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- (71) Applicant: AUDI AG [DE/DE]; 85045 Ingolstadt (DE).
- (72) Inventor: KAUSCH, Carsten; Orchid Garden 113,
100015 Beijing, PRC (CN).
- (74) Agent: AUDI AG; Patentabteilung, 85045 Ingolstadt
(DE).

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(54) Title: A METHOD FOR OPERATING A MOTOR VEHICLE, DETERMINATION DEVICE AND MOTOR VEHICLE WITH A DETERMINATION DEVICE

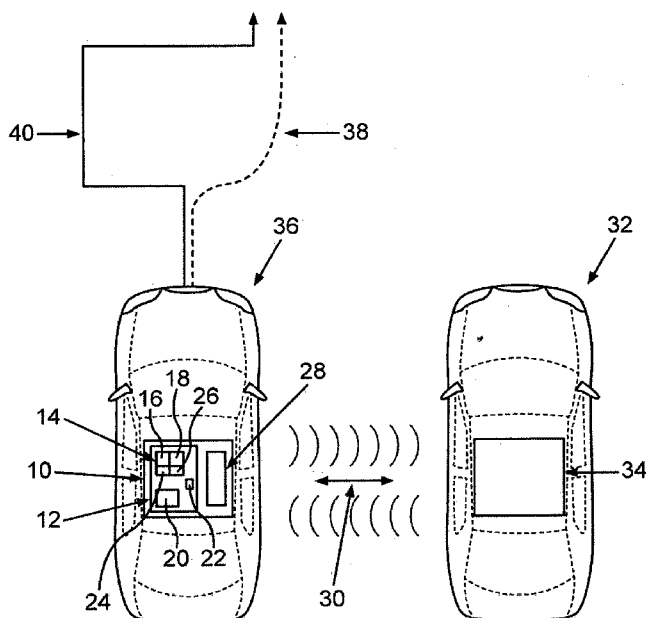


Fig.

(57) Abstract: The invention relates to a method for operating a motor vehicle (36), comprising at least the steps of: - determining an individual parameter value (16) of an occupant of the motor vehicle (36), the individual parameter value (16) being indicative of at least one individual mental condition of the occupant, - determining a vehicle position (18) simultaneously to the individual parameter value (16), - generating an individual data set (14) comprising at least the individual parameter value (16) and the vehicle position (18), - determining at least one deviation value (22) between the individual data set (14) and a reference data set (20), - generating a navigation route (40) of the motor vehicle (36) on the basis of the deviation value (22).



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5 A method for operating a motor vehicle, determination device and
 motor vehicle with a determination device

DESCRIPTION:

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The invention relates to a method of the kind specified in claim 1 for operating a motor vehicle. Furthermore, the invention relates to a determination device and to a motor vehicle with a determination device.

15 A method for operating a motor vehicle is disclosed in DE 10 2012 012 667 A1. In this connection a driver condition is monitored. Therefore a lane departure of the driver is determined and compared with map data of a navigation system. By warning the driver as soon as the vehicle departs from the lane unintentionally, the traffic safety can be increased.

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Document JP 2004114931 A shows a method for detecting a viewing direction of a driver. A so-called "risk map data" indicates the extent of a risk according to the viewing direction of the driver.

25 It is the object of the present invention to provide a method for operating a motor vehicle by means of which traffic safety can be increased.

 This object is solved by a method for operating a motor vehicle having the features of claim 1 as well as by a determination device and a motor vehicle
30 with a determination device. Advantageous embodiments of the invention are specified in the dependent claims.

 The method according to the invention for operating a motor vehicle comprises at least the steps of:

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- determining an individual parameter value of an occupant of the motor vehicle, the individual parameter value being indicative of at least one individual mental condition of the occupant,
- determining a vehicle position simultaneously to the individual parameter value,

- generating an individual data set comprising at least the individual parameter value and the vehicle position,
- determining at least one deviation value between the individual data set and a reference data set, and
- 5 – generating a navigation route of the motor vehicle on the basis of the deviation value.

The individual parameter which is determined by an appropriate determination device, may correspond to e.g. a voice volume or a heartbeat frequency of the occupant of the motor vehicle. Thus, the determination device comprises appropriate sensors in order to evaluate the individual parameter value being representative for an individual mental condition of the occupant, e.g. the driver. By means of the determination device, e.g. an individual mental condition 'angriness' or 'enthusiasm' of the occupant can be determined by measuring the individual parameter value (e.g. the heartbeat frequency or the voice volume). The vehicle position is determined simultaneously to the individual parameter value which allows for allocating the individual parameter value to a certain vehicle position. The vehicle position may be derived from an internal navigation system and the vehicle position may correspond to a position, in which the occupant of the motor vehicle has a certain individual mental condition which deviates from his normal mental condition ('equilibrium'). Thus, the vehicle position may correspond to e.g. a position in front of a railway crossing gate at which road users usually have to wait particularly long. At this vehicle position, the occupant of the motor vehicle has e.g. the individual mental condition 'angriness' due to the long waiting time. The determination device generates the individual data set comprising the individual parameter value and the vehicle position. In the individual data set the vehicle position is allocated to the individual parameter value. The determination device then determines a deviation value between the individual data set and the reference data set. The reference data set comprises at least one reference parameter value being indicative of at least one default mental condition. The default mental condition corresponds to an average mental condition, e.g. to an average mental condition of a plurality of drivers or occupants of a plurality of motor vehicles at a default position. The reference data set also comprises this default position. The default position corresponds to the vehicle position or to a location close to the vehicle position. The default position may correspond e.g. to an area within 10 m² up to 50 m² in order to allow an at least substantial overlap between the vehicle position and the default position. In the reference data set, the default mental condi-

tion is allocated to the default position. Thus, by comparing the individual data set and the reference data set, the deviation value is determined as a deviation between the individual mental condition and the default mental condition at the same location or at least close to the location (to the vehicle position). In other words, by determining the deviation value the determination device can evaluate, whether the individual mental condition of the occupant (e.g. the driver) deviates extraordinarily from the default mental condition (of the reference data set). In dependency on the deviation value the determination device then generates a navigation route of the motor vehicle. The navigation route may deviate from an original navigation suggestion, wherein the original navigation suggestion corresponds to a previously chosen driving route of the occupant of the motor vehicle. Thus, the navigation route corresponds to an alternative to the original navigation suggestion, wherein the navigation route redirects the occupant of the motor vehicle in such a manner, that traffic situations which would lead to e.g. increased 'angriness' of the occupant are avoided. Thus, e.g. a railway crossing gate is avoided, even if the alternative navigation route is more time consuming or longer than the previously chosen driving route. The alternative navigation route is provided for the occupant as an alternative to the original navigation suggestion. The occupant can then choose between the navigation route and the original navigation suggestion. Furthermore, it is also possible to automatically adjust the original navigation suggestion (to adjust the originally chosen route) and to set the navigation route instead. When driving on the alternative navigation route, the individual mental condition of the occupant is normalized (e.g. the 'angriness' of the occupant is reduced and the occupant is calmed down), and as a consequence of calming down, the occupant is less distracted from the traffic. Thus, the traffic safety is increased by normalizing certain individual mental conditions, such as increased 'angriness' or 'fear' or 'enthusiasm', to name but a few kinds of individual mental conditions which may distract the occupant from the traffic.

An advantageous embodiment of the invention provides the step of interacting with the occupant of the motor vehicle if the deviation value reaches a predetermined threshold value.

The threshold value can e.g. correspond to a certain heartbeat frequency threshold for a voice volume threshold, to name but a few kinds of predetermined threshold values. It is clear, that also a plurality of individual parameter values can be considered in order to evaluate the deviation (deviation value)

between the individual data set and the reference data set. As soon as the deviation value reaches or even exceeds the predetermined threshold value, the determination device interacts with the occupant of the motor vehicle in such a manner, that the determination device e.g. warns the occupant or gives recommendations for reacting upon a certain traffic situation. The interaction can also be based on e.g. praising the occupant for good driving or confirming a certain reaction of the occupant upon a certain traffic situation. This kinds of interacting with the occupant influences the individual mental condition of the occupant and thus increases the traffic safety.

A further advantageous embodiment of the invention provides the step of transmitting signals to other road users if the deviation value reaches the predetermined threshold value.

In other words, the other road users are warned, if the occupant of the motor vehicle is distracted from the traffic due to his individual mental condition. The transmitted signals can correspond to e.g. warning signals which are provided to the other road users as soon as they reach a certain distance to the motor vehicle. This increases the traffic safety in a particularly efficient manner, since the other road users, e.g. cars which are driving next to the motor vehicle are warned particularly early.

In a further advantageous embodiment of the invention an individual mental map is determined, wherein the individual mental map comprises the individual data set, at least another individual parameter value and at least another simultaneously determined vehicle position.

The another individual parameter value and the another vehicle position apply to the same point in time. Thus, a plurality of individual parameter values and appertaining vehicle positions of the motor vehicle may be determined in order to generate the individual mental map. The individual mental map both comprises different individual parameters (for different kinds of mental conditions such as "angriness", "enthusiasm", "sadness", to name but a few) and appertaining different individual parameter values as well as different vehicle positions which may be evenly distributed on a driving route of the motor vehicle or which may be selectively allocated to certain points in the landscape. This certain points may correspond to certain undesirable locations, such as the aforementioned railway crossing gate or - to name merely a further example for many points of that kind - a viaduct, since driving on a viaduct may

cause 'fear' as the individual mental condition. Furthermore, different times of day are considered by the individual mental map. This means, that about noon a different individual mental condition of the occupant can be present at the same vehicle position than at midnight. Thus, the time of day influences the generation of the navigation route. Considering the time of day increases the traffic safety, since this allows for an appropriate reaction on time-dependent individual mental conditions when generating the navigation route.

10 A further advantageous embodiment of the invention provides the step of determining an updated reference data set by means of the individual mental map and the reference data set.

15 The reference data set corresponds to a global mental map which is compared with the individual mental map. Determining the updated reference data set, which corresponds to an updated global mental map, is especially helpful if e.g. a new structure was built, wherein this structure may influence the individual mental condition of the occupant. For example, if a new viaduct was raised, driving on this viaduct may lead to a different individual mental condition, namely e.g. 'fear' than driving along a normal road (which would not influence the individual mental condition significantly). Thus, by means of the updated reference data set the individual mental condition (individual mood) when driving on the viaduct can be considered for future determinations of the deviation value and thus for the generation of the navigation route. If the individual mental condition corresponds to 'fear', the viaduct can be avoided in the future when the navigation route is generated.

A further advantageous embodiment of the invention provides the step of transmitting the updated reference data set to other road users.

30 The updated reference data set is then used as 'new' reference data set which provides for an updated default mental condition (updated average mental condition) in dependency on the individual mental conditions which occur due to e.g. new 'changes' such as a recently constructed viaduct. This increases the traffic safe significantly, since the other road users also benefit from the updated reference data set.

A further advantageous embodiment of the invention provides the step of determining a pulse frequency, a breath frequency, a change of skin temperature and/or an eye movement as the individual parameter value.

- 5 Using different kinds of individual parameter values such as e.g. the breath frequency or the change of skin temperature to name but a few, allows for an especially accurate determination of the individual mental condition. This allows for an appropriate reaction upon this individual mental condition and thus increases the traffic safety.

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The invention further relates to a determination device which is capable of executing a method according to the invention or an advantageous embodiment of the method according to the invention.

- 15 This determination device comprises appropriate sensors for detecting the individual mental condition of the occupant. By means of the determination device the individual mental condition can be influenced in a particularly appropriate manner. The determination device increases the traffic safety particularly for driving rookies.

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The invention also relates to a motor vehicle with such a determination device. Such a motor vehicle can be operated in an especially safe manner, wherein the traffic safety can be increased significantly.

- 25 Advantageous embodiments of the method according to the present invention are to be regarded as advantageous embodiments of the determination device and as advantageous embodiments of the motor vehicle according to the present invention and vice versa.

- 30 Further advantages, features and details of the invention derive from the following description of preferred embodiments as well as from the drawings. The features and feature combinations previously mentioned in the description as well as the features and feature combinations mentioned in the following description of the figure and/or shown in the figure alone can be employed not only in the respective indicated combination but also in any other
35 combination or taken alone without leaving the scope of the invention.

The only figure shows a schematic top view of a motor vehicle with a determination device according to the invention.

The figure shows a schematic top view of a motor vehicle 36 comprising a determination device 10. The determination device 10 is capable of determining an individual parameter value 16 of an occupant of the motor vehicle 36, wherein the occupant of the motor vehicle 36 is not shown at present. The individual parameter value 16 is indicative of at least one individual mental condition of the occupant. The individual mental condition may correspond to 'angriness', 'fear' or 'enthusiasm' to name but a few kinds of mental conditions. The individual mental condition can also be a combination of mental conditions which. Furthermore, the individual mental condition may be based on occupant conditions like 'daydreaming', 'health condition' or 'drunk driving'.

By means of the individual parameter value 16 the determination device 10 determines, which kind of individual mental condition of the occupant is existent. A pulse frequency (heartbeat frequency), a breath frequency, a change of skin temperature and additionally or alternatively an eye movement, to name but a few, can be determined as the individual parameter value 16. The determination device 10 is also capable of determining a vehicle position 18 simultaneously to the individual parameter value 16. In other words, both the vehicle position 18 and the individual parameter value 16 are related to the same point in time. This means, that a current location (vehicle position 18) is allocated to a current mood (individual mental condition of the occupant), wherein the determination device 10 is also capable of generating an individual data set 14 comprising at least the individual parameter value 16 and the vehicle position 18.

Furthermore, the determination device 10 is capable of determining an individual mental map 12 comprising the individual data set 14 as well as at least another individual parameter value 24 and at least another simultaneously determined vehicle position 26.

The determination device 10 is also capable of determining at least one deviation value 22 between the individual data set 14 and a reference data set 20. The reference data set 20 comprises at least one reference parameter value being indicative of at least one default mental condition and the reference data set comprises at least one default position, wherein the default position corresponds to the vehicle position. Alternatively, the default position corresponds to a position which is close to the vehicle position 18, e.g. to a

position which is between one meter and twenty meters away from the vehicle position. Alternatively, the default position can also correspond to an area within 10 m² up to e.g. 50 m² in order to allow an at least substantial overlap between the vehicle position 18 and the default position. The determination device 10 is also capable of generating a navigation route 40 of the motor vehicle 36 on the basis of the deviation value 22. Thus, in addition to an original navigation suggestion 38, the navigation route 40 may be provided for the occupant of the motor vehicle 36. When the motor vehicle 36 is moved according to the navigation route 40 instead of its movement on the original navigation suggestion 38, the individual mental condition of the occupant may be influenced in such a manner, that the deviation value 22 between the individual data set 14 and the reference data set 20 is decreased. In other words, the individual mental condition of the occupant influenced until it reaches a default mental condition. For example, if the occupant is angry about something and thus has the individual mental condition 'angriness', by choosing the navigation route 40 which has a relaxing effect upon the mood (the individual mental condition), the occupant is calmed down and thus the traffic safety is increased. The navigation route 40 is generated by means of the determination device 10 in order to provide an alternative route of the motor vehicle 36 (as an alternative for the original navigation suggestion 38). Using the navigation route 40 is individually safer for the occupant (and other traffic users) than driving according to the original navigation suggestion 38, since the navigation route 40 is generated in order to calm down the occupant.

The determination device 10 is also capable of interacting with the occupant of the motor vehicle 36 if the deviation value 22 reaches a predetermined threshold value. The predetermined threshold value may correspond to e.g. a pulse frequency threshold, a breath frequency threshold, a change of skin temperature threshold and additionally or alternatively an eye movement threshold, which is compared with the individual parameter value 16 by means of the determination device 10.

When interacting with the occupant, the determination device 10 emits e.g. voice signals or light signals which influence the individual mental condition of the occupant. In doing so, the determination device 10 uses respective output devices such as a loud speaker in order to praise the occupant (the driver) or in order to give recommendations of how to behave in certain traffic situations.

The determination device 10 is also capable of transmitting signals 30 to other road users 32. This is especially useful, if the deviation value 22 reaches the predetermined threshold value. The transmission of signals 30 can be
5 bidirectional, since the other road users 32 uses a road user determination device 34, which is constructed in the same way as the determination device 10.

The determination device 10 is also capable of determining an updated reference data set 28 by means of the individual mental map 12 and the reference data set 20, wherein the updated reference data set 28 is transmitted to
10 the other road user 32 by means of the determination device 10.

CLAIMS:

1. A method for operating a motor vehicle (36), comprising at least the steps of:
 - 5 – determining an individual parameter value (16) of an occupant of the motor vehicle (36), the individual parameter value (16) being indicative of at least one individual mental condition of the occupant,
 - 10 – determining a vehicle position (18) simultaneously to the individual parameter value (16),
 - generating an individual data set (14) comprising at least the individual parameter value (16) and the vehicle position (18),
 - determining at least one deviation value (22) between the individual data set (14) and a reference data set (20),
 - 15 – generating a navigation route (40) of the motor vehicle (36) on the basis of the deviation value (22).
2. The method according to claim 1,
20 characterized by the step of
 interacting with the occupant of the motor vehicle (36) if the deviation value (22) reaches a predetermined threshold value.
3. The method according to claim 2,
25 characterized by the step of
 transmitting signals (30) to other road users (32) if the deviation value (22) reaches the predetermined threshold value.
4. The method according to any one of the preceding claims,
30 characterized by the step of
 determining an individual mental map (12) comprising the individual data set (14), at least another individual parameter value (24) and at least another simultaneously determined vehicle position (26).
5. The method according to any one of the preceding claims,
35 characterized by the step of
 determining an updated reference data set (28) by means of the individual mental map (12) and the reference data set (20).
6. The method according to claim 5,

characterized by the step of
transmitting the updated reference data set (28) to other road users
(32).

- 5 7. The method according to any one of the preceding claims,
characterized by the step of
determining a pulse frequency, a breath frequency, a change of skin
temperature and/or an eye movement as the individual parameter val-
ue (16).

10

8. A determination device (10) which is capable of executing a method
according to any one of claims 1 to 7.

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9. A motor vehicle (36) with a determination device (10) according to
claim 8.

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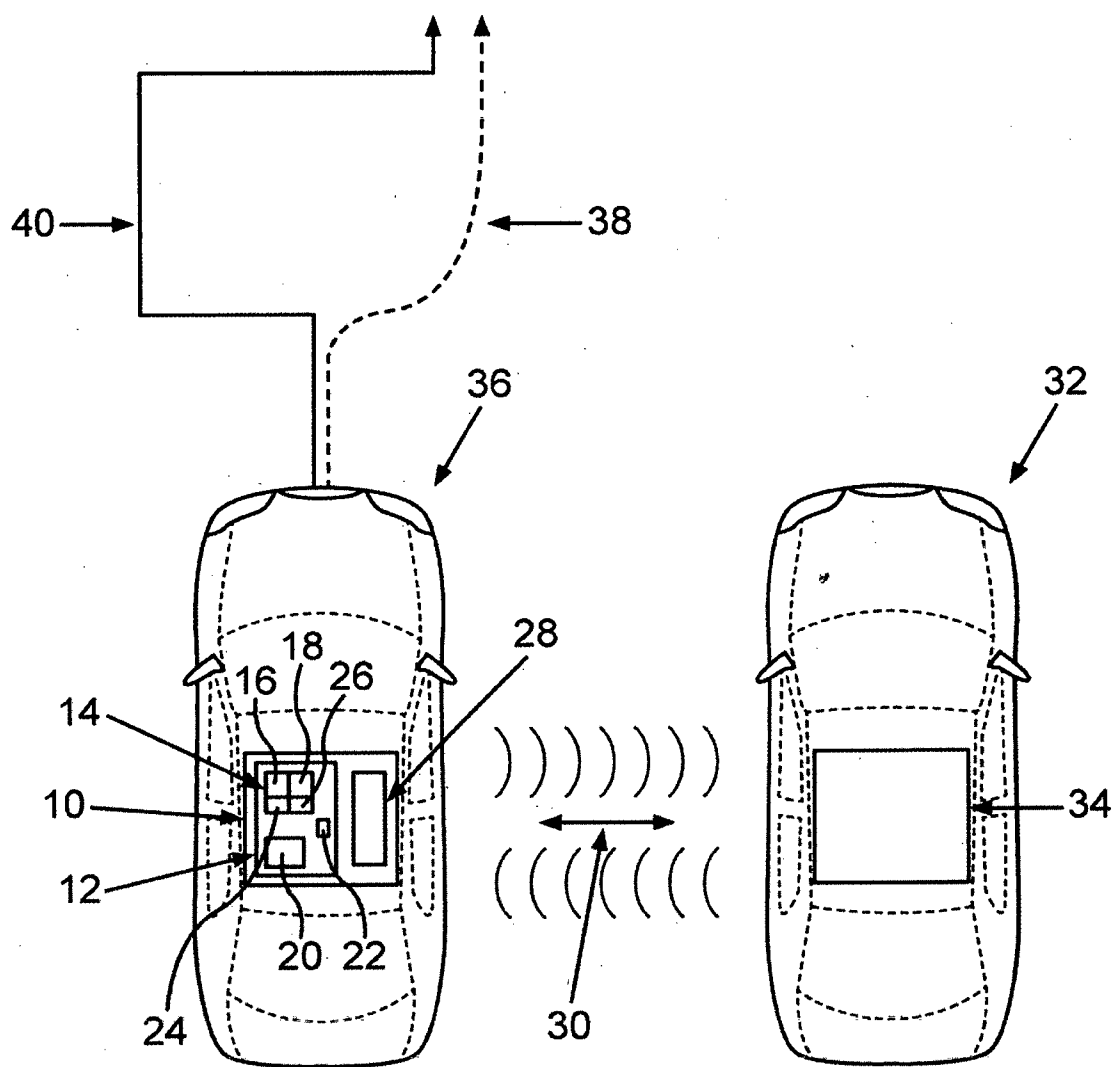


Fig.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. B60W50/08 B60W50/14 G01C21/34
ADD.

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)
B60W G01C

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2011 109564 A1 (DAIMLER AG [DE]) 7 February 2013 (2013-02-07)	1-5,7-9
Y	claims 1,2,10,12 paragraphs [0009], [0010], [0013], [0016], [0017], [0031], [0033], [0038] - [0041], [0072] - [0075] -----	1,6,8
Y	US 2014/240132 A1 (BYCHKOV DAVID [US]) 28 August 2014 (2014-08-28) paragraphs [0004], [0032], [0046], [0054], [0055] -----	1,8
A	DE 20 2013 009545 U1 (GM GLOBAL TECH OPERATIONS INC [US]) 27 January 2015 (2015-01-27) paragraphs [0015], [0016], [0051], [0052] ----- -/-	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Plenk, Rupert

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/001031

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2012/078509 A1 (CHOI DAVE [US]) 29 March 2012 (2012-03-29) paragraph [0064]; figures 4,5 -----	1
A	DE 10 2011 083370 A1 (BOSCH GMBH ROBERT [DE]) 28 March 2013 (2013-03-28) paragraphs [12to14], [0042], [0045], [0048] -----	1
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/001031

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