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(54) Title: OVERRUN AIR RECIRCULATION VALVE OF AN EXHAUST-GAS TURBOCHARGER COMPRESSOR

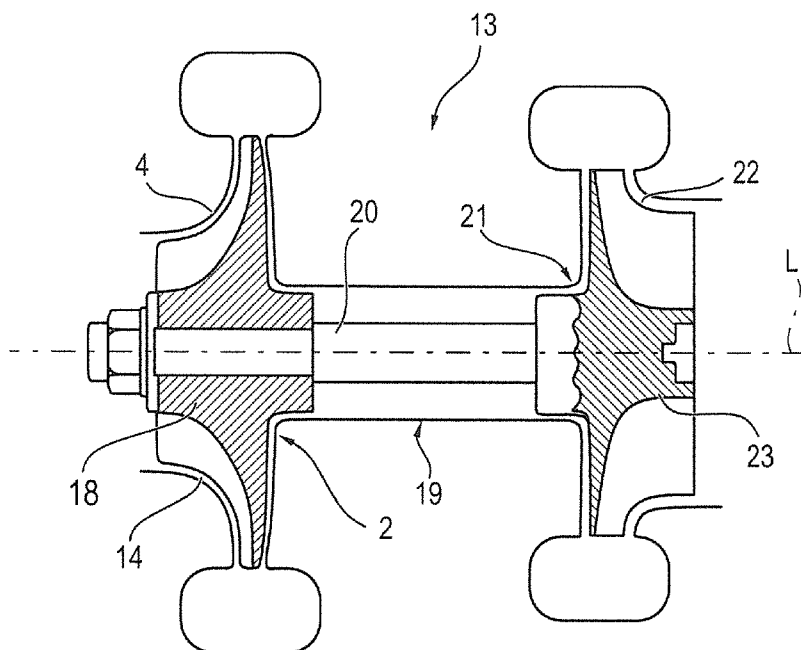


FIG. 1

(57) Abstract: The invention relates to an overrun air recirculation valve (1) of an exhaust-gas turbocharger compressor (2), having a valve housing (3) which has an interior (4), having a diaphragm (5) which is guided in the interior (4) and which has an edge-side sealing means (6); and having a connecting means (7) provided on the valve housing (3), wherein the sealing means (6) is in the form of a sealing means which acts in the radial direction R of the diaphragm (5).

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *of inventorship (Rule 4.17(iv))*

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- 1 -

OVERRUN AIR RECIRCULATION VALVE OF AN EXHAUST-GAS
TURBOCHARGER COMPRESSOR

DESCRIPTION

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The invention relates to an overrun air recirculation valve as per the preamble of claim 1, to a compressor of an exhaust-gas turbocharger as per the preamble of claim 10, and to a method as per claim 12.

10 A generic overrun air recirculation valve and a generic compressor are known from DE 20 2009 013 401 U1. Here, for the fastening of the overrun air recirculation valve to the compressor housing, use is made of a screw connection means which requires a multiplicity of bores in the valve housing, spacer sleeves arranged in said bores, and a number of screws and internal threads in the compressor housing, said number corresponding to the number of bores.

15 It is accordingly an object of the present invention to provide an overrun air recirculation valve and a compressor as per the preamble of claim 1 and the preamble of claim 10, respectively, which are of simpler construction and easier to assemble.

This object is achieved by the features of claim 1.

20 The embodiment of the overrun air recirculation valve according to the invention makes it possible for said overrun air recirculation valve to be completely preassembled to form a valve cartridge, the latter being delivered in the completely preassembled state for attachment to the compressor, it then being possible for said valve cartridge to be fastened to the fastening flange of the compressor housing in a simple and fast manner by way of the connecting means.

25 The sealing means of the overrun air recirculation valve according to the invention is in this case in the form of a radial seal which acts in the radial direction of the diaphragm and which takes effect during the course of the mounting process.

Dependent claims 2 to 9 relate to advantageous developments of the overrun air recirculation valve according to the invention.

30 Claims 10 and 11 define the compressor according to the invention as an object which can be marketed independently.

Claim 12 defines a mounting method in which the overrun air recirculation valve is completely preassembled with its valve housing, its diaphragm with the edge-

- 2 -

side sealing means thereof, and the other components of such overrun air recirculation valves such as for example a spring and a valve plate.

After delivery of the overrun air recirculation valve cartridge that is preassembled in this way, said cartridge can be fixed to the compressor in a simple manner, in particular if the connecting means of the overrun air recirculation valve according to the invention is in the form of a clip-type connecting means. A clip-type connecting means of said type generally has a multiplicity of clip lugs which extend in the axial direction of the valve plate and which each comprise detent catches. Here, the clip lugs are preferably of elastically resilient form and, at their free ends, have preferably conically chamfered detent catches which, as the overrun air recirculation valve is pushed onto the fastening flange of the compressor housing, can engage behind an annularly encircling detent edge of the compressor housing, whereby the fixing of the overrun air recirculation valve to the compressor housing can be realized.

In the design according to the invention, a screw connection would alternatively also be conceivable, preferably at three eyelets of the valve housing on the circumference thereof.

Further details, advantages and features of the present invention become apparent from the following description of an exemplary embodiment with reference to the drawing, in which:

Figure 1 is a schematically highly simplified illustration of an exhaust-gas turbocharger which can be provided with the overrun air recirculation valve according to the invention and the compressor according to the invention,

Figure 2 is a perspective illustration of the overrun air recirculation valve according to the invention in the state in which it is fixed to a fastening flange of the compressor housing,

Figure 3 is a sectional illustration through the overrun air recirculation valve as per Figure 2, and

Figure 4 is a view of the overrun air recirculation valve as per Figure 2 from below, in the direction of its diaphragm.

Figure 1 shows an exhaust-gas turbocharger 13 in a schematically highly simplified illustration, which exhaust-gas turbocharger can be provided with an overrun air recirculation valve 1 and a compressor 2 such as will be described on the basis of Figures 2 to 4.

- 3 -

In addition to the compressor 2 with its compressor housing 14 and the compressor wheel 18 arranged in the compressor housing 14, the exhaust-gas turbocharger 13 has a bearing housing 19 in which a shaft 20 is mounted, which shaft, at its two ends, bears the compressor wheel 18 at one end and, at the other end, bears a turbine wheel 23 which is arranged in a turbine housing 22 of a turbine 21. The exhaust-gas turbocharger 13 according to the invention self-evidently also has all the other components of such turbochargers, the explanation of which is however not necessary for the explanation of the principles of the present invention.

The overrun air recirculation valve 1 according the invention is illustrated in a perspective view in Figure 2. The overrun air recirculation valve 1 has a valve housing 3 which, on its outer circumference, is provided with a connecting means 7, the latter preferably being in the form of a clip-type connecting means which has a multiplicity of clip lugs, of which the clip lugs 7A to 7C are visible in Figure 2. As can be seen from the illustration of Figure 4, however, it is the case in the illustrated embodiment that the connecting means 7 has a total of five such clip lugs 7A to 7E. The number of said lugs is dependent on the installation conditions and/or the configuration of the exhaust-gas turbocharger 13 and/or of the compressor 2, and may vary according to the usage situation.

Figure 2 shows the mounted state of the overrun air recirculation valve 1 on a fastening flange 15, as will be explained in detail below on the basis of Figure 3.

Here, Figure 3 shows that the valve housing 3 has an interior 4 in which a diaphragm 5 is guided over a valve plate 26 which is acted on by a restoring spring 25.

The diaphragm 5 is provided, at the edge side, with a sealing means 6 which is connected to the diaphragm 5, the latter preferably being captively attached to the valve housing 3.

As can be seen from the illustration of Figure 3, the sealing means, which is a sealing means that acts in the radial direction R of the diaphragm 5, has two radial, annularly encircling sealing lips or sealing rings 8 and 9 in the example. In the particularly preferred embodiment illustrated in Figure 3, the sealing lips 8 and 9 are integrally connected to one another via a connecting portion 10. As illustrated in Figure 3, said sealing lips may form a V-shaped configuration or else a U-shaped configuration.

- 4 -

As is also illustrated in Figure 3, the sealing lips 8, 9 and the connecting portion 10 delimit a space 11 into which a fixing wedge (fixing cone or fixing cylinder) engages. As a result of said engagement of the fixing wedge 12, the sealing lips 8 and 9 are pressed radially against walls 27 and 28 of an annularly encircling receiving groove 16, which is open on the face side, of the fastening flange 15 of the compressor 2, and thereby build up the sealing action.

Finally, Figure 3 shows that the fastening flange 15 has an annularly encircling detent edge 17 which interacts with a detent catch 24 of the clip lugs 7A to 7E, wherein only the lug 7A with its associated detent catch 24 is visible in Figure 3.

10 In addition to the above written description of the invention, reference is hereby explicitly made, for supplementation thereof, to the diagrammatic illustration of the invention in Figures 1 to 4.

- 5 -

LIST OF REFERENCE SIGNS

	1	Overrun air recirculation valve
	2	Compressor
5	3	Valve housing
	4	Interior
	5	Diaphragm
	6	Edge-side sealing means
	7	Connecting means
10	7A-7E	Clip lugs
	8, 9	Sealing lips
	10	Connecting portion
	11	Space
	12	Fixing wedge
15	13	Exhaust-gas turbocharger
	14	Compressor housing
	15	Fastening flange
	16	Receiving groove
	17	Detent edge
20	18	Compressor wheel
	19	Bearing housing
	20	Shaft
	21	Turbine
	22	Turbine housing
25	23	Turbine wheel
	L	Longitudinal direction of the exhaust-gas turbocharger 13
	R	Radial direction of the diaphragm 5
	A	Axial direction of the valve plate

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CLAIMS

1. An overrun air recirculation valve (1) of an exhaust-gas turbocharger compressor (2),
 - 5 — having a valve housing (3) which has an interior (4),
 - having a diaphragm (5)
 - which is guided in the interior (4) and
 - which has an edge-side sealing means (6); and
 - having a connecting means (7) provided on the valve housing (3),
- 10 wherein
 - the sealing means (6) is in the form of a sealing means which acts in the radial direction (R) of the diaphragm (5).
2. The overrun air recirculation valve as claimed in claim 1, wherein the
- 15 sealing means (6) has two radial, annularly encircling sealing lips (8, 9).
3. The overrun air recirculation valve as claimed in claim 2, wherein the sealing lips (8, 9) are integrally connected to one another via a connecting portion (10).
- 20 4. The overrun air recirculation valve as claimed in claim 3, wherein the sealing lips (8, 9) form a V-shaped cross-sectional configuration.
5. The overrun air recirculation valve as claimed in claim 3, wherein the sealing lips (8, 9) form a U-shaped cross-sectional configuration.
- 25 6. The overrun air recirculation valve as claimed in one of claims 2 to 5, wherein a fixing wedge (12) engages into a space (11) between the sealing lips (8, 9).
7. The overrun air recirculation valve as claimed in claim 6, wherein the
- 30 fixing wedge (12) is conical.
8. The overrun air recirculation valve as claimed in claim 6, wherein the fixing wedge (12) is of cylindrical form.

- 7 -

9. The overrun air recirculation valve as claimed in one of claims 1 to 8, wherein the connecting means (7) is in the form of a clip-type connecting means (7A-7D).

- 5 10. A compressor (2) of an exhaust-gas turbocharger (13),
 – having a compressor housing (14) which has a fastening flange (15) for an overrun air recirculation valve (1) as claimed in one of claims 1 to 9, wherein
 – the fastening flange (15) has an annularly encircling receiving groove (16), which is open on the face side, for the sealing means (6).

10

11. The compressor as claimed in claim 10, wherein the compressor housing (14) has an annularly encircling detent edge (17).

12. A method for the mounting of an overrun air recirculation valve (1) on a
15 compressor housing (14) of a compressor (2) of an exhaust-gas turbocharger (13), having the following method steps:

- preassembling a valve housing (3), a diaphragm (5) and the other components of the overrun air recirculation valve (1) to form an overrun air recirculation valve cartridge; and
20 – fastening the overrun air recirculation valve cartridge to a fastening flange (15) of a compressor housing (14),
 – wherein, during the course of the mounting of the overrun air recirculation valve (1), the diaphragm (5) is radially sealed off at the edge side in an annularly encircling receiving groove (16) of a fastening flange (15) of the compressor
25 housing (14).

1/2

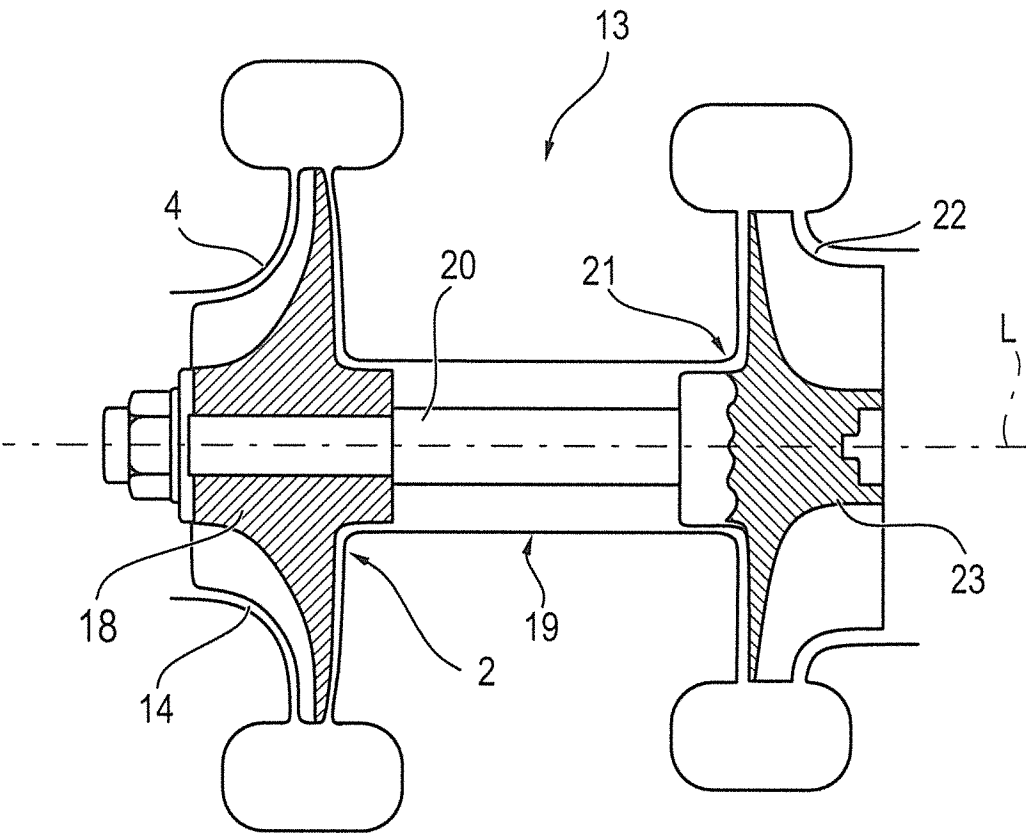


FIG. 1

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FIG. 2

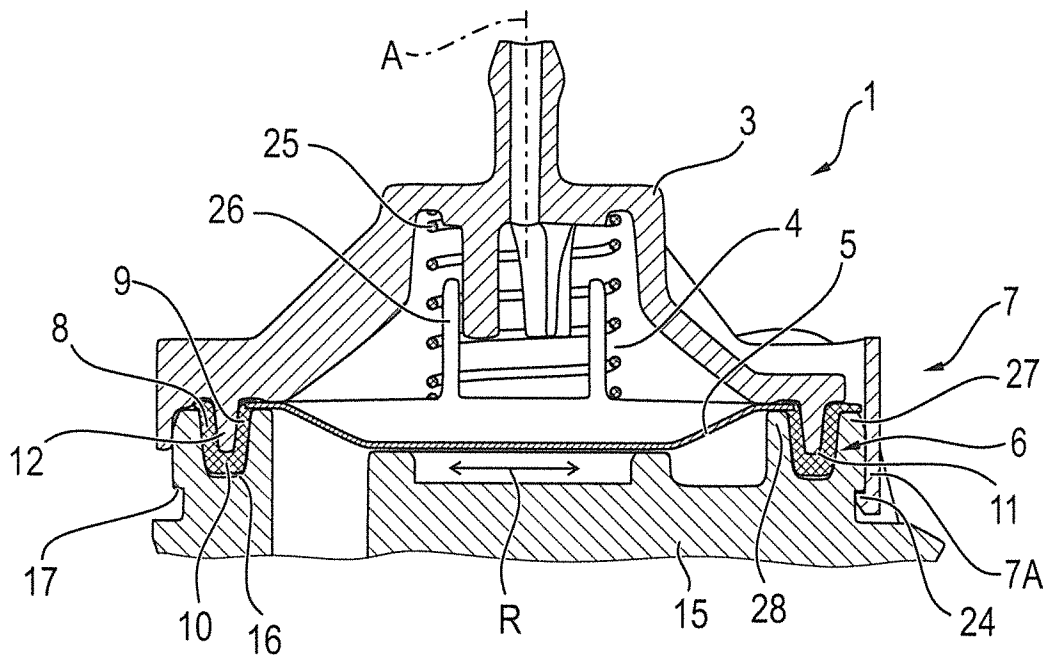
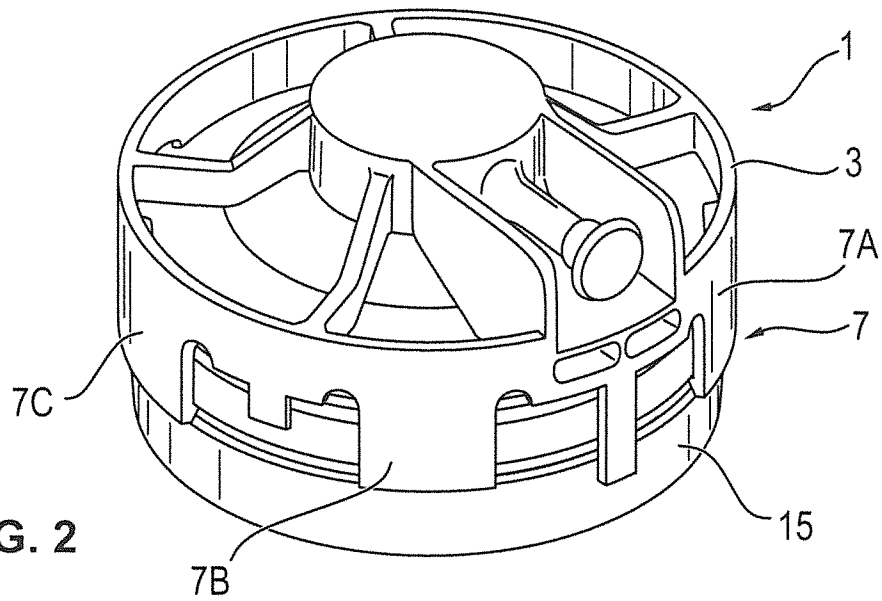
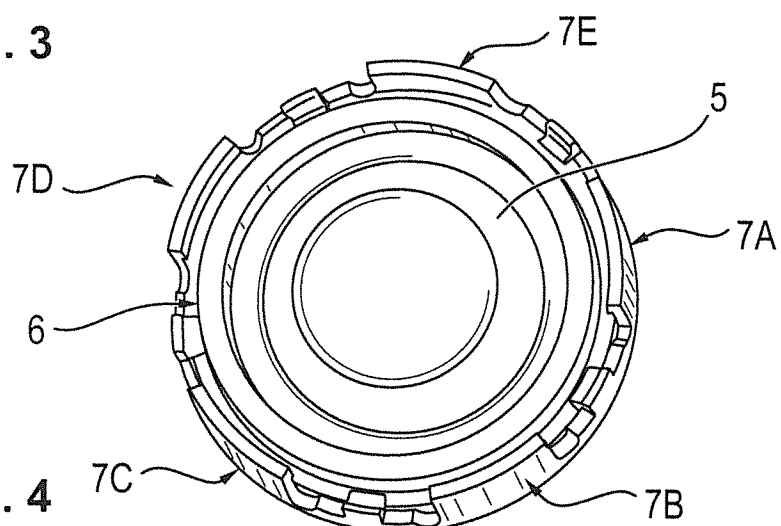


FIG. 3

FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/071930**A. CLASSIFICATION OF SUBJECT MATTER****F02B 37/16(2006.01)i, F02B 37/12(2006.01)i, F02B 39/00(2006.01)i, F01D 25/24(2006.01)i**

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)

F02B 37/16; F02B 37/10; H01R 13/648; F02B 47/08; H01R 13/64; F01D 17/00; F02M 25/07; F02M 37/04; F02B 37/12; F02B 39/00; F01D 25/24

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: recirculation-valve, compressor, diaphragm, sealing

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A		10-12
Y	US 2012-0015549 A1 (YOUN et al.) 19 January 2012 See See paragraph [0041]; and figure 5.	1-9
A	US 6,898,934 B1 (BAYER et al.) 31 May 2005 See claims 1,3 and figures 1-3.	1-12
A	US 5,909,725 A (BALSDON et al.) 08 June 1999 See claims 1,11 and figures 1-2.	1-12
A	US 7,213,586 B2 (WILSON et al.) 08 May 2007 See claims 1,8 and figures 5-7.	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of mailing of the international search report

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Name and mailing address of the ISA/KR

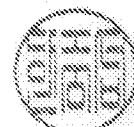
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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