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(54) Title: COMPRESSOR OF AN EXHAUST-GAS TURBOCHARGER

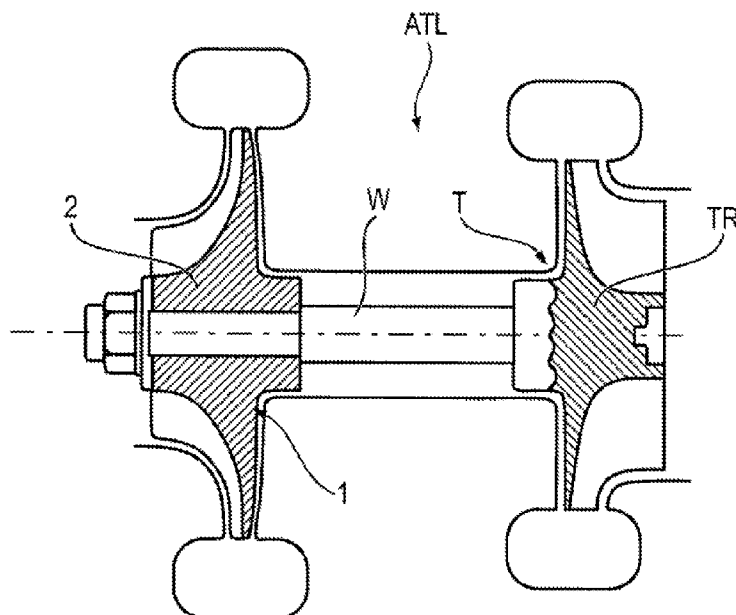


FIG. 1

(57) Abstract: The invention relates to a compressor (1) of an exhaust-gas turbocharger (ATL), having a compressor wheel (2); and having a compressor housing (3) which has a housing longitudinal axis (A), in which the compressor wheel (2) is arranged and which has an inlet duct (5), said inlet duct running from a compressor inlet (4) to the compressor wheel (2) and having a recirculation duct (6) which has a compressor-wheel-side inflow opening (7) and a compressor-inlet-side return flow opening (8), wherein the inflow opening (7) and the return flow opening (8) can be opened and closed.



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COMPRESSOR OF AN EXHAUST-GAS TURBOCHARGER

DESCRIPTION

5 The invention relates to a compressor of an exhaust-gas turbocharger as per the preamble of claim 1.

 A compressor of said type is known from DE 10 2009 019 754 A1.

 The bypass or recirculation duct provided therein, commonly referred to as a so-called "characteristic-map-stabilizing measure", has the effect that the compressor
10 characteristic map can be extended in the region of the surge limit. The provision of such a recirculation duct and of the passage in the region of the wheel contour however lead to a degradation in efficiency in wide ranges of the characteristic map, even though the characteristic-map-stabilizing measures are not active here.

 It is therefore an object of the present invention to create a compressor of the type
15 specified in the preamble of claim 1, which compressor makes it possible to provide a characteristic-map-stabilizing measure without efficiency disadvantages in relation to a compressor without such characteristic-map-stabilizing measures.

 Said object is achieved by means of the features of claim 1.

 By virtue of the fact that the inflow and return flow openings of the recirculation
20 duct can be opened and closed, said duct can be activated only in those characteristic map regions in which it also active in terms of the surge limit. The duct can be deactivated in the region of part load or full load of the engine, such that the efficiency of the compressor according to the invention can be improved overall.

 Although EP 1 639 245 B1 discloses a compressor which likewise has an
25 additional duct adjacent to the compressor inlet duct, said additional duct cannot serve as a recirculation duct because its inlet side is always flow-connected to an air collecting chamber even when its outlet side is closed by means of a shut-off element. Furthermore, in said blocking position, the entire inlet duct to the compressor wheel is closed by the shut-off element, whereas the inlet duct of the compressor according to
30 the invention remains open even when the recirculation duct is closed.

 The subclaims relate to advantageous refinements of the invention.

 Further details, advantages and features of the present invention will emerge from the following description of an exemplary embodiment on the basis of the drawing, in which:

35 Figure 1 shows a schematically highly simplified diagrammatic illustration of an exhaust-gas turbocharger which may be provided with a compressor according to the invention,

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Figure 2 shows a partial section through a compressor according to the invention, with the recirculation duct open, and

Figure 3 shows an illustration of the compressor corresponding to Figure 2, with the recirculation duct closed.

5 Figure 1 shows an exhaust-gas turbocharger ATL in a diagrammatically highly simplified illustration, which exhaust-gas turbocharger has, as is conventional, a turbine T whose turbine wheel TR is connected via a shaft W to a compressor wheel 2 of the compressor 1 according to the invention. The exhaust-gas turbocharger self-evidently also has all the other conventional components, the description of which is
10 however not necessary for explaining the principles of the present application.

Figures 2 and 3 show a sectional illustration through that region of the compressor 1 which is arranged above a longitudinal axis A. The compressor 1 has a compressor wheel 2 which is arranged in a compressor housing 3.

The compressor housing 3 has a compressor inlet 4 from which an inlet duct 5
15 leads to the compressor wheel 2. Here, the compressor longitudinal axis A also forms the longitudinal axis of said inlet duct 5.

As shown by Figures 2 and 3, the inlet duct 5 has a recirculation duct 6 preferably arranged parallel thereto. The recirculation duct 6 has a compressor-wheel-side inflow opening 7 and an inlet-side return flow opening 8.

20 In the particularly preferred embodiments of Figures 2 and 3, to make it possible for the inflow opening 7 and the return flow opening 8 to be opened and closed, an axially movable sleeve 9 and an axially movable slide 10 are provided, wherein the respective movement of the sleeve 9 and of the slide 10 takes place in the direction of the longitudinal axis A.

25 In the embodiment illustrated in Figures 2 and 3, the recirculation duct 6 is delimited by an inner wall surface 14', which runs parallel to the longitudinal axis A, of a housing region 11' of the compressor housing 3, by a return flow surface 11 of the slide 10, by an inflow surface 13 of the housing region 11', and by a flow surface 15 of the sleeve 9.

30 As shown in Figure 1, the return flow surface 11 is of rounded design in order to improve its flow characteristics. Accordingly, in the region of the return flow opening 8, the sleeve 9 has a likewise rounded return flow surface 12, the rounding of which corresponds to that of the return flow surface 11.

35 The inflow surface 13 of the housing region 11' is formed so as to be inclined relative to the longitudinal axis A, as shown in Figures 2 and 3. The sleeve 9 has, in the region of the inflow opening 7, a likewise inclined inflow surface 14, the inclination of

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which corresponds to the inclination of the inflow surface 13. These measures, too, serve to improve the flow characteristics of the inflow opening 7.

Figure 2 shows the open position of the inflow opening 7 and of the return flow opening 8, in which the recirculation duct 6 is consequently activated in order to permit
5 a return flow of intake air flowing to the compressor wheel 2, which serves to extend the characteristic map of the compressor or exhaust-gas turbocharger by shifting the surge limit.

In other characteristic map regions in which the recirculation duct 6 is not active in any case, said recirculation duct is closed by moving the slide 10 and the sleeve 9, as
10 illustrated in Figure 3. For this purpose, the slide 10 and if appropriate the sleeve 9 may in each case be connected to an actuator. The actuator for the sleeve 9 may for example be a spring (not illustrated) which preloads the sleeve 9 into the open position as per Figure 2.

To supplement the above written disclosure of the invention, reference is hereby
15 explicitly made to the diagrammatic illustration thereof in Figures 1 to 3.

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LIST OF REFERENCE SYMBOLS

	1	Compressor
	2	Compressor wheel
5	3	Compressor housing
	4	Compressor inlet
	5	Inlet duct
	6	Recirculation duct
	7	Inflow opening
10	8	Return flow opening
	9	Sleeve
	10	Slide
	11	First return flow surface
	11'	Housing region
15	12	Second return flow surface
	13	First inflow surface
	14	Second inflow surface
	14'	Inner surface
	15	Flow surface
20	ATL	Exhaust-gas turbocharger
	T	Turbine
	TR	Turbine wheel
	W	Shaft
	A	Longitudinal axis of the compressor housing 3, of the inlet duct 5 and of the
25		recirculation duct 6

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CLAIMS

1. A compressor (1) of an exhaust-gas turbocharger (ATL),
 - having a compressor wheel (2); and
 - 5 - having a compressor housing (3)
 - which has a housing longitudinal axis (A),
 - in which the compressor wheel (2) is arranged and
 - which has an inlet duct (5), said inlet duct running from a compressor inlet (4) to the compressor wheel (2) and having a
 - 10 recirculation duct (6) which has a compressor-wheel-side inflow opening (7) and a compressor-inlet-side return flow opening (8), wherein
 - the inflow opening (7) and the return flow opening (8) can be opened and closed.
- 15 2. The compressor as claimed in claim 1, wherein the recirculation duct (6) is delimited by an axially movable sleeve (9), an axially movable slide (10) and an inner surface (14') of an adjacent housing region (11') of the compressor housing (3).
- 20 3. The compressor as claimed in claim 2, wherein the slide (10) has a rounded first return flow surface (11) which leads to the return flow opening (8).
4. The compressor as claimed in claim 3, wherein the sleeve (9) has a rounded second return flow surface (12).
- 25 5. The compressor as claimed in one of claims 2 to 4, wherein the housing region (11') has a first inflow surface (13) which is inclined relative to the longitudinal axis (A) and which leads to the inflow opening (7).
- 30 6. The compressor as claimed in claim 5, wherein the sleeve (9) has a second inflow surface (14), the inclination of which corresponds to the inclination of the first inflow surface (13).
7. The compressor as claimed in one of claims 2 to 6, wherein the slide
- 35 (10) can be actuated by means of an actuator.
8. The compressor as claimed in one of claims 1 to 7, wherein the sleeve (9) can be actuated by means of an actuator.

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9. The compressor as claimed in one of claims 1 to 8, wherein the recirculation duct (6) runs parallel to the inflow duct (5).

- 5 10. A compressor housing (3) of a compressor (1),
- having a housing longitudinal axis (A) and
 - having an inlet duct (5) which has a recirculation duct (6) which has an inflow opening (7) and a return flow opening (8), wherein
 - the inflow opening (7) and the return flow opening (8) can be
- 10 opened and closed.

11. The compressor housing as claimed in claim 10, characterized by one of claims 2 to 9.

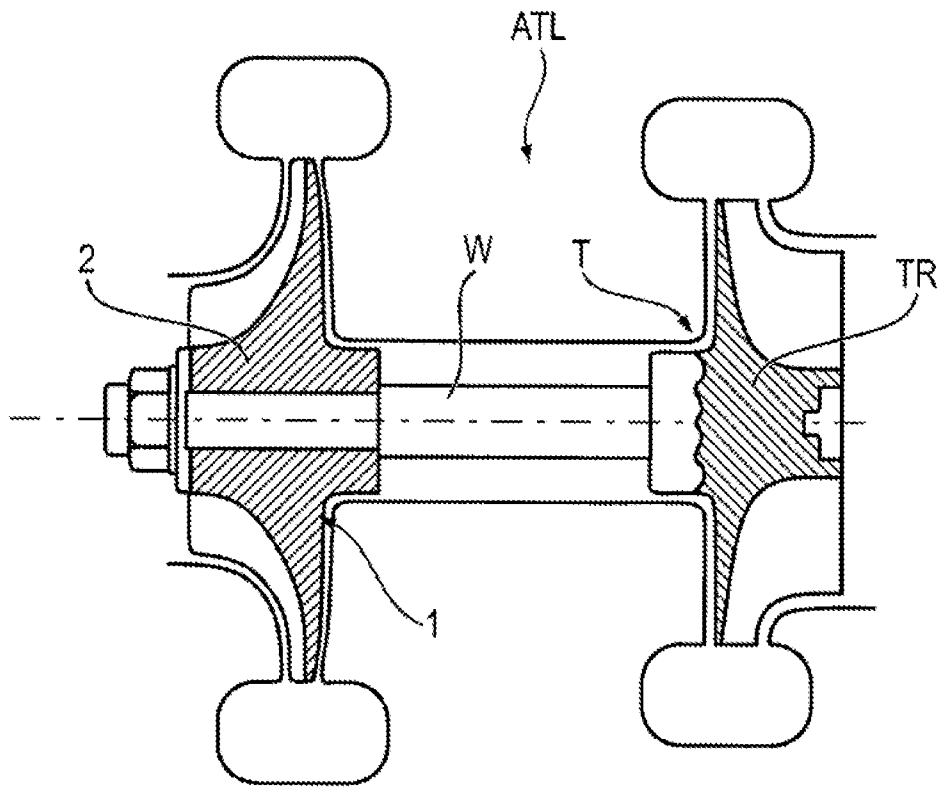


FIG. 1

