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Niederer

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[54] ELECTRICAL CONTACT STRUCTURE OF THE PLUG-AND-SOCKET TYPE CIRCUIT BREAKERS

[75] Inventor: Adolf Niederer, Unterehrendingen, Switzerland

[73] Assignee: Aktiengesellschaft Brown, Boveri & Cie, Boden, Switzerland

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Primary Examiner—Robert K. Schaefer

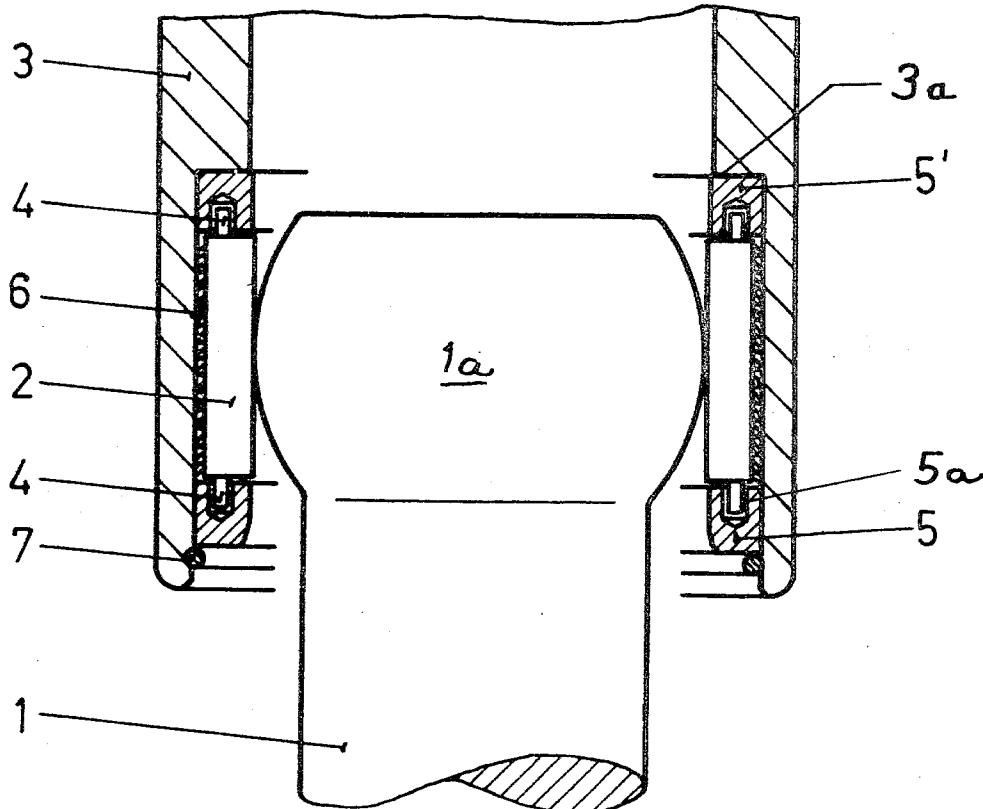
Assistant Examiner—William J. Smith

Attorney—Ralph E. Parker, Eugene J. Roberts et al.

[57] ABSTRACT

A plug-and-socket type of electrical contact structure designed for handling high currents includes a contact plug having a spherically shaped head adapted to enter a tulip type of socket formed by a cylindric assembly of resiliently mounted contact fingers which are forced in a radially outward direction by the head of the contact plug to establish a pressure contact with a cylindric support housing within which the cylindric assembly of contact fingers is mounted.

2 Claims, 2 Drawing Figures



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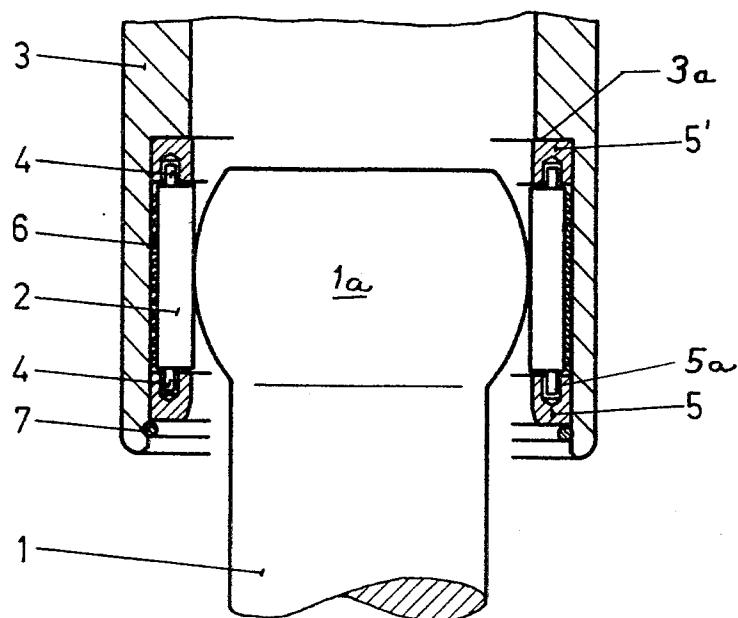


Fig. 1

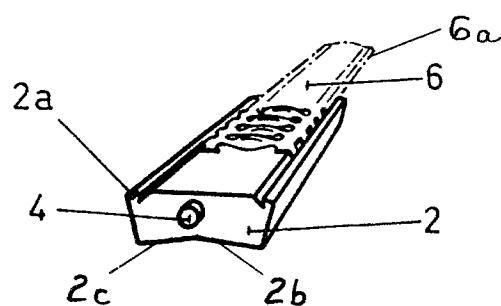


Fig. 2

ELECTRICAL CONTACT STRUCTURE OF THE PLUG-AND-SOCKET TYPE CIRCUIT BREAKERS

The present invention relates to an improvement in a separable electrical contact structures designed for handling high current, and more particularly to separable structures of the plug and socket type wherein a contact plug operates in conjunction with a socket formed by a cylindric tulip-like assembly of oblong lamellar contact fingers.

Electrical contact arrangements of this general type are known, reference being made for example to Swiss U.S. Pat. No. 474,876, German Pat. No. 1,160,914 and German published Pat. No. 1,924,076. The cylindric assembly of finger-type contacts are arranged at the perimeter of the contact members to be connected and are pressed against the contact members by separate blade springs supported within a housing. In such an arrangement, the housing and blade springs are not required to carry any significant amount of current.

Also known at the present time is a contact arrangement designed for handling high currents which utilize flat contact components movable relative to one another, these components being provided with grooves in the contact surface in which lamellar contact strips are located. Such a contact arrangement is disclosed in published German Pat. Nos. 1,286,170 and 1,665,132. In the case of these constructions, there occurs, in conjunction with the relative movements between the rail-shaped parts to be connected, a rather undesirable sliding motion between the lamellar contact strips and the counter rail parts.

The principal object of the present invention is to provide an improved construction for a tulip-formed socket and plug connection of the general type as described above wherein very little relative movement occurs between the parts to be connected by the lamellar contact strips or fingers either during opening or closing of the plug in contact apparatus. This is accomplished in that the individual contact finger units each consist of an essentially rigid contact finger preferably drawn copper having an elastic contact strip secured to and extending along one side thereof to effect a spring-like engagement with a surface of the cylindric conductive housing within which the cylindric assembly of contact finger units is supported when the contact plug is entered into the contact finger units and engages the other sides of the essentially rigid contact fingers in such manner as to urge them in a radially outward direction, the current being transferred from the contact plug to the conductive housing through the cylindric assembly of contact finger units supported therein. Mounting of the contact finger units to establish the cylindric assembly is accomplished by pins projecting from opposite ends of the finger units which are loosely fitted in complementary circumferentially spaced bores provided in support rings which are mounted in the conductive housing.

The foregoing as well as other objects and advantages inherent in the improved contact structure will become more evident from the following detailed description of a preferred embodiment thereof and the accompanying drawings wherein:

FIG. 1 is a view essentially in diametral section through those portions of the contact structure where contact is made between the end of the contact plug

and the cylindric tulip-type socket assembly of contact fingers; and

FIG. 2 is a view in perspective illustrating the detailed structure of one of the contact fingers and the associated arcuate resilient contact strip by which resilient contact is established between the contact finger unit and the inner cylindrical surface of the housing accomodating the contact finger units as the contact plug enters and presses radially outward against them.

10 With reference now to the drawing and to FIG. 1 in particular, the electrical contact structure of the circuit breaker is seen to include a contact plug 1 terminating in a spherically surfaced head 1a which is designed to enter and establish electrical with a complementary

15 contact socket 3 having a tubular cylindrical configuration. The desired electrical contact between these two contact members is established in a pressurized manner through a cylindric assembly of circumferentially spaced, radially displaceable socket finger units 20 mounted within the stationary contact member 3.

Each of these contact finger units, as depicted in FIG. 2, is constituted by a two-part structure, one part being an essentially rigid contact finger 2 preferably made from drawn copper and which is provided with a pin 4 projecting from each end. The front side of the contact finger 2 consists of two identical plane surfaced parts 2b, 2c arranged at an obtuse angle approaching 180° which intersect along a longitudinal center line of the finger, and this front side is adapted to be engaged by 30 the bulbous head 1a of the plug contact.

The back side of contact finger 2 is provided along each edge portion thereof with a longitudinally extending grove 2a, these grooves being provided to receive the flanged edges 6a of a lamellar contact strip 6, thereby to hold the contact strip frictionally in place at the back side of the finger 2. Each metallic contact strip 6 is so configured that part of the strip stands away from the back side of the contact finger to provide a space therebetween which establishes a "springy" 35 characteristic that enables the strip to yield elastically as contact pressure is developed by insertion of head 1a of the pin contact and, as shown in FIG. 2, strip 6 may be provided with a series of longitudinally spaced transversely extending slits establishing offset portions for this purpose.

The pins 4 projecting from opposite ends of the contact fingers 2 are received by and loosely fitted in circumferentially spaced bores 5a provided in support rings 5, 5' that are mounted within the socket member 3. As shown in FIG. 1, the assembly of the contact finger units and support rings therefor are held in place within socket member 3 by a retaining ring 7 located near the mouth of socket member 3 at the entry point of the plug contact which engages support ring 5, the other support ring 5' being stopped by contact with an internal shoulder 3a of socket member 3.

When it is desired to establish electrical contact between the contact members 1 and 3, the two are brought together such that the bulbous head 1a of the plug contact is entered into the mouth of tubular contact member 3 and into the cylindric assembly of contact finger units 2, 6 creating on the latter a radially outward pressure which causes the finger units to be displaced in a radially outward direction limited by the extent of the travel permitted by the loose fit of the pins 4 in their bores 5a so that the springy lamellar contact strips 6 are pressed elastically against the inner cylin-

drical surface of contact member 3, thus producing the contact pressure necessary for transfer of the current through the contact fingers from one to the other of the plug and socket contact members 1,3.

The improved contact arrangement is able to absorb forces in an axial as well as in a radial direction while under load current and will tolerate axial displacement between the contact members. By securing the support rings 5,5' against rotational displacement within the socket member 3, the contact arrangement will also tolerate relative rotation between the contact members.

I claim:

1. In a separable electrical contact structure of the plug-and-socket type for handling high currents, the combination comprising a cylindrical plug contact member, a complementary cylindrical socket contact member into which the end portion of said plug contact member is entered, a cylindric assembly of circumferentially spaced contact finger units each of which includes an essentially rigid contact finger having one side thereof engageable by said end portion of said plug contact member and a resilient lamellar contact strip secured to the opposite side thereof, and means mounting said cylindric assembly of contact finger units in-

cluding a pair of spaced supporting rings located within said socket contact member, each of said supporting rings being provided with circumferentially spaced bores loosely receiving support pins projecting from the opposite ends of said contact fingers thereby to permit forced movement of said contact fingers in a radially outward direction when engaged by said end portion of said plug contact member and establishment of a corresponding pressurized contact between the said resilient contact strips on said contact fingers and the adjacent surface portions of said socket contact member.

2. A separable electrical contact structure of the plug-and-socket type as defined in claim 1 wherein said socket contact member includes a cylindrical recess within which said cylindric assembly of said contact finger units and supporting rings are mounted, and a retaining ring held by said socket contact member near the mouth thereof and which engages the finger unit supporting ring adjacent thereto, the other finger unit supporting ring being engaged with the stopped by an internal shoulder portion of said socket contact member.

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