

ELECTRIC MACHINE ASSEMBLY

FIELD

[0001] Embodiments of the present disclosure generally relate to electric machine assembly.

5 BACKGROUND

[0002] A shaft electric machine generally comprises a body part, a shaft and a rotor such that there are no bearings between the shaft and the body part. The rotor may be connected to a shaft of a propeller. The shaft electric machine may drive the shaft to rotate via the rotor.

10 [0003] Conventionally, the shaft is directly connected to the rotor. The displacement of the rotor relative to the shaft is required to connect the rotor to the shaft or disconnect the rotor from the shaft. The electric machine on which the rotor is integrated has a big volume and weight, and thereby movement of the electric machine is cumbersome and labor-consuming.

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SUMMARY

[0004] Embodiments of the present disclosure provide an electric machine assembly and respective method of connecting and disconnecting the electric machine assembly from the shaft.

20 [0005] In a first aspect, an electric machine assembly is provided. The electric machine assembly comprises a body part, a stator supported by the body part, a rotor adapted to rotate relative to the stator, and a connecting member. The rotor comprises a rotor body configured to receive a shaft inside thereof, and a rotor flange extending from an interior surface of the rotor body. The connecting member may be movably coupled to the rotor
25 flange and at least partially enclose the shaft. The connecting member is configured to connect to a shaft flange of the shaft at a first position relative to the rotor flange, and separate from the shaft at a second position relative to the rotor flange.

[0006] In one or more embodiments, the first position may be a location where the connecting member is positioned such that the connecting member abuts against the rotor
30 flange.

[0007] By utilizing the design disclosed herein, both the connection and disconnection between the shaft and rotor may be facilitated. Specifically, it may cost less time to disconnect the rotor from the shaft, and thereby it satisfies the stringent temporal requirement when there is an emergency.

5 [0008] In one or more embodiments, the first position is one endpoint of a movement range of the connecting member relative to the rotor flange, and the second position is within the movement range, and the electric machine assembly comprises a position-limit mechanism configured to define said movement range, and a movement mechanism configured to translate the connecting member from the first position to the second position along a
10 direction parallel to an axis of the shaft.

[0009] In one or more embodiments, the position-limit mechanism comprises a lead screw and a nut assembly. The connecting member comprises an opening adjacent to an outer edge of the connecting member. The lead screw is configured to pass through the opening of the connecting member and abut against the rotor flange at a terminal tip of the lead screw.
15 The nut assembly is coupled to the lead screw via thread connection and configured to translate along the lead screw.

[0010] In one or more embodiments, the nut assembly comprises a first nut. The first nut is configured to abut against a side of the connecting member facing away from the rotor flange when the connecting member reaches a limit of the movement range.

20 [0011] In one or more embodiments, the rotor flange comprises a first threaded hole and the movement mechanism comprises a first screw coupled to the first threaded hole of the rotor flange. The first screw is configured to abut against the connecting member at a terminal tip of the first screw, and translate the connecting member in said direction away from the rotor flange via screwing in.

25 [0012] In one or more embodiments, the connecting member comprises a plurality of first further holes adjacent to an inner edge of the connecting member, and a plurality of second further holes adjacent to an outer edge of the connecting member. The connecting member is configured to, at said first position, be fixedly connected to the shaft using a first fastener passing through respective holes on the shaft flange and the plurality of first further holes.
30 The connecting member is configured to, at said first position, be fixedly connected to the rotor flange using a second fastener passing through respective holes on the rotor flange and the plurality of second further holes.

[0013] In one or more embodiments, the connecting member comprises a plurality of arc plates.

[0014] In one or more embodiments, the number of the arc plates in the plurality of arc plates is four, and each of the plurality of arc plates extends an angular distance of 90 degrees
5 across the shaft.

[0015] In one or more embodiments, the connecting member is a single monolithic part and extends an angular distance of 360 degrees across the shaft.

[0016] In a second aspect, a method for connecting a shaft to a rotor of an electric machine assembly is provided. The method comprises providing an electric machine assembly.
10 The electric machine assembly comprises a body part, a stator supported by the body part, a rotor adapted to rotate relative to the stator, and a connecting member. The rotor comprises a rotor body configured to receive a shaft inside thereof and a rotor flange extending from an interior surface of the rotor body. The connecting member is movably coupled to the rotor flange and configured to at least partially enclose the shaft, and configured to connect to the
15 shaft at a first position relative to the rotor flange, and separate from the shaft at a second position relative to the rotor flange. The method further comprises translating the connecting member to the first position, and connecting the connecting member to the shaft flange using a first fastener passing through respective holes on the shaft flange and a plurality of first further holes of the connecting member.

[0017] In a third aspect, a method of disconnecting a shaft from a rotor of an electric machine assembly is provided. The method comprises providing an electric machine assembly comprising. The electric machine assembly comprises a body part, a stator supported by the body part, a rotor adapted to rotate relative to the stator; and a connecting member. The rotor comprises a rotor body configured to receive a shaft inside thereof, and
25 a rotor flange extending from an interior surface of the rotor body. The connecting member is movably coupled to the rotor flange and configured to at least partially enclose the shaft, and configured to connect to the shaft at a first position relative to the rotor flange, and separate from the shaft at a second position relative to the rotor flange. The method further comprises disconnecting the connecting member from the shaft, and translating the
30 connecting member to the second position.

[0018] In one or more embodiments, the first position is one endpoint of a movement range of the connecting member relative to the rotor flange, and the second position is within the

movement range. Providing the electric machine assembly further comprises providing a position-limit mechanism configured to define the movement range, and providing a movement mechanism configured to translate the connecting member from the first position to the second position along a direction parallel to an axis of the shaft. Translating the
5 connecting member to the second position further comprises translating the connecting member to the second position using the movement mechanism.

[0019] In one or more embodiments, the position-limit mechanism comprises a lead screw and a nut assembly. The connecting member comprises an opening adjacent to an outer edge of the connecting member. The lead screw is configured to pass through the opening
10 of the connecting member and abut against the rotor flange at a terminal tip of the lead screw. The nut assembly is coupled to the lead screw via thread connection and configured to translate along the lead screw.

[0020] In one or more embodiments, the nut assembly comprises a first nut. The first nut is configured to abut against a side of the connecting member facing away from the rotor
15 flange when the connecting member reaches a limit of the movement range.

[0021] In one or more embodiments, the rotor flange comprises a first threaded hole, and the movement mechanism comprises a first screw coupled to the first threaded hole of the rotor flange. The first screw is configured to abut against the connecting member at a terminal tip of the first screw, and translate the connecting member in said direction away
20 from the rotor flange via screwing in.

[0022] It is to be understood that the Summary is not intended to identify key or essential features of embodiments of the present disclosure, nor is it intended to be used to limit the scope of the present disclosure. Other features of the present disclosure will become easily comprehensible through the description below.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The above and other objectives, features and advantages of the present disclosure will become more apparent through more detailed depiction of example embodiments of the present disclosure in conjunction with the accompanying drawings, wherein in the example
30 embodiments of the present disclosure, same reference numerals usually represent the same components.

[0024] Fig.1 illustrates an electric machine assembly according to an embodiment of the disclosure;

[0025] Fig. 2 illustrates the electric machine assembly of Fig. 1 without a shaft and end members;

5 [0026] Fig. 3 shows a cross-section of the electric machine assembly shown in Fig. 1;

[0027] Fig. 4 shows a cross-section of a rotor detached from the electric machine assembly of Fig. 1 and a pair of connecting member in form of arc plates;

[0028] Fig. 5 shows an enlarged view of the rotor and the connecting member shown in Fig. 4, in conjunction with the shaft and fasteners;

10 [0029] Fig. 6 shows an enlarged view of the rotor and connecting member shown in Fig. 4, in conjunction with the shaft, a position-limit mechanism and a movement mechanism;

[0030] Fig. 7 illustrates a schematic diagram of the relative position of the rotor, shaft and connecting member shown in Fig. 6;

15 [0031] Fig. 8 shows an another enlarged view of the rotor and connecting member shown in Fig. 4, in conjunction with the shaft, a position-limit mechanism and a movement mechanism;

[0032] Fig. 9 shows a further enlarged view of the rotor and connecting member shown in Fig. 4, in conjunction with the shaft, a movement mechanism and a position-limit mechanism;

20 [0033] Fig. 10 illustrates a schematic diagram of the relative position of the rotor, shaft and connecting member shown in Fig. 9; and

[0034] Fig. 11 shows a further enlarged view of the rotor and connecting member shown in Fig. 4, in conjunction with the shaft, a movement mechanism and a position-limit mechanism.

[0035] Throughout the drawings, the same or similar reference symbols are used to indicate the same or similar elements.

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DETAILED DESCRIPTION

[0036] The present disclosure will now be discussed with reference to several example embodiments. It is to be understood these embodiments are discussed only for the purpose of enabling those skilled persons in the art to better understand and thus implement the

present disclosure, rather than suggesting any limitations on the scope of the subject matter.

[0037] As used herein, the term “comprises” and its variants are to be read as open terms that mean “comprises, but is not limited to.” The term “based on” is to be read as “based at least in part on.” The term “one embodiment” and “an embodiment” are to be read as “at least one embodiment.” The term “another embodiment” is to be read as “at least one other embodiment.” The terms “first,” “second,” and the like may refer to different or same objects. Other definitions, explicit and implicit, may be comprised below. A definition of a term is consistent throughout the description unless the context clearly indicates otherwise.

[0038] Conventionally, the shaft flange is directly connected to the rotor. To disconnect the rotor from the shaft, the operator may need to remove the fasteners between the rotor and the shaft, and move the shaft electric machine relative to the shaft, so as to separate the rotor from the shaft by a distance. These processes are labor-consuming and time-costing.

[0039] Generally, there is a temporal requirement for separating the shaft from the rotor of the shaft electric machine. In particular, in case of emergency, the work of emergency removal for shaft electric machine on ship needs to be finished within limited times, such as three hours.

[0040] The present disclosure intends to provide an electric machine assembly suitable for being used in the shaft electric machine to facilitate the connection and disconnection of the shaft electric machine and the shaft.

[0041] Fig.1 illustrates an electric machine assembly according to an embodiment of the disclosure. Fig. 2 illustrates the electric machine assembly of Fig. 1 without a shaft and end members. Fig. 3 shows a cross-section of the electric machine assembly shown in Fig. 1.

[0042] The electric machine assembly of the present disclosure may be used for a shaft electric machine capable of operating both as a generator and a motor. The shaft electric machine is an electric machine whose shaft 4 is not supported by the body part of the electric machine. It is also possible that the electric machine assembly of the present disclosure may be modified to be suitable for other types of electric machines.

[0043] Herein, the electric machine assembly suitable for the shaft electric machine is illustrated as an example.

[0044] Referring to Figs. 1-3, the electric machine assembly may comprise a body part 10, a stator 2, a rotor 3, and a pair of end members 90. The stator 2 is supported by the body

part 10. The rotor 3 is located inside the stator 2, and is adapted to rotate relative to the stator 2. The rotor comprises a rotor body 31 and a rotor flange 32. The rotor body 31 is configured to receive a shaft 4 inside of the rotor body 31. For example, the shaft 4 may be the shaft 4 of a propeller of a ship. The shaft 4 may have a length extending across the electric machine assembly. The shaft 4 may comprise a shaft flange 41 radially extending from the shaft body and be an integral part of the shaft 4. In one example, the rotor body 31 may be in form of a cylinder and have a first inner diameter larger than the outer diameter of the shaft 4.

[0045] The rotor flange 32 may extend from an interior surface of the rotor body 31. In one example, the rotor flange 32 may radially extend from the interior surface of the rotor body 31 so as to form a circumferential wall on the interior surface. The proximal end of rotor flange 32 may have a thick portion to strengthen the structural stability. The distal end of the rotor flange 32 may be tapered and separated from the shaft flange 41 by a clearance.

[0046] The rotor may be coupled to the shaft flange 41 of the shaft 4 via a connecting member 5. The connecting member 5 may be movably coupled to the rotor flange 32 and configured to at least partially enclose the shaft 4. In an example, the connecting member 5 may be moved by means of force from external source before being locked.

[0047] In one example, the connecting member 5 may be in a form of a circular ring or be assembled to form a circular ring. The connecting member 5 may be dimensioned such that the connecting member 5 may partially overlap with the shaft flange 41 of the shaft 4 and the rotor flange 32 of the rotor, which is depicted in Fig. 6 and will be discussed in detail below.

[0048] The connecting member 5 may be configured to connect to the shaft 4 at a first position relative to the rotor flange 32, and be separated from the shaft 4 at a second position relative to the rotor flange 32. The operator may lock the connecting member 5 to the rotor flange 32 at the first position before inserting the shaft 4 within the rotor. In one example, the first position is determined as a location where the connecting member 5 is positioned such that the connecting member 5 abuts against the rotor flange 32. The increased contact area between the rotor flange 32 and the connecting member 5 may ensure that sufficient friction between the rotor flange 32, and the connecting member 5 may be induced to facilitate the rotation of the shaft 4 coupled to the connecting member 5 together with the rotor. In addition, a commercially available friction ring may be used in combination with the arrangement of the connecting member 5, which abuts against the rotor flange 32 at the

first position.

[0049] In one example, the connecting member 5 may comprise a plurality of arc plates. The number of the arc plates in the plurality of arc plates may be four. In particular, each of the four arc plates may extend an angular distance of 90 degrees across the shaft 4.

5 [0050] In another example, more or less arc plates are also possible. Also, each of the arc plates may extend a different angular distance across the shaft 4. For example, one of the arc plates may extend an angular distance of 60 degrees, or 120 degrees.

[0051] As an alternative, the connecting member 5 may be a single monolithic part. The connecting member 5 may extend an angular distance of 360 degrees across the shaft 4. In
10 another example, the connecting member 5 may have a notch extending in circumferential direction. In other words, the connecting member 5 may not be a complete circle. The connecting member 5 may extend an angular distance less than 360 degrees, for example, 320 degrees, 270 degrees, or 240 degrees.

[0052] Fig. 4 shows a cross-section of a rotor detached from the electric machine assembly
15 of Fig. 1 and a pair of connecting member 5 in form of arc plates. Fig. 5 shows an enlarged view of the rotor and connecting member 5 shown in Fig. 4, in conjunction with the shaft 4 and fasteners.

[0053] Referring to Figs. 4 and 5, the connecting member 5 may comprise a plurality of
20 first further holes 51 adjacent to an inner edge of the connecting member 5, and a plurality of second further holes 52 adjacent to an outer edge of the connecting member 5.

[0054] When the connecting member 5 is located at the first position, the connecting member 5 may be configured to be fixedly connected to the shaft 4 using a first fastener 101 passing through respective holes on the shaft flange 41 and the plurality of first further holes 51, and fixedly connected to the rotor flange 32 using a second fastener 102 passing through
25 respective holes on the rotor flange 32 and the plurality of second further holes 52.

[0055] In use, the operator may connect the connecting member 5 to the rotor flange 32 and the shaft flange 41 by means of the first and second fasteners 101, 102.

[0056] The first fasteners may comprise screws. In one example, the screws may be connected to the connecting member 5 via thread connection. Additionally, the screws may
30 further be connected to the rotor flange 32 via thread connection. In one example, the screws are screwed and the screw head of the screws may be configured to abut against a

side of the rotor flange 32 opposite to the side facing the connecting member 5.

[0057] In addition, the second fasteners 102 may comprise screws. In one example, the screws may be connected to the connecting member 5 via thread connection. Additionally, the screw may further be connected to the rotor via thread connection. In one example, the screw head may be configured to abut against a side of the shaft flange 41 opposite to the side facing the connecting member 5.

[0058] When there is need to disconnect the shaft 4 from the rotor, the operator may disconnect the connecting member 5 from the shaft flange 41, such that only the connecting member 5 needs to be moved, while the rotor is not required to be moved along the shaft 4. In one example, the operator may remove the first and second fasteners 101, 102 so as to detach the connecting member 5. In this way, the workload of disconnecting the shaft 4 from the rotor may be significantly reduced.

[0059] To further reduce the workload of disconnecting the shaft 4 from the rotor and speed up the process thereof, the present disclosure further provides a position-limit mechanism 6 and a movement mechanism 7 for being used in the electric machine assembly.

[0060] Fig. 6 shows an enlarged view of the rotor and connecting member 5 shown in Fig. 4, in conjunction with the shaft 4, a position-limit mechanism 6 and a movement mechanism 7, wherein the connecting member 5 is located at a first position. Fig. 7 illustrates a schematic diagram of the relative position of the rotor, shaft and connecting member shown in Fig. 6. Fig. 8 shows another enlarged view of the rotor and connecting member 5 shown in Fig. 4, in conjunction with the shaft 4, a position-limit mechanism 6 and a movement mechanism 7, wherein the connecting member 5 is located at a second position.

[0061] Referring to Figs. 6-8, the electric machine assembly may further comprise a position-limit mechanism 6 and a movement mechanism 7. The position-limit mechanism 6 may be configured to define a movement range of the connecting member 5 relative to the rotor flange 32. The first position may be one endpoint of the movement range, and the second position is within the movement range. The movement mechanism 7 may be configured to translate the connecting member 5 from the first position to the second position along a direction away from the rotor flange 32. The direction is oriented as being parallel to an axis of the shaft 4.

[0062] In one example, the position-limit mechanism 6 may comprise a lead screw 61 and

a nut assembly 62. The connecting member 5 may comprise an opening adjacent to an outer edge of the connecting member 5, and the lead screw 61 may be configured to pass through the opening of the connecting member 5. In one example, the lead screw 61 is configured to connect to the rotor flange 32 at a terminal tip of the lead screw. In particular, the terminal tip of the lead screw 61 may be threaded to the respective threaded holes on the rotor flange 32.

[0063] The nut assembly 62 may be coupled to the lead screw 61 via thread connection, and configured to translate along the lead screw. The nut assembly 62 may comprise a first nut. The first nut may be positioned adjacent to a side of the connecting member 5 facing away from the rotor flange 32. After the first and second fasteners 101, 102, which have been discussed above with reference to Fig. 5, are removed, the connecting member 5 is movable between a side of rotor flange 32 and a location where the nut assembly 62 is positioned. The first nut may further be configured to abut against a side of the connecting member 5 facing away from the rotor flange 32 when the connecting member 5 reaches a limit of the movement range. In another example, a bias spring is provided between the first nut and a screw head of the lead screw. The bias spring is configured to define the minimum available distance of the first nut to the screw head of the lead screw. By defining the minimum available distance, the movement range of connecting member 5 is also determined and thus the connecting member 5 may not be allowed to move to a location where the weight of the connecting member 5 caused by gravity would lead to fracture of the lead screw.

[0064] In one example, the movement mechanism 7 may comprise a first screw and the rotor flange 32 may comprise a first thread hole. The first screw may be coupled to the first threaded hole of the rotor flange 32. The first screw may be configured to abut against the connecting member 5 at a terminal tip of the first screw, and translate the connecting member 5 in the direction away from the rotor flange 32 via screwing in. In one example, the operator may firstly set the movement range of the connecting member 5 by adjusting the nut assembly 62 of the position-limit mechanism 6, and then screw in the first screw to push the connecting member 5 so that the connecting member 5 may be translated along the lead screw. Till the connecting member 5 is moved to a second position relative to the rotor flange 32, the operator may stop screwing in the first screw. In one example, the second position is determined based on the predetermined gap between the connecting member 5 and the shaft flange 41 according to safety requirement.

[0065] In one example, the second position of the connecting member may be corresponding to a location where the screw head of the first screw abuts against a side of the rotor flange 32 facing away from the connecting member 5.

[0066] In one example, the position-limit mechanism 6 and the movement mechanism 7 may be mounted on the connecting member 5 and the rotor flange 32, respectively, before the connecting member 5 is coupled to the shaft flange 41. Thus, the operator may separate the connecting member 5 from the shaft flange 41 using the position-limit mechanism 6 and the movement mechanism 7 immediately after the first and second fasteners 101, 102 mentioned above with reference to Fig. 5 are removed.

[0067] In another example, the position-limit mechanism 6 and the movement mechanism 7 may be mounted on the connecting member 5 and the rotor flange 32, respectively, after the removal of the first and second fasteners 101, 102. That is, before separating the connecting member 5 from the shaft flange 41, a two-step process needs to be done by the operator. The operator may remove the first and second fasteners 101, 102 one by one, and then couple the position-limit mechanism 6 and the movement mechanism 7 to the connecting member 5 and the rotor flange 32, respectively. This may provide the benefit that the position-limit mechanism 6 and the movement mechanism 7 may utilize the holes configured to receive the first and second fasteners. For example, one of the plurality of second further holes may be served as an opening to pass through the lead screw, and one of the respective holes to pass through the second fasteners 102 may be threaded to the terminal tip of the lead screw. Similarly, one of the respective holes to pass through the second fasteners 101 may be threaded to the first screw of the movement mechanism 7. In another example, the dedicated holes suitable for the position-limit mechanism 6 and the movement mechanism 7 are provided. These dedicated holes are distinct from the holes to pass through the first and second fasteners 101, 102.

[0068] In further examples, the movement mechanism 7 may further comprise a tab disposed between the screw head of the first screw and the rotor flange 32. The tab may be threaded to the first screw. The tab may be bended to contact the rotor flange 32 so as to prevent the reverse movement of the first screw, i.e. screwing out.

[0069] Fig. 9 shows a further enlarged view of the rotor and connecting member 5 shown in Fig. 4, in conjunction with the shaft 4, a movement mechanism 8 and a position-limit mechanism 9, wherein the connecting member 5 is located at a first position. Fig. 10

illustrates a schematic diagram of the relative position of the rotor, shaft and connecting member shown in Fig. 9. Fig. 11 shows a further enlarged view of the rotor and connecting member 5 shown in Fig. 4, in conjunction with the shaft 4, a movement mechanism 8 and a position-limit mechanism 9, wherein the connecting member 5 is located at a second position.

5 [0070] Referring to Figs. 9-11, the electric machine assembly may further comprise a movement mechanism 8 and a position-limit mechanism 9. Though the structure of the movement mechanism 8 and the position-limit mechanism 9 illustrated in Figs. 9-11 may be the same as the position-limit mechanism 6 and the movement mechanism 7 illustrated in Figs. 6-8 respectively, the working manner of the movement mechanism 8 and the position-limit mechanism 9 is different from the position-limit mechanism 6 and the movement mechanism 7. The position-limit mechanism 9 may be configured to define a movement range of the connecting member 5 relative to the rotor flange 32. The first position may be one endpoint of the movement range, and the second position is within the movement range. The movement mechanism 8 may be configured to translate the connecting member 5 from the first position to the second position along a direction away from the rotor flange 32. The direction is oriented as being parallel to an axis of the shaft 4.

[0071] The movement mechanism 8 may comprise a lead screw 81 and a nut assembly 82. The nut assembly 82 is coupled to the lead screw 81 via thread connection and configured to translate along the lead screw 81. The connecting member 5 may comprise an opening adjacent to an inner edge of the connecting member 5, and the lead screw 81 may be configured to pass through the opening of the connecting member 5. The lead screw 81 is configured to abut against the rotor flange 32 at a terminal tip of the lead screw 81. The lead screw 81 may be further coupled to the opening of the connecting member 5 via thread connection. The connecting member 5 may be translated along the lead screw 81 by rotating the lead screw 81. In one example, the connecting member 5 is translated from the first position towards the second position by screwing in the lead screw 81. The nut assembly 82 may be used to define the second position. In one example, the nut assembly 82 may be translated along the lead screw to a position where the connecting member 5 may abut against the nut assembly 82 when being translated to the second position.

30 [0072] The position-limit mechanism 9 may comprise a first screw. The rotor flange 32 may comprise an opening. The first screw may comprise a screw head and a screw body extending from the screw head. The screw body of the first screw may be arranged to pass

through the opening of the rotor flange 32 and be coupled to a respective threaded hole of the connecting member 5. In one example, the movement range may be determined based on the length of the screw body. In another example, the limit of movement of the position-limit mechanism 9 relative to the rotor flange 32 is reached when the screw head of the first screw abuts against the surface of the rotor flange 32. In case the first position is one endpoint of the movement range, the position where the screw head of the first screw abuts against the surface of the rotor flange may be determined as the other endpoint of the movement range. In a further example, the movement range may further be adjusted by adjusting the degree of thread connection between the first screw and connecting member 5.

10 [0073] Other arrangements described with reference to Figs. 6-8 may also be applied to these embodiments with reference to Figs. 9-11. For the sake of brevity, similar elements, functions, and operations between embodiments will not be repeatedly described.

15 [0074] In another embodiment, the position-limit mechanism 6 illustrated in Figs. 6-8 and the position-limit mechanism 9 illustrated in Figs. 9-11 may be omitted. When the connecting member 5 is lightweight such that the operator may lift it, only the movement mechanism 7, 8 is provided. This implementation may enhance the efficiency of disconnecting the shaft from the connecting member 5 because fewer components are used.

20 [0075] It should be appreciated that the above detailed embodiments of the present disclosure are only for exemplifying or explaining principles of the present disclosure and do not limit the present disclosure. Therefore, any modifications, equivalent alternatives and improvements, etc. without departing from the spirit and scope of the present disclosure shall be comprised in the scope of protection of the present disclosure. Meanwhile, appended claims of the present disclosure aim to cover all the variations and modifications falling under the scope and boundary of the claims or equivalents of the scope and boundary.

WHAT IS CLAIMED IS:

1. An electric machine assembly comprising:
- 5 a body part (10);
a stator (2) supported by the body part (10);
a rotor (3) adapted to rotate relative to the stator (2) and comprising:
a rotor body (31) configured to receive a shaft (4) inside thereof, and
a rotor flange (32) extending from an interior surface of the rotor body (31), and
10 a connecting member (5) movably coupled to the rotor flange (32) and at least partially enclosing the shaft (4), wherein the connecting member (5) is configured to:
connect to a shaft flange (41) of the shaft (4) at a first position relative to the rotor flange (32), and
separate from the shaft (4) at a second position relative to the rotor flange (32).
- 15 2. The electric machine assembly of claim 1, wherein the electric machine assembly further comprises:
a movement mechanism (7, 8) configured to translate the connecting member (5) from the first position to the second position along a direction parallel to an axis of the shaft (4).
- 20 3. The electric machine assembly of claim 2, wherein
the movement mechanism (8) comprises a lead screw (81) and a nut assembly (82),
the connecting member (5) comprises an opening adjacent to an inner edge of the connecting member (5), and
25 wherein the lead screw (81) is configured to couple to the opening of the connecting member (5) via thread connection and abut against the rotor flange (32) at a terminal tip of the lead screw (81),
the nut assembly (82) is coupled to the lead screw (81) via thread connection and configured to translate along the lead screw (81).
- 30 4. The electric machine assembly of claim 2, wherein the first position is one endpoint of a movement range of the connecting member (5) relative to the rotor flange (32), and the second position is within the movement range, and

the electric machine assembly further comprises:

a position-limit mechanism (6, 9) configured to define the movement range.

5. The electric machine assembly of claim 4, wherein

5 the position-limit mechanism (6) comprises a lead screw (61) and a nut assembly (62),
the connecting member (5) comprises an opening adjacent to an outer edge of the
connecting member (5), and

wherein the lead screw (61) is configured to pass through the opening of the
connecting member (5) and connect to the rotor flange (32) at a terminal tip of the lead
10 screw (61),

the nut assembly (62) is coupled to the lead screw (61) via thread connection and
configured to translate along the lead screw (61).

6. The electric machine assembly of claim 4, wherein the nut assembly (62) comprises

15 a first nut, the first nut is configured to abut against a side of the connecting member (5)
facing away from the rotor flange (32) when the connecting member (5) reaches a limit of
the movement range.

7. The electric machine assembly of claim 2, wherein the rotor flange (32) comprises

20 a first threaded hole, and

the movement mechanism (7) comprises a first screw coupled to the first threaded
hole of the rotor flange (32), wherein the first screw is configured to abut against the
connecting member (5) at a terminal tip of the first screw, and translate the connecting
member (5) in said direction away from the rotor flange (32) via screwing in.

25 8. The electric machine assembly of claim 1, wherein

the connecting member (5) comprises a plurality of first further holes (51) adjacent to
an inner edge of the connecting member (5), and a plurality of second further holes (52)
adjacent to an outer edge of the connecting member (5),

30 the connecting member (5) is configured to, at said first position, be fixedly connected
to the shaft (4) using a first fastener (101) passing through respective holes on the shaft
flange and the plurality of first further holes (51), and

the connecting member (5) is configured to, at said first position, be fixedly connected
to the rotor flange (32) using a second fastener (102) passing through respective holes on

the rotor flange (32) and the plurality of second further holes (52).

9. The electric machine assembly of claim 1, wherein the connecting member (5) comprises a plurality of arc plates.

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10. The electric machine assembly of claim 9, wherein the number of the arc plates in the plurality of arc plates is four, and each of the plurality of arc plates extends an angular distance of 90 degrees across the shaft (4).

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11. The electric machine assembly of claim 1, wherein the connecting member (5) is a single monolithic part and extends an angular distance of 360 degrees across the shaft (4).

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12. A method for connecting a shaft (4) to a rotor (3) of an electric machine assembly, comprising

providing an electric machine assembly comprising,

a body part (10);

a stator (2) supported by the body part (10);

a rotor (3) adapted to rotate relative to the stator (2), and comprising:

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a rotor body (31) configured to receive a shaft (4) inside thereof, and

a rotor flange (32) extending from an interior surface of the rotor body (31),

and

a connecting member (5) movably coupled to the rotor flange (32) and configured to at least partially enclosing the shaft (4),

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wherein the connecting member (5) is configured to:

connect to a shaft flange (41) of the shaft (4) at a first position relative to the rotor flange (32), and

separate from the shaft (4) at a second position relative to the rotor flange (32),

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translating the connecting member (5) to the first position,

connecting the connecting member (5) to the shaft flange using a first fastener passing through respective holes on the shaft flange and a plurality of first further holes of the connecting member (5).

13. A method of disconnecting a shaft (4) from a rotor (3) of an electric machine assembly,

providing an electric machine assembly comprising,

a body part (10);

5 a stator (2) supported by the body part (10);

a rotor (3) adapted to rotate relative to the stator (2), and comprising:

a rotor body (31) configured to receive a shaft (4) inside thereof, and

a rotor flange (32) extending from an interior surface of the rotor body (31),

and

10 a connecting member (5) movably coupled to the rotor flange (32) and configured to at least partially enclosing the shaft (4),

wherein the connecting member (5) is configured to:

connect to a shaft flange (41) of the shaft (4) at a first position relative to the rotor flange (32), and

15 separate from the shaft (4) at a second position relative to the rotor flange (32),

disconnecting the connecting member (5) from the shaft (4), and

translating the connecting member (5) to the second position.

20 14. The method of claim 13, wherein providing the electric machine assembly further comprises

providing a movement mechanism (7, 8) configured to translate the connecting member (5) from the first position to the second position along a direction parallel to an axis of the shaft (4), and

25 wherein translating the connecting member (5) to the second position comprises translating the connecting member (5) to the second position using the movement mechanism (7, 8).

30 15. The method of claim 14, wherein the first position is one endpoint of a movement range of the connecting member (5) relative to the rotor flange (32), and the second position is within the movement range, and

wherein providing the electric machine assembly further comprises

providing a position-limit mechanism (6, 9) configured to define the movement range.

16. The method of claim 14, wherein the movement mechanism (8) comprises a lead screw (81) and a nut assembly (82), the connecting member (5) comprises an opening adjacent to an outer edge of the connecting member (5), and

5 wherein the lead screw (81) is configured to pass through the opening of the connecting member (5) and abut against the rotor flange (32) at a terminal tip of the lead screw (81),

 the nut assembly (82) is coupled to the lead screw (81) via thread connection and configured to translate along the lead screw (81).