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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Concentric drive shafts**

(57) An improved drive shaft (2) is described. The drive shaft (2) includes an inner shaft (4) having a first end (4a) that is adapted to be connectable to a first connecting shaft (14) that is rotated by torque applied by an external electrical machine, and a second end (4b) that is adapted to be connectable to a second connecting shaft (22). A hollow outer shaft (6), coaxial with the inner shaft (4), defines at least part of a rotor assembly (40) of an associated electrical machine (38). The outer shaft (6) is adapted to be releasably connected to the inner shaft (4) so that the drive shaft (2) is selectively configurable in a first arrangement for normal operating conditions where the outer shaft (6) is connected to the inner shaft (4) for rotation therewith, and a second arrangement where the outer shaft (6) is not connected to the inner shaft (4).

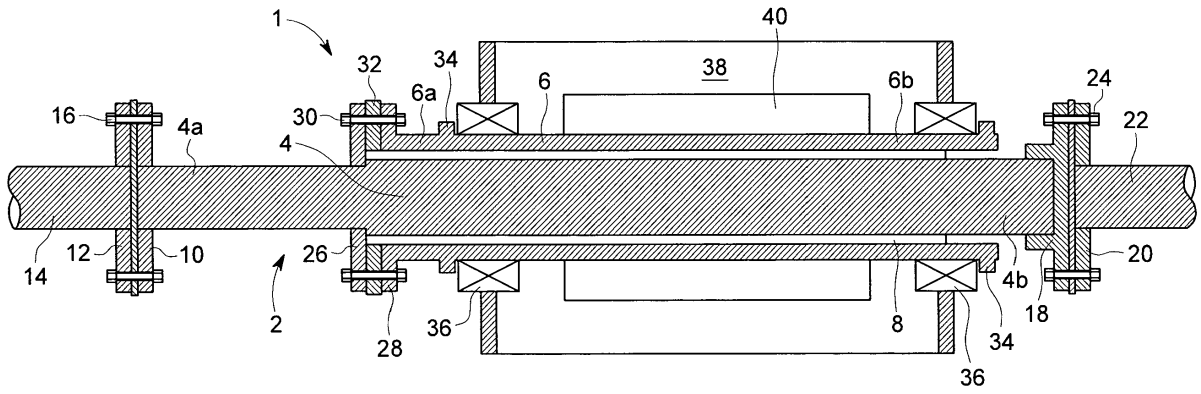

FIG. 1

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Description

Field of the Invention

[0001] The present invention relates to drive shafts, and in particular to drive shafts for applications where two electrical machines (e.g., electric motors) are used to drive a single drive shaft.

[0002] The drive shafts can be used in marine or ship propulsion assemblies.

Background Art

[0003] It is not unusual for two electrical machines (e.g., electric motors) to be arranged to apply torque to a single drive shaft. The electrical machines are typically arranged in a twin or tandem configuration. A fault in one of the electrical machines will typically mean that the drive shaft cannot be used until the fault is cleared.

Summary of the Invention

[0004] An objective of the present invention is to provide a drive shaft, with two driving electrical machines, where an electrical machine, typically the electrical machine that is closest to the load, can be disconnected easily, when faulty, so that the drive shaft can be returned to service and driven by the remaining electrical machine.

[0005] In particular, the present invention provides a drive shaft comprising:

an inner shaft having:

a first end that is adapted to be connectable to a first connecting shaft that is rotated by torque applied by an external electrical machine (e.g., an electric motor);
a second end that is adapted to be connectable to a second connecting shaft; and
a hollow outer shaft, coaxial with the inner shaft, the outer shaft defining at least part of, or being operatively coupled to, a rotor assembly of an associated electrical machine (e.g., an electric motor that is part of a drive assembly), and being adapted to be releasably connected to the inner shaft so that the drive shaft is selectively configurable in a first arrangement for normal operating conditions where the outer shaft is connected to the inner shaft for rotation therewith, and a second arrangement where the outer shaft is not connected to the inner shaft.

[0006] It will be readily appreciated that the first and second connecting shafts do not form part of the drive shaft *per se* but that the ends of the drive shaft are connected to the first and second connecting shafts in use. The second connecting shaft can be directly or indirectly coupled to any suitable load, e.g., a propulsion means such as a propeller, impeller, water jet etc. in the case of a marine propulsion assembly. Similarly, the external electrical machine and the non-related parts of the associated electrical machine (e.g., the stator assembly, active parts of the rotor assembly etc.) do not form part of the drive shaft *per se* but can apply a torque to the drive shaft in use. The electrical machines can have any suitable construction and can be arranged in a twin or tandem configuration. The outer shaft of the drive shaft can carry the active parts of the rotor assembly of the associated electrical machine or can be directly or indirectly coupled to the rotor assembly. In general terms, the external electrical machine will be operated to apply torque to the inner shaft through the first connecting shaft to which it can be directly or indirectly coupled. The associated electrical machine will be operated to apply torque to the outer shaft.

[0007] The inner shaft can be rated to take a higher torque than that delivered by the associated electrical machine.

[0008] The first end of the inner shaft can include a connecting flange that is connectable to a corresponding connecting flange of the first connecting shaft. Similarly, the second end of the inner shaft can include a connecting flange that is connectable to a corresponding connecting flange of the second connecting shaft. The first and second connecting shafts are therefore connected to the first and second ends of the inner shaft in use for rotation therewith. The connecting flange at the second end of the inner shaft can be releasably connected to the inner shaft. This allows the connecting flange to be fitted to the inner shaft after it has been properly located within the outer shaft. The respective connecting flanges can be connected together using mechanical fixings such as bolts, pins, clamps etc.

[0009] The inner shaft can include a first intermediate flange that is releasably connected to a flange provided at a first end of the outer shaft, e.g., using mechanical fixings such as bolts, pins, clamps etc. that can be removed to disconnect the inner and outer shafts at the first end and configure the drive shaft in the second arrangement. In one arrangement, the mechanical fixings are expanding hydraulic bolts. The drive shaft can further comprise a spacer between the first intermediate flange and the first end flange of the outer shaft. Any suitable spacer can be used. In one arrangement the spacer can be a segmented ring spacer that is divided into two or more segments, each segment receiving at least one mechanical fixing such as a bolt. Such a spacer can be removed in a radial direction while the inner shaft remains in place.

[0010] To provide additional protection against high shock loading, the inner and outer shafts can be releasably connected at both ends of the outer shaft. In particular, the inner shaft can further include a second intermediate flange that is releasably connected to a flange provided at a second end of the outer shaft, e.g., using mechanical fixings such as bolts, pins, clamps etc. that

can be removed to disconnect the inner and outer shafts at the second end and configure the drive shaft in the second arrangement. The drive shaft can further comprise a spacer between the second intermediate flange and the second end flange of the outer shaft. Once again, any suitable spacer can be used, e.g., a segmented ring spacer. Each spacer between an intermediate flange and the adjacent end flange of the outer shaft can be removed when the inner and outer shafts are disconnected to allow a clear gap to be created between the respective flanges.

[0011] In general terms, it will be readily appreciated that any suitable means can be used to releasably connect the inner and outer shafts to enable the drive shaft to be selectively configurable in the first or second arrangement. Such means can be provided at one or both ends of the outer shaft. The means can be a coupling of any suitable type (e.g., flange, viscous, magnetic, flexible etc.) or a clutch assembly of any suitable type (e.g., dog, friction, magnetic etc.). It will be readily appreciated that such means do not necessarily need to use corresponding flanges on the inner and outer shafts. The inner and outer shafts can be physically adapted or constructed in other ways to facilitate their releasable connection.

[0012] During normal operating conditions, torque from the external electrical machine can be transmitted between the first and second connecting shafts through the inner shaft. Torque from the associated electrical machine can also be transmitted between the outer shaft and the inner shaft through the intermediate flange(s). In the case of a fault condition which prevents the outer shaft from being rotated, the inner and outer shafts can be disconnected (e.g., by removing the bolts, pins, claims or other mechanical fixings, or by operating the clutch assembly) so that torque can still be transmitted between the first and second connecting shafts through the inner shaft. This means that the drive shaft can still be used even if there is a fault that requires the outer shaft to remain stationary.

[0013] The connecting flanges and intermediate flanges of the inner shaft are preferably located axially outside the outer shaft.

[0014] The outer shaft can further comprise one or more collars to prevent lateral movement of the drive shaft. Such collars are not normally intended to bear thrust load.

[0015] The present invention further provides a drive assembly comprising:

a drive shaft as herein described; and
an associated electrical machine having a rotor assembly defined at least in part by, or operatively coupled to, the outer shaft.

[0016] The drive assembly can further comprise one or more bearings for supporting the drive shaft.

[0017] The drive assembly can further comprise locking means for selectively preventing rotation of the outer shaft when the drive shaft is in the second arrangement.

[0018] The drive shaft (or the drive assembly) can be part of a marine propulsion assembly where the second connecting shaft can be used to drive propulsion means, e.g., a propeller, impeller, water jet etc. A marine propulsion assembly can also include components such as one or more plummer blocks, thrust block etc.

[0019] The present invention further provides a method of operating a drive shaft comprising:

an inner shaft having:

a first end that is adapted to be connectable to a first connecting shaft that is rotated by torque applied by an external electrical machine;
a second end that is adapted to be connectable to a second connecting shaft; and
a hollow outer shaft, coaxial with the inner shaft, the outer shaft defining at least part of, or being operatively coupled to, a rotor assembly of an associated electrical machine, and being adapted to be releasably connected to the inner shaft;
the method comprising the steps of:
connecting the outer shaft to the inner shaft during normal operating conditions; and
disconnecting the outer shaft from the inner shaft in response to a fault condition.

[0020] If the inner shaft includes a first intermediate flange that is releasably connected to a flange provided at a first end of the outer shaft using mechanical fixings such as bolts, pins, clamps etc. the method can include the step of removing the mechanical fixings to disconnect the outer shaft from the inner shaft in response to a fault condition. If the drive shaft includes a clutch assembly, the method can include the step of operating the clutch assembly to disconnect the outer shaft from the inner shaft in response to a fault condition.

[0021] The method can further include the step of preventing rotation of the outer shaft when disconnected from the inner shaft.

Drawings

[0022]

Figure 1 shows a drive assembly incorporating a first drive shaft according to the present invention;
Figure 2 shows a drive assembly incorporating a second drive shaft according to the present invention;
Figure 3 is a schematic view of a marine propulsion assembly incorporating a drive shaft according to the present invention; and
Figure 4 is a schematic view of the marine propulsion assembly of Figure 3 where the associated electric motor is out of service.

[0023] With reference to Figure 1, a drive assembly 1 for a marine propulsion assembly includes a first drive

shaft 2 according to the present invention. It will be readily appreciated that the drive assembly 1 is not limited to marine applications and can be used for other purposes.

[0024] The drive shaft 2 includes an inner shaft 4 and a hollow outer shaft 6 that is coaxially located with respect to the inner shaft and spaced apart by an axial gap 8.

[0025] The inner shaft 4 has a first end 4a and a second end 4b. The first end 4a includes a connecting flange 10 that is connected to a connecting flange 12 of a first connecting shaft 14 by means of a series of circumferentially spaced bolts 16. The second end 4b includes a connecting flange 18 that is connected to a connecting flange 20 of a second connecting shaft 22 by means of a series of circumferentially spaced bolts 24. The connecting flange 18 can be fitted to the second end 4b after the inner shaft 4 has been inserted through the outer shaft 6.

[0026] The outer shaft 6 includes a first end 6a and a second end 6b.

[0027] The inner shaft 4 includes an intermediate flange 26 that is releasably connected to an end flange 28 at the first end 6a of the outer shaft 6 by means of a series of circumferentially spaced bolts 30, e.g., expanding hydraulic bolts. Although not shown, it will be readily appreciated that the inner and outer shafts 4, 6 can be releasably connected together by other types of mechanical fixing or by a clutch assembly.

[0028] A segmented ring spacer 32 is located between the intermediate flange 26 and the end flange 28. As described above, the spacer 32 is divided into two or more segments and each segment receives one or more of the bolts 32 so that they are retained in position between the flanges 26, 28.

[0029] The outer shaft 6 includes a pair of axially spaced collars 34 that prevent lateral movement. Each collar 34 is positioned adjacent a bearing 36 that supports the drive shaft 2.

[0030] An associated electric motor 38 (or 'aft motor') includes a rotor assembly 40 that is provided on the outer shaft 6.

[0031] During normal operation, the intermediate flange 26 and the end flange 28 are connected by the bolts 30.

[0032] Torque is provided by an external electric motor (not shown) to the first connecting shaft 14 and is transmitted to the second connecting shaft 22 by the inner shaft 4. Torque provided by the associated electric motor 38 is transmitted to the second connecting shaft 22 by the outer shaft 6 and the inner shaft 4 through the intermediate flange 26 and the end flange 28.

[0033] In the event of a fault where the outer shaft 6 cannot rotate, the bolts 30 can be manually removed to disconnect the intermediate flange 26 and the end flange 28, and hence disconnect the stationary inner and outer shafts 4, 6. The segmented ring spacer 32 is also removed to provide a clear gap between the intermediate flange 26 and the end flange 28. The outer shaft 6 can optionally be locked to prevent rotation by a locking means (not shown).

[0034] The inner shaft 4 is still capable of transmitting torque from the external electric motor (not shown) to the second connecting shaft 22. No torque is applied to the outer shaft 6 by the inner shaft 4 during a fault condition.

[0035] When the fault condition has been cleared, the inner shaft can be held stationary while the segmented ring spacer 32 is repositioned between the intermediate flange 26 and the end flange 28 and the bolts 30 are manually reinserted to reconnect the intermediate flange 26 and the end flange 28.

[0036] Figure 2 shows a drive assembly 1' that includes a second drive shaft 2' according to the present invention. The second drive shaft 2' is similar to the first drive shaft shown in Figure 1 and like components have been given the same reference numbers.

[0037] The second drive shaft 2' provides additional protection in situations where the associated electric motor 38 is subject to high shock loading. The inner shaft 4' includes a first intermediate flange 26a that is releasably connected to an end flange 28a at the first end 6a of the outer shaft 6' by means of a series of circumferentially spaced bolts 30a. The inner shaft 4' also includes a second intermediate flange 26b that is releasably connected to an end flange 28b at the second end 6b of the outer shaft 6' by means of a series of circumferentially spaced bolts 30b. The second intermediate flange 26b can be fitted to the inner shaft 4' after it has been inserted through the outer shaft 6'. A segmented ring spacer 32a is located between the intermediate flange 26a and the end flange 28a. Similarly, a segmented ring spacer 32b is located between the intermediate flange 26b and the end flange 28b. In the configuration shown in Figure 2, i.e., during normal operation, the second drive shaft 2' is capable of withstanding high shock loads.

[0038] In the event of a fault where the outer shaft 6' cannot rotate, the bolts 30a can be removed to disconnect the intermediate flange 26a and the end flange 28a, and the bolts 30b can be removed to disconnect the intermediate flange 26b and the end flange 28b. The segmented ring spacers 32a, 32b are also removed to provide a clear gap between the respective intermediate flange and the end flange.

[0039] When the fault condition has been cleared, the inner shaft can be held stationary while the segmented ring spacers 32a, 32b are repositioned between the respective intermediate and end flanges 26a, 28a and 26b, 28b. The bolts 30a are then manually reinserted to reconnect the intermediate flange 26a and the end flange 28a and the bolts 30b are manually reinserted to reconnect the intermediate flange 26b and the end flange 28b.

[0040] With reference to Figures 3 and 4, a marine propulsion assembly 100 includes a drive assembly 1 as described above with reference to Figure 1.

[0041] The first connecting shaft 14 passes through a bulkhead seal 102 in a watertight bulkhead 104 and is connected to an electric motor 106 (or 'forward motor').

[0042] The second connecting shaft 22 is connected to a propeller 108 by means of a first plummer block 110,

a thrust block 112 and a second plummer block 114. A stern seal 116 is provided in the hull 118 of the marine vessel.

[0043] Figure 3 shows the drive assembly during normal operating conditions.

[0044] Figure 4 shows the drive assembly during a fault condition where the electric motor 38 is out of service. In particular, the bolts 30 and the segmented ring spacer 32 have been removed so the outer shaft 6 is disconnected from the inner shaft 4.

[0045] The inner shaft 4 is still capable of transmitting torque from the electric motor 106 to the second connecting shaft 22 to rotate the propeller 108.

[0046] The shaft that supports the rotor assembly of the electric motor 106 is connected to the first connecting shaft 14. The first connecting shaft 14 can be formed as two intermediate shaft sections 14a, 14b that can be disconnected from each other in a similar manner to that discussed above. If there is a fault condition where the electric motor 106 is out of service, it can be disconnected from the drive assembly 1. In particular, the support shaft can be disconnected from the first shaft section 14a (which can also optionally be removed completely) and the second shaft section 14b can be disconnected from the first end 4a of the inner shaft. The second shaft section 14b passes through the bulkhead seal 102 and can be supported on a temporary cradle.

[0047] The electric motor 38 can still be operated and torque is transmitted to the second connecting shaft 22 by means of the outer shaft 6 and the inner shaft 4 to rotate the propeller 108.

Claims

1. A drive shaft (2) comprising:

an inner shaft (4) having:

a first end (4a) that is adapted to be connectable to a first connecting shaft (14) that is rotated by torque applied by an external electrical machine (106);
a second end (4b) that is adapted to be connectable to a second connecting shaft (22); and
a hollow outer shaft (6), coaxial with the inner shaft (4), the outer shaft defining at least part of, or being operatively coupled to, a rotor assembly (40) of an associated electrical machine (38), and being adapted to be releasably connected to the inner shaft (4) so that the drive shaft (2) is selectively configurable in a first arrangement for normal operating conditions where the outer shaft (6) is connected to the inner shaft (4) for rotation therewith, and a second arrangement where the outer shaft (6) is not connected to the inner shaft (4).

2. A drive shaft (2; 2') according to claim 1, wherein the inner shaft (4; 4') includes a first intermediate flange (26; 26a) that is releasably connected to a flange (28; 28a) provided at a first end (6a) of the outer shaft (6; 6').

3. A drive shaft (2; 2') according to claim 2, further comprising a spacer (32; 32a) between the first intermediate flange (26; 26a) and the first end flange (28; 28a) of the outer shaft (6; 6').

4. A drive shaft (2') according to any preceding claim, wherein the inner shaft (6') includes a second intermediate flange (26b) that is releasably connected to a flange (28b) provided at a second end (6b) of the outer shaft (6').

5. A drive shaft (2') according to claim 4, further comprising a spacer (32b) between the second intermediate flange (26b) and the second end flange (28b) of the outer shaft (6').

6. A drive shaft (2) according to any preceding claim, wherein the inner and outer shafts (4, 6) are releasably connected using mechanical fixings (30) that can be removed to configure the drive shaft (2') in the second arrangement.

7. A drive shaft (2) according to any of claims 1 to 5, wherein the inner and outer shafts (4, 6) are releasably connected using a clutch assembly.

8. A drive shaft (2) according to any preceding claim, wherein the outer shaft (6) further comprises one or more collars (34) to prevent lateral movement of the drive shaft (2).

9. A drive assembly (1) comprising
a drive shaft (2) according to any preceding claim; and
an associated electrical machine (38) having a rotor assembly (38) defined at least in part by, or operatively coupled to, the outer shaft (6).

10. A drive assembly (1) according to claim 9, further comprising one or more bearings (36) for supporting the drive shaft (2).

11. A drive assembly according to claim 9 or claim 10, further comprising locking means for selectively preventing rotation of the outer shaft when the drive shaft is in the second arrangement.

12. A marine propulsion assembly (100) comprising a drive shaft (2) according to any of claims 1 to 8 or a drive assembly (1) according to any of claims 9 to

11, wherein the second connecting shaft (22) is used to drive propulsion means.

13. A method of operating a drive shaft (2) comprising:

an inner shaft (4) having:

a first end (4a) that is adapted to be connectable to a first connecting shaft (14) that is rotated by torque applied by an external electrical machine (106);
a second end (4b) that is adapted to be connectable to a second connecting shaft (22); and
a hollow outer shaft (6), coaxial with the inner shaft (4), the outer shaft defining at least part of, or being operatively coupled to, a rotor assembly (40) of an associated electrical machine (38), and being adapted to be releasably connected to the inner shaft (4);
the method comprising the steps of:

connecting the outer shaft (6) to the inner shaft (4) during normal operating conditions; and
disconnecting the outer shaft (6) from the inner shaft (4) in response to a fault condition.

14. A method according to claim 13, wherein the inner and outer shafts (4, 6) are releasably connected by mechanical fixings (30) or a clutch assembly, and wherein the method includes the step of removing the mechanical fixings (30) or operating the clutch assembly to disconnect the outer shaft (6) from the inner shaft (4) in response to a fault condition.

15. A method according to claim 13 or claim 14, further comprising the step of preventing rotation of the outer shaft when disconnected from the inner shaft.

Amended claims in accordance with Rule 137(2) EPC.

1. A drive assembly (1; 1') comprising:

a first electrical machine (106)
a first connecting shaft (14) rotated by torque applied by the first electrical machine (106);
a second connecting shaft (22);
a second electrical machine (38) having a rotor assembly (40); and
a drive shaft (2; 2') comprising:

an inner shaft (4; 4') having:

a first end (4a) connected to the first connecting shaft (14); and

a second end (4b) connected to the second connecting shaft (22);
and

a hollow outer shaft (6; 6'), coaxial with the inner shaft (4; 4'), the outer shaft defining at least part of, or being operatively coupled to, the rotor assembly (40), and being releasably connected to the inner shaft (4; 4') so that the drive shaft (2; 2') is selectively configurable in a first arrangement for normal operating conditions where the outer shaft (6; 6') is connected to the inner shaft (4; 4') for rotation therewith, and a second arrangement where the outer shaft (6; 6') is not connected to the inner shaft (4; 4').

2. A drive assembly (1; 1') according to claim 1, wherein the inner shaft (4; 4') includes a first intermediate flange (26; 26a) that is releasably connected to a flange (28; 28a) provided at a first end (6a) of the outer shaft (6; 6').

3. A drive assembly (1; 1') according to claim 2, further comprising a spacer (32; 32a) between the first intermediate flange (26; 26a) and the first end flange (28; 28a) of the outer shaft (6; 6').

4. A drive assembly (1') according to any preceding claim, wherein the inner shaft (6') includes a second intermediate flange (26b) that is releasably connected to a flange (28b) provided at a second end (6b) of the outer shaft (6').

5. A drive assembly (1') according to claim 4, further comprising a spacer (32b) between the second intermediate flange (26b) and the second end flange (28b) of the outer shaft (6').

6. A drive assembly (1; 1') according to any preceding claim, wherein the inner and outer shafts (4, 6; 4', 6') are releasably connected using mechanical fixings (30) that can be removed to configure the drive shaft (2; 2') in the second arrangement.

7. A drive assembly according to any of claims 1 to 5, wherein the inner and outer shafts are releasably connected using a clutch assembly.

8. A drive assembly (1; 1') according to any preceding claim, wherein the outer shaft (6; 6') further comprises one or more collars (34) to prevent lateral movement of the drive shaft (2; 2').

9. A drive assembly (1; 1') according to any preceding claim, further comprising one or more bearings (36) for supporting the drive shaft (2; 2').

10. A drive assembly according to any preceding claim, further comprising locking means for selectively preventing rotation of the outer shaft when the drive shaft is in the second arrangement.

11. A marine propulsion assembly (100) comprising:

propulsion means (108); and
a drive assembly (1; 1') according to any preceding claim, wherein the second connecting shaft (22) is directly or indirectly coupled to the propulsion means (108) and drives the propulsion means (108) in use.

12. A method of operating a drive shaft (2) comprising:

an inner shaft (4) having:

a first end (4a) that is adapted to be connectable to a first connecting shaft (14) that is rotated by torque applied by a first electrical machine (106);
a second end (4b) that is adapted to be connectable to a second connecting shaft (22); and
a hollow outer shaft (6), coaxial with the inner shaft (4), the outer shaft defining at least part of, or being operatively coupled to, a rotor assembly (40) of a second electrical machine (38), and being adapted to be releasably connected to the inner shaft (4);
the method comprising the steps of:

connecting the outer shaft (6) to the inner shaft (4) during normal operating conditions; and
disconnecting the outer shaft (6) from the inner shaft (4) in response to a fault condition.

13. A method according to claim 12, wherein the inner and outer shafts (4, 6) are releasably connected by mechanical fixings (30) or a clutch assembly, and wherein the method includes the step of removing the mechanical fixings (30) or operating the clutch assembly to disconnect the outer shaft (6) from the inner shaft (4) in response to a fault condition.

14. A method according to claim 12 or claim 13, further comprising the step of preventing rotation of the outer shaft when disconnected from the inner shaft.

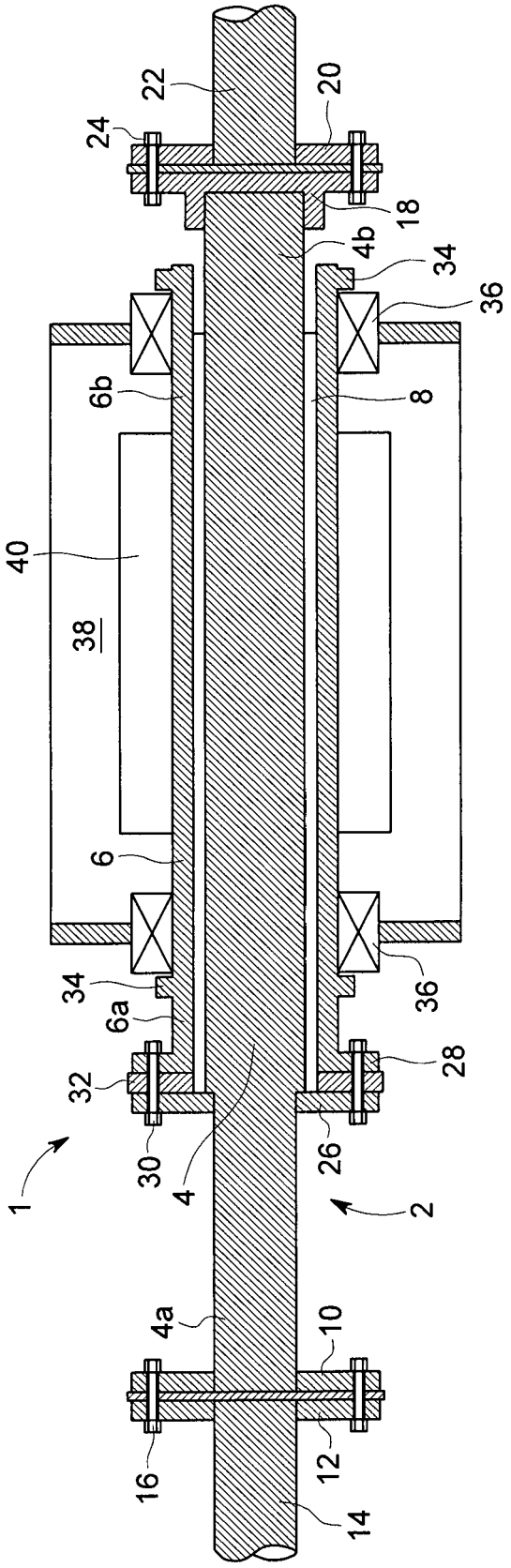

FIG. 1

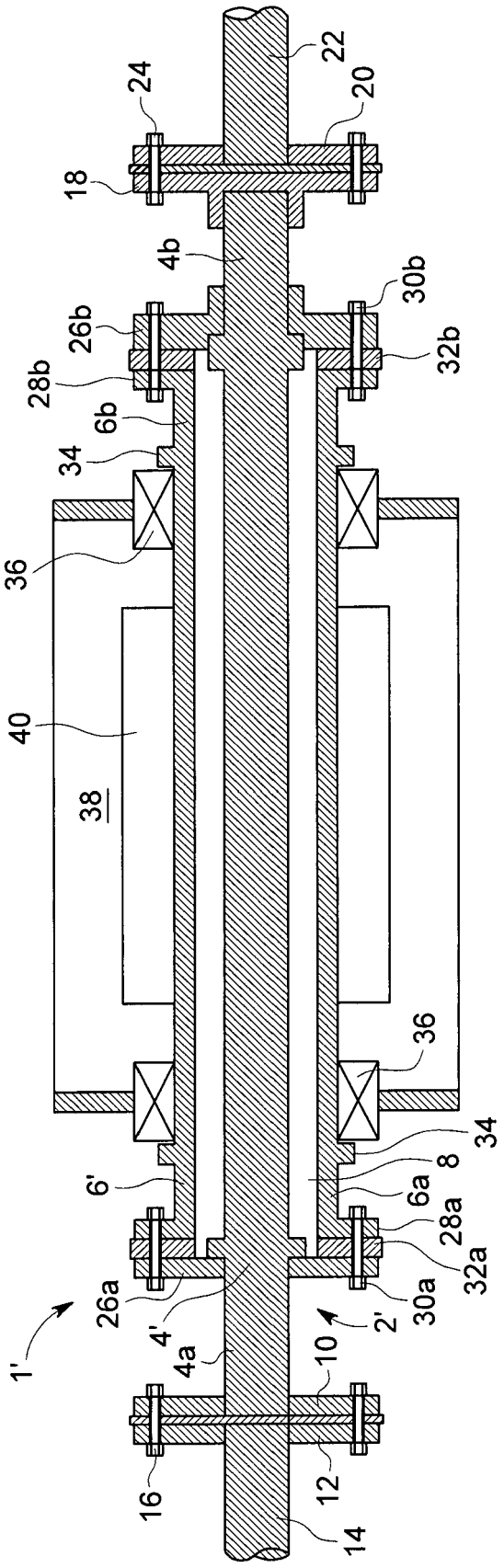
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FIG. 2

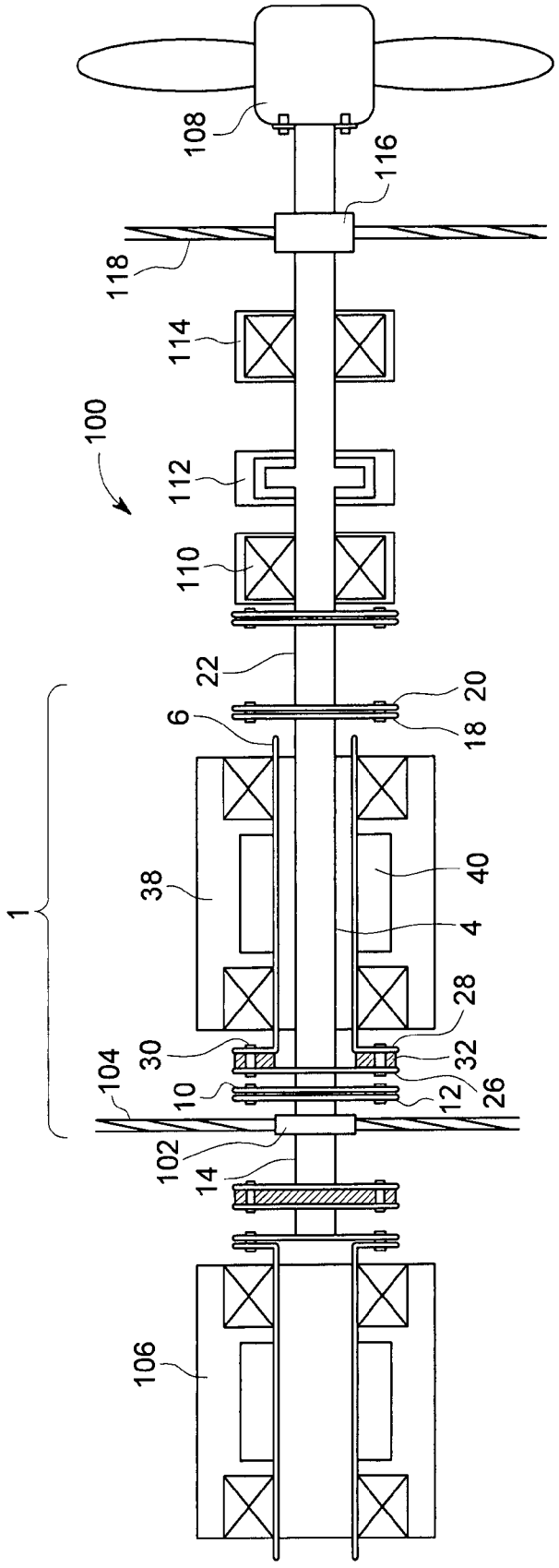
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FIG. 3

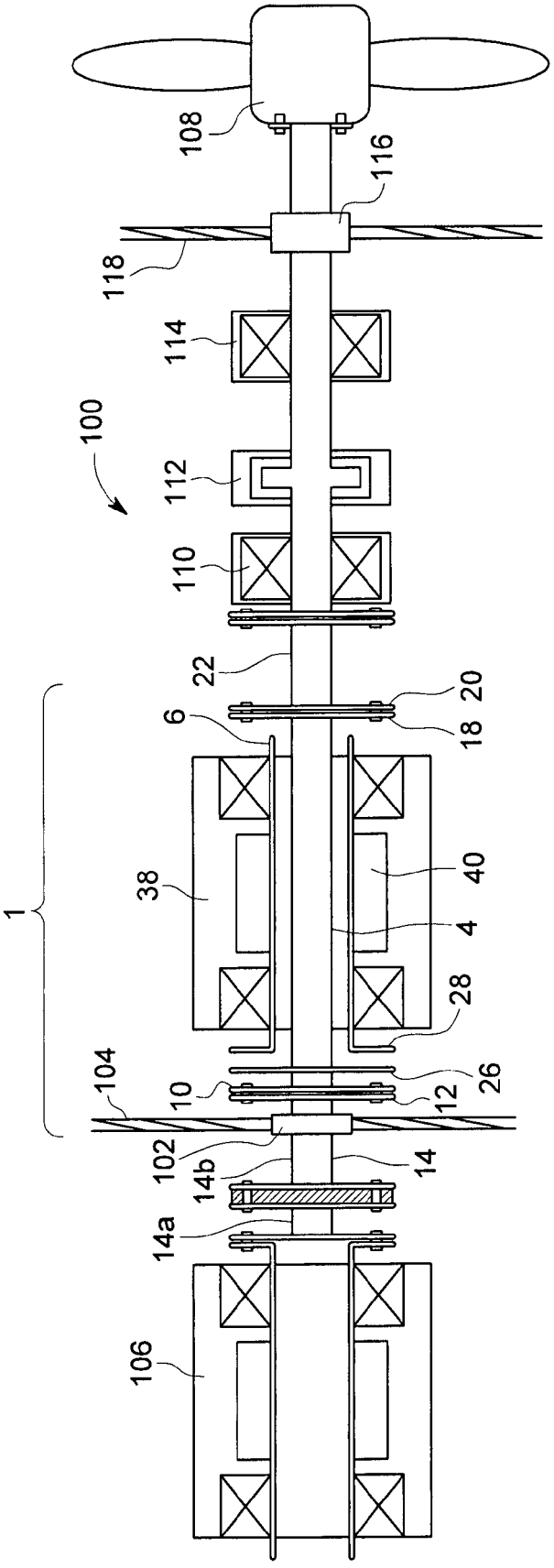
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FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 14 17 3593

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 127 080 A (LAKIZA ROSTISLAV I ET AL) 28 November 1978 (1978-11-28) * column 4, line 37 - column 5, line 14; figure 1 *	1-8	INV. B63H23/34
A	US 2011/021095 A1 (SHUTO HIDEKI [JP] ET AL) 27 January 2011 (2011-01-27) * column 5, line 32 - page 6, line 30; figure 2 *	1-8	
A	DE 196 30 835 A1 (MAN B & W DIESEL GMBH [DK]) 5 February 1998 (1998-02-05) * column 3, line 28 - column 5, line 17; figures 1, 2 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			B63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 December 2014	Brumer, Alexandre

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 17 3593

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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01-12-2014

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