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- (71) Applicant: **BORGWARNER INC.** [US/US]; Patent Department, 3850 Hamlin Road, Auburn Hills, Michigan 48326 (US).
- (72) Inventor: **SAUERSTEIN, Rolf**; Hauptstrasse 40, 67822 Finkenbach-Gersweiler (DE).
- (74) Agents: **PENDORF, Stephan A.** et al.; Patent Central LLC, 1401 Hollywood Boulevard, Hollywood, Florida 33020-5237 (US).
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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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- with international search report (Art. 21(3))

(54) Title: CONNECTION FOR MEDIA LINES ON AN EXHAUST-GAS TURBOCHARGER

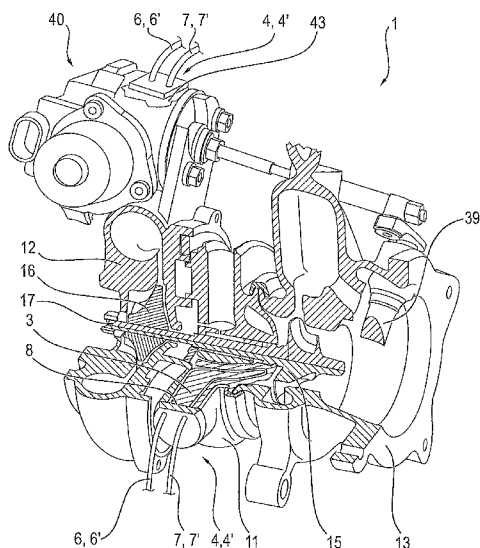


FIG. 1

(57) Abstract: The present invention relates to an exhaust-gas turbocharger (1) having a charger housing and having a cooling jacket (3) in the charger housing, which cooling jacket has a coolant connection (4) which is fastened to the charger housing and which comprises a connection flange (5), wherein the connection flange has at least one feed pipe (6) and one discharge pipe (7) which extend through the connection flange (5) and a single connection opening (8) of the charger housing.

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CONNECTION FOR MEDIA LINES ON AN EXHAUST-GAS TURBOCHARGER

DESCRIPTION

The invention relates to an exhaust-gas turbocharger according to the preamble of claim 1.

An exhaust-gas turbocharger of said type may be equipped with a charger housing which comprises a cooling jacket. Said cooling jacket may in this case be arranged either in the bearing housing, in the compressor housing, in the turbine housing or else in attached regulating elements. To make it possible for a coolant to be supplied to the cooling jacket, a coolant connection is provided which comprises a connection flange. In the case of generic exhaust-gas turbochargers, the connection flange in turn has multiple connection fittings, wherein the connection flange is fixed to the charger housing such that the connection fittings are aligned with a respectively associated housing bore in order to be able to produce the required flow connection.

The disadvantage of this known arrangement is however that precise bores for the connection fittings must be formed in the charger housing, but this considerably increases the outlay in terms of production. Furthermore, by means of this arrangement, when the coolant pump is deactivated, a circulating flow in the water jacket is prevented because the coolant, owing to the forced direct introduction and discharge without a facility for short-circuited flow, cannot circulate, or can circulate only to an inadequate extent, in the component to be cooled. This arises in particular when, for example, the engine has been shut down and the remaining residual heat of the exhaust-gas turbocharger in the for example liquid-cooled bearing housing must be dissipated. To remedy this, use is often made here of so-called afterrunning pumps which generate a forced throughflow over a temporally restricted time period.

It is therefore an object of the present invention to provide an exhaust-gas turbocharger of the type indicated in the preamble of claim 1, which exhaust-gas turbocharger has a coolant connection which is of simple construction and which can be installed in a simple manner.

This object is achieved by the features of claim 1.

According to the invention, an exhaust-gas turbocharger is provided which has a coolant connection with at least one integrated feed pipe and one integrated discharge

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pipe which, after the installation process, extend through a single connection opening of the charger housing. "Charger housing" refers to a housing part of the exhaust-gas turbocharger, which may be a bearing housing, a turbine housing, a compressor housing and an actuator housing.

This firstly yields the advantage that the connection opening or insertion recess in the charger housing can be implemented in a simpler manner, in particular formed as a cast opening which can be produced during the course of the casting of the charger housing. This yields an inexpensive and technically better form of the coolant connection and of the connection opening in the charger housing.

The dependent claims contain advantageous developments of the invention.

If the at least one feed pipe has a bent pipe region which projects into the charger housing or into the cooling jacket thereof, it is made possible for a preferred flow direction to be imparted to the coolant that is fed via the feed pipe. In this way, the connection opening or introduction recess in the charger housing can be formed in a simpler manner and, by contrast to conventional known designs, short-circuited cooling that bypasses those regions of the charger housing which are to be cooled can be prevented.

At the same time, an autosiphoning effect is possible during the engine post-heating phase. Since the voltage supply of the engine must or can be shut down after a certain period of time for safety reasons, it may be necessary for the cooling to be maintained using other means. This applies in particular to applications in which, owing to thermal insulation measures, the component to be cooled is subject to high thermal loads during post-heating operation. This relates in particular to engines with cylinders in a "V" arrangement, in which the outlet is situated in the middle of the "V".

If the discharge pipe is provided with a rounded inner pipe region which projects into the cooling jacket, it is made possible for pressure losses to be reduced and for the autosiphoning effect to thus be assisted in an effective manner.

For the fastening of the connection flange, it is possible for the latter to be welded to the charger housing or else to be arranged and welded within the connection opening. In principle, however, other fastening means, for example a screw connection, soldered connection or adhesively bonded connection, are also conceivable.

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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 shows an exemplary embodiment of an exhaust-gas turbocharger according to the invention, and

Figure 2 is a schematically simplified illustration of a coolant connection of the exhaust-gas turbocharger as per Figure 1, depicted on an enlarged scale, and

Figure 3 is a further illustration of a further exemplary embodiment of a coolant connection such as can be provided on an exhaust-gas turbocharger as per Figure 1.

Figure 1 illustrates an exhaust-gas turbocharger 1 according to the invention in a schematically simplified illustration. The exhaust-gas turbocharger 1 has charger housings, specifically a compressor housing 12 with compressor wheel 16 arranged therein, a bearing housing 11 with charger shaft 17 mounted therein, an actuator housing 40, and a turbine housing 13 with turbine wheel 15 arranged therein. In the actuator housing 40 there is provided a device (not illustrated) for actuating a regulating element in the form of a wastegate 39. The actuator 40 has a cooling jacket 43 by means of which heat generated in the actuator 40 itself, and externally supplied heat, can be dissipated to a coolant.

In the embodiment illustrated in figure 1, a cooling jacket 3 is likewise arranged in the bearing housing 11. In principle, however, it is also possible for a cooling jacket of said type to be arranged in the compressor housing 12 and/or in the turbine housing 13. The cooling circuit 43 of the actuator 40 may be connected to a low-pressure circuit.

The exhaust-gas turbocharger 1 according to the invention furthermore has a coolant connection 4; 4' which has a connection flange 5 fastened to the charger housing (in the example illustrated, to the bearing housing 11 thereof).

As can be seen from a juxtaposition of Figures 1, 2 and 3, the connection flange 5 is, in the example, equipped with a feed pipe 6 for coolant and with a discharge pipe 7. In principle, it is also possible for a multiplicity of such feed pipes and discharge pipes to be provided. The feed pipe 6 and the discharge pipe 7 are integrated components which are connected to and extend through the connection flange 5.

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In the bearing housing 11 there is furthermore provided a connection opening 8 through which both the feed pipe 6 and the discharge pipe 7 extend, such that according to the invention, it is adequate for a single such connection opening 8 to be provided in the bearing housing 11 or actuator 40.

As can be seen in particular from the enlarged illustration of Figure 2, the feed pipe 6 is equipped with a bent pipe region 9 which engages into the charger housing or the cooling jacket 5. A bent pipe region 9 of said type makes it possible for the coolant that is fed to have a preferred flow direction imparted to it.

Provision is made for the discharge pipe 7 to have an internal geometric formation for reducing flow resistance, which geometric formation makes it possible for the coolant to be discharged from the cooling jacket 3 of the bearing housing 11 or from the cooling jacket 43 of the actuator 40 in an expedient manner in terms of flow, said geometric formation being in the form of an inlet diffuser 10, for example.

A coolant connection 4' of alternative design is illustrated in Figure 3, said coolant connection having a single pipe 18 in which a feed line 6' and discharge line 7' may be formed. It can be seen that the pipe 18 has a bend in the interior of the bearing housing 11; 40 or actuator 40. An imaginary elongation of the feed line 7' ends at a housing section 19 which is formed as a means for diverting the coolant flow and which correspondingly diverts the coolant flow. The housing section 19 may be a thermally highly loaded region of the exhaust-gas turbocharger 1. The seal 14' illustrated in figure 3 is for example in the form of a flat seal (paper or HNBR or NBR seal), though alternative seals are possible. The coolant connection 4' with the elements described in this paragraph can be used, with the same effectiveness as the coolant connection 4 described in conjunction with Figure 2, for cooling the charger housing 11; 40 illustrated in Figure 1.

In the embodiment illustrated in Figures 1, 2 and 3, a seal 14; 14' is provided between the connection flange 5 and the charger housing 11; 40. The seal 14 illustrated in Figure 2 is in the form of an O-ring.

The coolant connection 4, 4' is fixed to the bearing housing 11 or to the actuator 40 by means of a fixing element 50 which acts on the connection flange 5. It is self-evidently also possible for a welded connection (not illustrated) to be used for fixing purposes.

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In addition to the above written disclosure, reference is hereby explicitly made, for supplementation of said disclosure, to the illustration of the invention in Figures 1, 2 and 3.

LIST OF REFERENCE SIGNS

1	Exhaust-gas turbocharger
3	Cooling jacket
4	Coolant connection
4'	Coolant connection
5	Connection flange
6	Feed pipe
6'	Feed pipe
7	Discharge pipe
7'	Discharge pipe
8	Connection opening
9	Bent pipe region
10	Inlet diffuser
11	Bearing housing
12	Compressor housing
13	Turbine housing
14	Seal
14'	Seal
15	Turbine wheel
16	Compressor wheel
17	Bearing shaft
18	Pipe
19	Housing section
39	Wastegate
40	Actuator housing
43	Cooling jacket
50	Fixing element

CLAIMS

1. An exhaust-gas turbocharger (1)
 - having a charger housing; and
 - having a cooling jacket (3) in the charger housing, which cooling jacket has a coolant connection (4) which is fastened to the charger housing and which comprises a connection flange (5),
characterized in that
 - the connection flange (5) has at least one feed pipe (6) and one discharge pipe (7) which extend through the connection flange (5) and a single connection opening (8) of the charger housing.
2. The exhaust-gas turbocharger as claimed in claim 1, characterized in that the feed pipe (6) has a bent pipe region (9) which projects into the charger housing.
3. The exhaust-gas turbocharger as claimed in claim 1 or 2, characterized in that a means for diverting a coolant that flows in through the feed pipe (6) is provided in an imaginary elongation of the feed pipe (6).
4. The exhaust-gas turbocharger as claimed in one of claims 1 to 3, characterized in that the discharge pipe (7) has an inner pipe region (10) which reduces the flow resistance.
5. The exhaust-gas turbocharger as claimed in one of claims 1 to 4, characterized in that the connection opening (8) is a cast opening of the charger housing.
6. The exhaust-gas turbocharger as claimed in one of claims 1 to 5, characterized in that the charger housing is a bearing housing (11) equipped with the cooling jacket (3).

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7. The exhaust-gas turbocharger as claimed in one of claims 1 to 6, characterized in that the charger housing is an actuator housing (40) equipped with the cooling jacket (3).

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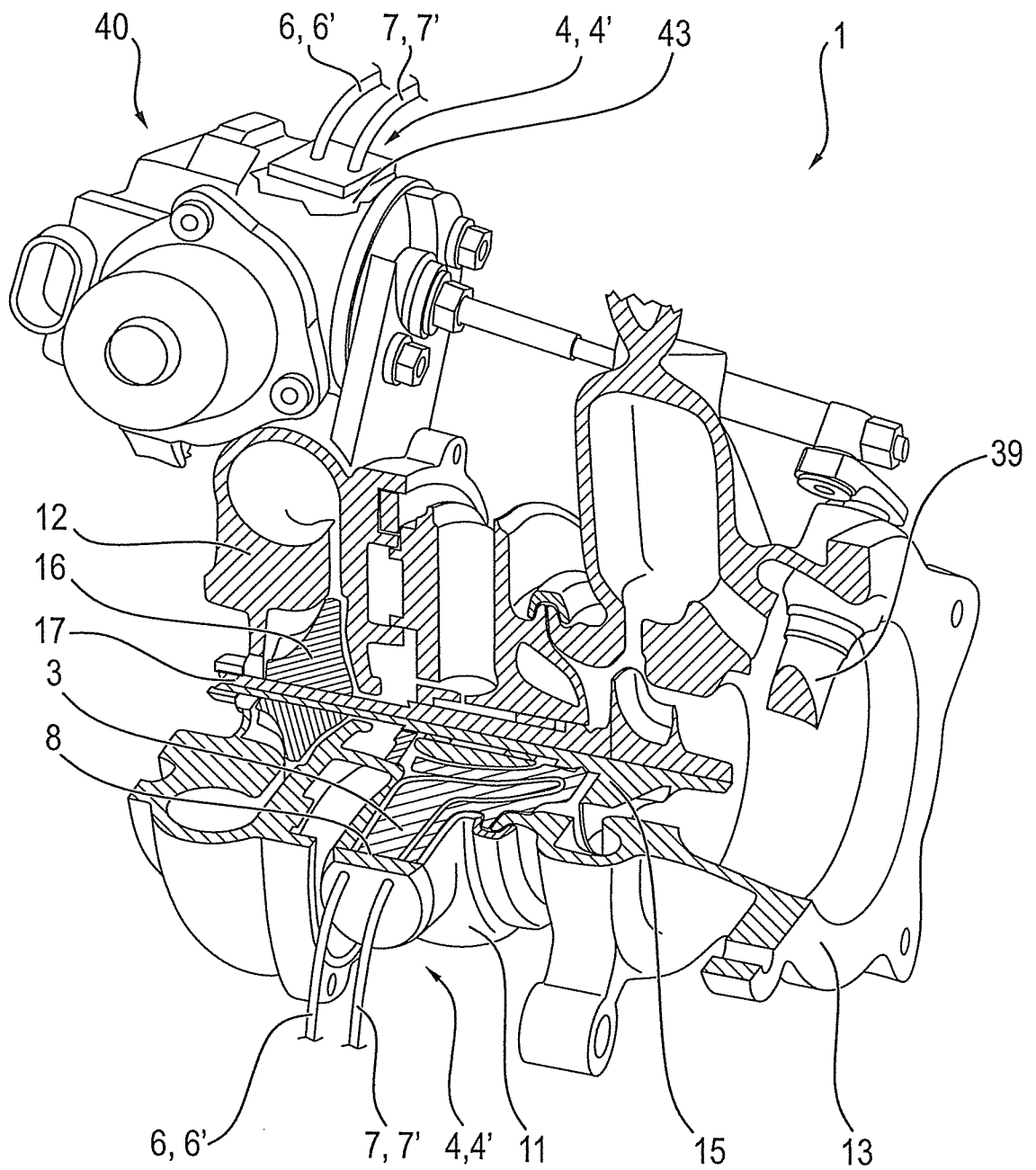


FIG. 1

2/2

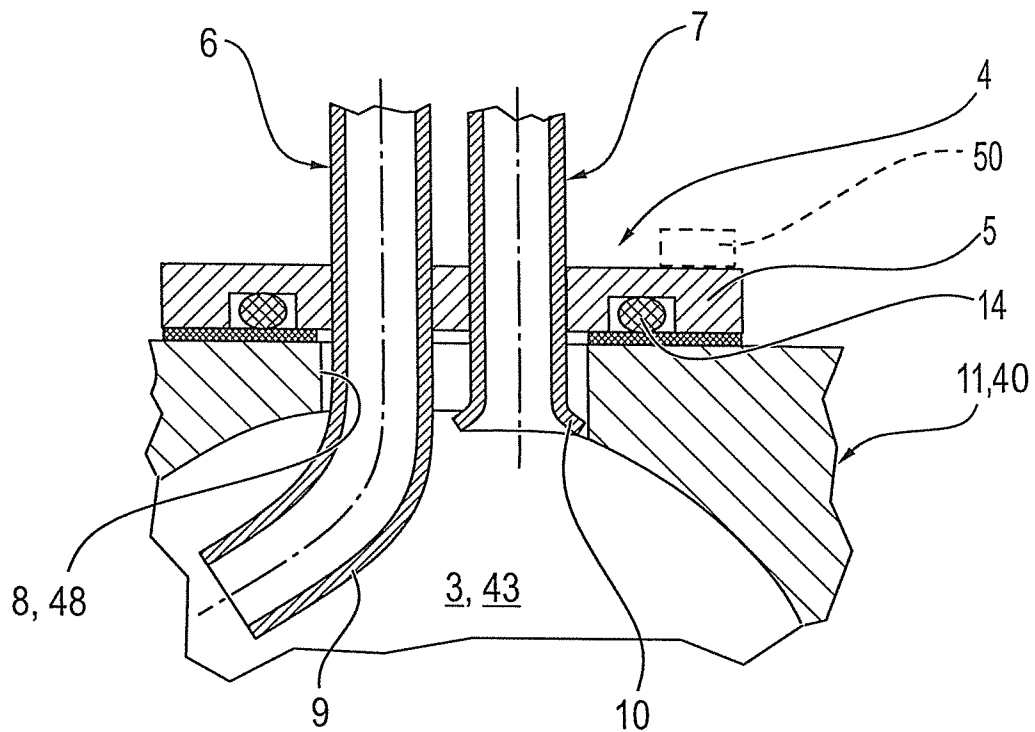


FIG. 2

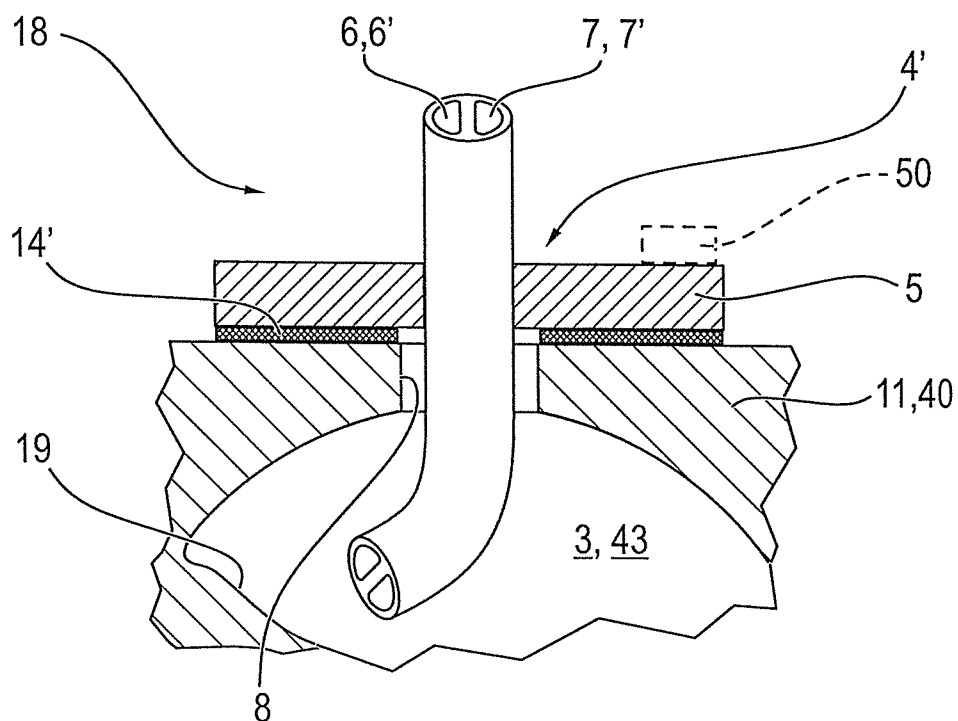


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/018375**A. CLASSIFICATION OF SUBJECT MATTER****F02B 39/16(2006.01)i, F01P 3/12(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 39/16; F02B 39/00; F01D 5/08; F01N 5/02; F01P 3/08; F02B 37/00; F01N 3/02; F01P 3/12

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, cooling jacket, feed pipe, discharge pipe, flange and coolant

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2013-011253 A (MITSUBISHI HEAVY IND LTD.) 17 January 2013 See paragraphs [0004], [0007]-[0020], claim 1 and figures 1-4.	1
Y		2-3
Y	US 2004-0083730 A1 (WIZGALL et al.) 06 May 2004 See paragraphs [0005]-[0011], [0018] and figures 1-6.	2-3
A	US 2010-0296920 A1 (KOCH, ACHIM) 25 November 2010 See paragraphs [0009]-[0024] and figures 1-2.	1-3
A	US 4928637 A (NAITOH et al.) 29 May 1990 See column 2, line 17 - column 3, line 31 and figures 1-2.	1-3
A	CN 103016138 A (SHENYANG AEROSPACE MISUBISHI MOTORS MANUFACTURING CO., LTD.) 03 April 2013 See abstract, claims 1-10 and figures 1-10.	1-3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"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

Date of the actual completion of the international search

12 June 2015 (12.06.2015)

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Name and mailing address of the ISA/KR

International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

HWANG, Chan Yoon

Telephone No. +82-42-481-3347



INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US2015/018375**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 4-7
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/018375

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