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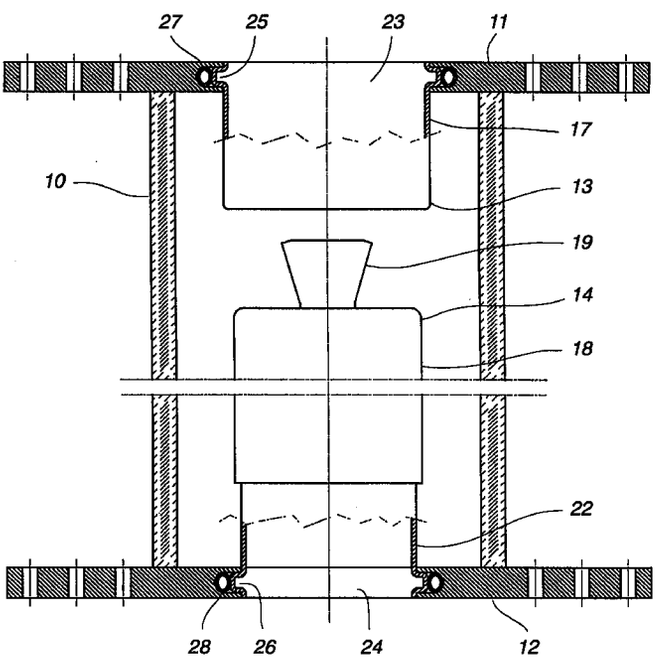
(54) High-voltage circuit breaker

(57) The invention relates to a high-voltage circuit breaker, the main current path of which is made of tubing (17, 18, 22) of a plastically machinable metallic material, preferably copper or a copper alloy. The connection flanges (11, 12) of the circuit breaker are fixed to the respective current-carrying metal tubes by rolling out one end portion of the tubes into a groove (25, 26) in the respective flange (11, 12). The current transfer between the tube and the flange is ensured with the aid of a resilient contact member (27, 28) arranged in the groove.

Fig 3



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Description

TECHNICAL FIELD

The present invention relates to a high-voltage circuit breaker of the kind described in the preamble to claim 1. The circuit breaker comprises an elongated casing of insulating material which is filled with a gaseous arc-extinguishing medium and provided with connection flanges. The casing comprises a contact device with cooperating fixed and movable main and arcing contacts. The fixed contacts are arranged at one end portion of a first metal tube which is secured to one of the connection flanges of the circuit breaker, whereas the movable contacts are arranged at one end portion of a second metal tube, which is connected via an operating rod to an operating device and, by means thereof, is axially displaceable in the casing between a closed and an open position. The second metal tube is permanently connected, via a sliding contact means, to a third metal tube secured to the other connection flange of the circuit breaker. The metal tubes are made of plastically machinable sheet material.

The invention is primarily intended for circuit breakers with rated operating voltages of the order of magnitude of 100-300 kV, but it may also be used to advantage in circuit breakers for voltages both above and below this range, for example in medium-voltage circuit breakers.

BACKGROUND ART

Circuit breakers of the above-mentioned kind are previously known, for example from the ABB pamphlet SESWG/B 2330 E "SF_6 Circuit-Breaker Type LTB", published in 1990. The circuit breaker shown in this publication has been described below with reference to the accompanying drawing figures 1 and 2. In this circuit breaker, the connection flanges have been fixed to the fixed metal tubes which are part of the current path of the circuit breaker in such a way that flanges are formed on the metal tubes and then screwed to the respective connection flange. To bring about a low contact resistance in the screw joint, a large number of screws are required, which entails a great deal of work during mounting and machining. In addition, it may be difficult, with this method, to obtain a sufficiently good perpendicular alignment between the flanged portion and the tube.

SUMMARY OF THE INVENTION

The invention aims to provide a circuit breaker of the above-mentioned kind which is simpler to manufacture and hence less expensive, and which has a lower contact resistance between the main current path and the connection flanges than comparable prior art circuit breakers. This is achieved according to the invention with a design which exhibits the characteristic features described in the claims.

According to the invention, the fixed current-carrying metal tubes are connected to the connection flanges by rolling out one end portion of the tubes into a groove prepared in the respective connection flange. The current transfer between the tube and the flange is ensured by means of a resilient contact member mounted in the bottom of the groove, for example in the form of a spiral spring of contact material. In this way, no current-carrying screw joints are needed between the tubes and the connection flanges, in contrast to the prior art design, and the metal tubes need not be provided with flanged portions.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be explained in greater detail by description of an embodiment with reference to the accompanying drawings, wherein

Figures 1 and 2 show the central part of a prior art high-voltage circuit breaker of the kind to which the present invention relates, wherein Figure 1 shows the circuit breaker in the closed position and Figure 2 shows the circuit breaker in the open position, and

Figure 3 schematically shows in partial axial section the central part of a high-voltage circuit breaker designed according to the invention, in the open position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The circuit breaker shown in Figures 1 and 2 is only one example of the type of circuit breaker, to which the present invention may advantageously be applied. The circuit breaker has an elongated casing 10 of insulating material provided with an upper and a lower connection flange 11 and 12, respectively. The contact device of the circuit breaker comprises a fixed main contact 13 which cooperates with an axially movable main contact 14, as well as a fixed plug-shaped arcing contact 15 which cooperates with an axially movable sleeve-shaped arcing contact 16.

At the upper connection flange 11 the circuit breaker has a stationary upper current path section 17 in the form of a copper tube with a thickness of one or a few millimetres. The lower end portion of the tube supports the fixed main contact 13 of the circuit breaker. The fixed arcing contact 15 of the circuit breaker is arranged coaxially in the tube 17 and is electrically and mechanically connected thereto.

The movable main contact 14 of the circuit breaker consists of the upper end portion of a hollow cylinder 18

(puffer-type cylinder) in the form of a copper tube, which may have the same cross-section dimension as the copper tube 17. The movable arcing contact 16 is arranged coaxially in the cylinder 18 and is electrically and mechanically connected thereto. At its upper end, the hollow cylinder 18 supports an electrically insulating blast nozzle 19. Via an insulating operating rod 20, which extends inside a supporting insulator 21 to a mechanism housing 29, the hollow cylinder 18 is connected by means of the movable contacts 14, 16 to an operating device and can be displaced by means of this device between the closed position shown in Figure 1 and the open position shown in Figure 2.

The hollow cylinder 18 surrounds the upper portion of a lower current path section 22 which is secured to the lower connection flange and which consists of a copper tube with substantially the same cross-section dimension as the copper tube 17. Via sliding contact means, the hollow cylinder 18 is electrically connected to the lower current path section 22.

Figure 3 shows how the fixed current path sections (the metal tubes) 17 and 22 according to the present invention may be connected to connection flanges 11 and 12, respectively, which may, for example, be of aluminium. Each one of the connection flanges 11, 12 exhibits a centrally placed circular hole 23 and 24, respectively, with a surrounding groove 25 and 26, respectively, arranged in the limiting surface of the hole. One end portion of the metal tubes 17, 22 extends into the holes 23 and 24, respectively, and is fixed to the respective flange 11, 12 by rolling the plastically machinable material in the tubes into the respective groove 25, 26. The current transfer between the tube and the flange is ensured with the aid of a resilient contact member 27, 28, arranged at the bottom of the respective groove 25, 26, for example in the form of a spiral spring of contact material.

Claims

1. A high-voltage circuit breaker comprising an elongated casing (10) which is filled with a gaseous arc-extinguishing medium and provided with connection flanges (11, 12), said casing comprising a contact device with cooperating fixed and movable main and arcing contacts (13-16), the fixed contacts (13, 15) being arranged at one end portion of a first metal tube (17) secured to one connection flange (11) of the circuit breaker, whereas the movable contacts (14, 16) are arranged at one end portion of a second metal tube (18), which is connected via an operating rod (20) to an operating device and with the aid of this device is axially displaceable in the casing between a closed and an open position, wherein the second metal tube (18), via a sliding contact means, is permanently connected to a third metal tube (22) secured to the other connection flange (12) of the circuit breaker, the metal tubes (17, 18, 22) being made of plastically machinable sheet material, **characterized** in that at least one of the connection flanges (11, 12) exhibits a circular hole (23, 24) with a surrounding groove (25, 26) provided in the limiting surface of the hole, and that one end portion of said first (17) or third metal tube (22) extends into the groove and is fixed to the flange by pressing the plastically machinable material in the tube into the groove (25, 26).

2. A circuit breaker according to claim 1, **characterized** in that members (27, 28) for current transfer between the metal tube (17, 22) and the flange (11, 12) are arranged in said grooves (25, 26).

3. A circuit breaker according to claim 2, **characterized** in that said current transfer members (27, 28) consist of a spiral spring of contact material.

4. A circuit breaker according to any of the preceding claims, **characterized** in that the material in said metal tubes (17, 18, 22) is copper or a copper alloy.

5. A circuit breaker according to any of the preceding claims, **characterized** in that metal tubes (17, 18, 22) are made of sheet with a thickness of at most 4 mm.

Fig 1

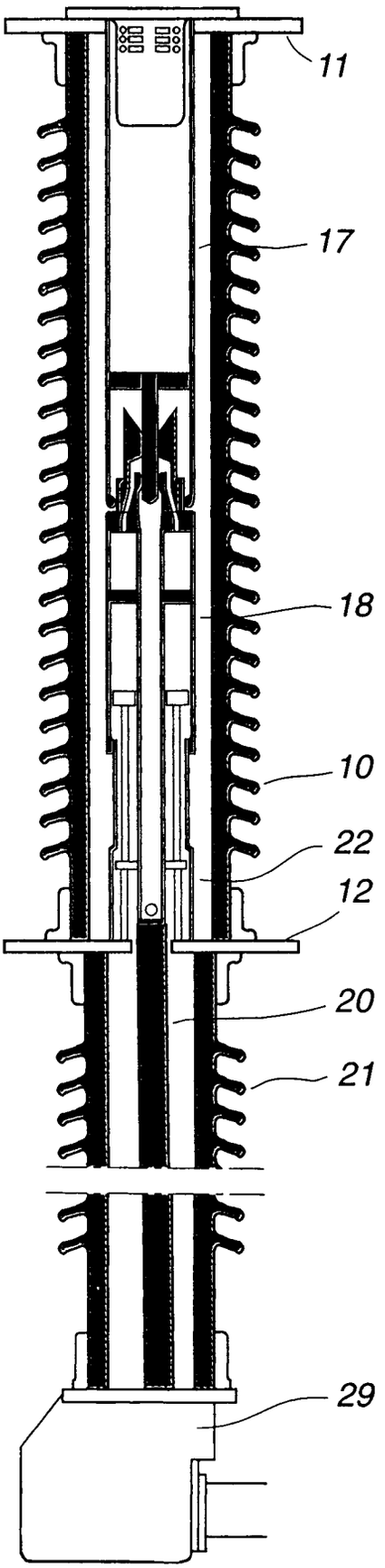

Fig 2

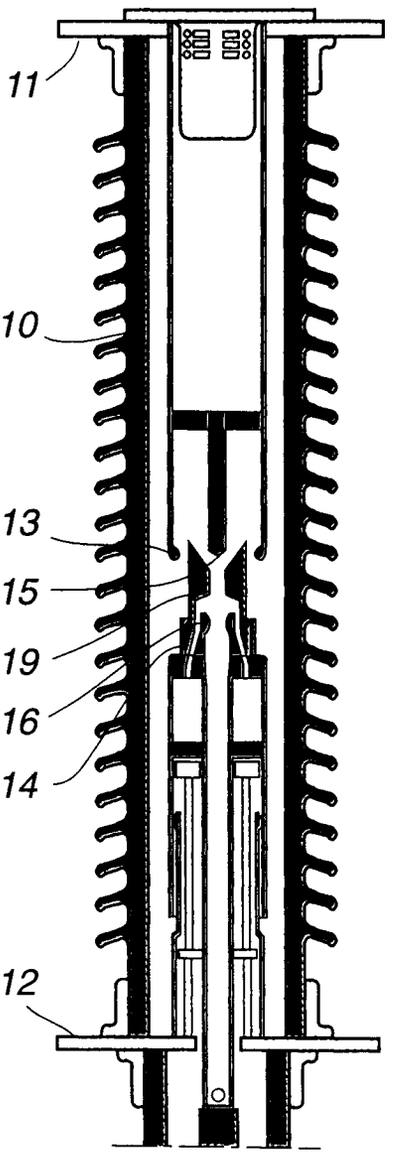

Fig 3