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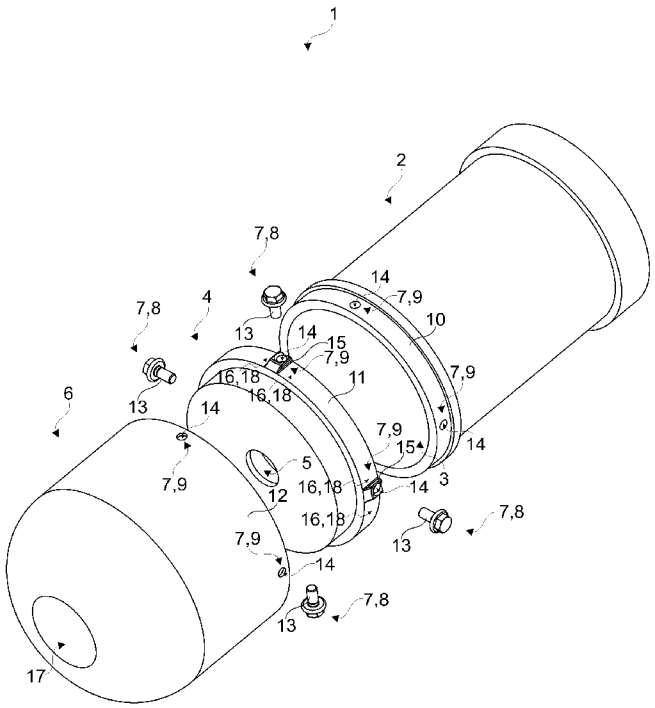
(54) Title: ELECTRIC MACHINE WITH IMPROVED ASSEMBLY

Fig. 1



(57) Abstract: The present invention relates to an electric machine (1) such as an electric motor, comprising a housing (2) which has an aperture (3) an endshield (4) for closing the aperture (3) and a fan cover (6) for enclosing a fan to be mounted on the rear end of the shaft which protrudes from the endshield (4) to the outside and one or more than one fastening unit (7) each including a releasable fastening member (8) which positions and secures the endshield (4) and the fan cover (6) in common to the housing (2).

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Description

ELECTRIC MACHINE WITH IMPROVED ASSEMBLY

[0001] The present invention relates to electric machines, in particular to electric motors and generators.

[0002] Electric machines such as electric motors and generators are commonly known. Electric motors can be used both in industrial and domestic applications. An electric motor can be used to drive a rotating member of a household appliance, for instance the drum of a laundry washer/dryer. An electric motor generally comprises a stator, a shaft and a rotor which is fixed to the shaft. The electric motor is usually provided with a housing and endshields which together enclose the stator, the shaft and the rotor so as to protect it from moisture and dirt. In general, the endshields are fastened onto the housing so as to conceal the axially opposing apertures thereof. The forward end of the shaft is generally protruded out of the bearing on the front endshield and can be connected, for instance, to the aforementioned rotating member. During the operation of the electric motor a large amount of heat is generated. Therefore, the electric motor must be suffiently cooled. In order to cool the electric motor, the housing is usually provided with a plurality of fins which radiate the thermal energy into the environment and thus function as a cooling facility. To promote the cooling process, the cooling facility is usually provided with a fan and a fan cover that move the ambient air over the housing, in particular through the spaces between the plurality of cooling fins. The rear end of the shaft is generally protruded out of the bearing in the rear endshield and is directly connected to the hub of the fan. In general, the fan cover is fastened onto the rear endshield or, alternatively onto the housing.

[0003] A drawback of the aforementioned electric motor is that during the maintenance, the service person must remove the fan cover and the endshields in order to access the motor parts. The disassembly and the reassembly are usually complicated and involve the unfastening/fastening of a large number of mechanical parts. This takes a comparatively long time and incurs additional labor costs. Moreover, the large number of mechanical parts used for fastening the fan cover, the endshields and the

housing increase the production costs both in terms of material costs and labor costs.

[0004] An objective of the present invention is to provide an electric machine and an electrical household appliance having the same which overcomes the drawbacks of the prior art in a cost effective way and which enables an improved production and assemblage.

[0005] This objective has been achieved by the electric machine as defined in claim 1 and the household appliance as defined in claim 12. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.

[0006] The electric machine of the present invention comprises one or more than one fastening unit each including a releasable fastening member for positioning and securing the endshield and the fan cover in common to the housing and three counterpart fastening members which are respectively disposed onto the housing, the endshield and the fan cover and jointly receive and engage with the fastening member of the respective fastening unit.

[0007] With the present invention, particularly by virtue of the fastening unit, the fan cover and the endshield can be secured in common to the housing by using a single fastening member. Thereby, the production and assembly costs can be reduced both in terms of material costs and labor costs. With the present invention, the electric machine can also be quickly disassembled and reassembled during the maintenance. Thereby, the maintenance costs can also be reduced. With the present invention, the consumer satisfaction can be increased.

[0008] In an embodiment, the three counterpart fastening members of each fastening unit are disposed onto the flanges of the housing, the endshield and the fan cover respectively.

[0009] In a version of this embodiment, the flanges are concentric and the three counterpart fastening members of each fastening unit are disposed on the flanges along a respective common radial direction so as to jointly and radially receive the fastening member.

[0010] In an alternative version of this embodiment, the flanges are side by side

in the axial direction and the three counterpart fastening members of each fastening unit are disposed along a respective common axial direction so as to jointly and axially receive the fastening member.

[0011] In another embodiment, the fastening member and the three counterpart fastening member of each fastening unit respectively comprise a screw and three mutually aligned matching screw holes for jointly receiving the screw.

[0012] The present invention also provides an electrical household appliance which has an electric machine, in particular an electric motor according to the present invention.

[0013] Additional advantages of the electric machine and the electrical household appliance of the present invention will become more apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:

[0014] Figure 1 - is a perspective exploded partial view of an electric motor according to an embodiment of the present invention;

[0015] Figure 2 - is another perspective exploded partial view of the electric motor according to an embodiment of the present invention;

[0016] Figure 3 - is another perspective exploded partial view of the electric motor according to an embodiment of the present invention;

[0017] Figure 4 - is a perspective partial view of the electric motor according to an embodiment of the present invention.

[0018] The reference signs appearing on the drawings relate to the following technical features.

1. Electric machine
2. Housing
3. Aperture
4. Endshield
5. Through hole
6. Fan cover
7. Fastening unit
8. Fastening member
9. Fastening member

10. Flange
11. Flange
12. Flange
13. Screw
14. Screw hole
15. Spacer
16. Gap
17. Air inlet
18. Air outlet

[0019] The electric machine (1) such as an electric motor comprises a housing (2) for accommodating a stator (not shown), a shaft (shown) and a rotor (shown) which is fixed onto the shaft, wherein the housing (2) has an aperture (3) for allowing access to its interior; an endshield (4) for opening/closing the aperture (3), wherein the endshield (4) has a through hole (5) for allowing the rear end of the shaft to be protruded to the outside and a fan cover (6) for enclosing a fan (shown) to be mounted on the rear end of the shaft.

[0020] The electric machine (1) of the present invention comprises one or more than one fastening unit (7) each including a releasable fastening member (8) for positioning and securing the endshield (4) and the fan cover (6) in common to the housing (2) and more than one counterpart fastening members (9) which are respectively disposed onto the housing (2), the endshield (4) and the fan cover (6) and adapted to jointly receive and engage with the respective fastening member (8) (Fig.1 to 4).

[0021] The electrical household appliance (not shown) of the present invention comprises the electric machine (1).

[0022] In an embodiment, the housing (2), the endshield (4) and the fan cover (6) respectively have flanges (10, 11, 12). The three counterpart fastening members (9) of each fastening unit (7) are respectively disposed onto these flanges (10, 11, 12).

[0023] In another embodiment, the flange (10) of the housing (2), the flange (11) of the endshield (4) and the flange (12) of the fan cover (6) are concentric. The three counterpart fastening members (9) of each fastening unit (7) are

disposed onto these flanges (10, 11, 12) along a respective common radial direction so as to jointly and radially receive the fastening member (8).

[0024] In another embodiment, the fastening units (7) are evenly disposed around the axial direction.

[0025] In another embodiment, the fastening member (8) and the three counterpart fastening member (9) of each fastening unit (7) respectively comprise a screw (13) and three mutually aligned matching screw holes (14) for jointly receiving the screw (13).

[0026] In another embodiment, the electric machine (1) comprises one or more than one spacer (15) each for securing one or more than one gap (16) between the inner surface of the fan cover (6) and the outer surface of the housing (2). In this embodiment, the fan cover (6) has at least one air inlet (17). Each gap (16) defines an air outlet (18) which is fluidly connected to the air inlet (17) and the periphery of the housing (2).

[0027] In another embodiment, each spacer (15) is disposed onto the endshield (4) and configured to abut against the inner surface of the fan cover (6).

[0028] In another embodiment, the air inlet (17) is centered with respect to the axial direction and the air outlets (18) are disposed circumferentially around the axial direction.

[0029] In another embodiment, the housing (2), the endshield (4) and the fan cover (6) respectively have cylindrical shapes.

[0030] In another embodiment, the electric machine (1) is provided as an electric motor.

Claims

1. An electric machine (1), in particular an electric motor comprising a housing (2) for accommodating a stator, a shaft and a rotor which is fixed onto the shaft, wherein the housing (2) has an aperture (3) for allowing access to its interior; an endshield (4) for opening/closing the aperture (3), wherein the endshield (4) has a through hole (5) for allowing the rear end of the shaft to be protruded to the outside and a fan cover (6) for enclosing a fan to be mounted on the rear end of the shaft, **characterized in that** one or more than one fastening unit (7) each including a releasable fastening member (8) for positioning and securing the endshield (4) and the fan cover (6) in common to the housing (2) and more than one counterpart fastening members (9) which are respectively disposed onto the housing (2), the endshield (4) and the fan cover (6) and adapted to jointly receive and engage with the respective fastening member (8).
2. The electric machine (1) according to claim 1, **characterized in that** the housing (2), the endshield (4) and the fan cover (6) respectively have flanges (10, 11, 12), wherein the three counterpart fastening members (9) of each fastening unit (7) are respectively disposed onto the flanges (10, 11, 12) of the housing (2), the endshield (4) and the fan cover (6).
3. The electric machine (1) according to claim 2, **characterized in that** the flanges (10, 11, 12) of the housing (2), the endshield (4) and the fan cover (6) are mutually concentric, wherein the three counterpart fastening members (9) of each fastening unit (7) are disposed on the flanges (10, 11, 12) of the housing (2), the endshield (4) and the fan cover (6) along a respective common radial direction so as to jointly receive the fastening member (8) from said respective common radial direction.
4. The electric machine (1) according to claim 2, **characterized in that** the flanges (10, 11, 12) of the housing (2), the endshield (4) and the fan cover (6) are axially next to each other, wherein the three counterpart fastening members (9) of each fastening unit (7) are disposed onto the flanges of the housing (2), the endshield (4) and the fan cover (6) along a respective common axial direction so as to jointly receive the fastening member from said respective common axial direction.
5. The electric machine (1) according to any one of claims 1 to 4, **characterized in**

that the fastening units (7) are evenly disposed around the axial direction.

6. The electric machine (1) according to any one of claims 1 to 5, **characterized in that** the fastening member (8) and the three counterpart fastening member (9) of each fastening unit (7) respectively comprising a screw (13) and three mutually aligned matching screw holes (14) for jointly receiving the screw (13).
7. The electric machine (1) according to any one of claims 1 to 6, **characterized in that** one or more than one spacer (15) each for securing one or more than one gap (16) between the inner surface of the fan cover (6) and the outer surface of the housing (2), wherein the fan cover (6) has at least one air inlet (17) and wherein each gap (16) defines an air outlet (18) which is fluidly connected to the air inlet (17) and the periphery of the housing (2).
8. The electric machine (1) according to claim 7, **characterized in that** each spacer (15) is disposed onto the endshield (4) and configured to abut against an inner surface of the fan cover (6).
9. The electric machine (1) according to claim 7 or 8, **characterized in that** air inlet (17) is centered with respect to the axial direction and the air outlets (18) are disposed circumferentially around the axial direction.
10. The electric machine (1) according to any one of claims 1 to 9, **characterized in that** the housing (2), the endshield (4) and the fan cover (6) respectively have cylindrical shapes.

Fig. 1

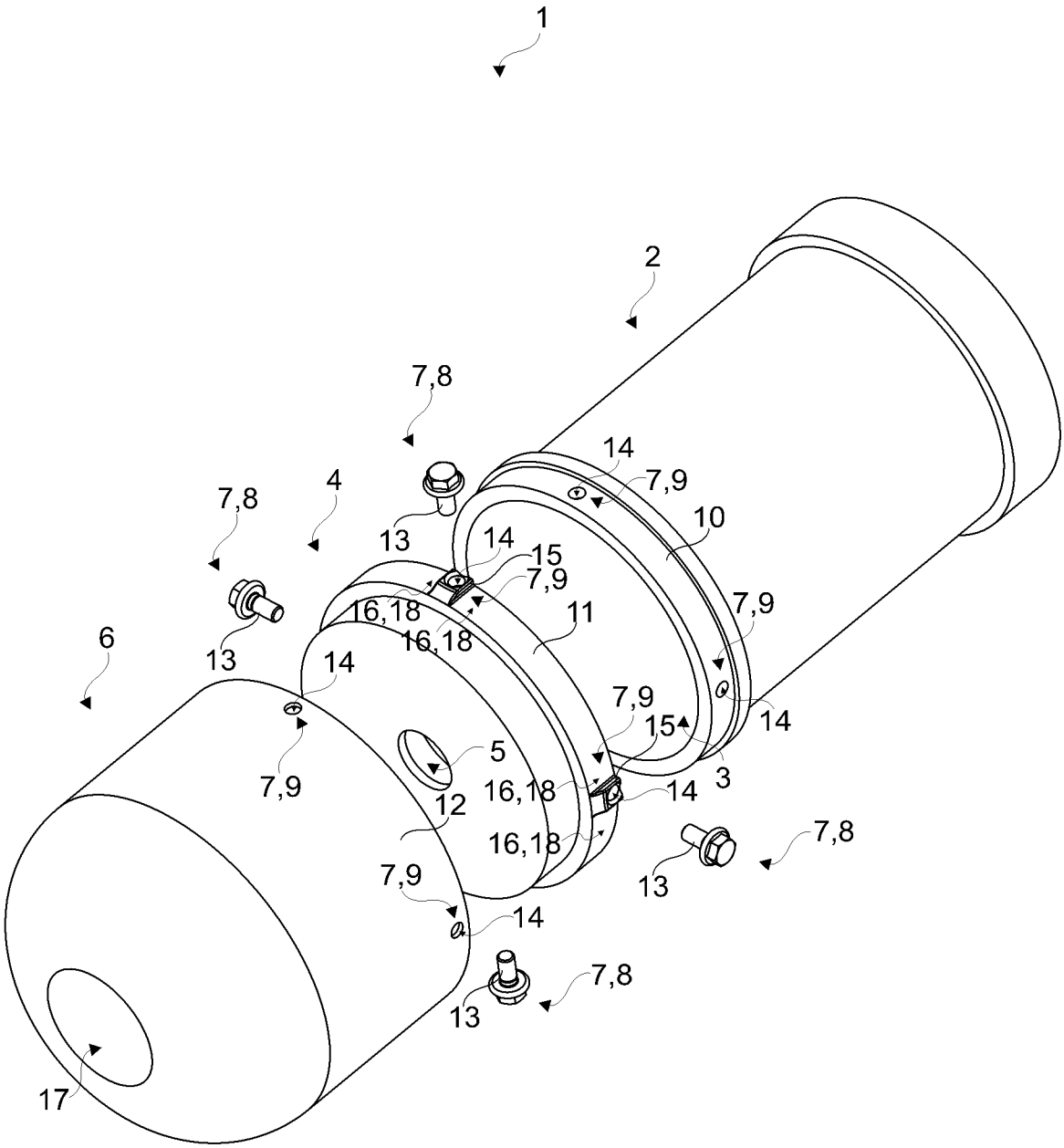
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Fig. 2

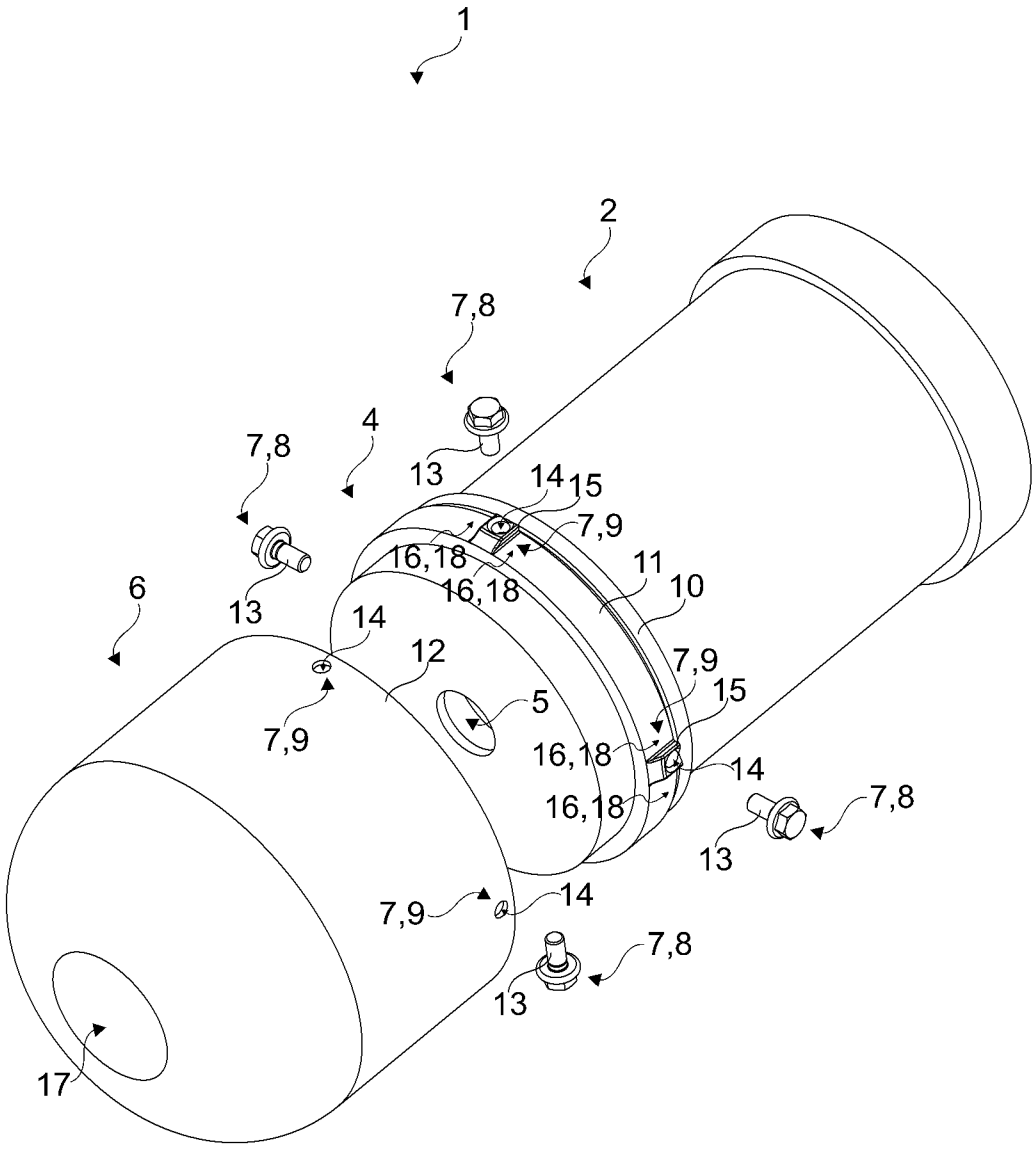
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Fig. 3

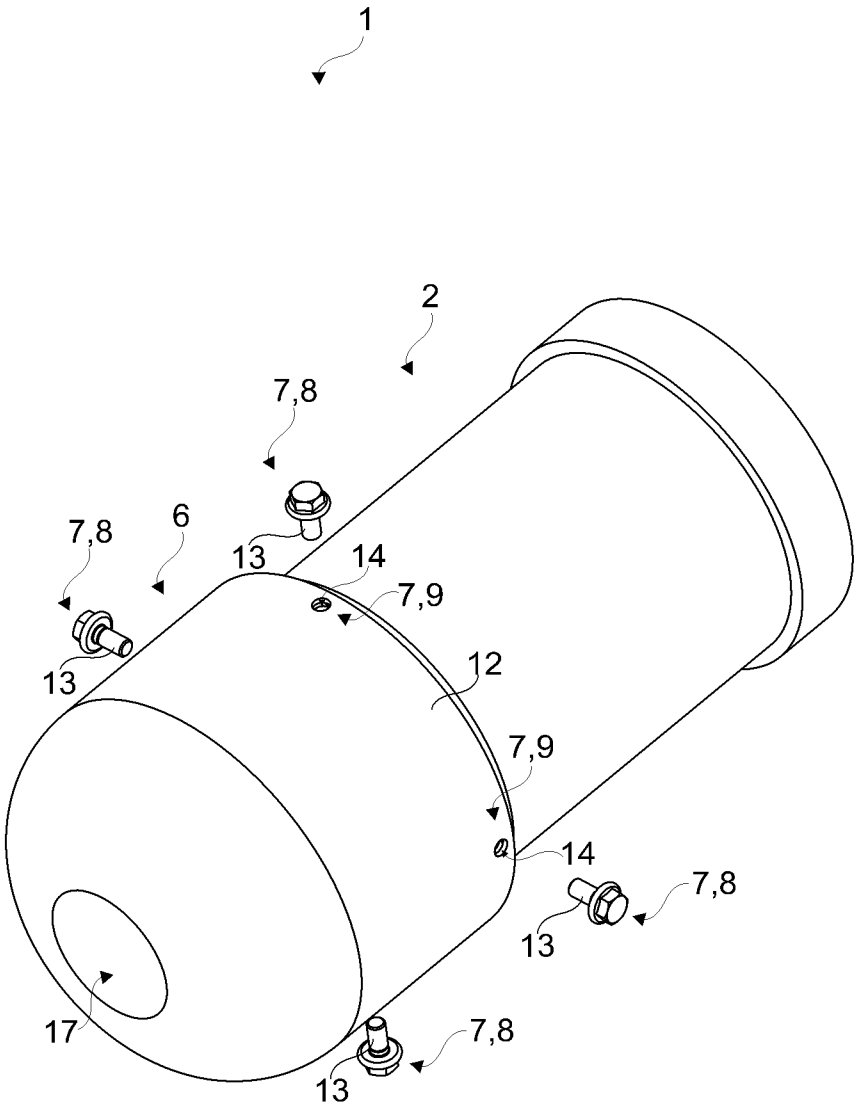
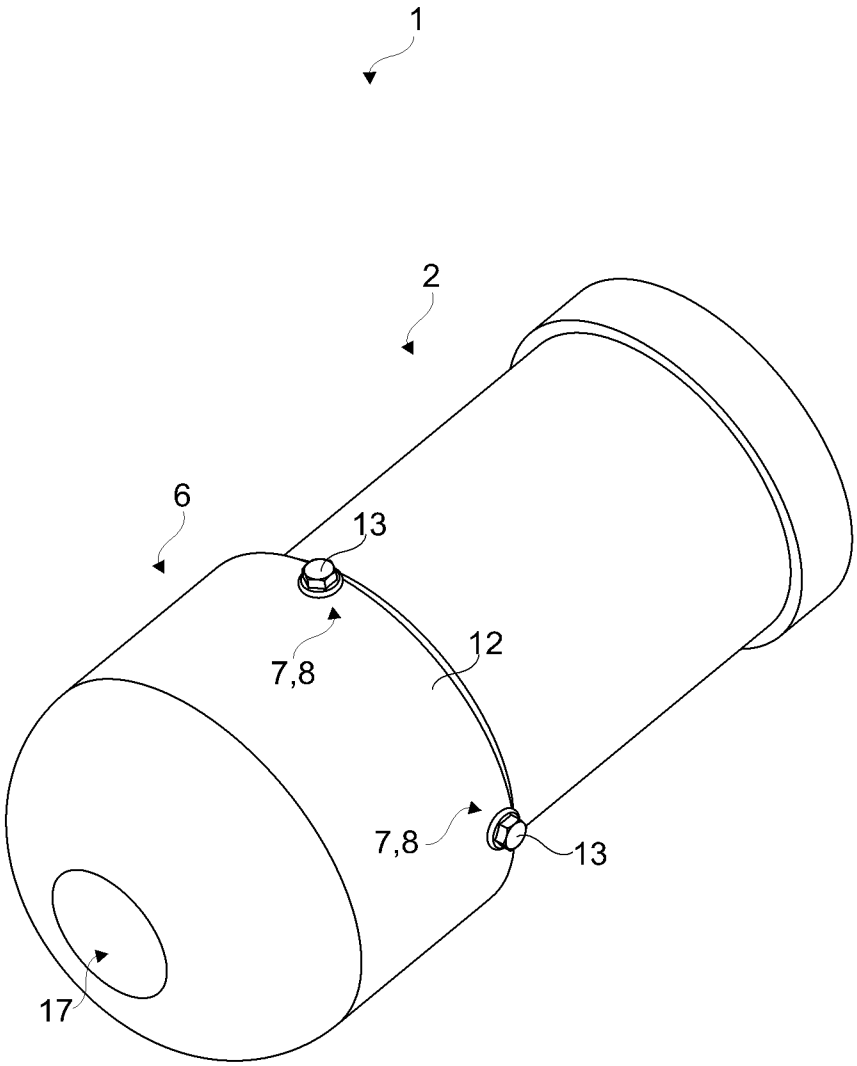


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/079343

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02K5/15 H02K5/20
ADD. H02K9/06 H02K9/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/103056 A1 (MITSUBISHI ELECTRIC CORP [JP]; ASO HIROKI [JP]; KAWAKUBO MAMORU [JP];) 3 July 2014 (2014-07-03)	1,5,6,10
Y	abstract; figures	2-4,7-9

X	EP 0 433 247 A1 (OEMER MOTORI ELETTRICI S P A [IT]) 19 June 1991 (1991-06-19) abstract; figures	1

Y	DE 20 2013 011883 U1 (HANNING ELEKTRO WERKE [DE]) 7 October 2014 (2014-10-07) abstract; figures	2-4,7-9

A	JP H04 67750 A (MITSUBISHI ELECTRIC CORP) 3 March 1992 (1992-03-03) abstract; figures	1-10

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
13 August 2015	21/08/2015

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP H08 168203 A (MEIDENSHA ELECTRIC MFG CO LTD) 25 June 1996 (1996-06-25) abstract; figures -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/079343

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014103056 A1	03-07-2014	NONE	
EP 0433247 A1	19-06-1991	AT 125399 T	15-08-1995
		DE 69021028 D1	24-08-1995
		DE 69021028 T2	11-01-1996
		EP 0433247 A1	19-06-1991
		ES 2077054 T3	16-11-1995
		IT 219068 Z2	27-11-1992
DE 202013011883 U1	07-10-2014	NONE	
JP H0467750 A	03-03-1992	NONE	
JP H08168203 A	25-06-1996	NONE	