Feb. 15, 1949. E. F. HANSEN 2,461,980

ELECTRIC CONTACT DEVICE

Filed Dec. 20, 1946

Fig. 2.

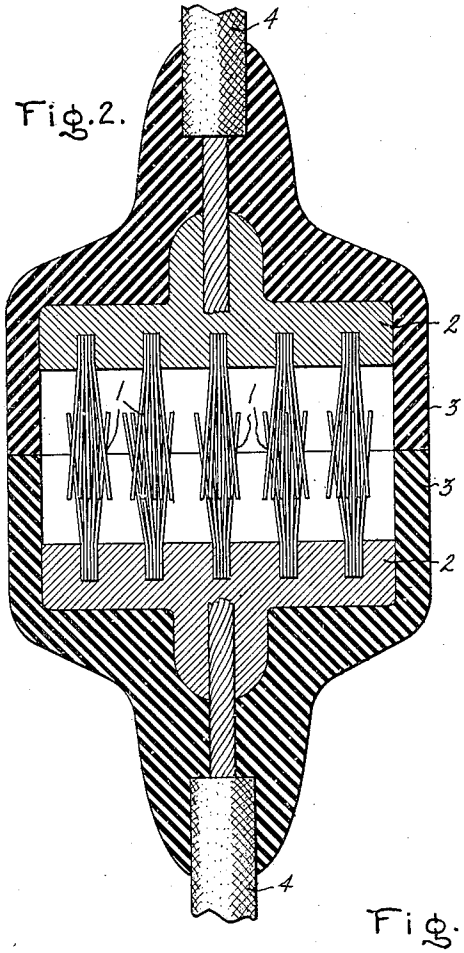


Fig. 1.

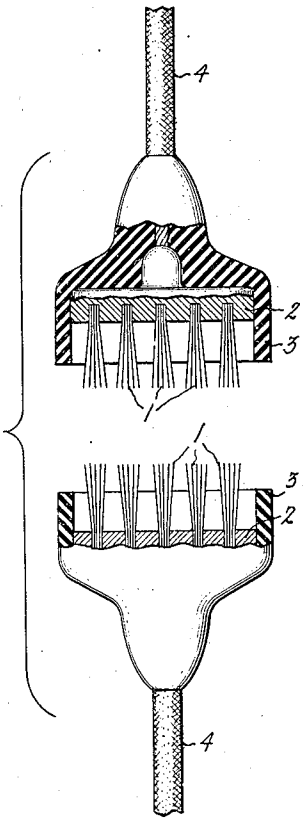
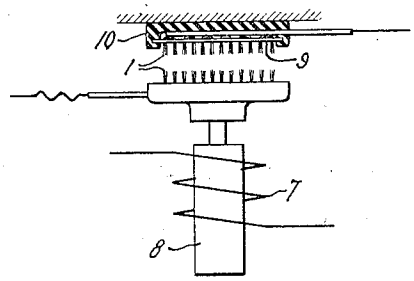


Fig. 3.



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ELECTRIC CONTACT DEVICE

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4 Claims. (Cl. 173—328)

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My invention relates to electric contact devices and has for its object the provision of a new and novel improved contact device which is self-retaining, shockproof, and capable of safely maintaining substantially arcless contact under conditions of severe vibration without application of external contact pressure.

In carrying out my invention, I provide a pair of cooperating contact elements, each comprising a plurality of relatively stiff electric conducting wires, mounted in closely spaced substantially parallel relation in the manner of a wire brush bristles or the like.

For a more complete understanding of my invention and a further appreciation of its objects and advantages, reference should be had to the following detailed specification taken in conjunction with the accompanying drawing, in which Fig. 1 is a cross-sectional view of a pair of cooperating contact elements embodying my invention; Fig. 2 is a view showing the contact elements of Fig. 1 in engaging position, and Fig. 3 is a cross-sectional view similar to Fig. 1 showing another embodiment of my invention.

Referring now to the drawing, at Figs. 1 and 2 I have shown my invention in one form applied to a cable connector of the plug type. Each plug comprises a contact member including a plurality of electrically conducting relatively stiff or rigid wires 1 mounted in closely spaced relation in an electric conducting base 2. The wires may be mounted upon the base 2 by any one of several well-known methods, such as by shrink fitting the wires into a plurality of recesses in the base or by welding or brazing the wires directly to the base. At Figs. 1 and 2 the wires 1 are shown mounted in tufts, though if desired the wires may be individually mounted in the base.

As shown at Figs. 1 and 2, the conducting base 2 is preferably mounted in a cup-shaped insulating support 3 and connected to a flexible conducting lead 4 by any suitable means. In the form of the invention shown, the leads 4 pass through apertures in the bases of the insulating cup 3 and are molded into the conducting bases 2.

In the embodiment of the invention shown in the drawing, the bristles of each tuft are mounted in slightly diverging relation, so that when the bristles of the opposite tufts are intermeshed the bristles are forced into wedging engagement such that each contact element holds the other element with more than sufficient force to support its own weight. Preferably the interstitial areas between bristles of each tuft at the free end of the tuft are of the same general order

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of magnitude as the cross-sectional areas of the bristles themselves, but it is not intended to imply any critical limitation in this respect. Indeed it has been found that where the total contact area is appreciable, the interstitial areas may be perhaps five to ten times the bristle cross-sectional area without impairing the sticking characteristics. Thus it is only necessary that the spacing be sufficiently close to enable the contact elements to grip each other in sticking or wedging relation.

In operation, when the contact elements are brought into engagement, the wires or bristles 1 of each contact element intermesh with the bristles of the other element, thereby to make contact at a plurality of points and over a considerable surface area. The relatively long, sliding or wiping movement of one set of wire bristles against the other in effecting engagement and disengagement of the contacts is advantageous in keeping the contact surfaces clean and thus promoting good contact. Moreover, the tight wedging engagement between the various bristles maintains excellent contact between the contact elements without the application of any external retaining force. It will be evident also that, with the bristles tightly wedged together, my improved contact device is substantially shockproof, for, so long as the contact elements are not drawn apart, even a substantial amount of vibration will not effect separation of enough of the individual wires to affect appreciably the conductivity of the connection. Similarly, the wedging engagement of the contact elements is advantageous in preventing bouncing where my invention is applied to relay contacts and the like.

At Fig. 3 I have shown an electromagnetic relay having contact elements embodying my invention. The relay itself comprises a coil 7 and an armature 8. In this embodiment of the invention, the wires or bristles 1 are shown mounted in substantially parallel spaced relation by sewing or interweaving on a thin metal backing 9, in much the same manner as commonly employed in making wire brushes and the like. The metal backing 9 with the attached bristles is secured to a rigid supporting base, such as the armature 8 and a portion 10 of the relay frame.

While I have shown only certain preferred embodiments of my invention by way of illustration, many modifications will occur to those skilled in the art and I, therefore, wish to have it understood that I intend in the appended claims to cover all such modifications as fall within the true spirit and scope of my invention.

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

1. An electric contact device comprising a pair of separable contact members each including a plurality of resilient electric conducting bristles mounted upon a base with the interstices between bristles at their free ends having an area of the same general order of magnitude as the cross-sectional area of said bristles, said bristles being arranged for sliding engagement and disengagement in mutual intermeshing and wedging relation, thereby to make self-retaining electric contact at a plurality of points and over a large total surface area.

2. A shockproof electric contact device comprising a pair of cooperating contact members each including a base of electric conducting material, and a plurality of resilient electric conducting bristles mounted in tufts in said base in slightly diverging relation with the interstices between the bristles of each tuft presenting areas of the same general order of magnitude as the cross-sectional area of each bristle, said contact members being arranged for sliding engagement and disengagement of said bristles in mutual intermeshing and wedging relation thereby to make a self-retaining contact resistant to shock and vibration.

3. An electric contact device for two electrical conductors comprising, a pair of cooperating contact members each including a base of electric conducting material securely attached to one of said conductors, a plurality of resilient electric conducting bristles mounted in tufts on said base

in spaced apart relation, said bristles being arranged for sliding engagement and disengagement in mutual intermeshing and wedging relation thereby to make a self-retaining contact resistant to shock and vibration, and interstices between the bristles of each said tuft at their free ends presenting areas of the same general order of magnitude as the cross-sectional area of each bristle.

4. An electric contact device comprising, a pair of separable contact members each including a base having mounted thereon in tufts a plurality of electrically conductive bristles, said tufted bristles providing for contact engagement and disengagement by mutual sliding and intermeshing action of the bristles, the tufting of said bristles providing a mutual wedging action in engagement, thereby frictionally to lock said contact members in engaged position against separation by shock or vibration.

ELMER F. HANSEN.

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The following references are of record in the file of this patent:

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