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(54) Slip ring assembly

(57) A slip ring and brush assembly comprising at least one brush supported on a spring arm extending in a substantially radial plane from an electrically insulating housing to a slip ring, in a direction transverse to the plane of rotation of the slip ring.

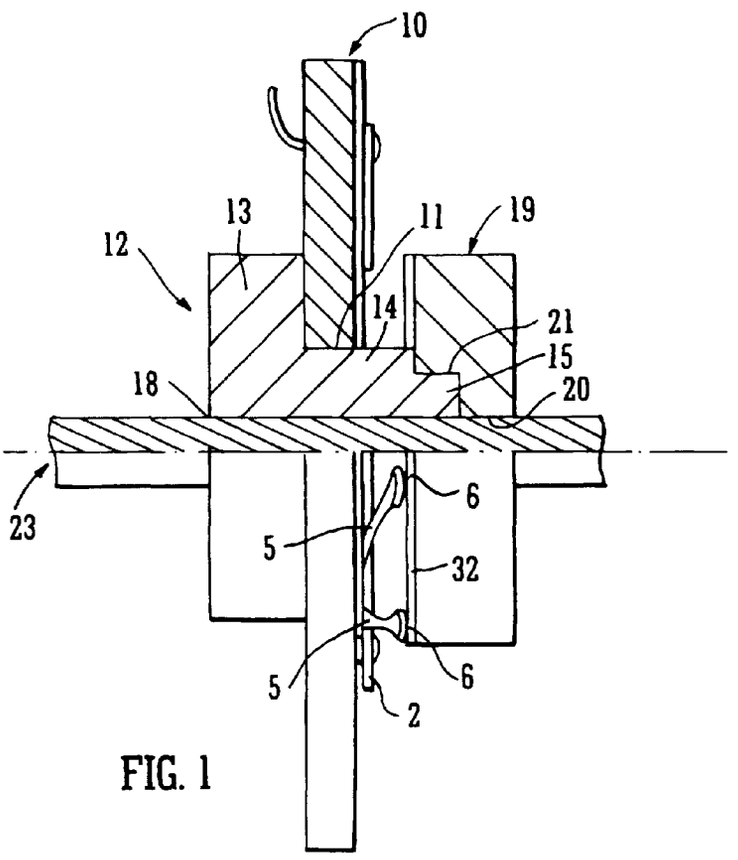

FIG. 1

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Description

[0001] The invention relates to a slip ring and brush assembly for transferring electrical energy between stationary and rotating objects and vice versa.

[0002] One known slip ring comprises cylindrical metallic tracks supported in a dielectric material in the rotating object. Brushes made of base metal and alloys or graphite and spring loaded to maintain electrical contact with the rotating conductors, are used for the stationary interface. In known slip rings the location of one module with respect to another provides the electrical contact force and axial bearing location for the slip ring.

[0003] It is an object of this invention to provide a slip ring and brush assembly of simple construction. It is a further object of this invention to provide an improved method of manufacturing the components of the slip ring assembly that allows smaller components to be used, with resultant savings in production costs. It is a further object to provide components arranged so that slip ring modules operate independently and can be stacked without the need to arrange them to exert electrical contact force and axial bearing location upon each other.

[0004] Accordingly, in one aspect, the invention provides a slip ring and brush assembly comprising at least one brush extending from an electrically insulating housing to a slip ring in a direction transverse to the plane of rotation of the slip ring.

[0005] Preferably, each brush has a contact element which is supported on a spring arm extending substantially in a radial plane.

[0006] Preferably, the brush is formed from a single sheet of metal.

[0007] Preferably, the brush comprises a pair of spring arms and brush contact elements which traverse a circular path within the confines of a circular slip ring having a central hole.

[0008] In order that the invention may be well understood one embodiment will now be described, by way of example only, with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a side elevation of a one-way slip ring and bush assembly in accordance with the invention with the view partly sectioned;

Figure 2 is a plan view of the brush disc of Figure 1;

Figure 3 is a plan view of the slip ring of Figure 1;

Figure 4 is a side elevation of the brush disc and brush disc carrier shown in Figure 1;

Figure 5 is a partly sectioned side elevation of a two-way slip ring module, and

Figure 6 is a partially sectioned plan view of the two way slip ring of Figure 5.

[0009] Figure 1 shows a one-way slip ring assembly comprising a brush ring 1 (best shown in Figure 2) made from a single thin metallic sheet such as copper or brass. The brush has a body portion 2 having an outwardly projecting electrical terminal 3 and three inner neck portions 4 spaced radially around the inner periphery of the ring at 120° intervals. Each of the three inner neck portions 4 has a pair of opposite arcuate spring arms 5, at the free ends of which is a dimple shaped contact element or a button contact 6.

[0010] The brush ring 1 is fixed to a brush ring carrier disc 10 by three small pins 40 (Figure 4) passing through respective holes 7 in the brush ring and holes 41 in the brush ring carrier. A washer 42 located around each pin 41 and between the brush ring and the brush ring carrier disc, ensures that there is a small gap between the outer annular portion 4 of the brush ring and the brush ring carrier disc 10. The disc 10 has a central hole 11.

[0011] The brush ring carrier disc is free to rotate on the cylindrical portion 14 of a bobbin shaped bearing member 12 having end walls 13. The bearing member 12 is stepped to form an inner cylindrical end 15 of smaller diameter than the cylindrical portion 14. The three cylindrical portions share a common axis coincident with the axis of a bore 18 in the bearing 12.

[0012] A slip ring carrier disc 19 has a central hole 20 and a concentric cylindrical recess 21, dimensioned to receive the inner portion 15 of the bearing 12 as a tight fit.

[0013] A slip ring 30 comprises an annulus 32 having a central hole 31 and an inwardly projecting electrical terminal 33 located between the brush ring 1 and slip ring carrier 19, the hole 31 being dimensioned so as to allow the ring to tightly, fit over the central portion 14 of bearing 12. This central portion has a recess (not shown) to receive terminal 33 shaped to prevent slip ring 30 from rotating about bearing 12.

[0014] The brush ring carrier 10, slip ring carrier 19 and bearing 12 are made of an electrically insulating material, such as plastics.

[0015] An electrical input lead (not shown) is connected to the electrical terminal 33 of the slip ring 30 and passes axially out of the assembly. An electrical output lead is connected to the electrical terminal 3 of the bush ring 1 and also passes out axially.

[0016] The slip ring carrier is rotatably mounted on a shaft 23 extending through hole 18 of the bearing and hole 20 of the slip ring carrier.

[0017] The spring arms 5 can flex in an axial direction because of the material of which they are made and because they are spaced from the brush ring carrier by spacers 42.

[0018] In use, the brush and brush ring carrier rotate relative to the bearing and slip ring carrier but the brush disc components are urged inwardly so that the six contact elements 6 are kept in good electrical contact with the slip ring.

[0019] A multi-way slip ring may be required, for ex-

ample, a two way slip ring (shown in Figures 5 and 6) will be required when using the device to connect a negative and positive power supply to an appliance. A series of brush rings and slip rings with suitable insulating housings and bearings can be stacked together to produce a multi-way unit. Each module operates independently, so there is no need to stack them in a bank arranged such that each ensures its neighbours has an effective location and electrical contact.

[0020] A slip ring of the invention may be used in a variety of apparatus such as that for power transmission, instrumentation, generation of signals for TV, high frequency signals; white goods; robotics; and the like. In one specific example the slip ring assembly is used as part of a power cable reel device designed to be mounted on a wall or the like and to allow the user readily to pull cable from the reel to extend the usable length facilities being provided for rewinding the extended wire on to a former.

[0021] The brush ring and slip ring are made from very thin metal sheet (as thin as 0.25 mm) and are manufactured by processes such as punching, piercing, blanking, pressing, photo-etching, laser cutting or water jet cutting. These techniques allow the slip rings and bushes to have a cross sectional area determined by their electrical current rating rather than being dimensioned greatly in excess of this requirement in order to withstand considerable moulding pressures and cutting forces required using moulding methods.

Claims

1. A slip ring and brush assembly comprising at least one brush extending from an electrically insulating housing to a slip ring in a direction transverse to the plane of rotation of the slip ring.

2. An assembly according to Claim 1, wherein each brush is supported on a spring arm extending substantially in a radial plane.

3. An assembly according to Claim 2, wherein the brush is formed from a single sheet of metal.

4. An assembly according to Claim 3, wherein the brush is formed of thin metallic sheet.

5. An assembly according to Claim 3 or 4, wherein the sheet is about 0.25 mm thick.

6. An assembly according to Claim 3, 4 or 5, wherein the brush is formed from the sheet by punching, piercing, blanking, pressing, water jet cutting, laser cutting; or the like.

7. An assembly according to Claim 3, 4 or 5, wherein the brush is formed by photo etching.

8. An assembly according to any preceding Claim, including a pair of spring arms and brush contact elements which traverse a circular path within the confines of a circular slip ring having a central hole.

9. An assembly according to Claim 8, comprising a plurality of spring arm and brush contactor pairs.

10. A bank of modules, each comprising a slip ring and brush assembly according to any preceding Claim.

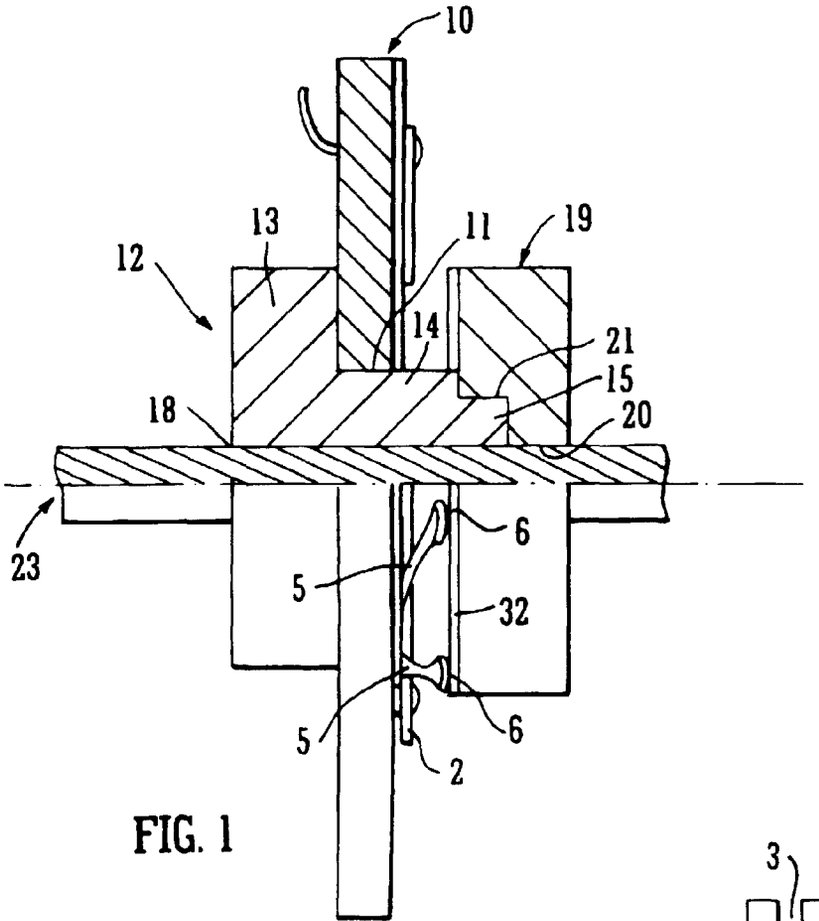

FIG. 1

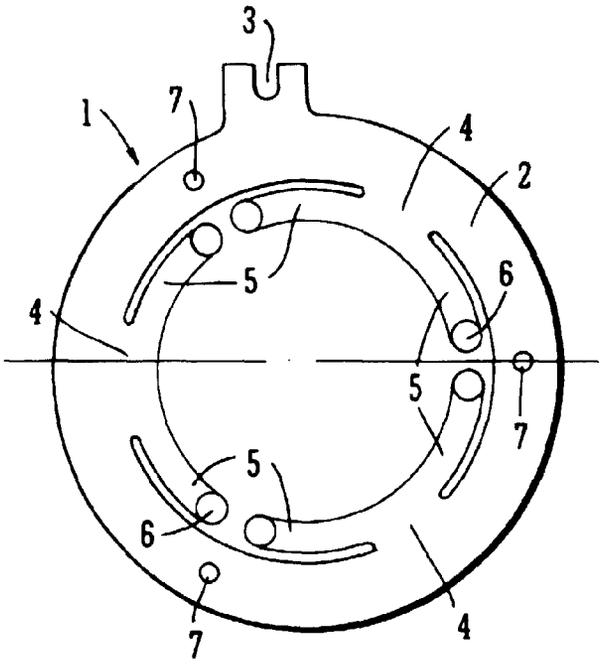

FIG. 2

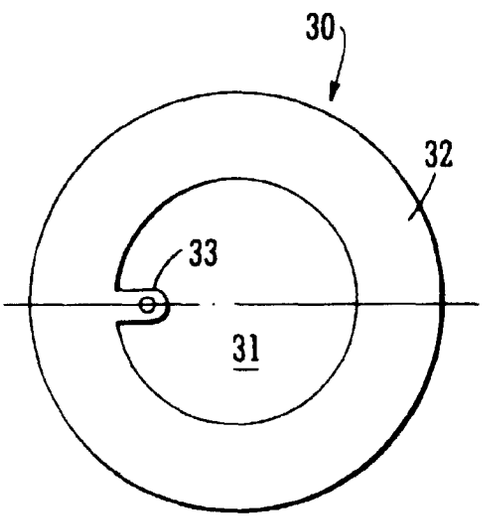

FIG. 3

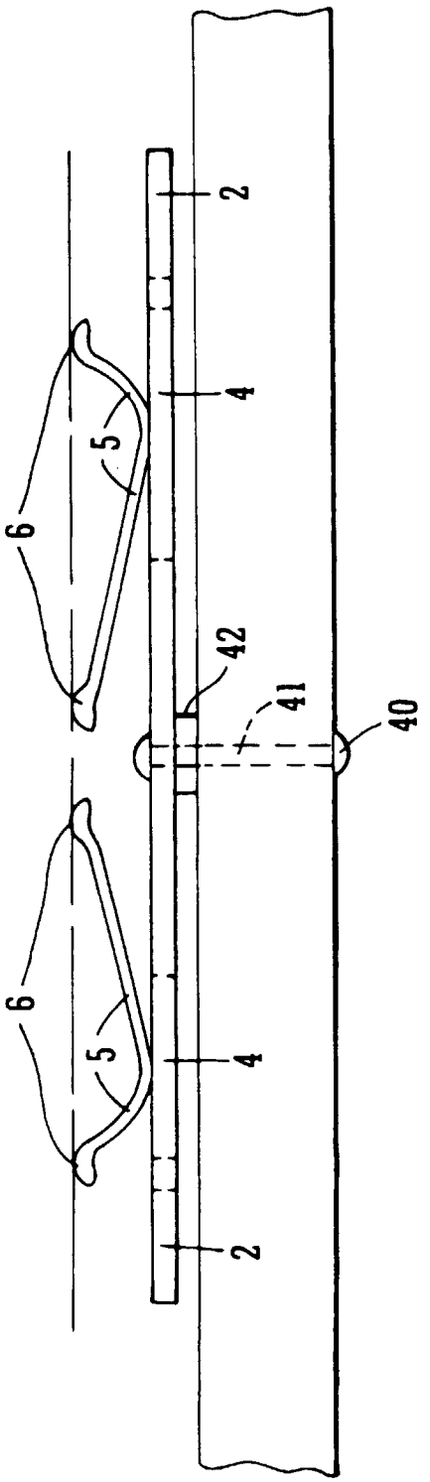

FIG. 4

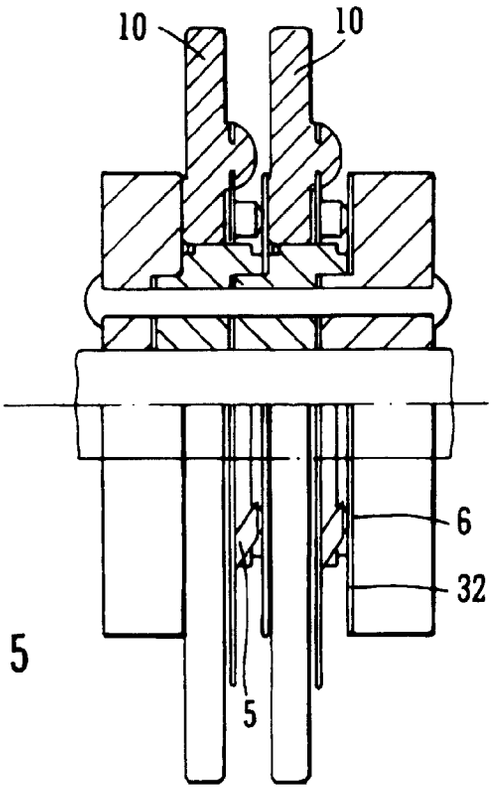

FIG. 5

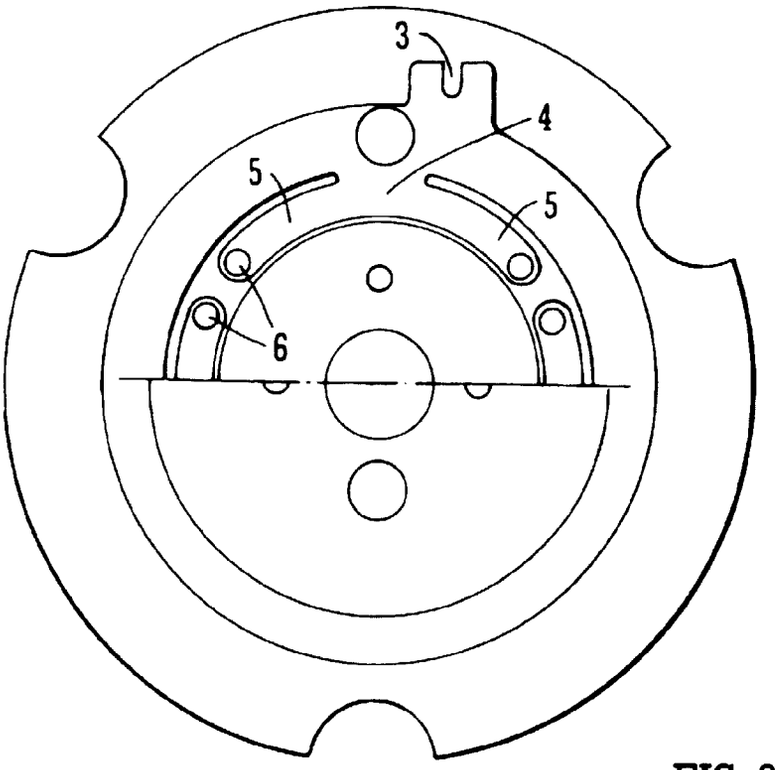

FIG. 6