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# CIRCUIT BREAKER

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the structure of a circuit breaker which switches a main circuit current.

2. Description of the Related Art

Fig. 8 is a side view showing the configuration of a circuit breaker of the prior art. This configuration is disclosed in, for example, Japanese Patent Publication (Kokai) No. SHO62-211822. Referring to Fig. 8, 1 denotes a support member, 2 denotes an operating mechanism which is fixed to the support member 1, 3 denotes an insulating frame which is fixed to the support member 1, and 4 denotes an operating lever which is coupled to the operating mechanism 2, and which is rotatably supported on the support member 1. The reference numeral 5 denotes a contact pressure spring which is coupled to the operating lever 4, and 6 denotes an insulating operating rod which is coupled to the contact pressure spring 5, and which elongates along the insulating frame 3. The reference numeral 7 denotes a movable current shaft which is coaxially coupled to the insulating operating rod 6, 8 denotes a movable contact which is connected to the movable current shaft 7, 9 denotes a stationary contact which is

opposed to the movable contact 8, 10 denotes a stationary current shaft which is connected to the stationary contact 9, and 11 denotes a vacuum bulb the exterior of which is surrounded by an insulator, and the interior of which constitutes an electrical connecting portion (during a closed period) or a isolating portion (during an opened period) between the movable contact 8 and the stationary contact 9.

The reference numeral 13 denotes a lower conductor which is fixed to the insulating frame 3, and which is connected to a load circuit of an enclosed switchboard (not shown) or the like, and 14 denotes a flexible conductor one end of which is connected to the movable current shaft 7, and the other end of which is connected to the lower conductor 13. The reference numeral 15 denotes an upper conductor which is fixed to the insulating frame 3, one end of which is connected to the stationary current shaft 10, and the other end of which is connected to a bus of the enclosed switchboard (not shown) or the like. The main circuit current flows in the path from the upper conductor 15 to the lower conductor 13 via the stationary current shaft 10, the stationary contact 9, the movable contact 8, the movable current shaft 7, and the flexible conductor 14. Therefore, the insulating operating rod 6 is disposed in order to ensure electrical insulation between the contact

pressure spring 5 which is a grounded part, and the movable current shaft 7 and the lower conductor 13 which are live parts.

The contact pressure spring 5 has the configuration shown in Figs. 9A and 9B. Figs. 9A and 9B are views showing main portions of Fig. 8. Fig. 9A shows the state of the contact pressure spring 5 when the vacuum bulb 11 is opened, and Fig. 9B shows the state of the contact pressure spring 5 when the vacuum bulb 11 is closed. Referring to Figs. 9A and 9B, 5a denotes a spring bracket coupled to the operating lever 4, 5b denotes a coil spring disposed on the spring bracket 5a, 5c denotes a stud which abuts against the coil spring 5b, one end of which is passed through the coil spring 5b, and the other end of which is embedded into the insulating operating rod 6, and 5d denotes a stop tab which is fixed to the stud 5c so as to abut against the spring bracket 5a when the vacuum bulb 11 is opened. The components 5a to 5d constitute the contact pressure spring 5.

Next, the operation will be described. When the vacuum bulb 11 is to be opened, the operating mechanism 2 operates the operating lever 4 in response to an opening command, so that the spring bracket 5a coupled to the operating lever 4 is lowered. At this time, the stored energy of the coil spring 5b is released, and the spring

bracket 5a is pressed down by the energy, whereby the spring bracket 5a is caused to abut against the stop tab 5d to apply a force to the stop tab, so that the stud 5c is lowered. Therefore, the insulating operating rod 6 into which the stud 5c is embedded, the movable current shaft 7 coupled to the insulating operating rod 6, and the movable contact 8 connected to the movable current shaft 7 are lowered, with the result that the vacuum bulb 11 is opened.

By contrast, when the vacuum bulb 11 is to be closed, the operating mechanism 2 causes the operating lever 4 to operate upward, in response to a closing command, so that the spring bracket 5a coupled to the operating lever 4 is raised. The insulating operating rod 6, the movable current shaft 7 of the vacuum bulb 11 and coupled to the insulating operating rod 6, and the movable contact 8 connected to the movable current shaft 7 are raised via the coil spring 5b which is contacted with the spring bracket 5a, so that the movable contact 8 is connected to the stationary contact 9, thereby closing the vacuum bulb 11. After the vacuum bulb 11 is closed, the operating lever 4 is caused to further operate upward, and the spring bracket 5a coupled to the operating lever 4 is further raised, thereby compressing the coil spring 5b. By the stored energy of the coil spring 5b, the electrical connecting portion between the movable contact 8 and the stationary

contact 9 is pressurized.

In such a circuit breaker of the prior art, the insulating operating rod 6 is disposed in order to ensure electrical insulation between the contact pressure spring 5 which is a grounded part, and the movable current shaft 7 and the lower conductor 13 which are live parts. In the prior art, however, the insulating operating rod 6 has a large length in the height direction so as to ensure the air insulating distance, and the dimension of the contact pressure spring 5 which is placed below the insulating operating rod 6 is added to the length. As a result, there arises a problem in that the height of such a circuit breaker is large.

## SUMMARY OF THE INVENTION

The invention has been conducted in order to solve the problem. It is an object of the invention to provide a circuit breaker the height of which can be reduced.

In the circuit breaker of the invention, a circuit breaker comprises: an operating lever which is rotatably supported on a support member; switching means having a movable contact which is coupled to the operating lever, and a stationary contact which is opposed to the movable contact; an insulating operating rod which is disposed between the operating lever and the switching means, and

which has plural ribs; and an insulating frame which is disposed on the support member to elongate along the insulating operating rod, the insulating frame having plural ribs which are formed on a face opposed to the ribs of the insulating operating rod, the ribs of the insulating frame and the ribs of the insulating operating rod alternately entering gaps formed between the ribs.

Furthermore, a circuit breaker comprises: an operating lever which is rotatably supported on a support member; switching means having a movable contact which is coupled to the operating lever, and a stationary contact which is opposed to the movable contact; an insulating operating rod which is disposed between the operating lever and the switching means, and which has plural ribs; an insulating frame which is disposed on the support member to elongate along the insulating operating rod, the insulating frame having plural ribs which are formed on a face opposed to the ribs of the insulating operating rod, the ribs of the insulating frame and the ribs of the insulating operating rod alternately entering gaps formed between the ribs; and a contact pressure spring which is coupled to the insulating operating rod.

The contact pressure spring may be disposed between the operating lever and the insulating operating rod.

The contact pressure spring may be disposed in a

recess which is formed in an inner side of the insulating operating rod, the inner side being on a side of the operating lever.

The contact pressure spring may be disposed in a recess which is formed in an inner side of the insulating operating rod, the inner side being on a side of the switching means.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view showing a circuit breaker of Embodiment 1 of the invention;

Figs. 2A and 2B are views showing main portions of Fig. 1, in which Fig. 2A shows the state of a contact pressure spring when a vacuum bulb is opened, and Fig. 2B shows the state of the contact pressure spring when the vacuum bulb is closed;

Figs. 3A and 3B are views illustrating the air insulating distance in a space between an insulating frame and an insulating operating rod, in which Fig. 3A shows the air insulating distance in a configuration in which ribs of the insulating frame, and those of the insulating operating rod are arranged so as to alternately enter the gaps formed therebetween, and Fig. 3B shows the air insulating distance in a space between an insulating frame having no ribs and the insulating operating rod having the ribs.

Fig. 4 is a side view showing a circuit breaker of Embodiment 2 of the invention;

Figs. 5A and 5B are views showing main portions of Fig. 4 and showing a contact pressure spring which is disposed in the inner side of an insulating operating rod, in which Fig. 5A shows the state of the contact pressure spring when a vacuum bulb is opened, and Fig. 5B shows the state of the contact pressure spring when the vacuum bulb is closed;

Fig. 6 is a side view showing a circuit breaker of Embodiment 3 of the invention;

Figs. 7A and 7B are views showing main portions of Fig. 6 and showing a contact pressure spring which is disposed in the inner side of an insulating operating rod, in which Fig. 7A shows the state of the contact pressure spring when a vacuum bulb is opened, and Fig. 7B shows the state of the contact pressure spring when the vacuum bulb is closed;

Fig. 8 is a side view showing the configuration of a circuit breaker of the prior art; and

Figs. 9A and 9B are view showing main portions of Fig. 8, in which Fig. 9A shows the state of a contact pressure spring when a vacuum bulb is opened, and Fig. 9B shows the state of the contact pressure spring when the vacuum bulb is closed.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiment 1.

Fig. 1 is a side view showing a circuit breaker of Embodiment 1 of the invention. Referring to Fig. 1, 21 denotes a support member, 22 denotes an operating mechanism which is fixed to the support member 21, 23 denotes an insulating frame which is fixed to the support member 21, and which has plural ribs 23a on a face opposed to an insulating operating rod (described later), and 24 denotes an operating lever which is coupled to the operating mechanism 22, and which is rotatably supported on the support member 21. The reference numeral 25 denotes a contact pressure spring which is coupled to the operating lever 24, and 26 denotes an insulating operating rod which elongates along the insulating frame 23 so as to be disposed between the operating lever 24 and a vacuum bulb (described later), which has plural ribs 26a, and which is coupled to the contact pressure spring 25. The ribs 23a of the insulating frame 23, and the ribs 26a of the insulating operating rod 26 are arranged so as to alternately enter the gaps formed therebetween.

The reference numeral 27 denotes a movable current shaft which is coaxially coupled to the insulating operating rod 26, 28 denotes a movable contact which is connected to the movable current shaft 27, 29 denotes a stationary contact which is opposed to the movable contact

28, 30 denotes a stationary current shaft which is connected to the stationary contact, and 31 denotes a vacuum bulb which serves as switching means, the exterior of which is surrounded by an insulator, and the interior of which constitutes an electrical connecting portion (during a closed period) or a isolating portion (during an opened period) between the movable contact 28 and the stationary contact 29.

The reference numeral 33 denotes a lower conductor which is fixed to the insulating frame 23, and which is connected to a load circuit of an enclosed switchboard (not shown) or the like, and 34 denotes a flexible conductor one end of which is connected to the movable current shaft 27, and the other end of which is connected to the lower conductor 33. The reference numeral 35 denotes an upper conductor which is fixed to the insulating frame 23, one end of which is connected to the stationary current shaft 30, and the other end of which is connected to a bus of the enclosed switchboard (not shown) or the like. The main circuit current flows in the path from the upper conductor 35 to the lower conductor 33 via the stationary current shaft 30, the stationary contact 29, the movable contact 28, the movable current shaft 27, and the flexible conductor 34. Therefore, the insulating operating rod 26 is disposed in order to ensure electrical insulation between the contact

pressure spring 25 which is a grounded part, and the movable current shaft 27 and the lower conductor 33 which are live parts.

The contact pressure spring 25 has the configuration shown in Figs. 2A and 2B. Figs. 2A and 2B are views showing main portions of Fig. 1. Fig. 2A shows the state of the contact pressure spring 25 when the vacuum bulb 31 is opened, and Fig. 2B shows the state of the contact pressure spring 25 when the vacuum bulb 31 is closed. Referring to Figs. 2A and 2B, 25a denotes a spring bracket coupled to the operating lever 24, 25b denotes a coil spring disposed on the spring bracket 25a, 25c denotes a stud which abuts against the coil spring 25b, one end of which is passed through the coil spring 25b, and the other end of which is embedded into the insulating operating rod 26, and 25d denotes a stop tab which is fixed to the stud 25c so as to abut against the spring bracket 25a when the vacuum bulb 31 is opened. The components 25a to 25d constitute the contact pressure spring 25.

Next, the operation will be described. When the vacuum bulb 31 is to be opened, the operating mechanism 22 operates the operating lever 24 in response to an opening command, so that the spring bracket 25a coupled to the operating lever 24 is lowered. At this time, the stored energy of the coil spring 25b is released, and the spring

bracket 25a is pressed down by the energy, whereby the spring bracket 25a is caused to abut against the stop tab 25d to apply a force to the stop tab, so that the stud 25c is lowered. Therefore, the insulating operating rod 26 into which the stud 25c is embedded, the movable current shaft 27 of the vacuum bulb 31 and coupled to the insulating operating rod 26, and the movable contact 28 connected to the movable current shaft 27 are lowered, with result that the vacuum bulb 31 is opened.

By contrast, when the vacuum bulb 31 is to be closed, the operating mechanism 22 causes the operating lever 24 to operate, in response to a closing command, so that the spring bracket 25a coupled to the operating lever 24 is raised. At this time, the insulating operating rod 26, the movable current shaft 27 of the vacuum bulb 31 and coupled to the insulating operating rod 26, and the movable contact 28 connected to the movable current shaft 27 are raised via the coil spring 25b, so that the movable contact 28 is connected to the stationary contact 29. The operating lever 24 is caused to further operate upward, and the spring bracket 25a coupled to the operating lever 24 is further raised, thereby allowing the spring bracket 25a to compress the coil spring 25b. By the stored energy of the coil spring 25b, the electrical connecting portion between the movable contact 28 and the stationary contact 29 is

pressurized, with the result that the vacuum bulb 31 is closed.

As described above, the relative positional relationship between the insulating operating rod 26 and the operating lever 24 is changed in accordance with the closing or opening operation of the vacuum bulb 31. When the extent of the change is measured from the outside, therefore, it is possible to know the degree of the stored or released energy of the coil spring 25b.

Figs. 3A and 3B are views illustrating the air insulating distance in a space between the insulating frame and the insulating operating rod. Fig. 3A shows the air insulating distance in a configuration in which, as Embodiment 1, the ribs 23a of the insulating frame 23, and the ribs 26a of the insulating operating rod 26 are arranged so as to alternately enter the gaps formed therebetween, and Fig. 3B shows the air insulating distance in a space between the insulating frame 3 having no ribs and the insulating operating rod 26 having the ribs 26a. The air insulating distance (A) which is indicated by the broken line in Fig. 3(a) is longer than the air insulating distance (B) which is indicated by the broken line in Fig. 3B Therefore, the height of the insulating operating rod 26 can be reduced for obtaining the same predetermined air insulating distance, so that the height of the circuit

breaker can be reduced. Furthermore, also the height of a panel which accommodates the circuit breaker can be reduced.

Embodiment 2.

Fig. 4 is a side view showing a circuit breaker of Embodiment 2 of the invention, and Figs. 5A and 5B are views showing main portions of Fig. 4 and showing a contact pressure spring which is disposed in the inner side of an insulating operating rod. Fig. 5A shows the state of the contact pressure spring when a vacuum bulb is opened, and Fig. 5B shows the state of the contact pressure spring when the vacuum bulb is closed. In Figs. 4, 5A and 5B, the reference numerals which are identical with those of Figs. 1, 2A, 2B, 3A and 3B denote the same or equivalent components, and description of the components is omitted.

Embodiment 2 is different from Embodiment 1 in the following point. In Embodiment 1, the contact pressure spring 25 is coupled between the operating lever 24 and the insulating operating rod 26. By contrast, in Embodiment 2, the contact pressure spring is disposed in the inner side of the insulating operating rod.

Referring to Figs. 4, 5A and 5B, 46 denotes an insulating operating rod which elongates along the insulating frame 23 so as to be disposed between the operating lever 24 and the vacuum bulb 31, which has plural ribs 46a, and which has a recess 46b on the side of the

operating lever 24. The ribs 46a and the ribs 23a of the insulating frame 23 are arranged so as to alternately enter the gaps formed therebetween. The one end of the rod is coupled to the movable current shaft 27, and the other end is coupled to the operating lever 24 via a contact pressure spring which will be described later. The reference numeral 45a denotes a spring bracket which is disposed in the recess 46b and coupled to the operating lever 24, 45b denotes a coil spring disposed between the spring bracket 45a and the recess 46b, 45c denotes a stud which is embedded into the insulating operating rod 46, and which is passed through the coil spring 45b, and 45d denotes a stop tab which is fixed to the stud 45c so as to abut against the spring bracket 45a when the vacuum bulb 31 is opened. The components 45a to 45d constitute the contact pressure spring 45.

Next, the operation will be described. When the vacuum bulb 31 is to be opened, the operating mechanism 22 operates the operating lever 24 in response to an opening command, so that the spring bracket 45a coupled to the operating lever 24 is lowered. At this time, the stored energy of the coil spring 45b is released, and the spring bracket 45a is pressed down by the energy, whereby the spring bracket 45a is caused to abut against the stop tab 45d to apply a force to the stop tab, so that the stud 45c

is lowered. Therefore, the insulating operating rod 46 into which the stud 45c is embedded, the movable current shaft 27 of the vacuum bulb 31 and coupled to the insulating operating rod 46, and the movable contact 28 connected to the movable current shaft 27 are lowered, with the result that the vacuum bulb 31 is opened.

By contrast, when the vacuum bulb 31 is to be closed, the operating mechanism 22 causes the operating lever 24 to operate, in response to a closing command, so that the spring bracket 45a coupled to the operating lever 24 is raised. At this time, the insulating operating rod 46, the movable current shaft 27 of the vacuum bulb 31 and coupled to the insulating operating rod 46, and the movable contact 28 connected to the movable current shaft 27 are raised via the coil spring 45b, so that the movable contact 28 is connected to the stationary contact 29. The operating lever 24 is caused to further operate upward, and the spring bracket 45a coupled to the operating lever 24 is further raised, thereby allowing the spring bracket 45a to compress the coil spring 45b. By the stored energy of the coil spring 45b, the electrical connecting portion between the movable contact 28 and the stationary contact 29 is pressurized, with the result that the vacuum bulb 31 is closed.

According to the configuration in which the ribs 23a

of the insulating frame 23, and the ribs 46a of the insulating operating rod 46 are arranged so as to alternately enter the gaps formed therebetween, the air insulating distance can be prolonged. Therefore, the height of the insulating operating rod 46 can be reduced for obtaining the same predetermined air insulating distance. Since the contact pressure spring 45 is disposed in the recess 46b which is formed in the inner side of the lower end portion of the insulating operating rod 46, the level difference between the insulating operating rod 46 and the operating lever 24 can be made smaller than that in Embodiment 1. Consequently, the height of the circuit breaker can be reduced.

Embodiment 3.

Fig. 6 is a side view showing a circuit breaker of Embodiment 3 of the invention, and Figs. 7A and 7B are views showing main portions of Fig. 6 and showing a contact pressure spring which is disposed in the inner side of an insulating operating rod. Fig. 7A shows the state of the contact pressure spring when a vacuum bulb is opened, and Fig. 7B shows the state of the contact pressure spring when the vacuum bulb is closed. In Figs. 6, 7A and 7B, the reference numerals which are identical with those of Figs. 1, 2A, 2B, 3A and 3B denote the same or equivalent components, and description of the components is omitted.

Embodiment 3 is different from Embodiment 1 in the following point. In Embodiment 1, the contact pressure spring 25 is coupled between the operating lever 24 and the insulating operating rod 26. By contrast, in Embodiment 3, the contact pressure spring is disposed in the inner side of the insulating operating rod. In Embodiment 2, the recess of the insulating operating rod in which the contact pressure spring is disposed is formed on the side of the operating rod. By contrast, in Embodiment 3, the recess is disposed on the side of the vacuum bulb.

Referring to Figs. 6, 7A and 7B, 56 denotes an insulating operating rod which elongates along the insulating frame 23 so as to be disposed between the operating lever 24 and the vacuum bulb 31, which has plural ribs 56a, and which has a recess 56b on the side of the vacuum bulb 31. The ribs 56a and the ribs 23a of the insulating frame 23 are arranged so as to alternately enter the gaps formed therebetween. The one end of the rod is coupled to the operating lever 24, and the other end is coupled to the movable current shaft 27 via a contact pressure spring which will be described later. The reference numeral 55a denotes a spring bracket disposed in the recess 56b, 55b denotes a coil spring which is disposed between the spring bracket 55a and the recess 56b and coupled to the movable current shaft 27, 55c denotes a stud

which is embedded into the insulating operating rod 56, and which is passed through the coil spring 55b, and 55d denotes a stop tab which is fixed to the stud 55c so as to abut against the spring bracket 55a when the vacuum bulb 31 is opened. The components 55a to 55d constitute the contact pressure spring 55.

Next, the operation will be described. When the vacuum bulb 31 is to be opened, the operating mechanism 22 operates the operating lever 24 in response to an opening command, so that the insulating operating rod 56 coupled to the operating lever 24, and the stud 55c embedded into the insulating operating rod 56 are lowered. At this time, the stored energy of the coil spring 55b is released, and the stud 55c is pressed down by the energy, whereby the stop tab 55d is caused to abut against the spring bracket 55a to apply a force to the spring bracket, so that the spring bracket 55a is lowered. Therefore, the movable current shaft 27 of the vacuum bulb 31 and coupled to the spring bracket 55a, and the movable contact 28 connected to the movable current shaft 27 are lowered, with the result that the vacuum bulb 31 is opened.

By contrast, when the vacuum bulb 31 is to be closed, the operating mechanism 22 causes the operating lever 24 to operate, in response to a closing command, so that the insulating operating rod 56 coupled to the operating lever

24 is raised. At this time, the spring bracket 55a, the movable current shaft 27 of the vacuum bulb 31 and coupled to the spring bracket 55a, and the movable contact 28 connected to the movable current shaft 27 are raised via the coil spring 55b which is contacted with the insulating operating rod 56, so that the movable contact 28 is connected to the stationary contact 29. The operating lever 24 is caused to further operate upward, and the insulating operating rod 56 coupled to the operating lever 24 is further raised, thereby allowing the insulating operating rod 56 to compress the coil spring 55b. By the stored energy of the coil spring 55b, the electrical connecting portion between the movable contact 28 and the stationary contact 29 is pressurized, with the result that the vacuum bulb 31 is closed.

In the configuration in which, as described above, the contact pressure spring 55 is disposed in the upper end portion of the insulating operating rod 56, i.e., on the side of the vacuum bulb 31, when the circuit breaker is to be opened, the insulating operating rod 56 is lowered and the stop tab 55d abuts against the spring bracket 55a. The stored energy of the coil spring 55b is released, and a force is applied to the spring bracket 55a, the movable current shaft 27 coupled to the spring bracket 55a, and the movable contact 28 connected to the movable current shaft

27, whereby the movable contact 28 is lowered.

By contrast, in the configuration in which, as Embodiment 2, the contact pressure spring 45 is disposed in the lower end portion of the insulating operating rod 46, i.e., on the side of the operating lever 24, when the circuit breaker is to be opened, a force is applied to the insulating operating rod 46, the movable current shaft 27 of the vacuum bulb 31 and coupled to the insulating operating rod 46, and the movable contact 28 connected to the movable current shaft 27, whereby the movable contact 28 is lowered.

Regarding the energy of the coil spring 55b which is necessary for lowering the movable contact 28, therefore, when the contact pressure spring 55 is disposed in the upper end portion of the insulating operating rod 56, the energy for pressing down the insulating operating rod is not required as compared with the case where the contact pressure spring 45 is disposed in the lower end portion of the insulating operating rod 46. As a result, the energy of the coil spring 55b can be reduced by the degree corresponding to the above.

According to the configuration in which the ribs 23a of the insulating frame 23, and the ribs 56a of the insulating operating rod 56 are arranged so as to alternately enter the gaps formed therebetween, the air

insulating distance can be prolonged. Therefore, the height of the insulating operating rod 56 can be reduced for obtaining the same predetermined air insulating distance. Since the contact pressure spring 55 is disposed in the recess 56b which is formed in the inner side of the upper end portion of the insulating operating rod 56, the level difference between the insulating operating rod 56 and the operating lever 24 can be made smaller than that in Embodiment 1. Consequently, the height of the circuit breaker can be reduced.

The invention is configured as described above, and hence attains the following effects.

Along the insulating operating rod having plural ribs, disposed is the insulating frame having plural ribs which are formed on the face opposed to the ribs of the insulating operating rod so that the ribs of the insulating frame and the ribs of the insulating operating rod alternately enter gaps formed between the ribs. Therefore, the air insulating distance can be prolonged. As a result, the height of the insulating operating rod can be reduced for obtaining the same predetermined air insulating distance, and the height of the circuit breaker can be reduced.

Along the insulating operating rod having plural ribs, disposed is the insulating frame having plural ribs which

are formed on the face opposed to the ribs of the insulating operating rod so that the ribs of the insulating frame and the ribs of the insulating operating rod alternately enter gaps formed between the ribs. Furthermore, the contact pressure spring coupled to the insulating operating rod is disposed. Therefore, the air insulating distance can be prolonged. As a result, the height of the insulating operating rod can be reduced for obtaining the same predetermined air insulating distance, and, when the circuit breaker is to be closed, the movable and stationary contacts can be pressurized.

Since the contact pressure spring is disposed between the operating lever and the insulating operating rod, the relative positional relationship between the insulating operating rod and the operating lever is changed in accordance with the closing or opening operation of the switching means. When the extent of the change is measured from the outside, therefore, it is possible to know the degree of the stored or released energy of the coil spring.

Since the contact pressure spring is disposed in the recess which is formed in the inner side of the insulating operating rod on the side of the operating lever, the level difference between the insulating operating rod and the operating lever can be made further small. Consequently, the height of the circuit breaker can be reduced.

Since the contact pressure spring is disposed in the recess which is formed in the inner side of the insulating operating rod on the side of the switching means, the level difference between the insulating operating rod and the operating lever can be made further small. Consequently, the height of the circuit breaker can be reduced. Furthermore, the energy of the coil spring which is necessary for lowering the movable contact can be reduced.




WHAT IS CLAIMED IS:

1. A circuit breaker comprising:

an operating lever which is rotatably supported on a support member;

switching means having a movable contact which is coupled to said operating lever, and a stationary contact which is opposed to said movable contact;

an insulating operating rod which is disposed between said operating lever and said switching means, and which has plural ribs; and

an insulating frame which is disposed on said support member to elongate along said insulating operating rod, said insulating frame having plural ribs which are formed on a face opposed to said ribs of said insulating operating rod, said ribs of said insulating frame and said ribs of said insulating operating rod alternately entering gaps formed between said ribs.

2. A circuit breaker comprising:

an operating lever which is rotatably supported on a support member;

switching means having a movable contact which is coupled to said operating lever, and a stationary contact which is opposed to said movable contact;

an insulating operating rod which is disposed between said operating lever and said switching means, and which

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has plural ribs;

an insulating frame which is disposed on said support member to elongate along said insulating operating rod, said insulating frame having plural ribs which are formed on a face opposed to said ribs of said insulating operating rod, said ribs of said insulating frame and said ribs of said insulating operating rod alternately entering gaps formed between said ribs; and

a contact pressure spring which is coupled to said insulating operating rod.

3. A circuit breaker according to claim 2, wherein said contact pressure spring is disposed between said operating lever and said insulating operating rod.

4. A circuit breaker according to claim 2, wherein said contact pressure spring is disposed in a recess which is formed in an inner side of said insulating operating rod, said inner side being on a side of said operating lever.

5. A circuit breaker according to claim 2, wherein said contact pressure spring is disposed in a recess which is formed in an inner side of said insulating operating rod, said inner side being on a side of said switching means.