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SEALED MERCURY SLIP RING ASSEMBLY

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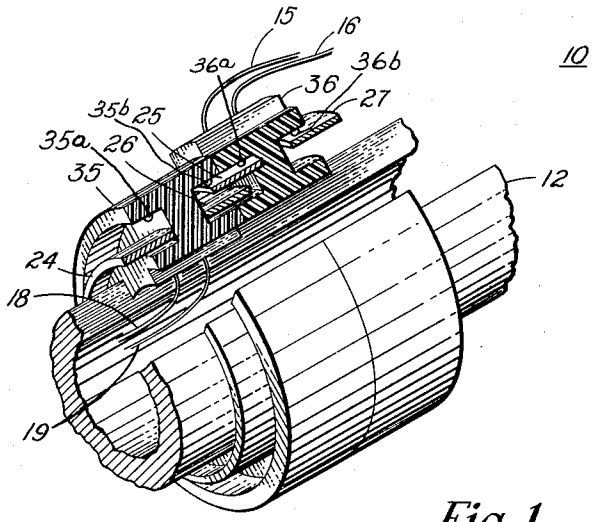

Fig. 1

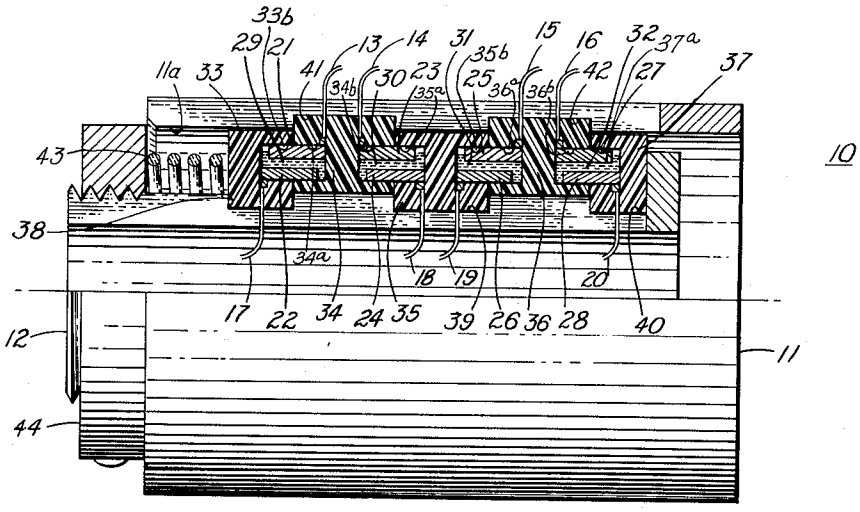

Fig. 2

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SEALED MERCURY SLIP RING ASSEMBLY

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The present invention relates in general to slip ring assemblies, and more particularly to slip ring assemblies utilizing mercury as the contacting material.

Heretofore electrical machinery have utilized mercury as the contacting material. However, such units utilized cups to contain the mercury, and, therefore, it was necessary to increase the diameter of the housing when adding additional slip rings.

Further, in such units the slip ring assemblies had to assume one position, and, if such assumed position were changed, the mercury contained by the cups would deposit outside of the cups. In addition thereto, such assemblies had excessive leakage.

Accordingly, an important object of the present invention is to provide a slip ring assembly having mercury therein as a contacting material in which added slip rings do not require an increase in diameter of the housing for each successive ring.

Another object of the present invention is to provide a slip ring assembly having mercury therein which can assume any position by providing insulating rings for sealing and containing the mercury.

Another object of the present invention is to provide a slip ring assembly in which the contacting noises are decreased by providing mercury as a contacting material contained in a plastic seal.

Another object of the present invention is to provide a slip ring assembly having mercury therein in which the slip rings can be aligned in a single row by providing a plastic seal for containing the mercury.

Other objects and features will appear upon further perusal of the detailed description taken in conjunction with the accompanying drawing in which:

Figure 1 is a perspective view of a portion of the slip ring assembly and having a cutaway portion to particularly illustrate the component arrangement thereof; and

Figure 2 is a partial sectional view of the slip ring assembly illustrating the plastic sealing and encasing of the mercury for providing a contact surface for the slip ring assembly.

Briefly described, a novel slip ring assembly for electrical machinery is herein provided comprising a conventional stator or stationary housing and a conventional rotor or rotatable shaft. For establishing an electrical connection between wire conductors of the rotating shaft and the housing, a suitable first slip ring is associated with the rotor and rotates therewith. A suitable second slip ring is associated with the stator and remains stationary therewith. In order to provide electrical contact between the first and second slip ring, mercury is deposited therebetween and makes contact with the opposing surfaces thereof. The first and second slip rings form a cooperative pair of slip rings, and in the preferred embodiment a plurality of cooperative pairs of slip rings is provided. For containing or sealing the mercury, a plurality of insulating rings, such as insulating plastic rings, is provided having grooves therein to provide a channel for the mercury which seal the mercury between the slip rings. In addition thereto, the slip rings are mounted in and supported by the plastic rings and received by the grooves to provide a guide edge. One plastic ring is keyed to the rotating shaft and rotates therewith. The plastic ring supports the rotating slip ring for rotation therewith. Another plastic ring is keyed to the housing and remains stationary therewith, and in addition thereto supports the stationary slip ring.

In the preferred embodiment, the plastic rings are alternately positioned so that the plastic ring keyed to the rotating shaft is contiguous with the plastic ring keyed to the housing and the grooves thereof are contiguous to provide an enclosed channel. The number of plastic rings will depend upon the number of cooperative pairs of slip rings in that each cooperative pair of slip rings has approximately one-half thereof surrounded by the plastic ring keyed to the rotating shaft and the remaining portion thereof surrounded by the plastic ring keyed to the housing. Accordingly, the plastic rings are compressed with a cooperating pair of slip rings so that, in combination with the opposing faces of the cooperative pair of slip rings and the grooves thereof, a seal is formed to captivate the mercury.

Referring now to Figures 1 and 2, a slip ring assembly **10** for electrical machinery is herein provided comprising a conventional stator or stationary housing **11** and a conventional rotor or stationary rotating shaft **12**. The housing **11** has a bore **11***a* therethrough for receiving the shaft **12**. For establishing electrical connections to the slip ring assembly **10** suitable lead conductors **13—16**, inclusive, are received by the housing **11** and, correspondingly, lead conductors **17—20**, inclusive, are received by the rotating shaft **12**.

For establishing electrical connections between the lead conductors **13—16**, inclusive, associated with the stationary housing and the corresponding lead conductors **17—20**, inclusive, associated with the rotating shaft **12**, a plurality of cooperating pairs of slip rings **21, 22; 23, 24; 25, 26; 27, 28**; is herein provided, which are aligned in a single row. Each lead conductor is individually connected to its associated slip ring by suitable means, such as solder.

In order to establish individual electrical contact between opposing surfaces of each cooperative pair of slip rings **21, 22; 23, 24; 25, 26; 27, 28**; a suitable conducting fluid, such as mercury, is provided. Accordingly, mercury **29—32**, inclusive, is positioned individually between opposing faces of the cooperative pair of slip rings **21, 22; 23, 24; 25, 26; 27, 28**. Therefore, mercury **29** provides a contacting material for the stationary slip ring **21** and the rotating slip ring **22**, thereby establishing an electrical connection between the conductors **13** and **17**. Accordingly, mercury **30, 31** and **32** function in a similar manner.

In order to seal or encase the mercury **29—32**, inclusive, individually between the opposing faces of the associated cooperating pair of slip rings **21, 22; 23, 24; 25, 26; 27, 28**; a plurality of insulating rings, such as insulating plastic rings **33—37**, inclusive, is provided. The plastic rings **33, 35**, and **37** are secured to the rotating shaft **12** in a suitable manner, such as keys, and rotates therewith. The plastic rings **33, 35** and **37** support the slip rings **22, 24, 26**, and **28** for rotation therewith. The plastic rings **34** and **36** are secured to the housing **11** in a suitable manner, such as keys, and remain stationary therewith. The plastic rings **34** and **36** support the slip rings **21, 23, 25**, and **27**, which remain stationary therewith. The plastic ring **33**, in the preferred embodiment, surrounds approximately one half of the cooperative pair of slip rings **21** and **22**. The plastic ring **34** is contiguous with the plastic ring **33** and surrounds the remaining portion of the cooperative pair of slip rings **21** and **22**,

thereby providing a seal to captivate the mercury 29. In addition thereto, the plastic ring 34 surrounds approximately one half of the cooperative pair of slip rings 23 and 24. The plastic ring 35, which is contiguous to the plastic rings 34 and 36, surrounds the remaining portion of the cooperative pair of slip rings 23 and 24, thereby providing a seal to captivate the mercury 30. Similarly, the plastic ring 36 functions. However, the plastic ring 37 abuts against the shaft 12 to form a compact assembly.

Accordingly, the plastic rings 33—36 are compressed with its associated pair of cooperative slip rings 21, 22; 23, 24; 25, 26; 27, 28; so that, in combination with the opposing faces of the cooperative pairs of slip rings, a seal is formed to captivate individually the mercury 29—32, inclusive. In more detail, the plastic rings 33—37, inclusive, are provided with circular grooves 34*a*—37*a*, respectively, and 33*b*—36*b*, respectively. The grooves 33*b* and 34*a* are positioned contiguous between one another to receive the slip rings 21 and 22 to provide a guide edge therefor and to receive the mercury 29 to provide an enclosed channel therefor. Similarly, grooves 34*b* and 35*a* are positioned contiguous to one another to receive the slip rings 23 and 24 to provide a guide edge therefor and to receive the mercury 30 to provide an enclosed channel therefor. Further, grooves 35*b* and 36*a* are positioned contiguous to one another to receive slip rings 25 and 26 to provide a guide edge therefor and to receive the mercury 31 to provide an enclosed channel therefor. In a like manner, grooves 36*a* and 37*b* are positioned contiguous to one another to receive slip rings 27 and 28 to provide a guide edge therefor and to receive the mercury 32 to provide an enclosed channel therefor.

It is to be noted that the rotating plastic rings 33, 35, and 37 are compressed in grooves 38, 39, and 40 so as to provide a secured attachment to the rotating shaft 12. The stationary plastic rings 34 and 36 are compressed in grooves 41 and 42 so as to provide a secured attachment to the stationary housing 11. The plastic rings 33, 35, and 37 are formed so as to provide a space between the portion thereof facing the housing 11 and the housing 11 so as to enable free rotation of the shaft 12. Accordingly, the plastic rings 34 and 36 are formed so as to provide a space between the portion thereof facing the shaft 12 and the shaft 12 so as to enable free rotation of the shaft 12. The rotating slip rings 22, 24, 26, and 28 are positioned so that one face thereof abuts against its associated rotating plastic ring and the other face thereof is adjacent to its associated stationary plastic ring, thereby permitting a space therebetween to allow for expansion of the mercury in the event it so requires. Likewise, stationary slip rings 21, 23, 25, and 27 are positioned so that one face thereof abuts against its associated stationary plastic ring and the other face thereof is adjacent to its associated rotating plastic ring, thereby permitting a space therebetween to allow for expansion of the mercury, in the event it so requires.

In the preferred embodiment, the plastic rings are made

of suitable material, such as Teflon or nylon, which are self lubricating, to minimize the friction against the surfaces of the plastic rings that rotate in respect to each other.

For holding the plastic rings 33—37, inclusive, in abutting relationship, a resilient member, such as spring 43, is provided. In order to keep the spring 43 positioned, a nut 44 is provided which is received by threads on the shaft 12 in a conventional manner.

It is to be understood that variations and modifications may be effected without departing from the scope of the appended claims.

I claim:

1. In an electrical assembly, in combination with a rotor and a stator, a pair of plastic rings secured to said rotor and stator, respectively, said rings having laterally matching recesses forming an annular chamber whose boundaries are intermediate the inner and outer peripheries of said plastic rings, a pair of metallic rings disposed within said chamber, said metallic rings being spaced to provide an annular sub-chamber bounded peripherally by said metallic rings and laterally by said plastic rings, and a current-conducting fluid occupying said sub-chamber and serving as an electrical connection between said metallic rings.

2. An assembly as defined in claim 1, and further including means for exerting clamping pressure along the axis of rotation of said rotor, to impede leakage of said current-conducting fluid.

3. An assembly as defined in claim 1, including axially operating means for establishing a fluid-tight seal around said chamber.

4. In an electrical assembly, in combination with a rotor and a stator, a pair of annular insulators splined to said rotor and stator, respectively, said insulators having laterally matching recesses forming an annular chamber intermediate the inner and outer peripheries of said insulators, a pair of electrically conductive rings integrated with said insulators and forming an annular sub-chamber bounded partly by said rings and partly by said insulators, and means for electrically connecting said rings.

5. An assembly as defined in claim 4, wherein said connecting means comprises current-conducting fluid occupying said sub-chamber.

6. An assembly as defined in claim 5, including means for pressing said insulators toward each other, to seal-in said fluid.

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