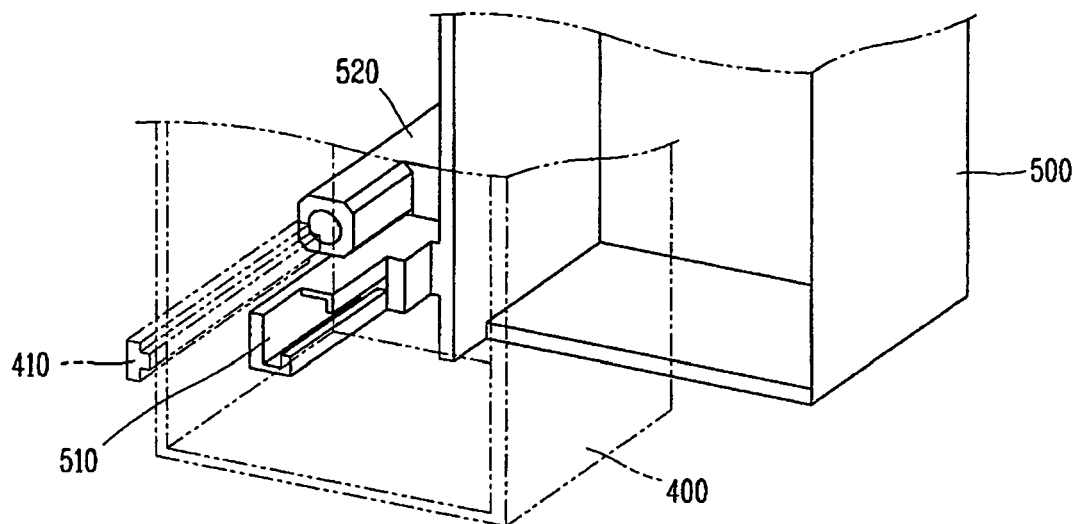


FIG. 8

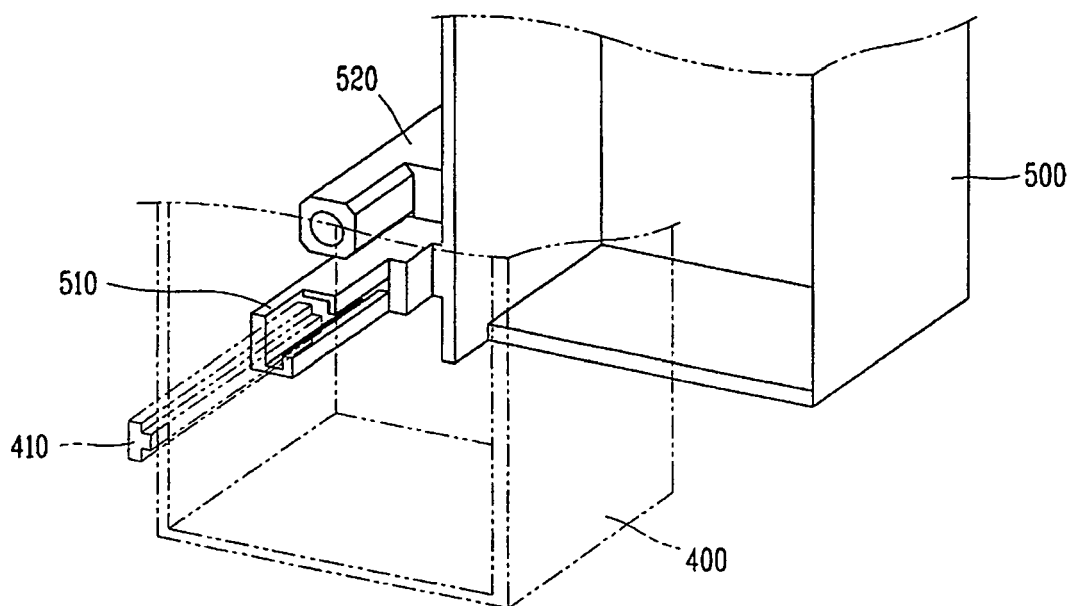


FIG. 9

