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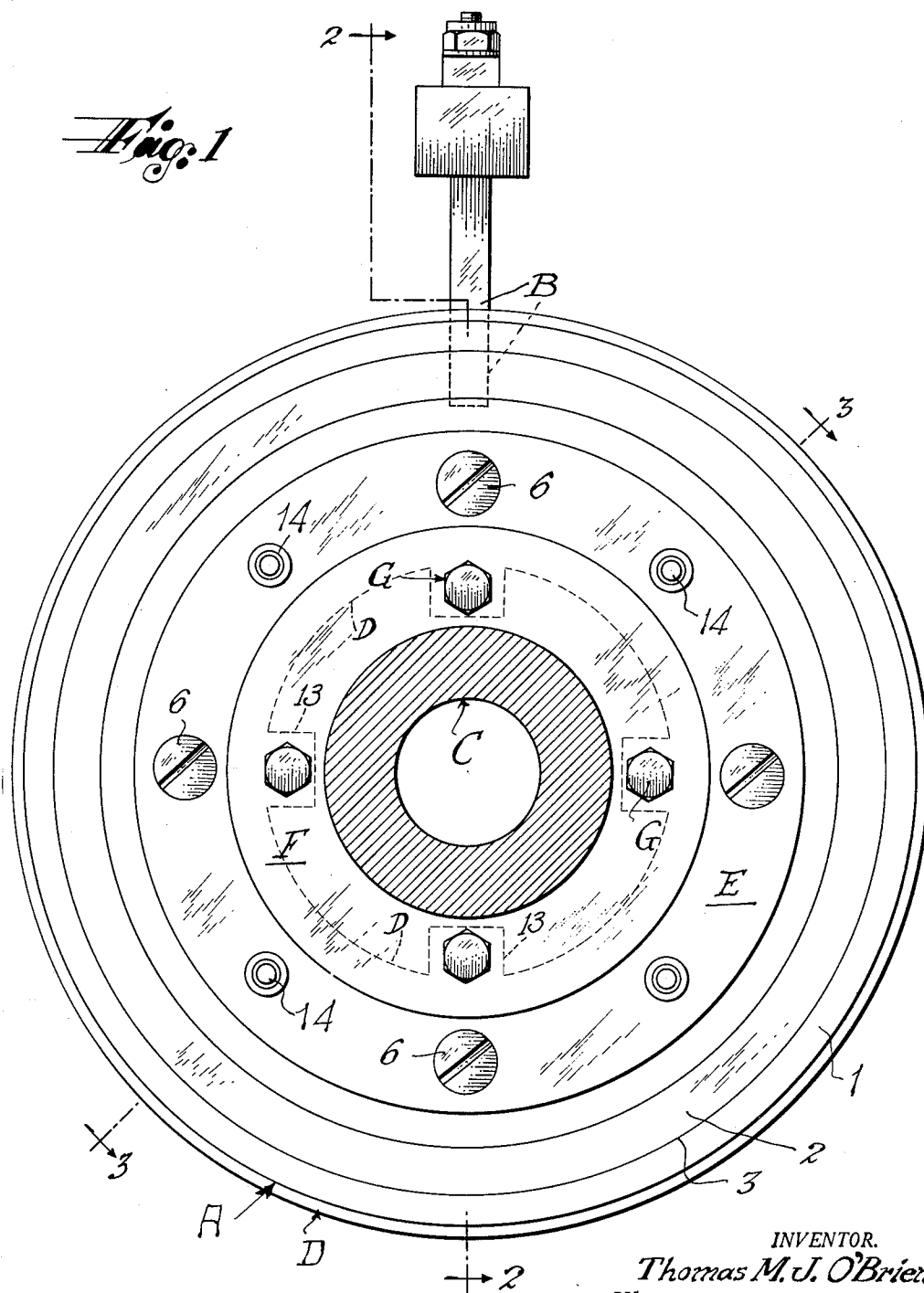
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SLIP RING ASSEMBLY HAVING A PLURALITY OF METAL BASED SLIP RINGS

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3 Sheets-Sheet 1

Fig. 1



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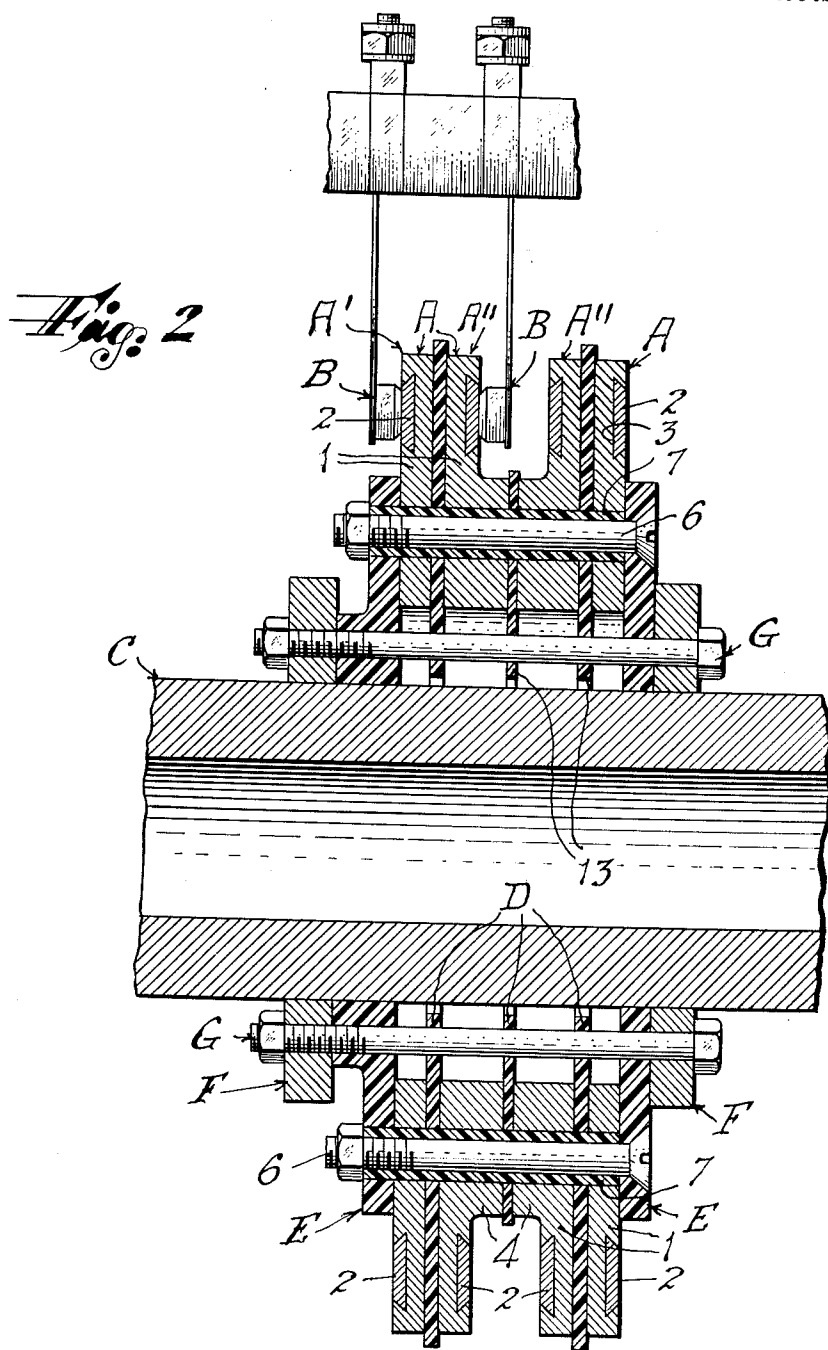
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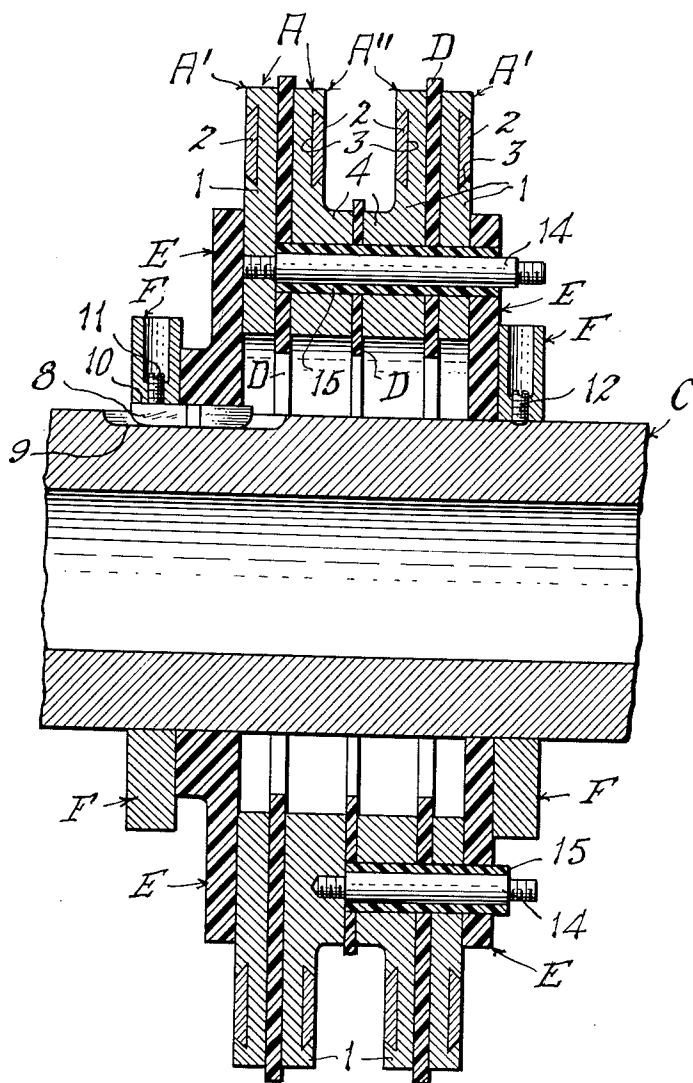
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Fig. 3



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SLIP RING ASSEMBLY HAVING A PLURALITY OF METAL BASED SLIP RINGS

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1 Claim. (Cl. 339—5)

This invention relates in general to the manufacture of slip ring assemblies of the general type that include one or more base members, usually rings, mounted on a suitable support and carrying contact or slip surfaces to frictionally contact with another element, for example, a brush.

It has been common practice in making such slip ring assemblies to provide a plurality of dielectric rings arranged in parallel spaced relation on a shaft and each having at least one circular contact or slip surface comprising, for example, a circular thin layer of silver alloy, in combination with a brush or other suitable contact element frictionally engaging the contact or slip surface. The dielectric rings generally are formed of a synthetic plastic composition and they are not entirely satisfactory because they are too weak to withstand the strains incident to use and they tend to warp. Furthermore, they are not capable of carrying high electrical voltages and they easily become overheated so that the dielectric ring is weakened.

In these known slip ring assemblies, the dielectric base plates or rings are depended upon for structural support of the contact or slip layers, and consequently it has been necessary to exercise care in securing dielectrics that will have the proper machinability and adequate structural strength as well as the necessary dielectric properties.

A primary object of the present invention is to provide a novel and improved slip ring assembly which shall include a plurality of thin generally flat metal base members, usually rings, each arranged with one face in closely spaced opposed and parallel relation to one face or another, and a dielectric member interposed between each two adjacent base members in abutting contact with both of said faces and insulating said base members from each other, each said base member having a slip surface on its other face to frictionally coact with a brush element whereby the metal base member, plate or ring shall provide adequate structural strength, can be accurately cut or ground by machine, and dielectric materials of relatively poor quality with respect to structural strength and susceptibility to machine cutting may be utilized.

Another object is to provide such a slip ring assembly which shall include a novel and improved construction and combination of metal base members, contact or slip layers on said base members, dielectric plates or rings and means for mounting the assembly on a support such as a shaft, whereby the assembly shall be structurally strong, shall possess high current-carrying capacity and shall be capable of withstanding high temperatures and of rapid cooling.

Still another object is to provide such a slip ring assembly wherein a greater number of slip rings or contact layers can be placed in a given space than has been possible heretofore and wherein a large number of slip rings can be arranged compactly in an unusually

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structurally strong assembly and at lower cost than known electrically and mechanically equivalent units.

Other objects, advantages and results will be brought out by the following description in conjunction with the accompanying drawings in which:

Figure 1 is a front elevation of a slip ring assembly and a brush assembly embodying the invention;

Figure 2 is a central vertical longitudinal sectional view approximately on the plane of the line 2—2 of

Figure 1, showing the brush assembly in side elevation; and

Figure 3 is a transverse vertical sectional view approximately on the plane of the line 3—3 of Figure 1.

Specifically describing the illustrated embodiment of the invention, the slip ring assembly includes a plurality of slip rings A each of which includes a metal base member 1 which is shown in the form of a ring that is elongated in cross section and has a thin rigid marginal portion and may be made of various suitable metals, for example, steel or aluminum or alloys. Each metal base member carries a contact or slip surface 2 shown as a ring and exposed on one flat side of said marginal portion of the base member.

The nature of the slip surface may be as desired but preferably a contact layer 2 is electrodeposited in an undercut groove 3 in the flat surface of the base member, whereby the contact or slip layer 2 is electrolytically and physically bonded to the base member in said groove. Any suitable material may be utilized for the contact layer and may be deposited either directly on the steel base member or on an intermediate layer of another metal such as copper that is applied directly to the steel. For example, a layer of copper may be deposited in the groove 3 directly on the steel base member and then a layer of silver may be electrodeposited on the copper. Other outer surface layers may be electrodeposited in a similar manner either directly on the steel plate or upon an intermediate layer.

Where the base member 1 is made of aluminum, it is desirable that the aluminum first be given a zincate treatment, after which a layer of copper may be electrodeposited on the thus treated aluminum, following which an outer surface layer of silver is deposited on the copper layer.

A beryllium copper alloy also is a desirable material for the base member.

It should be understood that the method of applying the contact layer to the metal base is a secondary consideration and any suitable electrodeposition method may be utilized.

The cross-sectional shape of the metal base members may be varied according to the intended use thereof and the manner in which a plurality of the slip rings are to be assembled. For the purpose of illustration, two of the slip rings A' have been shown as flat, rectangular in cross section while each of two other slip rings A'' has a concentric circular projection 4 on one side thereof disposed inwardly of the corresponding contact layer 2 so that when the two rings are disposed in side by side parallel relation with the projections abutting each other as shown in Figure 3, a space is provided between the juxtaposed contact layers for a brush B as shown in Figure 2.

For mounting a plurality of the slip rings on a support such as a shaft C, the invention contemplates the arrangement of a plurality of the slip rings in parallel spaced relation with dielectric plates or rings D between each two adjacent slip rings and the clamping of the assembled slip rings between dielectric mounting rings E by which the assembly may be mounted on a support such as a shaft C. As shown, the rings are clamped together and to the mounting rings by bolts 6 around which

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are insulating sleeves 7 disposed in aligned openings in the slip rings, the insulating rings D and the mounting rings E. Preferably the interior peripheries of the slip rings and the insulating rings D are substantially spaced from the support, while the mounting rings E preferably have direct contact with the support. For securing the assembly on the support, a pair of clamping rings or plates F are provided, one in abutting relation to each of the mounting rings E and the assembled mounting ring E, slip rings A and insulating rings D are clamped between the clamping rings F by bolts G. Where the assembly is mounted on a shaft as shown, the mounting rings and clamping rings are secured on the shaft for rotation therewith, as by a key 8 fitted in registering slots 9 and 10 in the shaft and in the clamping rings F, respectively. Preferably means is provided for slight adjustment of the assembly longitudinally on the shaft to provide proper engagement between the brushes B and the contact layers and for this purpose set screws 11 and 12 may be provided in the clamping rings to engage respectively the key 8 and the shaft C and hold the assembly as adjusted.

As shown in Figure 2, preferably the bolts G pass through openings in circumferentially spaced lugs 13 on the inner peripheries of the dielectric rings D.

The various slip rings may be connected in circuit in any suitable manner but, for example, a conductor rod 14 is provided for each slip ring and extends through openings in the other slip rings from which the rod is insulated by a dielectric sleeve 15. As shown in Figure 3, the rod 14 at the top of the figure is screwed into and electrically connected to the left hand slip ring, while the rod 14 at the bottom of Figure 3 is screwed into and electrically connected to the next adjacent slip ring, and similar rods for the other two slip rings are provided as shown in Fig. 1.

With this construction it will be observed that the metal base members 1 provide strong structural support for the contact or slip layers 2 and also make it possible for the slip layers to withstand higher temperatures without injury to either the layers or the brushes; and the metal base rings also make it possible for the slip rings to carry high currents and to rapidly dissipate heat from the contact layers so as to maintain low operating temperatures in the slip rings and brushes. A large number of the slip rings may be arranged side by side and yet the assembly will have great mechanical and structural strength. The insulating or dielectric rings D effectively insulate the base members from each other but are not required to assume any mechanical strains incident to operation of the assembly, so they may be formed of suitable rela-

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tively inexpensive material regardless of the structural strength or susceptibility to machine cutting.

While the invention has been shown as embodied in a particular type of slip ring assembly, it will be understood that this is primarily for the purpose of illustrating the principles of the invention and that the invention may be embodied in slip rings of other shapes and types and in other slip ring assemblies within the spirit and scope of the invention.

What I claim is:

A slip ring assembly comprising a plurality of rigid ring-like metal base members each having opposite flat faces in planes perpendicular to its axis, said base members being arranged each with one face in closely spaced, opposed and parallel relation to one face of another, a dielectric member interposed between each two adjacent base members in abutting contact with both of said faces and insulating said base members from each other, each said base member having an annular slip surface on its other face disposed outwardly of said dielectric member to frictionally coact with a brush element, a mounting member formed of dielectric material abutting the second-mentioned face of each of the endmost base members, means fastening the mounting members together with said base members and the first-mentioned dielectric members clamped between them, each dielectric member and each mounting member comprising a ring of insulating material extending inwardly beyond the inner peripheries of said base members, a ring-like clamping member abutting the outer face of each mounting member, means fastening said clamping members together with said base members, mounting members and dielectric members between them, and a shaft extending through said clamping members, said base members, said dielectric members and said mounting members and frictionally engaging the inner peripheries of said clamping members to support the assembly on said shaft, and means for connecting said base members in electrical circuits.

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