

Abstract

Disclosed is a compact miniature circuit breaker assembly. The compact miniature circuit breaker assembly comprises a base housing with a half module width. The base housing includes a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly housed therein. Further, the compact miniature circuit breaker assembly includes a covering member capable of securing the base housing thereby forming a half module width miniature circuit breaker.

Figure 1

We claim

1. A compact miniature circuit breaker assembly comprising:
 - a base housing with a half module width, the base housing having a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly housed therein; and
 - a covering member capable of securing the base housing thereby forming a half module width miniature circuit breaker.

2. A compact miniature circuit breaker assembly comprising:
 - a base housing with a half module width, the base housing having a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly housed therein;
 - a common middle housing having,
 - a front portion capable of securing to the base housing thereby forming a covering thereon, and
 - a rear portion with a half module width capable of housing a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly therein;
 - a covering member capable of securing to the rear portion of the common housing, thereby forming a two pole miniature circuit breaker on a single pole width,
 - wherein, the base housing and the rear portion of the common middle housing houses a magnetic release module on the left side thereof, a thermal release module on right side thereof, a contact system with arc chamber on the left bottom side and the trip mechanism on the central top area thereof.

3. The compact miniature circuit breaker assembly as claimed in claim 1 and 2, wherein the combination of the half module miniature circuit breaker and

the two pole miniature circuit breaker on single pole width is obtained by having separate knobs.

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Compact Miniature Circuit Breaker Assembly

Field of the invention

The present invention relates to low voltage switchgear applications, and more specifically, to a compact miniature circuit breakers having particular module size.

Background of the invention

In low voltage distribution system, circuit breakers provide rapid and reliable protection against both overload and short-circuit currents. During abnormal conditions such as short circuit currents, a short circuit protection module comprising magnetic release and for over load currents, a over current protection module comprising thermal release gives required trip signal for trip mechanism to act. This causes tripping of the circuit breaker and take contacts to open position protecting the circuit and appliances.

Generally, miniature circuit breakers (MCB) fall under modular device category having a constant module width. A single pole (MCB) has a single module width, and similarly four poles MCB have four module widths. The single pole MCB with single module gives protection to either phase or neutral lines. The single pole MCB contains both short circuit protection module as well as over load protection module. In two pole MCB, three pole or four pole MCB, the pole intended to protect neutral can be given with or without protection module as per the requirement, whereas the other poles have protective modules along with them. However, the circuit breaker device of the prior art are bulky and require more space for installation. Accordingly, it is desirable to have compact circuit breaker devices without sacrificing the performance thereof.

US Patent Application No. 2012/0250206 discloses a single-module circuit breaker which includes a first longitudinal portion, a second longitudinal portion, and a third longitudinal portion proximate the first and second longitudinal

portions. The first longitudinal portion includes overcurrent detection componentry configured to detect an overcurrent condition. The second longitudinal portion includes leakage current detection componentry configured to detect a leakage current condition. The third longitudinal portion includes a contact mechanism, a first conduction path, and a second conduction path, and the contact mechanism is configured to disrupt the first and second conduction paths in response to at least one of the overcurrent condition and the leakage current condition.

However, the single-module circuit breaker described above has magnetic release and arc chute designed with full mod width. The miniature circuit breakers having single module width is commonly used for protection purposes in distribution boards. For example, a typical 4 pole circuit breaker is of four module widths, which takes up much space in the distribution board. Further, the magnetic release and the arc chute occupy one module size. Furthermore, 1 pole and 3 pole miniature circuit breaker options not possible with arrangement mentioned in the prior art.

Accordingly, there exist a need to provide circuit breaker assembly which overcomes drawbacks of the prior art.

Objects of the invention

An object of the present invention is to reduce space requirement for mounting the miniature circuit breaker assembly.

Another object of the present invention is to provide a compact multiple pole circuit breaker.

Summary of the invention

Accordingly, the present invention provides a compact miniature circuit breaker assembly, in one aspect of the present invention. The compact miniature circuit breaker assembly comprises a base housing with a half module width. The base housing includes a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly housed therein. Further, the compact miniature circuit breaker assembly includes a covering member capable of securing the base housing thereby forming a half module width miniature circuit breaker.

In another aspect, the present invention provides a compact miniature circuit breaker assembly. The compact miniature circuit breaker assembly includes a base housing with a half module width. The base housing includes a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly housed therein. Further, the compact miniature circuit breaker assembly includes a common housing having a front portion capable of securing to the base housing thereby forming a covering thereon, and a rear portion with a half module width capable of housing a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly therein. Furthermore, the compact miniature circuit breaker assembly includes a covering member capable of securing to the rear portion of the common housing, thereby forming a two pole miniature circuit breaker on a single pole width. Typically, the base housing and the rear portion of the common housing houses a magnetic release module on left side thereof, a thermal release module on right side thereof, a contact system with arc chamber on left bottom side, and the trip mechanism on central top area thereof.

Brief description of the drawings

Figure 1 shows an isometric view of a compact miniature circuit breaker assembly with half module width, in accordance with one aspect of the present invention;

Figure 2 shows an isometric view of a compact miniature circuit breaker assembly with single module width in accordance with another aspect of the present invention;

Figure 3 represents the compact miniature circuit breaker assembly of figure 1 and 2, in ON condition;

Figure 4 shows another exploded view of the compact miniature circuit breaker assembly of figure 2;

Figure 5 shows an exploded view of the compact miniature circuit breaker assembly of figure 2;

Figure 6 shows a terminal region with a shutter assembly, in accordance with the present invention; and

Figure 7 shows an isometric view of common middle housing of the compact miniature circuit breaker of figure 2.

Detailed description of the invention

The foregoing objects of the present invention are accomplished and the problems and shortcomings associated with the prior art, techniques and approaches are overcome by the present invention as described below in the preferred embodiments.

The present invention provides a compact miniature circuit breaker assembly. The compact miniature circuit breaker assembly of the present invention brings more compactness therein by having two pole circuit breakers in single module width. A second pole of the two pole circuit breakers can be used for either phase protection or neutral protection. Further, the compact miniature circuit breaker

assembly of the present invention has a provision to give neutral either protected or unprotected one.

In one aspect, the present invention provides a compact miniature circuit breaker assembly (100) (hereafter referred to as 'the assembly (100)') with a half module width. Specifically, figure 1 shows an isometric view of the assembly (100). The assembly (100) includes a base housing (10) and a covering member (30).

The base housing (10) is half module width(10a) housing. As described with conjunction with figure 3, the base housing (10) includes a contact system (12) for carrying current and tripping in case of fault conditions, a trip mechanism (14), a magnetic release (16), a thermal release (18), an arc chute (20) for quenching arc, an arc runner (22) for providing magnetic force to pull the arc towards arc chute (18), terminals (24), shutters (26) and a box clamp assembly (28) housed therein to form a first portion (10b) .

The covering member (30) is secured the base housing (10) thereby forming a half module width miniature circuit breaker assembly (100). In an embodiment, the covering member (30) is secured to the base housing (10) by click fit mechanism. However, it is evident to those skilled in the art to use known fastening means to secure the covering member (30) to the base housing (10).

The assembly (100) gives the high end compactness to the existing range of the miniature circuit breakers. Further, the assembly (100) can very effectively be used for low breaking capacity related applications.

In another aspect, the present invention provides a compact miniature circuit breaker assembly (200) (hereafter referred to as 'the assembly (200)') with a single module width. Specifically, figure 2 and 4 shows the assembly (200). The assembly (200) includes a base housing (110), a common middle housing (130) and a covering member (140).

The base housing (110) is half module width (110a) housing. As described with conjunction with figure 3, the base housing (110) includes a contact system (112), a trip mechanism (114), a magnetic release (116), a thermal release (118), an arc chute (120), an arc runner (122), terminals (124), shutters (126) and a box clamp assembly (128) housed therein to form a first portion (110b). The base housing (110) is covered with the common housing (130).

Specifically, the common housing (130) as shown in figure 7, includes a front portion (132) and a rear portion (134). The front portion (132) is capable of securing to the base housing (110) thereby forming a covering thereon. In an embodiment, the front portion (132) is secured to the base housing (110) by click fit mechanism. However, it is evident to those skilled in the art to use known fastening means to secure the front portion (132) to the base housing (10).

Further, the rear portion (134) with a half module width houses components of the miniature circuit breaker similar to the base housing (110) thereby forming a second portion (130a) as shown in figure 2, and 3, and are not described herein again for the brevity of the description. Figure 5 shows an exploded view of the assembly (200).

The covering member (140) is capable of securing to the rear portion (134) of the common housing (130) thereby forming a two pole miniature circuit breaker on a single pole width (110a).

Similarly, multiple pole miniature circuit breakers are obtained by use of base housing (110), the common middle housings (130) in between and covering member (140) at end. Specifically, multiple common housing (130) may be used depending on the poles of circuit breakers required.

As shown in figure 3, the base housing (10, 110) of the assembly (100, 200) and the front portion (134) of the common housing houses a magnetic release module (16,116) on the left side thereof, a thermal release module (18, 118) on right side

thereof, a contact system (12, 112) with arc chamber (22, 122) on the left bottom side and a trip mechanism (14, 114) on the central top area thereof.

The assembly (100, 200) can be used for various combinations of load protection such as half module miniature circuit breaker, 1pole + 1poleminiature circuit breaker, 1pole + 1 neutral miniature circuit breaker, 2 pole miniature circuit breaker, 3 pole miniature circuit breaker and 4 pole miniature circuit breakers. Combination of the half module miniature circuit breaker (100) and a two pole miniature circuit breaker (200) on single pole width can be obtained by having separate knobs (40) without a knob sleeve and interconnecting trip pin, which are used for connecting the adjacent pole trip latch in 2, 3 and 4 pole circuit breakers of the prior art

However, in the 1 pole+ 1 neutral, 2 pole, 3 pole and 4 pole miniature circuit breaker, the common ON – OFF operation is achieved using a common knob sleeve and interconnecting trip pins. All the interconnected trip pins drives together the individual trip mechanism (114) to a common position. Proper clearance and creepage values according to the standards are achieved using offsetted terminal arrangement with the help of the shutter (126a, 126b) assembly.

Accordingly, the present invention provides a novel space circuit breaker assembly with multiple poles that can be used in the distribution boards.

Advantages of the invention

1. The assembly (100) of the present invention provides optimized space allocation which reduces 50% of space in distribution board against the usage of normal miniature circuit breaker.
2. The assembly (100) consists of arrangement of components in the base housing and covering the last pole components using a cover, wherein the common middle housing acts as cover for first pole and housing for the adjacent pole.

3. The assembly (100) leads to a half module circuit breaker product, with components assembled on housing and then closed with a cover.
4. The assembly (100) provides for stacking multiple poles with similar construction, which addresses the functional needs like 1 pole in half module, 1pole+1pole in 1 module, 1pole+1neutral in 1 module, 2 pole in 1 module, 3 pole in 1.5 module, and 4pole in 2 module construction.
5. The assembly (100) achieves dependent as well as independent multiple pole operation with or without interconnecting trip pin set and knob sleeve respectively.
7. The assembly (100) consists of a shutter assembly which takes care of creepage and clearance between the adjacent poles.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the present invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the present invention and its practical application, to thereby enable others skilled in the art to best utilize the present invention and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omission and substitutions of equivalents are contemplated as circumstance may suggest or render expedient, but such are intended to cover the application or implementation without departing from the spirit or scope of the present invention.

We claim

1. A compact miniature circuit breaker assembly comprising:
 - a base housing with a half module width, the base housing having a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly housed therein; and
 - a covering member capable of securing the base housing thereby forming a half module width miniature circuit breaker.

2. A compact miniature circuit breaker assembly comprising:
 - a base housing with a half module width, the base housing having a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly housed therein;
 - a common middle housing having,
 - a front portion capable of securing to the base housing thereby forming a covering thereon, and
 - a rear portion with a half module width capable of housing a contact system, a trip mechanism, a magnetic release, a thermal release, an arc chute, an arc runner, terminals, shutters and a box clamp assembly therein;
 - a covering member capable of securing to the rear portion of the common housing, thereby forming a two pole miniature circuit breaker on a single pole width,
 - wherein, the base housing and the rear portion of the common middle housing houses a magnetic release module on the left side thereof, a thermal release module on right side thereof, a contact system with arc chamber on the left bottom side and the trip mechanism on the central top area thereof.

3. The compact miniature circuit breaker assembly as claimed in claim 1 and 2, wherein the combination of the half module miniature circuit breaker and

the two pole miniature circuit breaker on single pole width is obtained by having separate knobs.

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