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 SEGMENTED CONTACT ASSEMBLY HAVING PIVOTAL AND  
 SIDEWISE-ROTATABLE CONTACT SEGMENTS  
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3,194,934

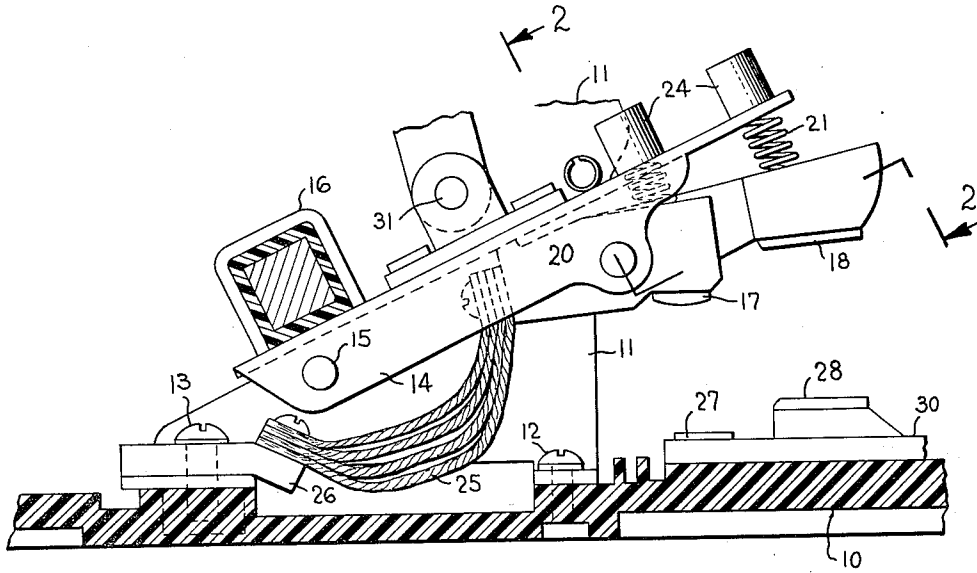


FIG. 1

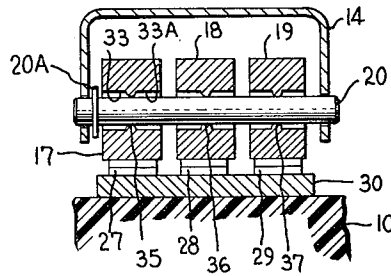


FIG. 2

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## 3,194,934 SEGMENTED CONTACT ASSEMBLY HAVING PIVOTAL AND SIDEWISE-ROTATABLE CONTACT SEGMENTS

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3 Claims. (Cl. 200—166)

My invention relates to multiple electrical contact assemblies, and more particularly to multiple contact assemblies of the type comprising a plurality of relatively heavy contact members pivotally supported on a common pivot pin and movable as an assembly between open and closed circuit positions with respect to a corresponding plurality of stationary contacts.

Devices utilizing contact assemblies of the type described are ordinarily designed to carry substantial amounts of current, such for example as 1000 or more amperes. With such high currents, even a relatively small amount of resistance at contact interfaces in the closed circuit position can give rise to excessive amounts of heat, causing deterioration of adjacent metal parts and supporting structure. In order to maintain good conductivity with low temperature rise, it is essential that the surfaces of meeting contacts shall each seat in conforming flatwise engagement with each other. In accordance with the prior art, it has been common practice to pivotally support each of the contact members of an assembly of contacts. For economy of manufacture and compactness, it is desirable to support all contact members of a given assembly on a common pivot pin. While each of the contact members is individually movable in its plane of rotation, that is, at right angles to the axis of the pivot pin, the contact members are not individually movable in any other plane, since they are all carried by the same pivot pin. It has been found that the stationary contact surfaces, with which the movable contacts must meet, often do not all lie in perfectly parallel planes. Therefore, in the closed circuit position, not all of the movable contacts can seat themselves in conformity with the flat surfaces of the corresponding stationary contacts. This increases the resistance at the contact interface and contributes to heating of the contact assembly.

It is an object of the present invention to provide a multiple contact assembly comprising a plurality of contacts supported on a common pivot pin in which each of the contacts is individually capable of seating itself in flatwise conformity with its corresponding stationary contact even though such stationary contacts do not all lie in the same or parallel planes.

It is another object of the invention to provide such a contact assembly which is no more complicated or expensive than prior art contact assemblies.

In accordance with the invention in one form, a movable contact assembly is provided comprising a generally channel-shaped contact arm having a pivot pin passing between the opposed side wall portions thereof adjacent one end. A plurality of contact members, comprising substantially rectangular blocks of conductive material, are pivotally supported in side-by-side relation on the pivot pin, and each biased for rotation about the pivot pin by a compression spring between a portion of the contact and a corresponding portion of the contact arm. Rotation of each contact member about the pivot pin is limited by engagement of an extension of the contact with a corresponding portion of the contact arm.

In addition to rotational adjustment, sidewise adjusting movement of each of the contact members is provided for by shaping the hole through which the pivot pin passes in each of the contact members in such a way that the

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outer portions of the hole are of greater diameter than the central portion. Contact between the pivot pin and each of the contact members takes place substantially exclusively at the reduced diameter center portion. Each of the contact members is therefore permitted to rock axially or to "wobble" on the pivot pin, as well as to rotate thereabout, thereby assuring complete freedom to seek conformity with the corresponding surface of the stationary contact member.

The invention will be more fully understood from the following detailed description, and its scope will be pointed out in the appended claims.

In the drawings,

FIGURE 1 is a side elevation view of a portion of an electric switch or circuit breaker incorporating the invention, and

FIGURE 2 is a sectional view of the contact arm of the switch of FIGURE 1 taken substantially as indicated on the line 2—2 of FIGURE 1, but with the movable contact assembly in the closed circuit position.

Referring to FIGURE 1, the invention is shown as incorporated in an electric switching device comprising an insulating base 10 on which a metallic supporting frame 11 is mounted by suitable means such as by screws 12 and 13. The frame member 11 comprises two spaced apart parallel side plate portions, only one of which is shown in FIGURE 1, the side nearest the observer being omitted to show the working parts.

A generally channel-shaped movable contact arm 14 is pivotally supported on a pivot pin 15 extending between the side plates of the frame 11. The contact arm 15 is adapted to be ganged to other similar contact arms, not shown, by a contact cross-arm 16. The contact arm 14 carries an assembly of three movable contact members 17, 18, 19, all pivotally supported on a common pivot pin 20 extending between the sides of the channel-shaped contact arm 14. The pivot pin 20 is retained in place on the channel-shaped contact arm 14 by means of a snap-on type washer 20A which fits in a groove in the pin 20 (see FIGURE 2). Each of the contact members 17, 18, 19 is biased for rotation about the pivot pin 20 by a corresponding compression spring 21 (only two shown). The upper portion of each of the springs 21 is retained in an inverted cup-shaped retainer 24 carried by the contact arm 14. Rotation of each of the contact members 17, 18, 19, about the pivot pin 20 is limited by engagement of an opposite end portion thereof with the bight portion of the contact arm 14.

The movable contacts 17, 18, 19 are electrically connected by means of flexible conductive braids 25, with a terminal 26 anchored to the base 10 by the same screw 13 which retains the frame 11 in place.

The contacts 17, 18 and 19 are adapted to engage correspondingly positioned relatively stationary contacts 27, 28, 29, all fixedly mounted on a stationary terminal strap 30 supported on the base 10.

The contact arm 14 is movable between open and closed circuit positions so as to move the movable contacts 17, 18, 19 into and out of engagement with the stationary contacts 27, 28, 29, by suitable operating means, not shown, engaging the contact arm at pivot pin 31.

Referring to FIGURE 2, in accordance with the invention the contacts 17, 18, and 19 are each enabled to seat themselves in conformity with the flat surfaces of the stationary contacts 27, 28, 29, by providing each of the contacts 17, 18 and 19 with specially shaped holes through which the pivot pin 20 extends. As shown in FIGURE 2, each of the holes 33 includes a pair of enlarged outer portions 33A, leaving a reduced diameter inner portion defining a centrally positioned raised abutment or rib 35, 36, 37 in each of the contacts 17, 18 and 19.

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As shown in FIGURE 2, in the event that the stationary contacts 27, 28, 29 are mounted on the line terminal 30 in such a way that their upper flat surfaces are not exactly parallel to each other, the movable contacts will nevertheless be able to seat themselves in conformity thereto by reason of the ability of each of the movable contact members to rock side-wise on the pivot pin 20 because of the particular mounting provisions described. This assures good electrical and thermal contact, and substantially reduces heating at the contact interfaces.

While the invention has been described in only one particular embodiment, it will be readily apparent that modifications thereof may readily be made by those skilled in the art, and it is therefore intended by the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric contact assembly comprising:
  - (a) a movable contact arm;
  - (b) a pivot pin carried by said contact arm;
  - (c) a plurality of individual contact members supported on said pivot pin;
  - (d) each of said contact members having a hole therethrough through which said pivot pin extends, said hole having a transverse dimension at each end thereof of substantially greater than the diameter of said pivot pin at a point adjacent said ends of said hole, said hole having a transverse dimension at the central portion thereof substantially equal to the diameter of said pivot pin at a point adjacent said central portion of said hole, whereby each of said contact members is rotatable about said pivot pin in a plane perpendicular to the axis of said pivot pin and each of said contact members is rotatable a limited amount in a plane parallel to said axis of said pivot pin.
2. A movable contact assembly comprising:
  - (a) a contact arm;
  - (b) a pivot pin carried by said contact arm;
  - (c) a plurality of individual contact members supported on said pivot pin;
  - (d) each of said contact members having a hole therethrough for said pivot pin, said hole having enlarged portions at each end thereof and a reduced diameter central portion, and each of said contact members contacting said pivot pin substantially entirely at said reduced diameter central portion;

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(e) whereby each of said contact members is rotatable in a plane perpendicular to the axis of said pivot pin and also rotatable in at least one plane parallel to said axis of said pivot pin.

3. An electric switching device comprising:

- (a) an insulating support;
- (b) a plurality of spaced stationary contacts mounted on said support;
- (c) a contact arm pivotally mounted on said support;
- (d) a plurality of movable contact members carried by said contact arm and each adapted to engage one of said stationary contacts respectively;
- (e) a pivot pin of predetermined diameter carried by said contact arm;
- (f) each of said contact members having a dimension in the direction of said pivot pin at least twice said predetermined diameter;
- (g) each of said contact members having a hole therethrough receiving said pivot pin, each of said holes comprising an enlarged portion at each end thereof and a reduced diameter central portion, each of said contact members being supported on said pivot pin substantially entirely by contact with reduced diameter central portion;
- (h) said stationary contacts each having a substantially planar upper surface, said planar upper surfaces of said stationary contacts lying in planes other than parallel planes;
- (i) said relatively movable contacts each being rotatable about said pivot pin in a plane perpendicular to said axis of said pivot pin and also being pivotal about said pivot pin in at least one plane parallel to said axis of said pivot pin;
- (j) whereby each of said relatively movable contact members may seat itself in flatwise conformity with its corresponding stationary contact to provide optimum electrical and thermal engagement therewith.

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