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SLIP RING BRUSH ASSEMBLY

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2 Sheets-Sheet 1

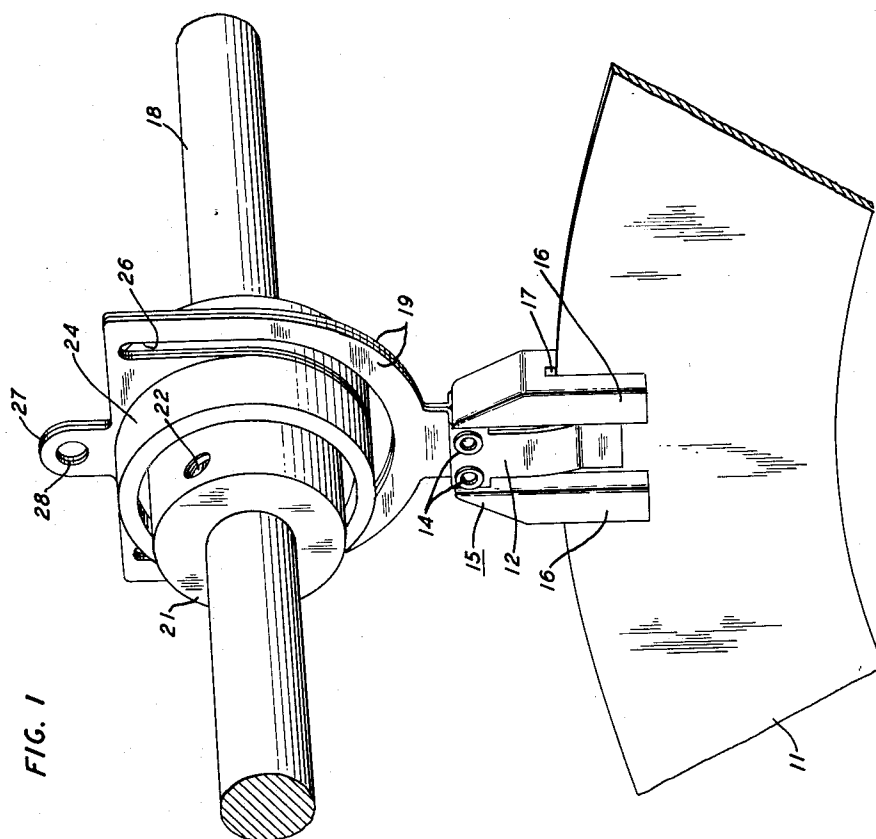


FIG. 1

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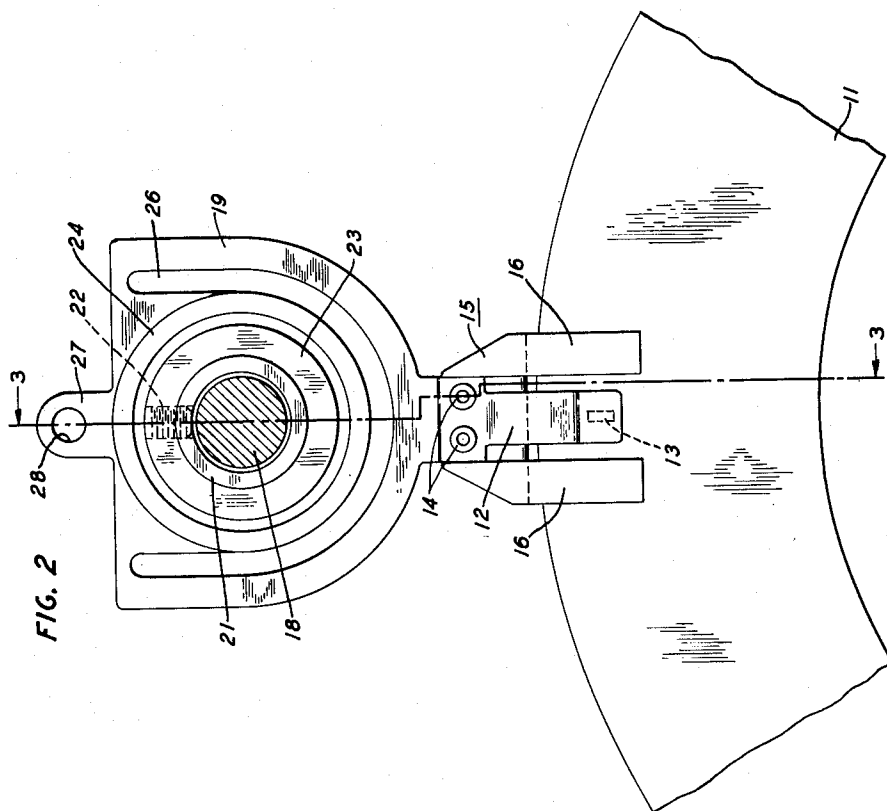
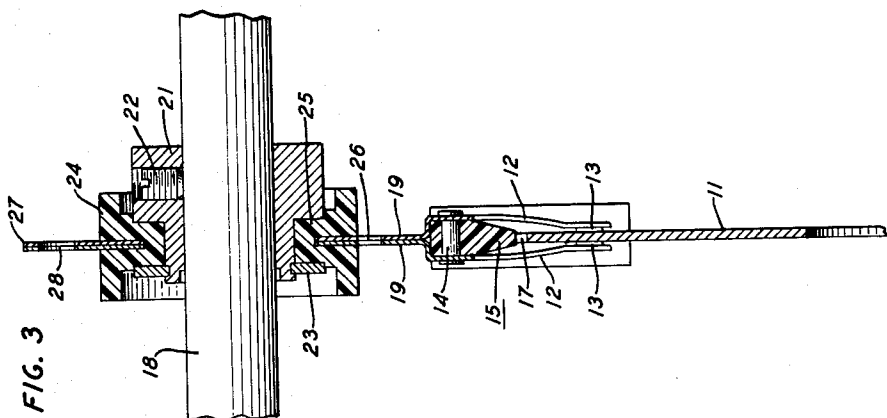
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2 Sheets-Sheet 2



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SLIP RING BRUSH ASSEMBLY

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6 Claims. (Cl. 339—5)

This invention relates to a self-aligning slip ring brush assembly.

Slip ring assemblies are used for the purpose of transmitting electrical power or signals between stationary and moving parts. Typically, such assemblies are used in radar systems for electrically interconnecting the antenna with the transmitter and/or receiver. To reduce brush and slip ring wear and to achieve low electrical noise operation, it is desirable that a flush or flat contact be maintained between the brush or brushes and the slip ring. Notwithstanding the fact that brush assemblies are usually quite accurately positioned and adjusted when initially assembled into a slip ring unit, it is virtually impossible to achieve the necessary alignment of (i.e., flush contact between) the contacting surfaces on the brushes and slip ring at all positions in the rotation of the latter. Some of the factors which result in misaligned contacts are the waviness of the slip ring itself, the brush post whose axis is not normal to the plane of the slip ring, and the slight wobble of the slip ring which is encountered when the same is rotated. This wobble is the result of not being able to position the slip ring so that the same rotates in a true plane. All of these factors, which cause contact misalignment, bring about the aforementioned noise and wear, unpredictable contact bearing pressure, inadequate current carrying capacities because of point and edge or line contact, and possible overstrain in the brush parts leading ultimately to brush failure.

It is the object of this invention therefore to reduce the aforementioned misalignment difficulties.

It is a further object of this invention to provide a self-aligning slip ring brush assembly which maintains a flush or flat contact between the brush and/or brushes and the slip ring.

These objects are attained in accordance with the present invention wherein a pair of brush contacts are spring biased to ride on the opposite flat surfaces of a disk-like slip ring, and a nonmetallic, substantially rigid, slip ring follower maintains flat contact between each of said contacts and the slip ring surfaces despite inaccuracies in alignment, or rotational disturbances of the slip ring surfaces which would normally cause misalignment. The brush contacts are mounted at the ends of a pair of aligned flexible spring arms, the latter being biased so as to urge said contacts against said slip ring surfaces. The slip ring follower is U-shaped, with the ends of said spring arms opposite the contact carrying ends being fixedly secured to the base of the U. The legs of the U extend parallel to the spring arms with the latter disposed therebetween. The slip ring rides in close fitting slots provided in the legs of the follower. A flush or flat relationship between the pair of contacts and the slip ring surfaces is thereby maintained since the slip ring follower will position the brush contacts to conform to the irregularities and/or rotational disturbances of the slip ring. Flexible spring means are used to mount the follower and attached

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spring arms to a stationary post whereby the follower is permitted to shift its position in response to the aforementioned irregularities and rotational disturbances of the slip ring.

The advantages and features of the invention will become more apparent from the following detailed description which, together with the accompanying drawings, discloses a preferred embodiment.

FIG. 1 is a perspective view of a slip ring and self-aligning brush assembly therefor in accordance with the present invention;

FIG. 2 is a side elevation view of the assembly of FIG. 1; and

FIG. 3 is a cross-section view of the slip ring and brush assembly taken on the line 3—3 of FIG. 2.

Referring to the drawings, there is shown therein a fragmentary view of a disk-like slip ring 11 which, when in use, will be secured to a moving part, such as a rotatable antenna mast, by any suitable means (not shown). A pair of aligned, coextensive, flexible spring arms 12 have a pair of brush contacts 13 respectively mounted at the ends thereof. The spring arms 12 are biased so as to urge the brush contacts 13 toward each other and into contact with the opposite flat surfaces of the slip ring 11 disposed therebetween.

The ends of the spring arms 12 opposite the contact carrying ends are fixedly secured, by means of rivets 14, to the base portion of a U-shaped slip ring follower 15. The follower 15 comprises the aforementioned base portion and a pair of integral side extensions or legs 16. As indicated in the drawings, the follower 15 is inverted so that the legs 16 extend parallel to the aligned spring arms 12 with the latter disposed therebetween. Each of the legs 16 is provided with a slot 17 which receives the slip ring 11. These slots are of a width just sufficient to permit the slip ring to slide or move freely therein. This width is in no way critical and all that is really necessary is that it be somewhat greater than (e.g., of the order of several thousandths of an inch) the thickness of slip ring 11.

As indicated in FIG. 1, the slots 17 are cut to a depth such as to provide some clearance between the ends or terminations thereof and the peripheral edge of the slip ring. Likewise, as indicated in FIGS. 2 and 3, there should be some clearance between the base portion of the follower and said peripheral edge. Obviously, these clearances are not critical.

The follower 15 is made of substantially rigid nonconductive material. In one operative embodiment constructed in accordance with the invention, a slip ring follower made of "Teflon" was utilized. "Teflon" is a well-known plastic (a polytetrafluoroethylene compound) that possesses a slippery texture. This slipperiness insures a relatively friction free movement of the slip ring in slots 17. The invention, however, is in no way limited by the material used for the follower and it will be clear that other nonconductive materials can be utilized to advantage.

The brush subassembly, comprising the follower 15 and attached spring arms 12, is secured to a stationary brush post 18 by means of a pair of flexible spring elements 19. For ease in fabrication, these flexible elements are preferably integral with respective spring arms 12, as shown in the drawings, the respective elements and

arms being thus formed by a single punch-press stroke. However, it is to be understood that the invention is in no way limited to such an integral construction and the flexible elements can, if desired, be separately formed. All that is required in this regard is that the brush sub-assembly be flexibly supported and the supporting means be electrically connected to the spring arms for current conduction purposes.

The hub 21 is secured to the stationary brush post 18 by set screws 22. The retaining ring 23 when snapped in position on the hub retains the insulator 24 between it and the shoulder 25 of the hub. The plastic insulator 24 is preferably molded to the flexible spring elements 19.

The semicircular-shaped, punched out portions 26 of flexible elements 19 provide the latter with a degree of flexibility somewhat similar to that of a ball joint. Thus, for example, with the follower and slip ring disengaged, the follower is capable of being moved or shifted along a path parallel to the axis of post 18. The follower is also capable of being rotated, in either direction, from the position shown in the drawings. And various combinations of these two types of movement are possible. Of course, the above described movements of the follower are limited by the extent to which the flexible elements 19 can be distorted without exceeding the elastic limit thereof. This, however, constitutes no significant limitation since the degree of movement actually experienced by the follower, when in use, is quite small.

The slots 17 and the contact faces of the spring biased brushes can be considered as lying in the same plane (i.e., they are aligned) and since the spring arms 12 are fixedly mounted to the follower and the follower is formed of substantially rigid material, this relationship is maintained. The slots 17 can further be described as lying in the same plane as the engaged slip ring, disregarding for the moment any waviness of the latter, and this relationship is likewise maintained. Accordingly, the brush contact surfaces or faces and slip ring surfaces are maintained in the same plane, i.e., a flat contact relationship between the brush and slip ring surfaces is assured at all times.

For purposes of illustration, let it be assumed that the slip ring position is not quite vertical, as shown in FIG. 3, but rather at some slight angle with respect thereto. Since the follower is substantially rigid it is forced to assume a position aligned with the slip ring with the result that the brush contacts attached thereto are shifted accordingly and a flush or flat relationship between the latter and the slip ring is maintained. The flexible elements 19 will deflect according to the type and amount of misalignment present without disturbing the alignment of the contact faces on the slip ring.

In addition to continuously positioning the brush contacts, the follower 15 acts as a "sweeper" and cleans the brush paths on the slip ring to thereby eliminate noise and wear.

The extensions 27 of flexible elements 19 are provided with apertures 28 for the purpose of facilitating the making of an electrical connection thereto. The flexible elements and integral spring arms are formed of electrically conductive material and thus a low resistance path is provided from the slip ring, through the brushes 13, spring arms 12 and flexible elements 19, to said electrical connection.

While the double brush arrangement of the drawings has increased current handling capabilities, it will be clear to those in the art that only a single spring arm and brush contact need be used. The slip ring follower functions in the same manner whether a single or double brush arrangement is utilized.

It is understood, therefore, that the foregoing disclosure relates to only a preferred embodiment of the invention and that numerous modifications or alterations may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A slip ring and brush assembly comprising a disk-like slip ring, a U-shaped slip ring follower of substantially rigid nonconductive material comprising legs and a base portion, the legs of said follower being slotted and so positioned as to receive said slip ring in said slots, elongated spring means secured at one of the ends thereof to the base portion of said U-shaped follower, said elongated spring means extending parallel to said legs and being disposed therebetween, brush contact means mounted adjacent the other of the ends of said elongated spring means, said elongated spring means serving to bias said brush contact means into contact engagement with said slip ring, and flexible spring means for mounting said follower to a stationary post.

2. A slip ring and brush assembly comprising a pair of flexible spring arms having a pair of contacts respectively mounted at one of the ends thereof, a disk-like slip ring disposed between said contacts, said spring arms serving to bias said contacts toward each other and into contact with the opposite flat surfaces of said slip ring, and a U-shaped slip ring follower of substantially rigid nonconductive material comprising legs and a base portion, the ends of said spring arms opposite the contact carrying ends being secured to the base portion of said U-shaped follower, and the legs of said U-shaped follower being slotted to receive said slip ring.

3. A slip ring and brush assembly comprising a pair of aligned flexible spring arms having a pair of contacts respectively mounted at one of the ends thereof, a disk-like slip ring disposed between said contacts, said spring arms serving to bias said contacts toward each other and into contact with the opposite flat surfaces of said slip ring, a U-shaped slip ring follower of substantially rigid nonconductive material comprising legs and a base portion, the ends of said spring arms opposite the contact carrying ends being secured to the base portion of said U-shaped follower, the legs of said U-shaped follower having close fitting slots which receive said slip ring, and flexible spring means for mounting said follower to a stationary post whereby said follower is permitted to shift its position in response to the irregularities and rotational disturbances of said slip ring.

4. A slip ring and brush assembly comprising a pair of aligned coextensive spring arms having a pair of brush contacts respectively mounted at one of the ends thereof, a disk-like slip ring disposed between said brush contacts, said spring arms serving to bias said brush contacts toward each other and into contact with the opposite flat surfaces of said slip ring, a nonconductive slip ring follower having a central portion to which the opposite ends of said spring arms are secured and integral side extensions, said side extensions extending on either side of said spring arms and having respective slots therein which are aligned with the contact surfaces of the spring biased brush contacts, said slots serving to slidably engage said slip ring, and flexible spring means for mounting said follower to a stationary post.

5. A self-aligning slip ring brush assembly comprising a pair of aligned coextensive spring arms having a pair of contacts respectively mounted at one of the ends thereof, said spring arms serving to bias said contacts toward each other and into contact with the opposite flat surfaces of a disk-like slip ring adapted to be disposed therebetween, a U-shaped slip ring follower of substantially rigid nonconductive material comprising legs and a base portion, the ends of said spring arms opposite the contact carrying ends being secured to the base portion of said U-shaped follower with the legs of said follower extending parallel to said aligned spring arms and disposed on either side thereof, each of the legs of said follower having a slot therein which is adapted to slidably receive said slip ring, and flexible spring means secured to said follower for mounting the same to a stationary post whereby said follower is permitted to shift its position in

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response to the irregularities and rotational disturbances of said slip ring.

6. A slip ring and brush assembly comprising a pair of aligned coextensive spring arms having a pair of brush contacts respectively mounted at one of the ends thereof, a disk-like slip ring disposed between said brush contacts, said spring arms serving to bias said contacts toward each other and into contact with the opposite flat surfaces of said slip ring, a U-shaped slip ring follower of substantially rigid nonconductive material comprising legs and a base portion, the ends of said spring arms opposite the

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contact carrying ends being secured to the base portion of said U-shaped follower with the legs of said follower extending parallel to said aligned spring arms and disposed on either side thereof, each of the legs of said follower having a slot therein which slidably engages said slip ring, and flexible spring means for mounting said follower to a stationary post whereby said follower is permitted to shift its position in response to the irregularities and rotational disturbances of said slip ring.

No references cited.