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(54) Title: TURBINE WHEEL

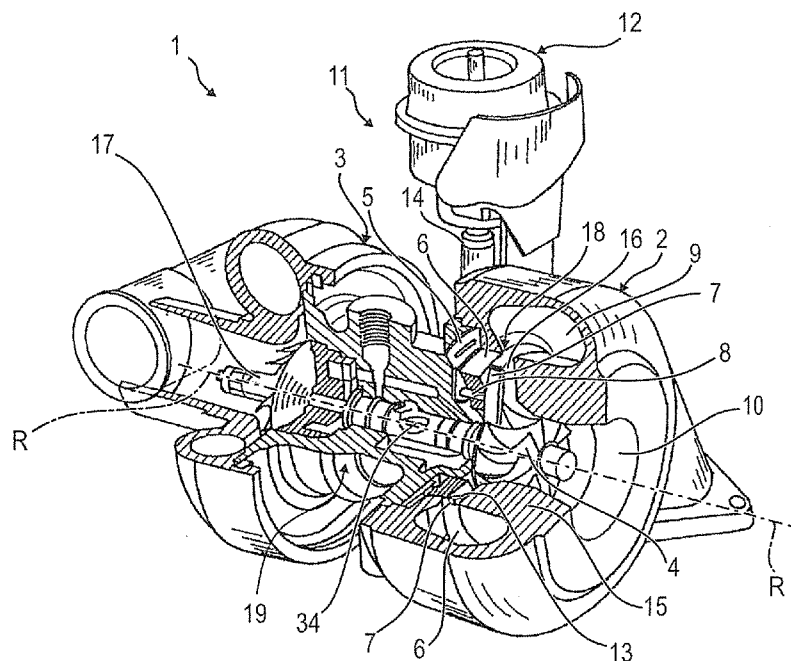


FIG. 1

(57) Abstract: The invention relates to a turbine wheel (4) having a hub (29); having a multiplicity of turbine wheel blades (30) arranged around the hub (29); having a turbine wheel back wall (31) which is arranged on the hub (29) adjacent to an edge region (32) of the turbine wheel blades (30); wherein the wall thickness (W) of the turbine wheel back wall (4) is reduced in regions.

**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))*

Published:

— *with international search report (Art. 21(3))*

- 1 -

TURBINE WHEEL

DESCRIPTION

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

 A known turbine wheel has a hub around which a multiplicity of turbine wheel blades are arranged. A turbine wheel back wall is arranged on the hub at an edge region, which in the installed state of the turbine wheel is adjacent to a shaft, of the
10 turbine wheel blades.

 It is an object of the present invention to provide a turbine wheel of the type specified in the preamble of claim 1, the mass moment of inertia of which turbine wheel is reduced.

 This object is achieved by the features of claim 1.

15 It is accordingly possible according to invention for the wall thickness of the turbine wheel back wall to be reduced at least in regions.

 The dependent claims contain advantageous developments of the inventions.

 For the reduction of the wall thickness of the turbine wheel back wall in regions, said turbine wheel back wall may preferably be provided with pockets which
20 are open on one side and which are arranged on that side of the turbine wheel back wall which faces away from the turbine wheel blades.

 Said pockets are preferably arranged on the outer diameter of the turbine wheel, between the turbine wheel blades.

 The depth of the pockets is dependent on the desired extent of the reduction in
25 mass moment of inertia. In any case, however, the pockets are not formed so as to be continuous, that is to say are not formed so as to extend through the entire wall thickness of the turbine wheel back wall.

 The arrangement at the outer diameter or outer circumference of the turbine wheel means that the pockets are arranged at the inlet diameter or inlet circumference
30 of the turbine wheel.

 The exhaust-gas turbocharger according to invention defined in claim 5 is provided with a turbine wheel according to the invention.

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

Figure 1 shows a perspective sectional illustration through an exhaust-gas turbocharger according to the invention,

Figure 2 shows a perspective illustration of a turbine wheel according to the invention, and

figure 3 shows a sectional illustration through a partial region of the turbine wheel as per figure 2.

Figure 1 illustrates an exhaust-gas turbocharger 1 according to the invention which has a turbine housing 2 in which a turbine wheel 4 is arranged.

With regard to all other components of the exhaust-gas turbocharger 1 according to the invention, reference may be made to the list of reference signs provided at the end of this description, because a detailed description of said elements is not important for explaining the principles of the present invention.

The turbine wheel 4 according the invention is illustrated in figure 2. Said turbine wheel 4 has a hub 29 around which are arranged a multiplicity of turbine wheel blades, of which, in figure 2, one turbine wheel blade is identified, representatively of all of the blades, by the reference sign 30.

The turbine wheel 4 furthermore has a turbine wheel back wall 31 which is arranged on the hub 29 at an edge region 32 of the turbine wheel blades 30. As shown by figure 2 in conjunction with figure 1, the edge region 32 is that region which, in the installed state of the turbine wheel 4, faces toward a shaft 34, to which shaft the turbine wheel 4 is fastened, of the exhaust-gas turbocharger 1.

As can be seen viewing figures 2 and 3 together, for the reduction of the wall thickness W of the turbine wheel back wall 31 in regions, it is provided in the example that a multiplicity of pockets which are open on one side are arranged in the turbine wheel back wall 31, of which pockets one pocket 33 is denoted, representatively of all of the pockets, in figures 2 and 3. The pockets 33 may be of various forms, for example semi-circular, and do not extend through the entire wall thickness W , as can be seen from the reduced wall thickness W_R , indicated in figure 3, in the region of the pockets 33.

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The pockets 33 are furthermore arranged at the outer circumference (inlet circumference) 35 of the turbine wheel 4 or of the turbine wheel back wall 31.

The number of pockets 33, and also the depth thereof in the wall thickness W of the turbine wheel back wall 31, may be reduced or increased depending on the
5 application.

In addition to the above written disclosure of the invention, reference is hereby explicitly made to the illustrative presentation of the invention in Figures 1 to 3.

LIST OF REFERENCE SIGNS

	1	Turbocharger
	2	Turbine housing
	3	Compressor housing
5	4	Turbine wheel
	5	Unison ring
	6	Blade bearing ring
	7	Adjusting blades
	8	Rotary axles
10	9	Supply duct
	10	Axial connector
	11	Actuating device
	12	Control casing
	13	Free space for adjusting blades 7
15	14	Plunger element
	15	Annular part of the turbine housing 2
	16	Spacer/spacer cam
	17	Compressor wheel
	18	Guide grate
20	28	Bearing housing
	29	Hub
	30	Turbine wheel blades
	31	Turbine wheel back wall
	32	Edge
25	33	Pockets
	34	Shaft
	W	Wall thickness of the turbine wheel back wall
	W _R	Reduced wall thickness
	R	Axis of rotation

CLAIMS

1. A turbine wheel (4)
 - having a hub (29);
 - 5 - having a multiplicity of turbine wheel blades (30) arranged around the hub (29);
 - having a turbine wheel back wall (31) which is arranged on the hub (29) adjacent to an edge region (32) of the turbine wheel blades (30);wherein
 - 10 - the wall thickness (W) of the turbine wheel back wall (4) is reduced in regions.
2. The turbine wheel as claimed in claim 1, wherein the turbine wheel back wall (31) has at least one pocket (33) which is open on one side.
- 15 3. The turbine wheel as claimed in claim 2, wherein the pocket or the pockets (33) are arranged on the inlet circumference (35) of the turbine wheel back wall (31).
- 20 4. The turbine wheel as claimed in claim 2 or 3, wherein the pocket or the pockets (33) do not extend through the entire wall thickness (W) of the turbine wheel back wall (31).
5. An exhaust-gas turbocharger (1)
 - 25 - having a turbine housing (2) in which is arranged a turbine wheel (4) which has:
 - a hub (29);
 - a multiplicity of turbine wheel blades (30) arranged around the hub (29),
 - and
 - 30 • a turbine wheel back wall (31) which is arranged on the hub (29) adjacent to an edge region (32) of the turbine wheel blades (30),wherein

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– the wall thickness (W) of the turbine wheel back wall (31) is reduced in regions.

6. The exhaust-gas turbocharger as claimed in claim 5, characterized by one
5 of claims 2 to 4.

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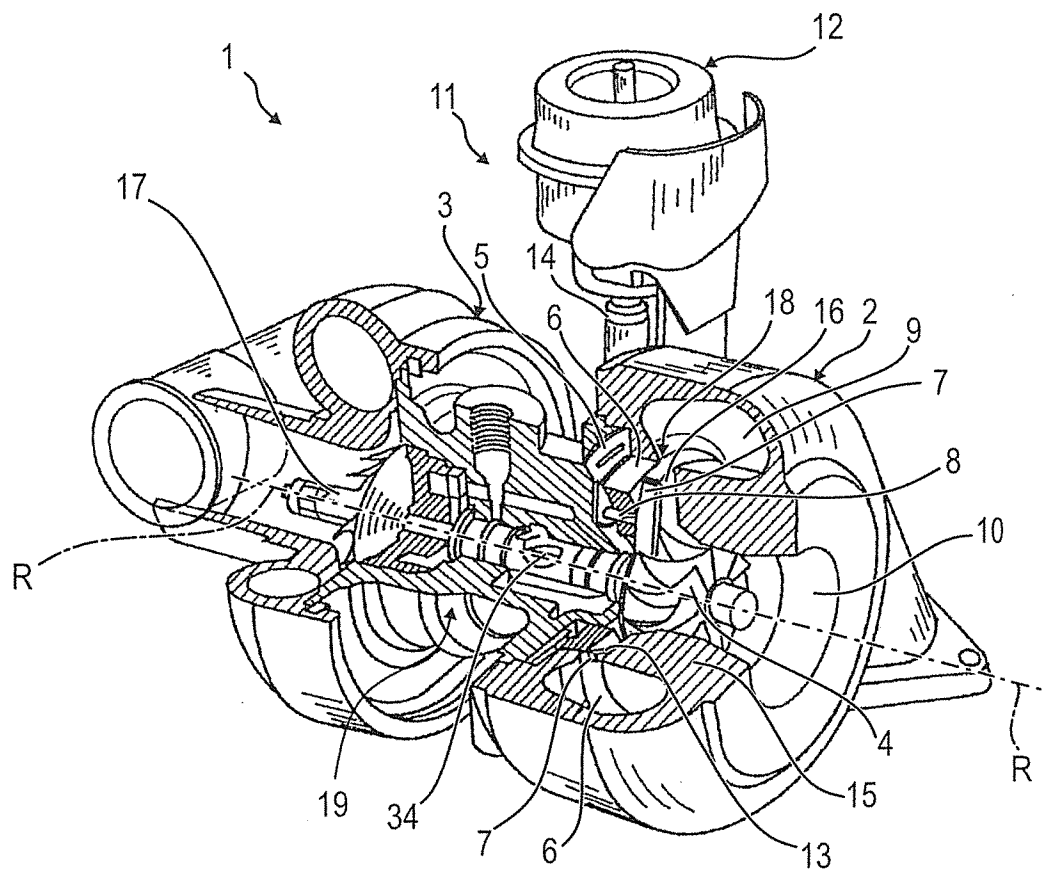


FIG. 1

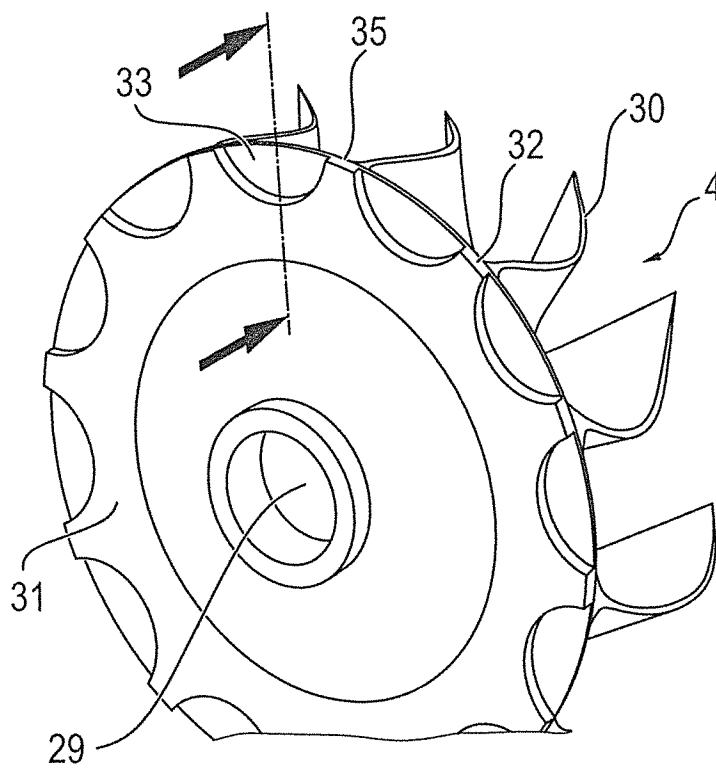


FIG. 2

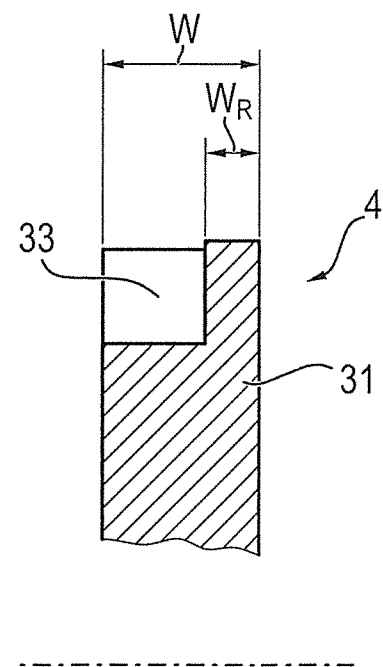


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/059159**A. CLASSIFICATION OF SUBJECT MATTER****F02B 37/00(2006.01)i, F02B 39/00(2006.01)i, F01D 5/12(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 37/00; F04D 17/08; F02B 39/00; F04D 29/28; F04D 25/04; F01D 5/30; F01D 1/02; F01D 5/12

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:turbocharger, blade, hub, wall, thickness and mass moment

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012-0183406 A1 (YOSHIDA et al.) 19 July 2012 See abstract; paragraphs [0059],[0063]; figure 1.	1-6
A	KR 10-2011-0122192 A (TURBOMECA) 09 November 2011 See abstract; paragraph [0042]; claim 1 and figure 3.	1-6
A	US 2005-0111971 A1 (FUKIZAWA et al.) 26 May 2005 See abstract; paragraph [0036]; figure 2.	1-6
A	JP 2002-047944 A (TOYOTA MOTOR CORP.) 15 February 2002 See abstract; claim 1 and figure 2.	1-6
A	JP 2012-149583 A (IHI CORP.) 09 August 2012 See abstract; claim 1.	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

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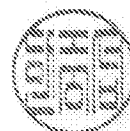
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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