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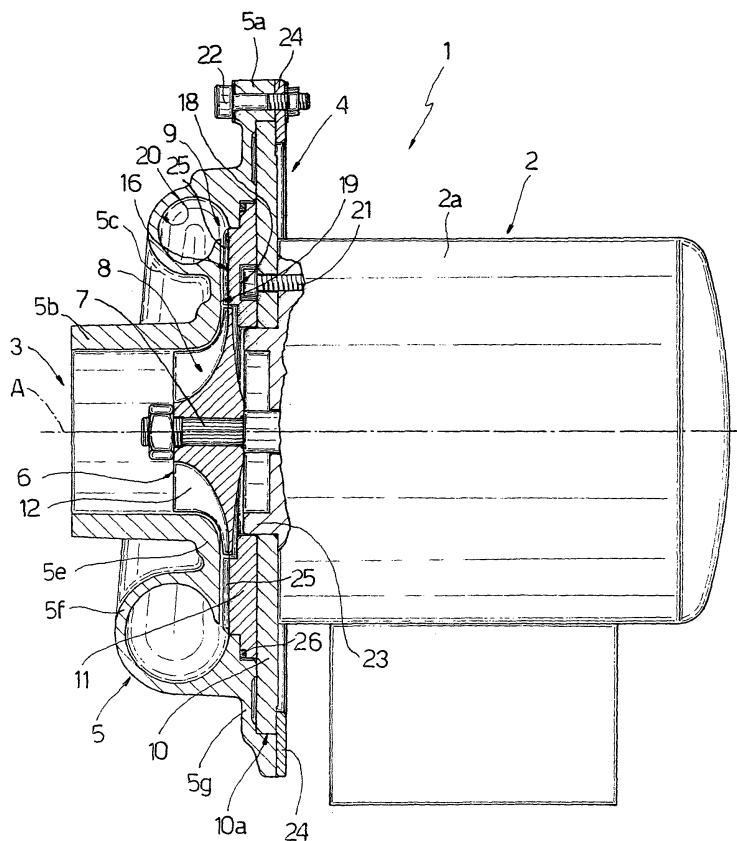
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(54) **Automotive motor-compressor assembly**

(57) There is described an automotive motor-compressor assembly (1) having an electric motor (2); a compressor (3) through which a work fluid flows, and having a housing (5) and an impeller (6); and connecting means (4) for releasably fixing the compressor (3) to the

motor (2), and having a first connecting member (10) defining a locating surface (10a) for a connecting portion (5a) of the housing (5), and a second connecting member (11) defining at least one guide surface (16) for guiding the work fluid inside the housing (5).



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Description

[0001] The present invention relates to an automotive motor-compressor assembly, in particular for supplying compressed air to fuel-cell systems.

[0002] Automotive motor-compressor assemblies are known which substantially comprise an electric motor; and a centrifugal compressor having a housing fixed to and supported by the electric motor housing, and one or more impellers connected to an output shaft of the motor. More specifically, at one axial end, the electric motor housing has a connecting flange, an outer circumferential surface of which supports and is fitted with the compressor housing.

[0003] More specifically, the compressor housing defines an intake at the opposite axial end to the connecting flange, and a volute supply manifold with the flange. The impeller comprises a number of blades fitted to a portion of the output shaft of the electric motor projecting inside the compressor housing.

[0004] In a normal operating cycle, air flows from the intake to the supply manifold along a path defined by the inner contour of the compressor housing and by the outer contour of the impeller rotated by the electric motor shaft.

[0005] The outer circumferential surface of the connecting flange provides for locating the compressor housing, so the connecting flange involves a relatively high degree of dimensional precision to reduce the gap between the inner contour of the housing and the outer contour of the impeller, and so enhance the overall efficiency of the compressor.

[0006] The circular surface, facing the compressor housing, of the connecting flange also provides for guiding the air supply, so that each compressor size calls for a connecting flange of specific shape and size.

[0007] When frequent changes are made to the size of the turboblowers fitted to the same type of electric motor, either for test reasons or to permit a certain amount of flexibility in the equipment of different types of vehicles, the above motor-compressor assembly configuration calls for changing the entire connecting flange, which involves complex machining work, especially in view of the close dimensional tolerances of the circumferential surface by which the compressor is located.

[0008] It is an object of the present invention to provide an automotive motor-compressor assembly designed to eliminate the aforementioned drawback typically associated with known motor-compressor assemblies.

[0009] According to the present invention, there is provided an automotive motor-compressor assembly comprising:

- an electric motor;
- a compressor through which a work fluid flows, and having a housing and an impeller; and

- connecting means for releasably fixing said compressor to said motor, and comprising at least a first connecting member defining a locating surface for a connecting portion of said housing;

characterized in that said connecting means comprise a second connecting member defining at least one guide surface for guiding the work fluid inside the housing.

[0010] For a clearer understanding of the present invention, a preferred non-limiting embodiment of a motor-compressor assembly will be described by way of example with reference to the accompanying drawing showing a partly sectioned side view of the assembly.

[0011] Number 1 in the accompanying drawing indicates as a whole an automotive motor-compressor assembly, in particular for supplying compressed air to fuel-cell systems.

[0012] Assembly 1 has an axis A, and substantially comprises a known electric motor 2 illustrated only insofar as necessary for a clear understanding of the present invention; a compressor 3 - in the example shown, a centrifugal compressor; and connecting means 4 for connecting electric motor 2 and compressor 3.

[0013] More specifically, of electric motor 2 are shown only a casing 2a, and an output shaft 7 extending partly inside casing 2a and partly outwards from one side of casing 2a.

[0014] Compressor 3 comprises a housing 5; and an impeller 6 having a number of blades 12 fixed releasably to the portion of output shaft 7 projecting from casing 2a of electric motor 2. Housing 5 defines a through axial cavity, and comprises an axial end portion 5a fixed by connecting means 4 to casing 2a of electric motor 2; an opposite axial end portion 5b defining an intake; and an intermediate portion 5c defining a compression conduit 8 with impeller 6, and a radially outer compressed-air supply manifold 9.

[0015] More specifically, axial end portion 5b has the smallest diameter, and is connected to end portion 5a, defining the largest diameter, by successive sections varying in diameter and including a radial first portion 5e, a volute-shaped second portion 5f, and a radial third portion 5g.

[0016] Supply manifold 9 is therefore defined by a radial initial portion 19 defined between radial portion 5e of intermediate portion 5c and connecting means 4 (as described in more detail later on), and by a volute-shaped final portion 20 defined entirely by portion 5f of intermediate portion 5c.

[0017] Connecting means 4 comprise a first plate 10 fixed coaxially to casing 2a of motor 2, on the side from which shaft 7 projects, and having an outer circumferential surface 10a for locating end portion 5a; and a second plate 11 retained coaxially with casing 2a, located on the opposite side of plate 10 to electric motor 2, and defining, with intermediate portion 5c of housing 5, initial

portion 19 of supply manifold 9.

[0018] More specifically, plate 10 is connected to casing 2a by releasable fastening means defined, in the example shown, by screws 21, the heads of which are housed inside respective dead seats 18 formed in plate 11. Plate 11 therefore also provides for preventing the drag induced by screws 21 from interfering with the compressed-air flow.

[0019] Plate 11 is sandwiched axially between plate 10 and housing 5, and preferably comprises a number of air-guide blades 25. More specifically, housing 5 is fixed at end portion 5a to the radially outermost portion of plate 10 by means of releasable fastening means defined, in the example shown, by bolts 22, and cooperates, by means of a shoulder formed in volute-shaped portion 5f, with plate 11 to keep it in axial contact with plate 10. A sealing ring 26 is interposed between said shoulder and plate 11 to fluidtight seal initial portion 19 of supply manifold 9.

[0020] At assembly, end portion 5a of housing 5 is fitted in rotary manner to circumferential surface 10a of plate 10, and is locked angularly to plate 10 by bolts 22.

[0021] More specifically, the radially outermost portion of plate 10 is gripped axially, by means of bolts 22, between radial portion 5g of housing 5 and two half-ring-shaped stop members 24.

[0022] Both plates 10, 11 have an axial hole through which to insert shaft 7 projecting from electric motor 2, and both are centred on a lateral collar 23 of electric motor 2.

[0023] As shown clearly in the attached drawing, portion 19 of supply manifold 9 is defined between radial portion 5e of housing 5 and a surface 16 of plate 11, which is opposite the surface contacting plate 10 and is provided with blades 25.

[0024] The advantages of motor-compressor assembly 1 according to the present invention will be clear from the foregoing description.

[0025] In particular, by simply modifying plate 11, electric motor 2 can be fitted with impellers 6 and housings 5 of different shapes and sizes, without having to remake plates 10, which are dimensionally much more precise and therefore more expensive.

[0026] Moreover, fastening housing 5 to electric motor by means of bolts 22 and stop members 24 leaves housing 5 free to rotate about axis A of electric motor 2. Once, the desired angular position is reached, bolts 22 are tightened, thus simplifying the fastening of housing 5 to electric motor 2.

[0027] Clearly, changes may be made to motor-compressor assembly 1 as described and illustrated herein without, however, departing from the scope of the accompanying Claims.

Claims

1. An automotive motor-compressor assembly (1)

comprising:

- an electric motor (2);
- at least one compressor (3) through which a work fluid flows, and having a housing (5) and an impeller (6); and
- connecting means (4) for releasably fixing said compressor (3) to said motor (2), and comprising at least a first connecting member (10) defining a locating surface (10a) for a connecting portion (5a) of said housing (5);

characterized in that said connecting means (4) comprise a second connecting member (11) defining at least one guide surface (16) for guiding the work fluid inside the housing (5).

2. A motor-compressor assembly as claimed in Claim 1, **characterized in that** said second connecting member (11) is sandwiched axially between said first connecting member (10) and said housing (5).
3. A motor-compressor assembly as claimed in Claim 2, **characterized by** comprising releasable first fastening means (21) for fastening said first connecting member (10) to said motor (2); said second connecting member (11) defining at least one seat (18) for a respective projecting portion of said releasable first fastening means (21).
4. A motor-compressor assembly as claimed in any one of the foregoing Claims, **characterized in that** said connecting portion (5a) of said housing (5) is fitted in rotary manner to said locating surface (10a) of said first connecting member (10); second fastening means (22) being provided to lock said housing (5) to said first connecting member (10) in the desired angular position.
5. A motor-compressor assembly as claimed in any one of the foregoing Claims, **characterized in that** said second connecting member (11) has blades (25).

Amended claims in accordance with Rule 86(2) EPC.

1. An automotive motor-compressor assembly (1) comprising:

- an electric motor (2);
- a compressor (3) through which a work fluid flows, and having a housing (5) and an impeller (6); and
- connecting means (4) for releasably fixing said compressor (3) to said motor (2), and comprising a first connecting member (10) and a second connecting member (11); said first con-

necting member (10) being separated from and releasably fixed to said housing (5), and defining a locating surface (10a) for a connecting portion (5a) of said housing (5), and said second connecting member (11) being separated from and releasably fixed to said first connecting member (10) and said housing (5), and defining one guide surface (16) for guiding the work fluid inside the housing (5);

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characterized in that said second connecting member (11) is freely sandwiched between said first connecting member (10) and said housing (5), so as to be axially free from said first connecting member (10) when said housing (5) is released from said first connecting member (10).

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2. A motor-compressor assembly as claimed in Claim 1, **characterized by** releasable first fastening means (21) for fastening said first connecting member (10) to said motor (2); said second connecting member (11) defining one seat (18) for a respective projecting portion of said releasable first fastening means (21).

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3. A motor-compressor assembly as claimed in any one of the foregoing Claims, **characterized in that** said connecting portion (5a) of said housing (5) is fitted in rotary manner to said locating surface (10a) of said first connecting member (10); second fastening means (22) being provided to lock said housing (5) to said first connecting member (10) in the desired angular position.

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4. A motor-compressor assembly as claimed in any one of the foregoing Claims, **characterized in that** said second connecting member (11) has blades (25).

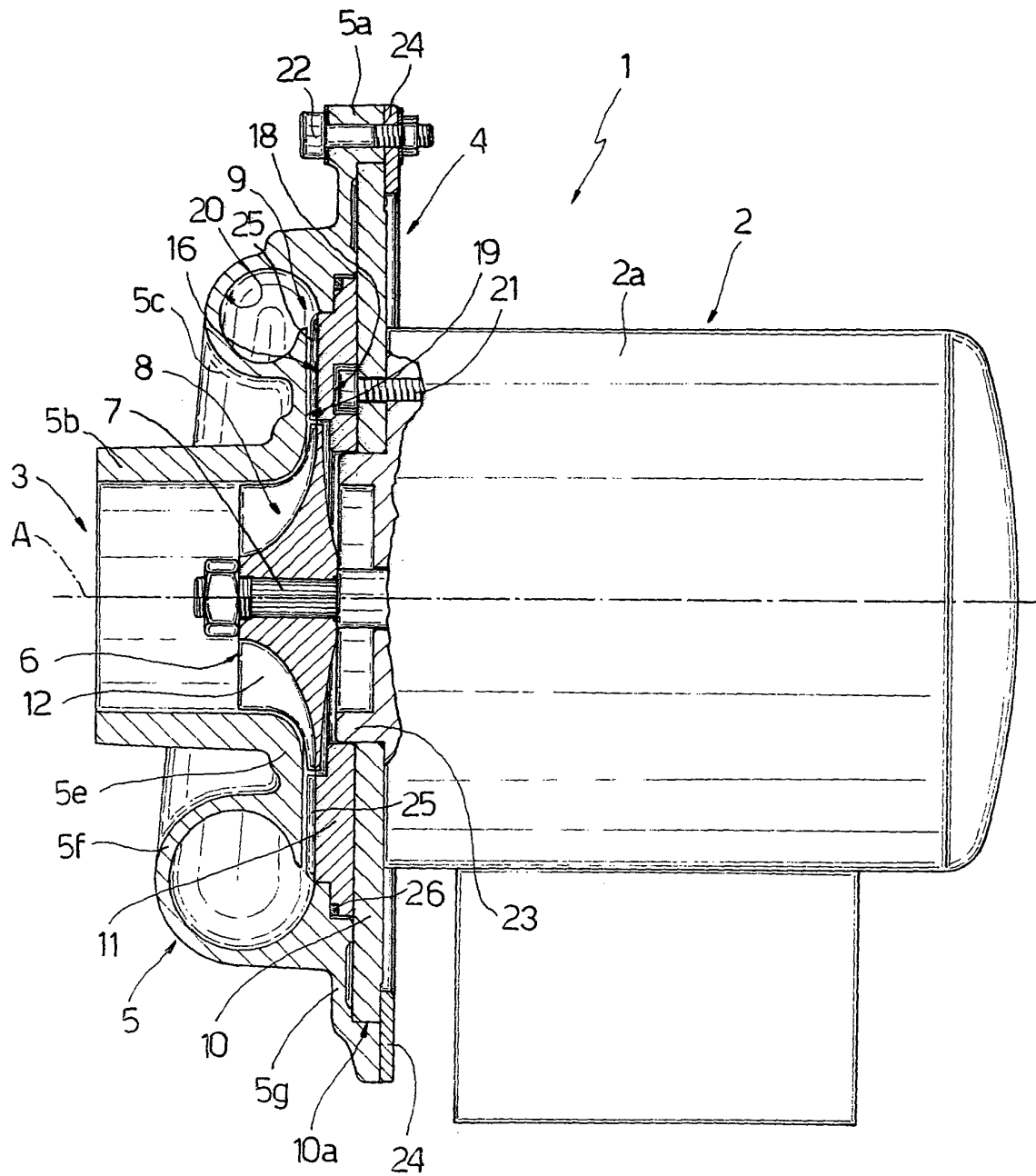
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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5144

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X	US 5 638 796 A (ADAMS III HERBERT L ET AL) 17 June 1997 (1997-06-17)	1	F04D25/06
Y	* column 3, line 21 - column 4, line 35; figure 2 *	2,5	F04D29/44
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Y	* column 1, line 16 - line 21 *	2	
	* column 5, line 25 - column 8, line 10; figure 2 *		
X	US 4 767 285 A (TOYOSIMA HISANORI ET AL) 30 August 1988 (1988-08-30)	1-3	
Y	* column 3, line 45 - column 5, line 22; figure 2 *	5	
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 28 July 2004	Examiner Di Giorgio, F
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 42 5144

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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