(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 019 460 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
26.10.2011 Bulletin 2011/43

(21) Application number: **08157572.2**

(22) Date of filing: **04.06.2008**

(51) Int Cl.:
H01R 39/08 *(2006.01)* ***H02K 13/00*** *(2006.01)*

(54) **Rotary electrical slip ring assembly**

Drehbare elektrische Schleifringanordnung

Ensemble de bague glissante électrique rotative

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR

(30) Priority: **24.07.2007 IT MI20071486**

(43) Date of publication of application:
28.01.2009 Bulletin 2009/05

(73) Proprietor: **Ravioli S.P.A.**
20139 Milano (IT)

(72) Inventor: **Daidone, Giorgio**
20141 Milano (IT)

(74) Representative: **Pesce, Michele**
Giambrocono & C. S.p.A.
Via Rosolino Pilo, 19/B
20129 Milano (IT)

(56) References cited:
DE-A1- 2 306 792
FR-A1- 2 790 614
US-A1- 2003 176 082

EP 2 019 460 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to a rotary electrical slip ring assembly.

[0002] When energy has to be transmitted between a fixed source and a rotary electrical machine, it is known to use appropriate devices provided with a part (the stator) arranged for coupling to a fixed source, and a part (the rotor) arranged for coupling to the rotary electrical machine; the stator and rotor are coupled together by a plurality of sliding contacts.

[0003] A rotary electrical machine usually requires the transmission of very high currents (for example for powering the machine) and also of low intensity currents (for example for signals for controlling and verifying machine operation).

[0004] Consequently, traditional slip ring assemblies must be able to transmit numerous electrical currents and are consequently provided with numerous sliding contacts between the rotor and stator; the result is that the rotor and stator have very large dimensions (height) which, in certain cases, are incompatible with the required use.

[0005] DE2306792 (A1) describes a rotary electrical slip ring assembly according to the precharacterizing portion of claim 1.

[0006] US 2003176082 (A1) describes an improved electrical cylindrical circuit collector ring assembly. The assembly includes an axial stack of multiple torodial-shaped spacer members and at least one electrical conductor ring member. The spacer members each include one insulating face and one electrically conductive face. The ring assembly also includes a general adhesive for mounting the insulator face to the ring members and an electrically conductive adhesive for mounting the conductive face to the ring members and for mounting ring members to ring members where applicable. The ring assembly also includes a radial extension on each of the conductive faces of the spacer members beyond the ring member diameter providing for an electrical connecting point. Finally, radial tabs provide lead wire channels and means of improved electrical shielding.

[0007] The technical aim of the present invention is therefore to provide a rotary slip ring assembly by which the stated technical drawbacks of the known art are eliminated.

[0008] Within the scope of this technical aim, an object of the invention is to provide a rotary slip ring assembly of small dimensions (in particular along its axis of rotation or height).

[0009] The technical aim, together with this and other objects are attained according to the present invention by a rotary slip ring assembly in accordance with claim 1.

[0010] Other characteristics of the present invention are defined in the subsequent claims.

[0011] Advantageously, the rotary slip ring assembly of the present invention also has a lesser weight than a traditional slip ring assembly with the same number of sliding contacts.

[0012] Further characteristics and advantages of the invention will be more evident from the description of a preferred but non-exclusive embodiment of the rotary slip ring assembly according to the invention, illustrated by way of non-limiting example in the accompanying drawing, in which:

the single figure represents a partially sectional view of a slip ring assembly according to the invention.

[0013] With reference to said figure, this shows a rotary slip ring assembly indicated overall by the reference numeral 1.

[0014] The electrical slip ring assembly 1 comprises a first electrical energy transmission unit 2 defined by a first rotor 3 slidably associated with a first stator 4.

[0015] The slip ring assembly 1 comprises a second electrical energy transmission unit 6 having a structure similar to that of the first unit 2 and hence defined by a second rotor associated with a second stator.

[0016] As shown in the figure, the second electrical energy transmission unit 6 is housed in a chamber 7 within the first rotor 3.

[0017] The chamber 7 of the first rotor 3 is formed on the same axis 9 as the first rotor 3 and is symmetrical about this axis 9.

[0018] The first rotor 3, the second rotor and the chamber 7 are all mutually coaxial (about the axis 9), the first rotor 3 and the second rotor being fixed to the same shaft 11.

[0019] The slip ring assembly 1 presents a frame composed of a first and a second plate 15, 16 which oppose each other and are joined together by ties 17, the first stator 4 being fixed between the first and second plate 15, 16.

[0020] The first plate 15 presents a hole 19 on the axis 9 of the first and second rotor, the conductor cables (not shown) connected to the second stator (of the transmission unit 6) passing through this hole 19.

[0021] Then all the cables (hence both said cables of the second stator and the cables of the first stator) pass through and are retained by a nozzle 20 passing through a lug 21 extending from the second plate 16.

[0022] The second electrical energy transmission unit 6 is positioned at the hole 19 and is fixed to the first plate 15.

[0023] The first rotor 3 is defined by first electrically conducting rings 25 electrically insulated from each other by rings of insulating material (typically plastic material) 26.

[0024] The first stator 4 comprises first electrical contacts 27 each connected to first brushes 29 slidable on the first conducting rings 25.

[0025] The second rotor (although not shown in detail) presents a structure identical to that of the first rotor 3 and is defined by second electrically conducting rings insulated electrically from each other; in the same man-

ner the second stator presents a structure similar to that of the first stator 4 and comprises second electrical contacts each connected to second brushes slidable on the second conducting rings.

[0026] The chamber 7 is defined within the first conducting rings 25 (in a position corresponding with the first plate 15 and the hole 19).

[0027] The operation of the slip ring assembly according to the invention is apparent from that described and illustrated and is substantially the following.

[0028] The electric cables (not shown) are firstly connected to achieve the correct electrical connections between the various parts of the electrical machine.

[0029] In this respect, it will be noted that the first transmission unit 2 is able to transmit greater current intensities than the second transmission unit 6 because of the greater dimensions of the first and second brushes and of the first and second rings.

[0030] Consequently, power for the electrical machine and the high-power signals is preferably provided via the first transmission unit 2, while power for the control and verification signals is preferably provided via the second transmission unit 6.

[0031] Operation is similar to that of a rotary slip ring assembly of traditional type.

[0032] Modifications and variants, in addition to those already described, are evidently possible, for example the number of transmission units inserted one into the other can be greater than two; for example in the case of groups of electrical signals of mutually different intensity, a slip ring assembly provided with numerous transmission units could be provided, each within another and each suitable for transferring a predetermined current intensity.

[0033] It has been found in practice that the rotary slip ring assembly of the invention is particularly advantageous, being of particularly small dimensions.

[0034] In practice the materials used and the dimensions can be chosen at will according to requirements and to the state of the art.

[0035] In a further embodiment, for example the plates 15 and 16 can be of circular shape (simplifying its construction) and can be of plastic material.

Claims

1. A rotary electrical slip ring assembly (1) comprising a first electrical energy transmission unit (2) defined by a first rotor (3) slidably associated with a first stator (4), at least a second electrical energy transmission unit (6) defined by a second rotor associated with a second stator, the second electrical energy transmission unit (6) being housed in a chamber (7) of the first rotor (3)
characterised in that the first rotor (3) is defined by first electrical conducting rings (25) electrically insulated from each other, the first stator (4) comprising first electrical contacts (27) each connected to first brushes (29) slidable on said first conducting rings (25), the second rotor being defined by second conducting rings electrically insulated from each other, the second stator comprising second electrical contacts each connected to second brushes slidable on said second conducting rings,
said chamber (7) being defined within said first conducting rings (25).

2. A slip ring assembly (1) as claimed in claim 1, **characterised in that** the chamber (7) of the first rotor (3) is provided on the axis (9) of the first rotor (3) and is symmetrical about that axis (9).

3. A slip ring assembly (1) as claimed in one or more of the preceding claims, **characterised in that** the first rotor (3), the second rotor and the chamber (7) are coaxial.

4. A slip ring assembly (1) as claimed in one or more of the preceding claims, **characterised in that** the first rotor (3) and the second rotor are fixed to one and the same shaft (11).

5. A slip ring assembly (1) as claimed in one or more of the preceding claims, **characterised by** presenting a frame composed of a first and a second plate (15, 16) which oppose each other and are joined together by ties (17), said first stator (4) being fixed between said first and second plate (15, 16).

6. A slip ring assembly (1) as claimed in one or more of the preceding claims, **characterised in that** at least said first plate (15) presents a hole (19) on the axis (9) of said first and second rotor, the conductor cables connected to said second stator passing through said hole (19).

7. A slip ring assembly (1) as claimed in one or more of the preceding claims, **characterised in that** said second electrical energy transmission unit (6) is located in a position corresponding with said hole (19).

8. A slip ring assembly (1) as claimed in one or more of the preceding claims, **characterised in that** the second electrical energy transmission unit (6) is fixed to said first plate (15).

9. A slip ring assembly (1) as claimed in claim 1, **characterised in that** said chamber (7) lies within said first rotor (4).

Patentansprüche

1. Drehbarer elektrischer Schleifringkörper (1) umfassend eine erste Übertragungseinheit (2) für elektri-

sche Energie, welche durch einen ersten Rotor (3) definiert ist, welcher einem ersten Stator (4) verschiebbar zugeordnet ist, mindestens eine zweite Übertragungseinheit (6) für elektrische Energie, welche durch einen zweiten Rotor definiert ist, der einem zweiten Stator zugeordnet ist, wobei die zweite Übertragungseinheit (6) für elektrische Energie in einer Kammer (7) des ersten Rotors (3) untergebracht ist, **dadurch gekennzeichnet, dass** der erste Rotor (3) durch gegeneinander elektrisch isolierte erste elektrisch leitende Ringe (25) definiert ist, wobei der erste Stator (4) erste elektrische Kontakte (27) umfasst, die jeweils mit auf den ersten leitenden Ringen (25) verschiebbaren ersten Bürsten (29) verbunden sind, wobei der zweite Rotor durch gegeneinander elektrisch isolierte zweite leitende Ringe definiert ist, wobei der zweite Stator zweite elektrische Kontakte umfasst, die jeweils mit auf den zweiten leitenden Ringen verschiebbaren zweiten Bürsten verbunden sind, wobei die Kammer (7) innerhalb der ersten leitenden Ringe (25) definiert ist.

2. Schleifringkörper (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kammer (7) des ersten Rotors (3) auf der Achse (9) des ersten Rotors (3) vorgesehen ist und in Bezug auf diese Achse (9) symmetrisch ist.

3. Schleifringkörper (1) nach einem oder mehreren der voranstehenden Ansprüche, **dadurch gekennzeichnet, dass** der erste Rotor (3), der zweite Rotor und die Kammer (7) koaxial sind.

4. Schleifringkörper (1) nach einem oder mehreren der voranstehenden Ansprüche, **dadurch gekennzeichnet, dass** der erste Rotor (3) und der zweite Rotor an ein und derselben Welle (1) befestigt sind.

5. Schleifringkörper (1) nach einem oder mehreren der voranstehenden Ansprüche, **dadurch gekennzeichnet, dass** er ein Gestell bereitstellt, welches aus einer ersten und einer zweiten Platte (15, 16), die einander gegenüberliegen und aneinander durch Bindebalken (17) gekoppelt sind, zusammengesetzt ist, wobei der erste Stator (4) zwischen der ersten und zweiten Platte (15, 16) befestigt ist.

6. Schleifringkörper (1) nach einem oder mehreren der voranstehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens die erste Platte (15) ein Loch (19) auf der Achse (9) des ersten und zweiten Rotors bereitstellt, wobei mit dem zweiten Stator verbundene Leiterkabel durch das Loch (19) hindurch laufen.

7. Schleifringkörper (1) nach einem oder mehreren der voranstehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Übertragungseinheit (6) für elektrische Energie in einer mit dem Loch (19) korrespondierenden Position angeordnet ist.

8. Schleifringkörper (1) nach einem oder mehreren der voranstehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Übertragungseinheit (6) für elektrische Energie an der ersten Platte (15) befestigt ist.

9. Schleifringkörper (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kammer (7) innerhalb des ersten Rotors (4) liegt.

Revendications

1. Ensemble de bague collectrice électrique rotative (1) comprenant une première unité de transmission d'énergie électrique (2) définie par un premier rotor (3) associé de manière coulissante à un premier stator (4), au moins une deuxième unité de transmission d'énergie électrique (6) définie par un deuxième rotor associé à un deuxième stator, la deuxième unité de transmission d'énergie électrique (6) étant logée dans une chambre (7) du premier rotor (3) **caractérisé en ce que** le premier rotor (3) est défini par des premières bagues conductrices électriques (25) électriquement isolées les unes des autres, le premier stator (4) comprenant des premiers contacts électriques (27), chacun raccordé aux premiers balais (29) pouvant coulisser sur lesdites premières bagues conductrices (25), ledit deuxième rotor étant défini par des deuxièmes bagues conductrices, électriquement isolées les unes des autres, le deuxième stator comprenant des deuxièmes contacts électriques, chacun raccordé à des deuxièmes balais pouvant coulisser sur lesdites deuxièmes bagues conductrices, ladite chambre (7) étant définie à l'intérieur desdites premières bagues conductrices (25).

2. Ensemble de bague collectrice (1) selon la revendication 1, **caractérisé en ce que** la chambre (7) du premier rotor (3) est prévue sur l'axe (9) du premier rotor (3) et est symétrique autour de cet axe (9).

3. Ensemble de bague collectrice (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** le premier rotor (3), le deuxième rotor et la chambre (7) sont coaxiaux.

4. Ensemble de bague collectrice (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** le premier rotor (3) et le deuxième rotor sont fixés à un seul et même arbre (11).

5. Ensemble de bague collectrice (1) selon une ou plusieurs des revendications précédentes, **caractérisé par** la présentation d'un châssis composé d'une pre-

mière et d'une deuxième plaque (15, 16) qui s'opposent et sont assemblées par des attaches (17), ledit premier stator (4) étant fixé entre lesdites première et deuxième plaques (15, 16).

6. Ensemble de bague collectrice (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**au moins ladite première plaque (15) présente un trou (19) sur l'axe (9) desdits premier et deuxième rotors, les câbles conducteurs étant raccordés audit deuxième stator qui passe à travers ledit trou (19).

7. Ensemble de bague collectrice (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** la deuxième unité de transmission d'énergie électrique (6) est positionnée dans une position correspondant avec ledit trou (19).

8. Ensemble de bague collectrice (1) selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** la deuxième unité de transmission d'énergie électrique (6) est fixée sur ladite première plaque (15).

9. Ensemble de bague collectrice (1) selon la revendication 1**, caractérisé en ce que** ladite chambre (7) se trouve à l'intérieur dudit premier rotor (4).

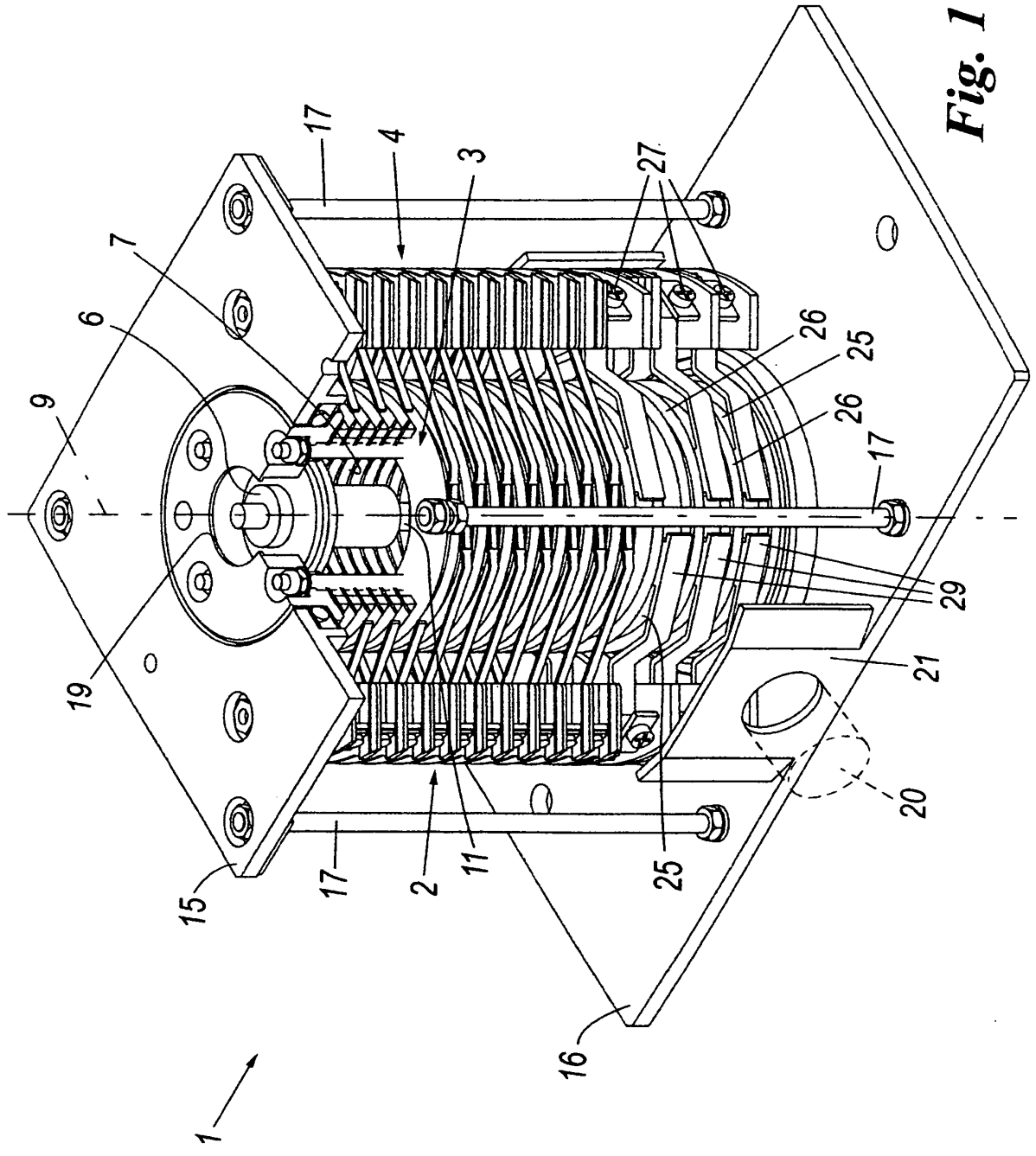

Fig. 1

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 2306792 **[0005]**
- US 2003176082 A **[0006]**