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(54) **Title:** ARRANGEMENT OF AN OBSERVATION DEVICE ON A MOTOR VEHICLE, MOTOR VEHICLE WITH SUCH AN ARRANGEMENT AND METHOD FOR OPERATING AN OBSERVATION DEVICE

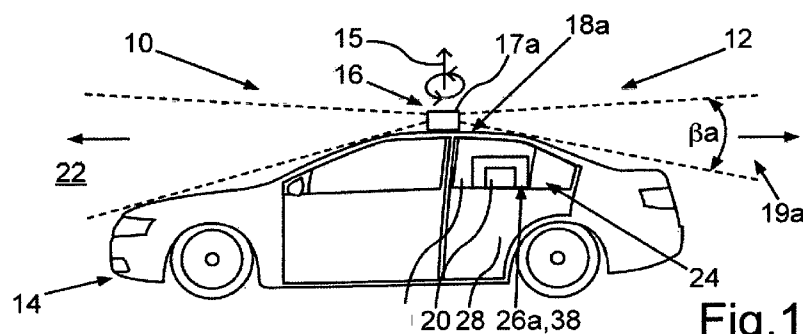


Fig. 1

(57) **Abstract:** The invention relates to an arrangement (10) of an observation device (12) on a motor vehicle (14), in which at least one panoramic camera device (16) of the observation device (12) is arranged on an exterior element (18a, 18b, 18c, 18d) of the motor vehicle (14), the panoramic camera device (16) being configured to capture a one-piece panoramic picture (20) of the surroundings (22) of the motor vehicle (14), and in which the observation device (12) comprises a display device (24) for displaying the one-piece panoramic picture (20) as a plurality of separated picture portions (36a, 36b, 36c, 36d), and the display device (24) comprises a plurality of displays (26a, 26b, 26c, 26d) each for displaying a different picture portion of the plurality of picture portions (36a, 36b, 36c, 36d).



-
- 5 Arrangement of an observation device on a motor vehicle, motor vehicle with
such an arrangement and method for operating an observation device
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DESCRIPTION:

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The invention relates to an arrangement of an observation device on a motor vehicle and to a method for operating an observation device. Furthermore, the invention relates to a motor vehicle with an arrangement of an observation device.

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Observing at least parts of the surroundings of a motor vehicle is well known from the prior art. As an example, the observation by means of e.g. IR cameras (infrared camera) or the usage of rear view cameras is commonly provided for modern motor vehicles.

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Document US 2012/0287510 A1 discloses an observation device wherein a vehicle is equipped with a reflective vehicle mirror system comprising an interior unit having a display which is capable of displaying an image captured by a camera viewing an area about the vehicle.

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Document JP 10067258 A discloses a car which is equipped with sun visors, wherein the sun visors comprise several displays being capable of displaying e.g. a speedometer, the content of a navigation system or TV content. Such sun visors are also disclosed in WO 98/57216 and in DE 197 39 352 A1.

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It is the object of the present invention to provide an arrangement of an observation device on a motor vehicle as well as a method for operating an observation device, by means of which the traffic safety can be increased.

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This object is solved by an arrangement of an observation device on a motor vehicle as well as by a method for operating an observation device having the features of the independent claims as well as by a motor vehicle with such an arrangement. Advantageous embodiments of the invention are specified in the dependent claims.

According to the invention, in the arrangement of an observation device on a motor vehicle at least one panoramic camera device of the observation device is arranged on an exterior element of the motor vehicle, the panoramic camera device being configured to capture a one-piece panoramic picture of the surroundings of the motor vehicle. Furthermore, the observation device comprises a display device for displaying the one-piece panoramic picture as a plurality of separated picture portions, and the display device comprises a plurality of displays each for displaying a different picture portion of the plurality of picture portions.

The panoramic camera device may comprise one or more panoramic cameras, wherein the panoramic cameras are capable of capturing a one-piece panoramic picture of the surroundings of the motor vehicle. Capturing a one-piece panoramic picture is of special advantage in contrast to taking a plurality of pictures of different areas of the surroundings and merging these different pictures together to one panoramic image. This is because merging together a plurality of fragments of images of the surroundings requires a higher computing power than just taking the one-piece panoramic picture by a single panoramic camera. Thus, a major disadvantage of merging together different fragments of images of the surroundings can be avoided by capturing one-piece panoramic pictures, wherein by merging a plurality of these images together distortions at the image boundaries have to be smoothed, which requires even more computing capacity, as well as displaying the merged images in real time on an vehicle internal display. Thus, it is much easier to separate the one-piece panoramic picture taken by a single panoramic camera into the plurality of separated picture portions, wherein each picture portion may be displayed on a different display of the aforementioned display device. These displays may be arranged e.g. in a half circle around an occupant of the motor vehicle, wherein the display surfaces of the displays are facing the respective occupant. Thus, each display of the plurality of displays can be directed e.g. towards the driver of the motor vehicle, wherein each picture portion is assigned to one of the displays in such a manner, that the driver gets an intuitively correct overview of the surroundings. In other words, e.g. a picture portion showing e.g. a 90°-portion of the one-piece panoramic picture at the left of the motor vehicle, a respective display mounted at a vehicle door left of the driver is used to display this picture. The same applies to a picture portion showing e.g. a 90°-portion of the one-piece panoramic picture behind the driver. This portion may be displayed e.g. on a display on the

headliner close to the rear window and thus behind the driver. Furthermore, the picture portion displayed on the display behind the driver may be displayed mirror-inverted. Thus, by taking a look into a rear mirror, which is arranged in an area close to the middle of the wind shield, the driver can see the portion of the surroundings behind him with its original orientation. The panoramic camera device also detects objects in the surroundings of the motor vehicle which are e.g. situated between the roof of the motor vehicle and the driver. Thus, even if the motor vehicle is halted almost perpendicularly below a traffic light, and thus, the view to the traffic light is covered by the vehicle roof, by means of the panoramic camera device this traffic light is detected and displayed on at least one display of the plurality of displays. This is possible, because an angle of view of at least one panoramic camera of the panoramic camera device is oriented in such a manner, that an area perpendicular above the motor vehicle is detected by means of the respective camera.

In an advantageous embodiment of the invention, the displays are arranged in an passenger cabin of the motor vehicle in a distance between each other. This means, that the different displays may be arranged evenly e.g. in an semicircle or a complete circle around the occupant of the motor vehicle. This is of advantage, because the arrangement of the different displays is then ergonomically designed and the occupant e.g. has to turn his head to the right in order to take a look at a picture portion of the one-piece panoramic picture showing the surroundings on the right side of the motor vehicle. The occupant may then observe the surroundings especially intuitively.

In a further advantageous development of the invention, it is provided that the displays are arranged in an angle to each other, wherein the angle corresponds to an acute angle or the angle corresponds to an obtuse angle. The said angle is related to a horizontal inclination of the displays to each other according to a horizontal plane of the motor vehicle. The displays may be pivoted in such a manner, that the occupant looks perpendicular to each display surface of the respective displays. The orientation of the respective displays may be adjusted automatically by means of an adjustment device of the observation device, wherein the adjustment device comprises a plurality of electric actuators. Each display may be engaged with one actuator in order to orient each of the displays towards the occupant. In other words, by means of this adjustment device, each of the displays is automatically pivotable towards the occupant of the motor vehicle. This is of special ad-

vantage, since undesirable specular reflections, which may occur with an oblique look at the display can be prevented especially effectively.

5 An advantageous embodiment of the invention provides that at least one display of the plurality of displays is arranged on a door of the motor vehicle.

This allows for an especially intuitive perception of the surroundings of the motor vehicle, since taking a view to the display arranged at the door allows for observing the area behind and above this door in an ergonomically correct manner.

10 In an advantageous embodiment of the invention, at least one display of the plurality of displays is arranged on a wind shield of the motor vehicle. This arrangement is of special advantage, because the occupants can take a look on the display without the need for pivoting his head. Hence, the arrangement of at least one display on the wind shield allows for an ergonomic posture of the head when taking a look at the display.

15 An advantageous embodiment of the invention provides that a rear mirror of the motor vehicle comprises at least one display of the plurality of displays and/or at least one display of the plurality of displays is arranged on a sun visor of the motor vehicle. The rear mirror can be designed such, that it comprises a mirror element with a reflecting mirror surface on one side and one of the displays on a different side, which is averted from the aforementioned side. Thus, the rear mirror can be moved between e.g. a use position, in which the display is facing the passenger cabin (driver cabin) and the occupants respectively and e.g. a non-use position, in which the display is facing the wind shield of the motor vehicle and thus the mirror element is facing the occupants. This is of special advantage, since the rear mirror may be used both as display or as a mirror. If one of the displays is arranged on the sun visor, this display can be moved between the use position and the non-use position especially easily, since sun visors are per se pivotable.

20 An advantageous embodiment of the invention provides that at least one display of the plurality of displays is movable between a use position, in which at least one of the picture portions is visible for occupants of the motor vehicle and a non-use position, in which at least one of the picture portions is invisible for the occupants. Each of the displays may be moved automatically between the use position and the non-use position by means of the aforementioned adjustment device. This allows for directing the drivers view only on

certain displays (which are then in the use position) in order to avoid the distraction of the driver by the other displays (which are then in the non-use position).

- 5 An advantageous embodiment of the invention provides that the panoramic camera device comprises at least one panoramic camera, the panoramic camera being configured to capture one-piece panoramic pictures. In other words, a 360°-view of the surroundings of the motor vehicle is possible by using only one single panoramic camera. Thus, an especially inexpensive
10 panoramic camera device is provided, since only one panoramic camera is necessary to provide a 360°-view.

In a further advantageous development of the invention, the panoramic camera is arranged on the top of a vehicle roof of the motor vehicle. This arrangement provides for an especially undisturbed overview of the surroundings of the motor vehicle, wherein the panoramic view is not disturbed by exterior elements or mounting parts of the motor vehicle.
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In a further advantageous development of the invention, the panoramic camera is arranged on an engine hood of the motor vehicle. This arrangement allows for an observation of the area directly in front of the motor vehicle. Thus, by means of the panoramic camera being arranged on the engine hood, e.g. harmful objects such as pieces of broken glass in front of the motor vehicle may be detected especially early and thus damage to the motor vehicle or its tires may be prevented especially effective.
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In a further advantageous development of the invention, the panoramic camera is arranged on a door frame of the motor vehicle. An arrangement of the panoramic camera on the door frame is of special advantage, since obstacles which may cause damage when opening the door can be detected especially early.
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In a further advantageous development of the invention, the panoramic camera is arranged on a luggage compartment door of the motor vehicle. This arrangement allows for detecting obstacles during reversing, even if the obstacles are situated in a height in which this obstacles are not detected e.g. by distance sensors of the motor vehicle, wherein the distance sensors are arranged at the bumper bar of the motor vehicle.
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The motor vehicle according to the invention includes the arrangement of the observation device according to the invention or an advantageous embodiment of the arrangement according to the invention.

- 5 In the method according to the invention for operating an observation device, at least one one-piece panoramic picture of the surroundings of a motor vehicle is captured by means of a panoramic camera device of the observation device. The one-piece panoramic picture is segmented into a plurality of picture portions by means of a processing unit of the observation device. The picture portions are displayed by means of a display device of the observation device, wherein each of the picture portions is displayed on a different display of plurality of displays of the display device.

- 15 Advantageous developments of the arrangement according to the invention are to be considered as advantageous developments of the method according to the invention. In addition, the observation device includes means correspondingly formed for performing the method steps.

- 20 Further advantages, features and details of the invention are apparent from the following description of a preferred embodiment as well as based on the drawing. The features and feature combinations mentioned above in the description as well as the features and feature combinations mentioned below in the description of figures and/or shown in the figures alone are usable not only in the respectively specified combination, but also in other combinations or alone without departing from the scope of the invention.

The drawing shows in:

- 30 Fig. 1 A side view on a motor vehicle with an arrangement of an observation device according to the invention;
- Fig. 2 A top view of the motor vehicle, wherein the observation device comprises a plurality of panoramic cameras, which are arranged on different exterior elements of the motor vehicle;
- 35 Fig. 3 A rear view on the motor vehicle showing different view angles of panoramic cameras which are mounted to a door frame of a vehicle door of the motor vehicle;

Fig. 4 A side view on the motor vehicle showing a view angle of a panoramic camera arranged on an engine hood of the motor vehicle; and in

5 Fig. 5 A perspective view on a part of a passenger cabin of the motor vehicle showing the arrangement of different displays of a display device of the observation device.

10 In the figures the same elements or elements having the same functions are designated with the same reference signs.

Fig. 1 shows an arrangement 10 of an observation device 12 on a motor vehicle 14. In the embodiment shown in fig. 1, the observation device 12 comprises a panoramic camera device 16 with only one panoramic camera 17a, wherein the panoramic camera 17a is arranged on an exterior element 18a of the motor vehicle 14. In this embodiment, the exterior element 18a corresponds to the top of a vehicle roof of the motor vehicle 14. The panoramic camera device 16 is configured to capture a one-piece panoramic picture 20 of the surroundings 22 of the motor vehicle 14 by means of the panoramic camera 17a. The panoramic camera 17a captures the one-piece panoramic picture 20, wherein the boundaries of the one-piece panoramic picture 20 are defined by a circumferential capturing area with a view angle β_a , wherein the circumferential capturing area corresponds to a panoramic detection area 19a of the panoramic camera 17a, which extends over a 360°C zone around a vertical axis 15. In fig. 1, the one-piece panoramic picture 20 is displayed on a display 26a, wherein the display 26a is arranged at a side door 28 of the motor vehicle 14. The display 26a is assigned to a display device 24 of the observation device 12. The display 26a is currently in a use position 38 in which the display 26a covers at least a part of a door window 29. In the use position 38, the display 26a corresponds to a window screen, which reaches a height between 8 to 15cm. In the use position 38 an occupant (e.g. the driver) of the motor vehicle 14 can see the one-piece panoramic picture 20 displayed on the display 26a.

35 Fig. 2 shows another embodiment, in which the panoramic camera device 16 comprises four panoramic cameras, namely the panoramic camera 17a, on the vehicle roof 18a of the motor vehicle 14, as well as three more panoramic cameras 17b, 17c and 17d. The panoramic camera 17b is currently arranged on an engine hood of the motor vehicle 14, wherein the engine hood corre-

sponds to an exterior element 18b. The panoramic cameras 17c, 17d are arranged on exterior elements 18c and 18d, respectively. The exterior elements 18c, 18d each correspond to a door frame close to the vehicle roof 18a, wherein the exterior element 18c corresponds to a door frame, which is
5 arranged on an opposite side of the motor vehicle 14 in comparison with the exterior element 18d. One of the panoramic cameras 17a, 17b, 17c, 17d could also be arranged on a luggage compartment door of the motor vehicle 14, although this is not shown here. A synopsis of fig. 2 and fig. 4 shows, that a panoramic detection area 19b of the panoramic camera 17b extends over a
10 view angle β_b , which corresponds to a reflex angle. The same applies to the respective panoramic detection areas 19c, 19d of the panoramic cameras 17c, 17d as one can see in synopsis of fig. 2 and fig. 3. In other words, the panoramic detection area 19c of the panoramic camera 17c extends over the view angle β_c which also corresponds to a reflex angle as well as a view an-
15 gle β_d , wherein the view angle β_d defines the panoramic detection area 19d of the panoramic camera 17d. The synopsis of fig. 4 and fig. 5 shows, that the display device 24 of the observation device 12 comprises a plurality of displays, namely the aforementioned display 26a as well as further displays 26b, 26c and 26d. The observation device 12 also comprises a processing
20 unit 13 by means of which the one-piece panoramic picture 20 can be segmented into a plurality of picture portions 36a, 36b, 36c and 36d. Each of the displays 26a to 26d is capable of displaying any one-piece panoramic picture 20 independent on by which panoramic camera 17a to 17d it was captured. Furthermore, each display 26a to 26d is capable of displaying a different pic-
25 ture portion of the plurality of picture portions 36a to 36d. Thus, the picture portion 36a can be displayed on the display 26a, the picture portion 36b can be displayed on the display 26b and so on. Each of the picture portions 36a to 36d corresponds to a quarter of the one-piece panoramic picture 20 captured by one of the panoramic cameras 17a to 17d. It is clear, that the pro-
30 cessing unit 13 is also capable of segmenting the one-piece panoramic picture 20 into more or less than four parts. The displays 26a to 26d are arranged in a passenger cabin of the motor vehicle 14 and in a distance between each other, wherein the distance corresponds to at least an air gap between the displays 26a to 26d as it is shown in fig. 5. Furthermore, the
35 displays 26a and 26b are arranged in an angle α to each other, wherein the angle α corresponds to an acute angle or to an obtuse angle. It is of special advantage, if each of the displays 26a to 26d is directed towards the driver of the motor vehicle 14. At least some of the displays can be directed to any other passenger (occupant), e.g. an assistant driver by means of an adjust-

ing device of the observation device 12. The adjusting device is not shown here but comprises means for redirecting at least some of the displays 26a to 26d in such a manner, that the displays 26a to 26d are facing the respective occupant of the motor vehicle 14. This means (not shown) are designed e.g. as electric actuators.

Although it is not shown here, at least one display of the plurality of displays 26a to 26d can be arranged directly on a wind shield 30 of the motor vehicle 14. Thus, an area of the wind shield 30 next to a rear mirror 32 could be used as one of the displays. In the present embodiment shown in fig. 5, the rear mirror 32 of the motor vehicle 14 comprises the display 26c, a sun visor 34a comprises the display 26b and a sun visor 34b comprises the display 26d.

In the present embodiment all of the displays 26a to 26d are movable between the use position 38, in which the respective picture portions 36a to 36d are visible for the occupants of the motor vehicle 14 and a non-use position 40, in which the respective picture portion 36a to 36d is invisible for the occupants. In fig. 5, a movement between the use position 38 and the non-use position 40 is illustrated by a movement 44, which corresponds to a longitudinal motion in the case of the display 26a and wherein the movement 44 corresponds to a rotary motion in the case of the display 26c which is arranged on the rear mirror 32. Moving the display 26a from the use position 38 to the non-use position 40 according to the respective movement 44 means, that the display 26a is moved from a position (use position 38) in which it extends over height of 8 to 15cm over the door window 29, into the non-use position 40, in which the display 26a is stowed and retracted inside the door 28.

The rear mirror 32 comprises a mirror element 33 with a reflecting mirror surface. The mirror element 33 is facing the wind shield 30, when the display 26c is facing the driver cabin and thus the occupants of the motor vehicle 14, when the display 26c is in its use position 38. In other words, the mirror element 33 and the display 26c are arranged on opposite sides of the rear mirror 32. In order to move the display 26 from the use position 38 to the non-use position 40, the mirror element 33 and the display 26c are rotary moved (movement 44) until the display 26c is facing the wind shield 30 and the mirror element 33 is facing the occupants. When the display 26c is in the non-use position 40, in which it faces the wind shield 30, the display 26c is invisible for the occupants of the motor vehicle 14.

CLAIMS:

1. An arrangement (10) of an observation device (12) on a motor vehicle (14), in which
 - 5 – at least one panoramic camera device (16) of the observation device (12) is arranged on an exterior element (18a, 18b, 18c, 18d) of the motor vehicle (14), the panoramic camera device (16) being configured to capture a one-piece panoramic picture (20) of the surroundings (22) of the motor vehicle (14), and in which
 - 10 – the observation device (12) comprises a display device (24) for displaying the one-piece panoramic picture (20) as a plurality of separated picture portions (36a, 36b, 36c, 36d), and the display device (24) comprises a plurality of displays (26a, 26b, 26c, 26d) each for displaying a different picture portion of the plurality of picture portions (36a, 36b, 36c, 36d).
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2. Arrangement(10) according to claim 1,
characterized by
the displays (26a, 26b, 26c, 26d) being arranged in a passenger cabin of
20 the motor vehicle (14) in a distance between each other.
3. Arrangement (10) according to claim 1 or 2,
characterized by
the displays (26a, 26b, 26c, 26d) being arranged in an angle (α) to each
25 other, wherein the angle (α) corresponds to an acute angle or the angle (α) corresponds to an obtuse angle.
4. Arrangement (10) according to any one of the preceding claims,
characterized by
30 at least one display (26a) of the plurality of displays being arranged on a door (28) of the motor vehicle (14).
5. Arrangement (10) according to any one of the preceding claims,
characterized by
35 at least one display of the plurality of displays (26a, 26b, 26c, 26d) being arranged on a wind shield (30) of the motor vehicle (14).
6. Arrangement (10) according to any one of the preceding claims,
characterized by

a rear mirror (32) of the motor vehicle (14) comprising at least one display of the plurality of displays (26a, 26b, 26c, 26d) and/or at least one display of the plurality of displays (26a, 26b, 26c, 26d) being arranged on a sun visor (34a, 34b) of the motor vehicle (14).

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7. Arrangement (10) according to any one of the preceding claims, characterized by

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at least one display of the plurality of displays (26a, 26b, 26c, 26d) being movable between a use position (38), in which at least one of the picture portions (36a, 36b, 36c, 36d) is visible for occupants of the motor vehicle (14) and a non-use position (40), in which at least one of the picture portions (36a, 36b, 36c, 36d) is invisible for the occupants.

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8. Arrangement (10) according to any one of the preceding claims, characterized by

the panoramic camera device (16) comprising at least one panoramic camera (17a, 17b, 17c, 17d), the panoramic camera (17a, 17b, 17c, 17d) being configured to capture one-piece panoramic pictures (20).

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9. Arrangement (10) according to claim 8, characterized by

the panoramic camera (17a, 17b, 17c, 17d) being arranged on the top of a vehicle roof (18a) of the motor vehicle (14).

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10. Arrangement (10) according to claim 8 or 9, characterized by

the panoramic camera (17a, 17b, 17c, 17d) being arranged on an engine hood of the motor vehicle (14).

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11. Arrangement (10) according to any one of claims 8 to 10, characterized by

the panoramic camera (17a, 17b, 17c, 17d) being arranged on a door frame of the motor vehicle (14).

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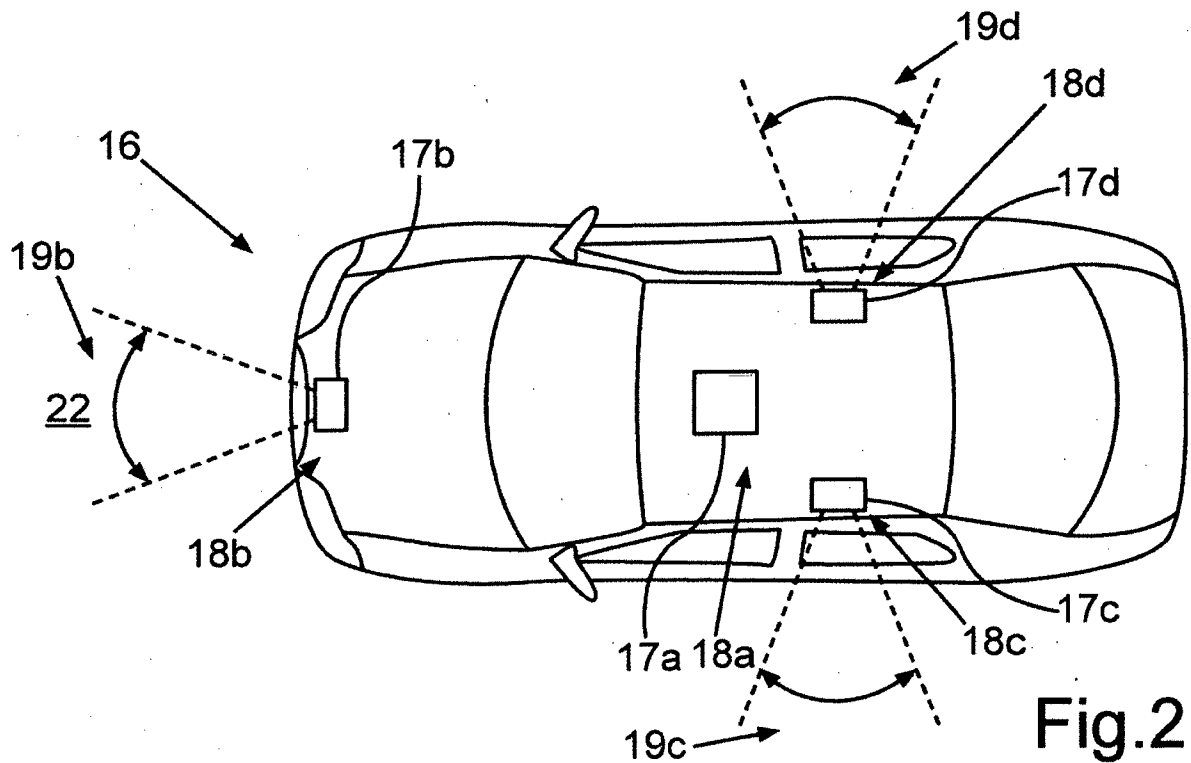
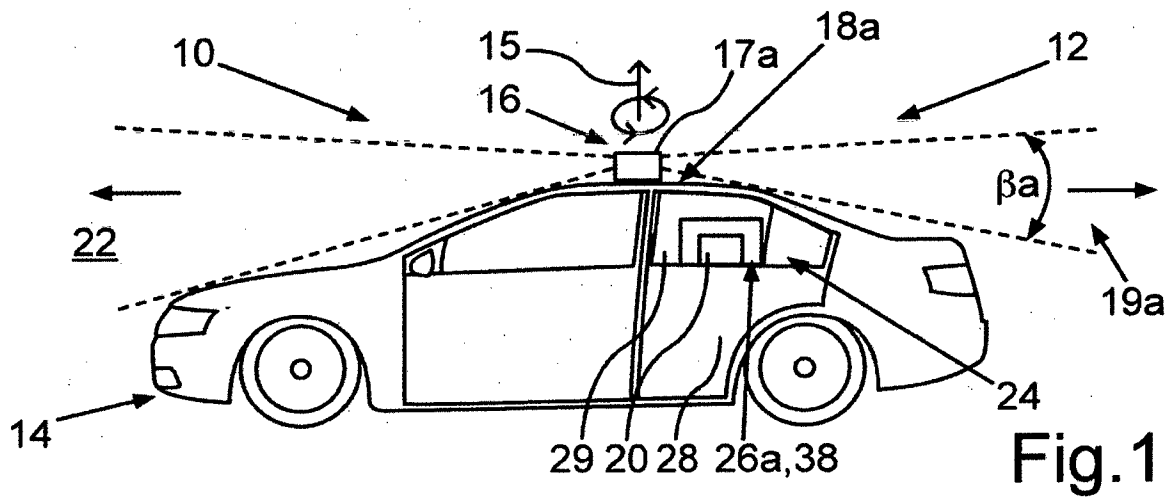
12. Arrangement (10) according to any one of claims 8 to 11, characterized by

the panoramic camera (17a, 17b, 17c, 17d) being arranged on a luggage compartment door of the motor vehicle (14).

13. A motor vehicle (14) with an arrangement (10) according to any one of claims 1 to 8.

14. A method for operating an observation device (12), the method comprising at least the steps of:

- capturing at least one one-piece panoramic picture (20) of the surroundings (22) of a motor vehicle (14) by means of a panoramic camera device (16) of the observation device (12),
- segmenting the one-piece panoramic picture (20) into a plurality of picture portions (36a, 36b, 36c, 36d) by means of a processing unit (13) of the observation device (12),
- displaying the picture portions (36a, 36b, 36c, 36d) by means of a display device (24) of the observation device (12), wherein each of the picture portions (36a, 36b, 36c, 36d) is displayed on a different display of a plurality of displays (26a, 26b, 26c, 26d) of the display device (24).



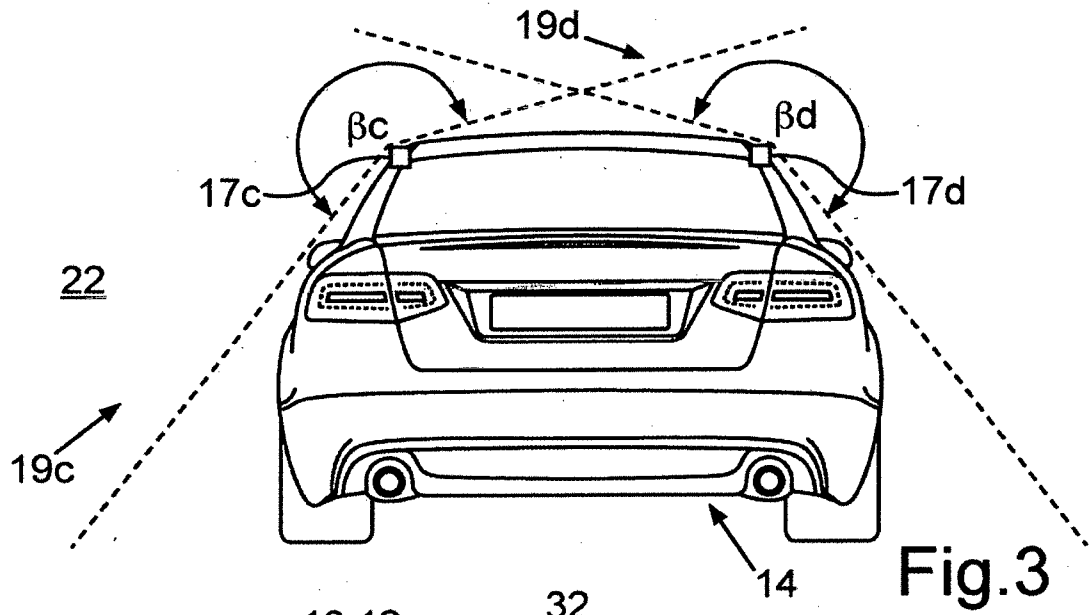


Fig.3

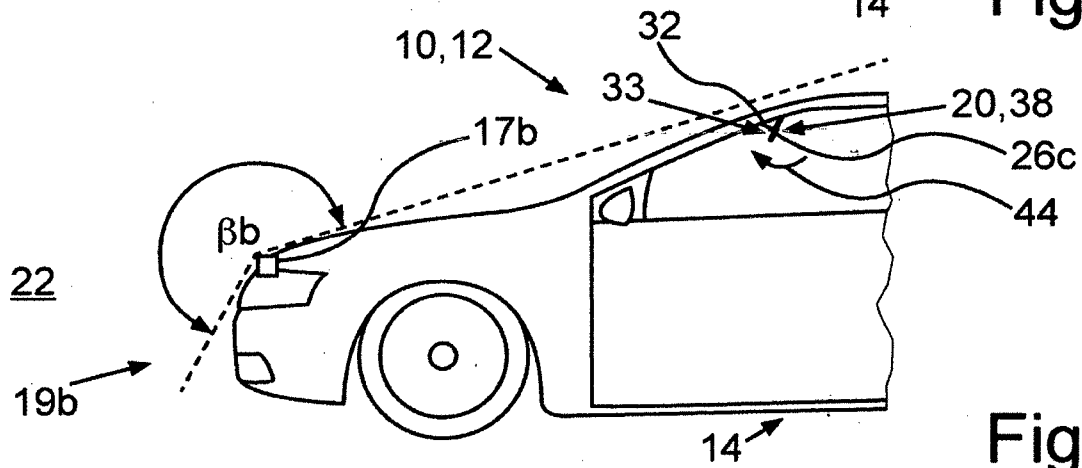


Fig.4

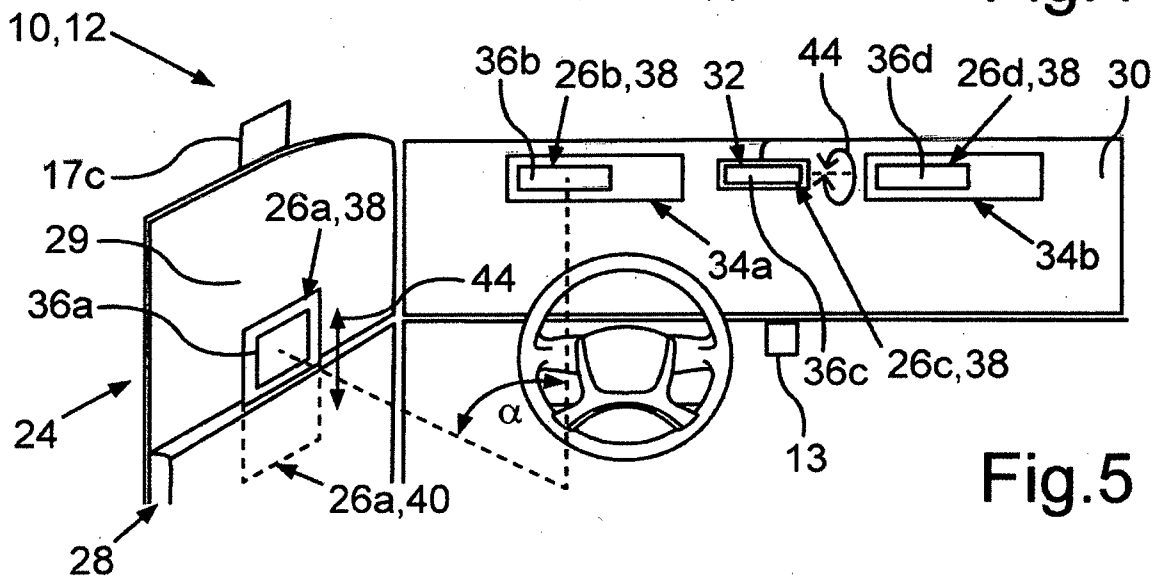


Fig.5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/001030

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60R1/10 B60R1/00
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)
B60R

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	WO 2012/029063 A1 (GOLDEMAN RAUL [IL]) 8 March 2012 (2012-03-08) page 5, line 1 - page 7, line 22; figures 1-3	1-14
X	----- US 2008/122597 A1 (ENGLANDER BENJAMIN [US]) 29 May 2008 (2008-05-29) claims 1,17; figures 1-8	1,2,5,6, 8,13,14
X	----- WO 2012/075250 A1 (MAGNA ELECTRONICS INC [US]; LU YUESHENG [US]) 7 June 2012 (2012-06-07) abstract; figure 1	1,8,13, 14
	----- -/-	



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

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Date of the actual completion of the international search

14 September 2016

Date of mailing of the international search report

20/09/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Scheuer, Jürgen

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/001030

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98/57216 A2 (LCI COMPUTER GROUP N V [NL]; SCHRIJVER STEFAAN A DE [US]) 17 December 1998 (1998-12-17) cited in the application page 2, line 12 - line 19; figures 1,2 -----	1,7
X	EP 2 127 950 A1 (RHEINMETALL LANDSYSTEME GMBH [DE]) 2 December 2009 (2009-12-02) paragraph [0007] - paragraph [0012]; claims 1-5; figures 1,2 -----	1,2,8-14
X	WO 2011/087354 A2 (MIMOS BERHAD [MY]; HON HOCK WOON [MY]) 21 July 2011 (2011-07-21) page 3, line 11 - line 28; claim 1; figures 1-3 -----	1,2,8,9, 13,14
X	DE 10 2013 017862 A1 (BUNDESREP DEUTSCHLAND [DE]) 30 April 2015 (2015-04-30) the whole document -----	1,2,13, 14
A	US 2011/074916 A1 (DEMIRDJIAN DAVID [US]) 31 March 2011 (2011-03-31) claims 1,11,13; figures 1-12 -----	1,2,8,9, 13,14
A	US 2014/176699 A1 (WANG KANG-BIN [CN]) 26 June 2014 (2014-06-26) claims 1,2,6,8,9,13; figures 1-3 -----	1,2,8,9, 13,14
A	US 2014/327775 A1 (CHO KYU HWANG [US]) 6 November 2014 (2014-11-06) claims 1,7,8; figures 7,8 -----	1,11,13, 14
A	US 2008/117288 A1 (PARK MICHAEL C [US]) 22 May 2008 (2008-05-22) claims 1,2,4,10; figures 1-18 -----	1,2,9, 13,14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/001030

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012029063 A1	08-03-2012	EP 2612491 A1	10-07-2013
		US 2013162761 A1	27-06-2013
		WO 2012029063 A1	08-03-2012
US 2008122597 A1	29-05-2008	US 2008122597 A1	29-05-2008
		US 2012105638 A1	03-05-2012
		US 2014192196 A1	10-07-2014
WO 2012075250 A1	07-06-2012	US 2013250114 A1	26-09-2013
		WO 2012075250 A1	07-06-2012
WO 9857216 A2	17-12-1998	AU 7835498 A	30-12-1998
		CA 2293454 A1	17-12-1998
		EP 1010034 A2	21-06-2000
		JP 2002504043 A	05-02-2002
		WO 9857216 A2	17-12-1998
EP 2127950 A1	02-12-2009	AT 538972 T	15-01-2012
		DE 102008026059 A1	03-12-2009
		EP 2127950 A1	02-12-2009
		ES 2378742 T3	17-04-2012
		PL 2127950 T3	31-07-2012
WO 2011087354 A2	21-07-2011	NONE	
DE 102013017862 A1	30-04-2015	NONE	
US 2011074916 A1	31-03-2011	NONE	
US 2014176699 A1	26-06-2014	CN 103879353 A	25-06-2014
		TW 201425105 A	01-07-2014
		US 2014176699 A1	26-06-2014
US 2014327775 A1	06-11-2014	NONE	
US 2008117288 A1	22-05-2008	NONE	