April 23, 1929. F. PRANTL 1,709,947

ELECTRIC SWITCH APPARATUS

Filed Aug. 25, 1926

Fig. 2.

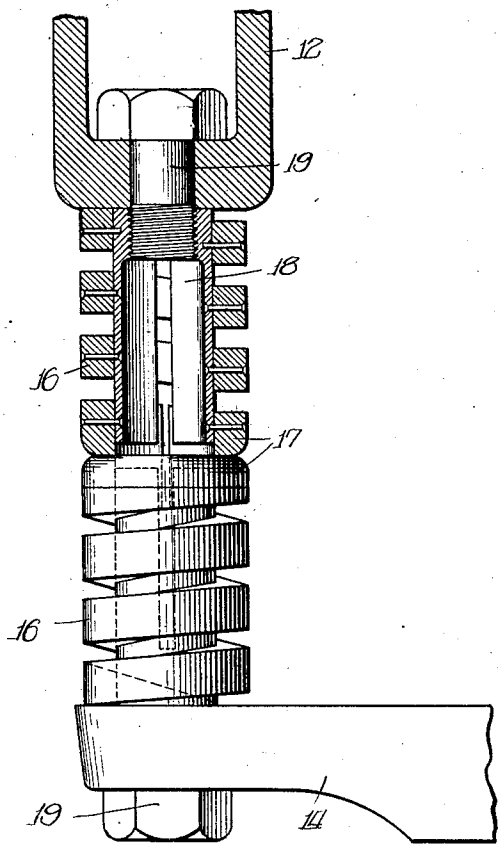


Fig. 1.

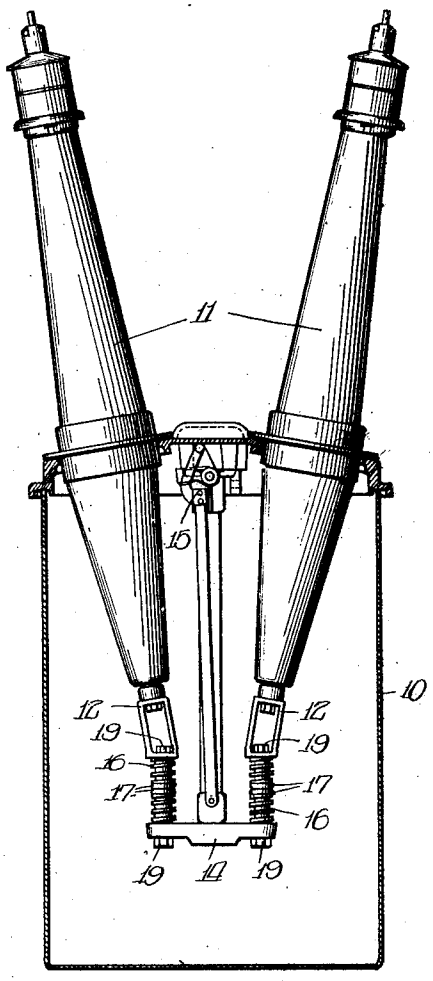
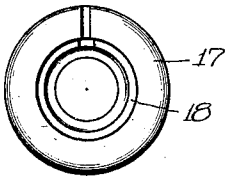


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC-SWITCH APPARATUS.

Application filed August 25, 1926, Serial No. 131,329, and in Germany September 4, 1925.

This invention relates to electric switch apparatus, particularly to apparatus for dealing with large current surges. It constitutes an improvement on the type of apparatus described in the copending application of Gottfried Bruhlmann, Serial No. 671,583, filed October 29, 1923.

A general object of the invention is the provision of switch apparatus of the circuit breaker type containing provision for resisting electro-dynamic and thermic forces tending to separate the contacts, such as are frequently produced upon a closing of the switch after an immediately previous short circuit.

A particular object of the present invention is the provision of a simple construction whereby there will be generated electro-dynamic forces tending to press the cooperating contacts together, with the effect of overcoming or substantially diminishing the forces tending to separate the contacts.

Another specific object of the invention is the provision of a construction having these capabilities, which will be very strong and stable and qualified to sustain the forces to which it is subjected without distortion.

Other and further objects of the invention will be pointed out or indicated hereinafter, or apparent to one skilled in the art upon an understanding of the invention.

In the drawing forming a part of this specification, I show one form in which the invention may be embodied, but it is to be understood that this is presented for purpose of illustration only and is not to be accorded any interpretation having the effect of limiting the claims short of the true and most comprehensive scope of the invention in the art.

In the drawing,

Fig. 1 represents a sectional elevational view of a circuit breaker;

Fig. 2 is a detail of the contact elements, showing one in elevation and one in sectional elevation, and

Fig. 3 is a detail showing a plan or top view of one of the contact elements.

An understanding of the invention will be obtained most readily by consideration immediately of the illustrative form. In Fig. 1 is shown a switch apparatus or circuit breaker of the oil quenched type, including the casing 10 and terminal insulators 11 which support the terminals 12 carrying the stationary contact members across which the circuit is closed through a movable yoke member 14 carrying the movable contact members. The yoke member 14 is adapted to be moved vertically by mechanism 15 to close and open the circuit. In the position illustrated in Fig. 1 the circuit is closed, and it is opened by the lowering of the yoke member 14. The invention has to do with the construction of the contact members. In the embodiment illustrated in Fig. 2 these are shown as composed of spiral coils 16 of heavy cooper, terminating in the annular contact pieces 17. These coils of cooperating upper and lower contact members are wound in the same direction, and the contact pieces are arranged to meet when the yoke 14 is in raised position. The turns of the respective coils are afforded rigid support by stud members 18. These are illustrated as split tubular members securely fastened to the appropriate mountings by the bolts 19. They fit closely within the spirals of copper, and the several turns of the spirals are rigidly secured to them so that the turns are held in fixed relative positions. The stud members are of a suitable strong non-conducting material, or of a strong material having a greater resistively than the copper coil, such as steel. The fastening of the respective turns to the tubes may be by riveting, brazing or other suitable means. In the operation of the device, upon the closing of the circuit, the current finds a low resistance path through the coils 16, which, being similarly wound, attract each other. Owing to their comparatively high electrical resistance, the studs take only a small portion of the current in comparison with that carried by the copper spirals. Eddy currents are avoided by the gaps in the studs and in the annular contact members. Consequently, the desired electro-dynamic effect, tending to press contact members together, is obtained in an effective degree. At the same time, the copper spirals are afforded the desirable rigid support which sustains them against lateral deflection and against compression upon one another. Consequently, upon the closing of the circuit, the cooperating contact members are firmly maintained in contact and the repellent thermic

and electro-dynamic forces which are likely to occur on the closing of the circuit, are substantially decreased or overcome.

What I claim is:—

1. In electrical switch apparatus, the combination with switch contact members, of coils associated with the contact members, said coils arranged to carry current that passes from one contact member to the other and disposed so that the resulting electro-dynamic forces mutually attract them, and means for supporting the coils against flexion.

2. In switch apparatus, the combination of coils arranged to carry the switch current, said coils arranged for mutual electro-dynamic attraction, cooperating contact members carried by the coils, and means supporting the respective turns of the coils.

3. In switch apparatus, in combination, cooperating relatively movable contact members, current carrying portions connected to said contact members, said current carrying portions arranged to induce mutually attractive electro-dynamic forces, and supporting members for the contact members and current carrying portions, said supporting members having relatively small electrical conductivity and operating to hold each of such portions rigid with respect to the associated contact member.

4. In switch apparatus, the combination with cooperating contact members, of current carrying coils of relatively high conductivity connected to the contact members, and supporting members of relatively low conductivity sustaining the contact members and turns of the coils.

5. In electrical switch apparatus, a terminal member comprising a contact member, a coil of relatively high conductivity connected thereto for carrying the switch current, and a supporting member of relatively low conductivity sustaining the contact member and coil and operating to hold the same against yielding action under pressure applied to the contact member incident to closing operation of said apparatus.

6. In switch apparatus, a switch terminal comprising a supporting stud, a conductive coil wound thereon, and a contact member connected to the coil, said contact member and the turns of the coil being connected to the stud member to retain them against relative movement.

7. In an electric switch, relatively movable contact members, similarly wound coils connected to said contact members in series, and supporting members holding said coils against compressing action.

8. In an electric switch, a contact member, a coil wound coaxially thereof and connected in series therewith, and a supporting member holding said coil against compressing action and being provided with a gap disposed to prevent flow of eddy currents in said supporting member.

In testimony whereof I have hereunto subscribed my name at Zurich, Switzerland, on the 6th day of August, A. D. 1926.

FRANZ PRANTL.