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(54) **METHOD FOR TRUNK INSPECTION**

(57) The present invention refers to a method for inspection of a trunk (2) of a vehicle (1). This method comprises at least the steps: Visually detecting at least one section of the interior space of the trunk (2) with at least one camera (6), wherein the camera (6) is arranged inside the closed trunk (2), wherein the camera (6) generates image data or video data representing the interior space,

Transmitting image data or video data with a wireless communication device (8) to an external receiver device (12, 14) and/or cloud-based server (10), wherein the wireless communication device (8) is arranged inside the vehicle (2), in particularly as part of the vehicle (2), wherein the wireless communication device (8) and the camera (6) are functionally connected.

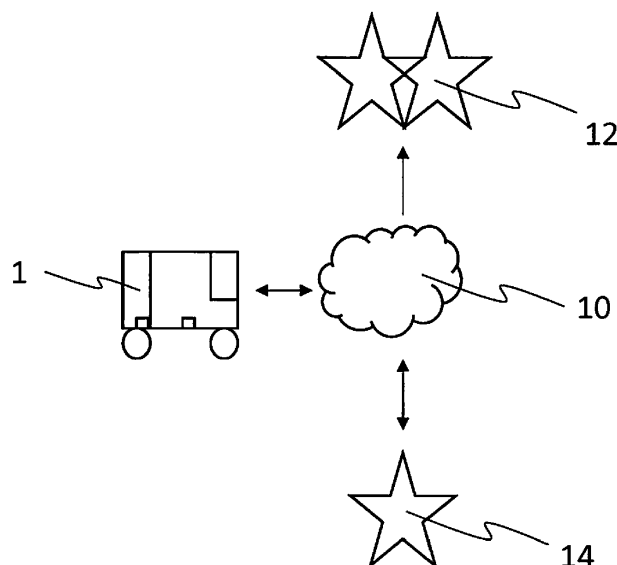


Fig. 2

Description

[0001] The present invention refers according to claim 1 to a method for inspection of a trunk of a vehicle and according to claim 15 to a computer program product for executing such a method.

Background of the invention

[0002] Nowadays companies, like malls, or embassies need to check the interior of trunks of vehicles, due to security concerns, which are entering or leaving a defined area. To check the trunk of the vehicles, the security officers stop the vehicles and wait for the trunk to open. This creates both waste of time and unnecessary waiting and traffic. It is also not possible for the security forces to control the vehicle without drivers.

[0003] Document US 6, 480, 103 B1 discloses a system for sensing ambient conditions in a compartment, such as the trunk of an automobile, generates a control signal in response to the sensed conditions. This control signal actuates indicators to notify operators of the vehicle that there is a person trapped in the trunk. The control signal is also used to actuate a lamp inside the trunk to provide light for the trapped person. A trunk release is also actuated, by a control module, to free the trapped person. The trunk release of the automobile can be prevented from being actuated if the automobile is moving, which prevents the trunk lid from unexpectedly opening while the vehicle is in motion.

[0004] US 6, 480, 103 B1 does not sent image or video data to an external device.

Object of the invention

[0005] It is the object of the present invention to provide a trunk inspection method that is better compared to the know methods, in particularly which is more effective.

Description of the invention

[0006] The before mentioned object is solved by a method for inspection of a trunk of a vehicle according to claim 1. The inventive method preferably comprises at least the steps: Visually detecting at least one section of the interior space of the trunk with at least one camera, wherein the camera is arranged inside the closed trunk, wherein the camera generates image data or video data representing the interior space, transmitting image data or video data with a wireless communication device to an external receiver device or cloud-based server, wherein the wireless communication device is arranged inside the vehicle, in particularly as part of the vehicle, wherein the wireless communication device and the camera are functionally connected. Transmission of image or video data is preferably carried out in answer to a request provided by the external device.

[0007] This solution is beneficial since an inspection

of a trunk can be carried out without a need of opening the trunk.

[0008] Further preferred embodiments are subject-matter of the following specification parts and/or of the dependent claim.

[0009] According to a further preferred embodiment of the present invention transmitting of the image data or video data to the external receiver device is triggered in dependency of a request associated to one of multiple security levels. At least two different security levels are preferably provided. A first security level is a high security level, wherein the visual detection and transmitting of image or video data is carried automatically in case the request refers to the first security level and/or wherein a second security level is a medium security level, wherein the visual detection and transmitting of image or video data is carried out in case the request refers to the second security level and in case a confirmation is made. It is alternatively possible that multiple, in particular more than two like three or up to three or more than three, like five or up to five or more than five, like seven or up to seven or more than seven, like 10 or up to 10 or more than 10 different security levels are possible respectively are provided. This embodiment is beneficial since different authorities, like police, military or private security services, can have different rights respectively information respectively access to the individual trunks.

[0010] According to a further preferred embodiment of the present invention the camera means is automatically operated after the trunk is closed or after a predefined time after the trunk is closed. The generated image or video data, in particularly as image data file or video data file or multimedia file, is preferably automatically transmitted to the cloud-based service. The image or video data which is preferably transferred to the external receiver device is preferably triggered in dependency of a request associated to one of multiple security levels. This embodiment is beneficial since information about the interior of the trunk are provided after each closing of the trunk. Thus, if the image or video data is provided to a cloud-based server they can be accessed and/or analyzed by one or more authorities in dependency of the respective security level. However, in case a cloud-based service is used it is also possible to analyze multiple image or video data files by means of an image processing algorithm, in particularly an algorithm for detecting predefined structures, object and/or elements and/or living beings, in particularly human beings.

[0011] The wireless communication device detects according to a further preferred embodiment of the present invention one or multiple wireless networks or a direct connection to an external device. The external device is preferably associated to an external network or registered in that network. A wireless connection for data exchange is set up between the wireless communication device and at least the external network. The security level is preferably identified prior to the setup of the connection or after setting up the connection. This embodi-

ment is beneficial since image or video data is shared locally, in particularly directly between the vehicle or a communication device associated with the vehicle, in particularly the wireless communication device. This embodiment is further beneficial since data can be transferred in very short distance, preferably less than 1000m or less than 500m or less than 200m or less than 100m. Thus, time for transmitting the data is very short and the required energy is also very small.

[0012] The data connection between the wireless communication device and at least one network, in particularly a network associated to a high security level, is preferably encrypted. This embodiment is beneficial since the transferred data is protected. Thus, undesired usage of said data can be prevented.

[0013] At least one control device, in particularly two, exactly two or more than two control devices, for confirming a request of the external device is/are according to a further preferred embodiment of the present invention linked to the vehicle. The request is preferably forwarded to the control device, wherein the control device preferably outputs the request in visual and/or acoustical manner and provides an input unit for responding to the request, in particularly allowing or rejecting. The control device preferably comprises a touch screen, in particularly a capacitive screen and/or speaker for outputting audio signals, in particularly speech.

[0014] The control device is according to a further preferred embodiment of the present invention connected via a wireless connection, in particularly WLAN or GSM or Bluetooth or ZigBee, to the vehicle, wherein the control device is a smart phone, smart watch, tablet PC or laptop or navigation device. This embodiment is beneficial since devices like smart phones, smart watches, tablet PCs or laptops or navigation devices are very common. Thus, since such devices are cheap and often connectable to the internet local applications linked to cloud-based services implementable in an easy manner. Older vehicles, in particular cars or trucks or busses, can be upgraded in such a way to provide the functionality of the present invention.

[0015] Thus, the control device is according to a further preferred embodiment of the present invention linked to the cloud-based service, wherein the request is redirected via the cloud-based service to one or multiple control devices. Thus, the external device is according to a further preferred embodiment of the present invention linked to the cloud-based service, wherein the image or video data with respect an individual vehicle is transmitted to the external device in dependency of an identification of the vehicle and the security level. This embodiment is beneficial since all devices linked to a cloud-based service are linked to the database, thus different authorities can analyze the image or multimedia data at the same time.

[0016] According to a further preferred embodiment of the present invention a camera respectively a camera unit linked with the external receiver device captures an

image or video of the number blade of the vehicle, wherein the image or video of the number blade is provided as number blade data, wherein the number blade data is used for identifying the respective vehicle. The server based service, in particularly cloud-based service, preferably comprises a number blade database which is linked to an image or video or multimedia data database. Thus, it is preferably possible to access the image or video data in case the number blade is detected respectively identified. This solution is beneficial since a direct communication between the external device respectively external receiver device and the vehicle is not required.

[0017] A notification is transmitted according to a further preferred embodiment together with the image or video data to the external receiver device indicating if the image or video data represents the current situation inside the trunk. Thus, the vehicle is preferably online respectively communicates to the server that since the last accessing of the trunk no further accessing was detected. It is further possible that one or multiple cameras or sensor devices detect after a signal representing a closing event of the trunk if the trunk is really closed, in particularly by capturing an image or video. However, it is alternatively possible that at least one camera always captures an image that comprises data about the position of the trunklid.

[0018] A detection device is provided according to a further preferred embodiment of the present invention for detecting an accessing of the trunk via a down folded seat or a down folded hatch. The detection device preferably triggers the camera inside the trunk to capture an image or video and/or notification data about that accessing is transferred to the cloud-based server. This embodiment is beneficial since some vehicles provide multiple possibilities to access the trunk and this embodiment helps to detect trunk access that differs from regular trunklid movements. Thus, the present method is much more secure.

[0019] A lighting means is preferably provided inside the trunk for illuminating the trunk. The lighting means is preferably a LED or OLED light and is preferably operated in case the camera is operated. Additionally, or alternatively multiple cameras are arranged inside the trunk, wherein at least two cameras are inclined with respect to each other, in particularly directed into opposing directions.

[0020] The above mentioned object is also solved by a computer program product for executing a method according to any of the preceding claims.

[0021] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which exemplarily components of the invention are illustrated. Components of the devices, units and methods according to the invention, which match at least essentially with respect to their function can be marked with the same reference sign, wherein such components do not have to be marked or described multiple times with respect to said figures.

In the following the invention is just exemplarily described with respect to the attached figures.

Brief Description of the Drawings

[0022]

- Fig. 1 shows a vehicle upgraded with at least one camera inside the trunk;
- Fig. 2 shows a cloud-based system, wherein one or more different authorities have access to image data and/or video data generated by the camera arranged inside the trunk; and
- Fig. 3 shows a peer to peer connection for exchanging the image or video data with an authority.

Detailed Description of the Drawings

[0023] Fig. 1 shows a vehicle 1, in particularly a car or bus or truck. The vehicle 1 comprises a trunk 2, wherein the trunk 2 has a trunklid 4 for opening and closing the trunk 2. Preferably at least or exactly one camera 6 is arranged inside the trunk 2 to capturing images or videos of the interior of the trunk 2. The camera 6 is functionally, in particularly by wire or wireless, connected to a wireless communication device 8. It is possible that the wireless communication device 8 and the camera 6 are arranged in a common housing. It is further possible that the camera 6 and/or the communication device 8 is/are connected to a control device of the vehicle, in particularly by wire. The camera 6 and/or the wireless communication device is/are preferably powered by a battery of the vehicle 1, wherein the battery preferably also powers lights inside the trunk 2 and/or an electric engine and/or displays inside the vehicle.

[0024] Reference number 16 indicates a control device, which can be part of the vehicle 1 or which can be a portable end user device.

[0025] In case the trunklid 4 closes the trunk 2, camera 6 takes one or multiple images or a video of the interior of the trunk 2. Data representing said image/s or video is preferably transferred to wireless communication device 8.

[0026] As described in figures 2 and 3 the generated image or video files are transferred or streamed to a cloud-based server 10 or directly to one or multiple receiving device/s 12, 14.

[0027] In the illustrated case of fig. 2 the receiving devices 12, 14 have different security levels, wherein a first security level is a high security level and accessed by a first authority, like the police, wherein the visual detection and transmitting of image or video data is preferably carried automatically in case the request refers to the first security level. The second security level is a medium or low security level and accessed by a further or different authority, like the security service of a shopping center.

The visual detection and transmitting of image or video data is carried out in case the request refers to the second security level and in case a confirmation is made. Such a confirmation can be preferably made by means of control device 16 (cf. fig. 1).

[0028] The image or video data can be directly transferred to an authority respectively an receiving device of an authority in case a peer-to-peer connection can be established between the wireless communication device 8 of the vehicle 1 and the receiving device respectively receiver device 12, 14.

[0029] Thus, in case in particularly in case of peer to peer connection a security person might approach the vehicle 1 and uses his viewing device respectively receiving device 12, 14 to send information. This information includes the security level of the security person respectively the authority. If the security level is high then interior view of the device is transmitted automatically. If the security level is low then trunk checking request is asked to driver. If driver let's the system to transmit signal then interior view of trunk 2 is transmitted. If driver does not let the system to transmit signal then interior view of trunk 2 is not transmitted.

[0030] Therefore, the system will include an in-car imaging system, in particularly a camera 6, a wireless transmitter 8 that allows the captured image to be transmitted, and a protection mechanism that allows the vehicle to be controlled only by security forces. The protection mechanism is represented by the different security levels. The security forces respectively authority will use imaging devices respectively receiving devices 12, 14. The access right of these devices 12, 14 will change depending on the security power respectively security level.

[0031] For example, according to one case in-trunk images are transmitted when the driver allows via the control device for security forces at the entry points of the shopping malls. But security forces, such as police or gendarmerie, will be able to control trunk 2 even if there are no drivers in the vehicle 1. For the operation of the system, firstly, the cameras that transmit different point images is placed in the trunk 2. These camera/s 6 can be IR or standard camera. Since the car's trunk 2 will be closed, the lamps or lights will be used to illuminate the interior. Received image is sent wirelessly and within a short distance to the controller respectively receiving device 12, 14. The signal transmission will be under the control of the user for low safety vehicles 2. When the security officer brings the imaging device closer to the trunk compartment, a signal will be sent to the trunk compartment and signal will consist of security level information. According to the incoming information, the permission of sending image of the trunk 2 will be asked to the user. If allowed, the image will be transmitted to the security officer's screen. If the device of the security officer has a high level of authority, then image of inside the trunk 2 will be transferred to the security officer, even if the user is not inside the vehicle 1. This is to be able to control the suspicious vehicles 1 at the desired time with-

out interfering with the intended terrorist acts.

[0032] Thus, the present invention refers to a method for inspection of a trunk 2 of a vehicle 1. This method comprises at least the steps: Visually detecting at least one section of the interior space of the trunk 2 with at least one camera 6, wherein the camera 6 is arranged inside the closed trunk 2, wherein the camera 6 generates image data or video data representing the interior space, Transmitting image data or video data with a wireless communication device 8 to an external receiver device 12, 14 and/or cloud-based server 10, wherein the wireless communication device 8 is arranged inside the vehicle 2, in particularly as part of the vehicle 2, wherein the wireless communication device 8 and the camera 6 are functionally connected.

List of reference numbers

[0033]

1	vehicle
2	trunk
4	trunklid
6	camera
8	wireless communication device
10	server, in particular cloud server
12	receiver device with first security level permission
14	receiver device with second security level permission
16	control device

Claims

1. Method for inspection of a trunk (2) of a vehicle (1), at least comprising the steps:

visually detecting at least one section of the interior space of the trunk (2) with at least one camera (6),
 wherein the camera (6) is arranged inside the closed trunk (2),
 wherein the camera (6) generates image data or video data representing the interior space,
 transmitting image data or video data with a wireless communication device (8) to an external receiver device (12, 14) and/or cloud-based server (10),
 wherein the wireless communication device (8) is arranged inside the vehicle (2), in particularly as part of the vehicle (2),
 wherein the wireless communication device (8) and the camera (6) are functionally connected.

2. Method according to claim 1, **characterized in that** transmitting of the image data or video data to the external receiver device (12, 14) is triggered in de-

pendency of a request associated to one of multiple security levels.

3. Method according to claim 1, **characterized in that** the camera (6) is automatically operated after the trunk (2) is closed or after a predefined time after the trunk (2) is closed,
 wherein the generated image or video data is automatically transmitted to the cloud-based service (10),
 wherein the image or video data is transferred to the external receiver device (12, 14) is triggered in dependency of a request associated to one of multiple security levels.

4. Method according to claim 2 or 3, **characterized in that** at least two different security levels are provided,
 wherein a first security level is a high security level, wherein the visual detection and transmitting of image or video data is carried automatically in case the request refers to the first security level and/or
 wherein a second security level is a medium security level,
 wherein the visual detection and transmitting of image or video data is carried out in case the request refers to the second security level and in case a confirmation is made.

5. Method according to claim 4, **characterized in that** the wireless communication device detects wireless networks,
 wherein the external device is associated to an external network,
 wherein a wireless connection for data exchange is set up between the wireless communication device and at least the external network,
 wherein the security level is identified prior to the setup of the connection or after setting up the connection.

6. Method according to claim 5, **characterized in that** the data connection between the wireless communication device (8) and at least one network, in particularly a network associated to a high security level, is encrypted.

7. Method according to claim 4, **characterized in that** at least one control device (16), in particularly two, exactly two or more than two control devices, for confirming a request of the external device (12, 14) is/are linked to the vehicle (2),
 wherein the request is forwarded to the control de-

vice (16),
 wherein the control device (16) outputs the request
 in visual and/or acoustical manner and provides an
 input unit for responding to the request, in particularly
 allowing or rejecting.

8. Method according to claim 7,
characterized in that
 the control device (16) is connected via a wireless
 connection, in particularly WLAN or GSM, to the ve-
 hicle (2),
 wherein the control device (16) is a smart phone,
 smart watch, tablet PC or laptop. 5
9. Method according to claim 8,
characterized in that
 the control device (16) is linked to the cloud-based
 service (10),
 wherein the request is redirected via the cloud-based
 service (10) to one or multiple control devices (10). 10
10. Method according to claim 9,
characterized in that
 the external device (12, 14) is linked to the cloud-
 based service (10),
 wherein the image or video data with respect an in-
 dividual vehicle (2) is transmitted to the external de-
 vice in dependency of an identification of the vehicle
 (2) and the security level. 15
11. Method according to claim 10,
characterized in that
 a camera unit linked with the external receiver device
 captures an image or video of the number blade of
 the vehicle, wherein the image or video of the number
 blade is provided as number blade data, wherein the
 number blade data is used for identifying the respec-
 tive vehicle. 20
12. Method according to claims 9 or 10,
characterized in that
 wherein a notification is transmitted together with the
 image or video data to the external receiver device
 indicating if the image or video data represents the
 current situation inside the trunk. 25
13. Method according to any of the before mentioned
 claims,
characterized in that
 a detection device for detecting an accessing of the
 trunk via a down folded seat or a down folded hatch
 is provided,
 wherein the detection device triggers the camera in-
 side the trunk to capture an image or video
 and/or
 notification data about that accessing is transferred
 to the cloud-based server. 30

14. Method according to any of the before mentioned
 claims,
characterized in that
 a lighting means inside the trunk for illuminating the
 trunk is operated in case the camera is operated
 and/or multiple cameras are arranged inside the
 trunk, wherein at least two cameras are inclined with
 respect to each other, in particularly directed into op-
 posing directions. 35
15. Computer program product for executing a method
 according to any of the preceding claims. 40

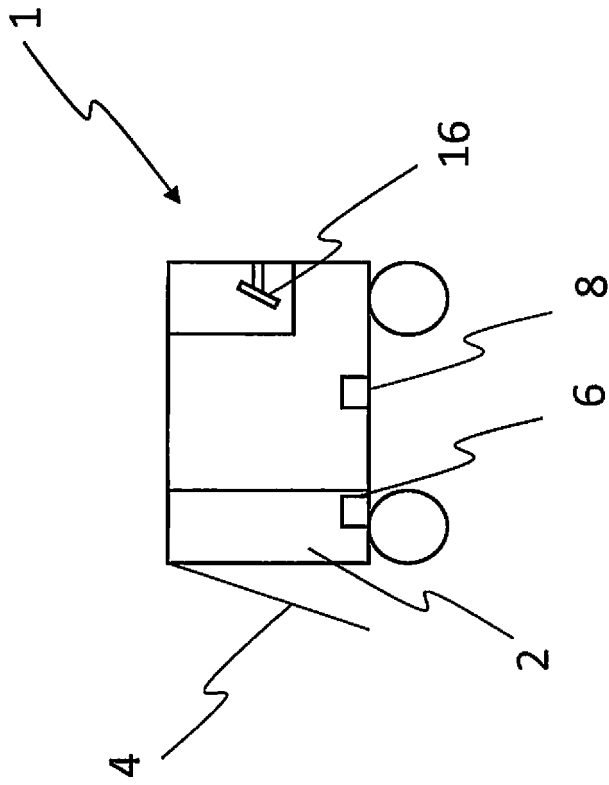


Fig. 1

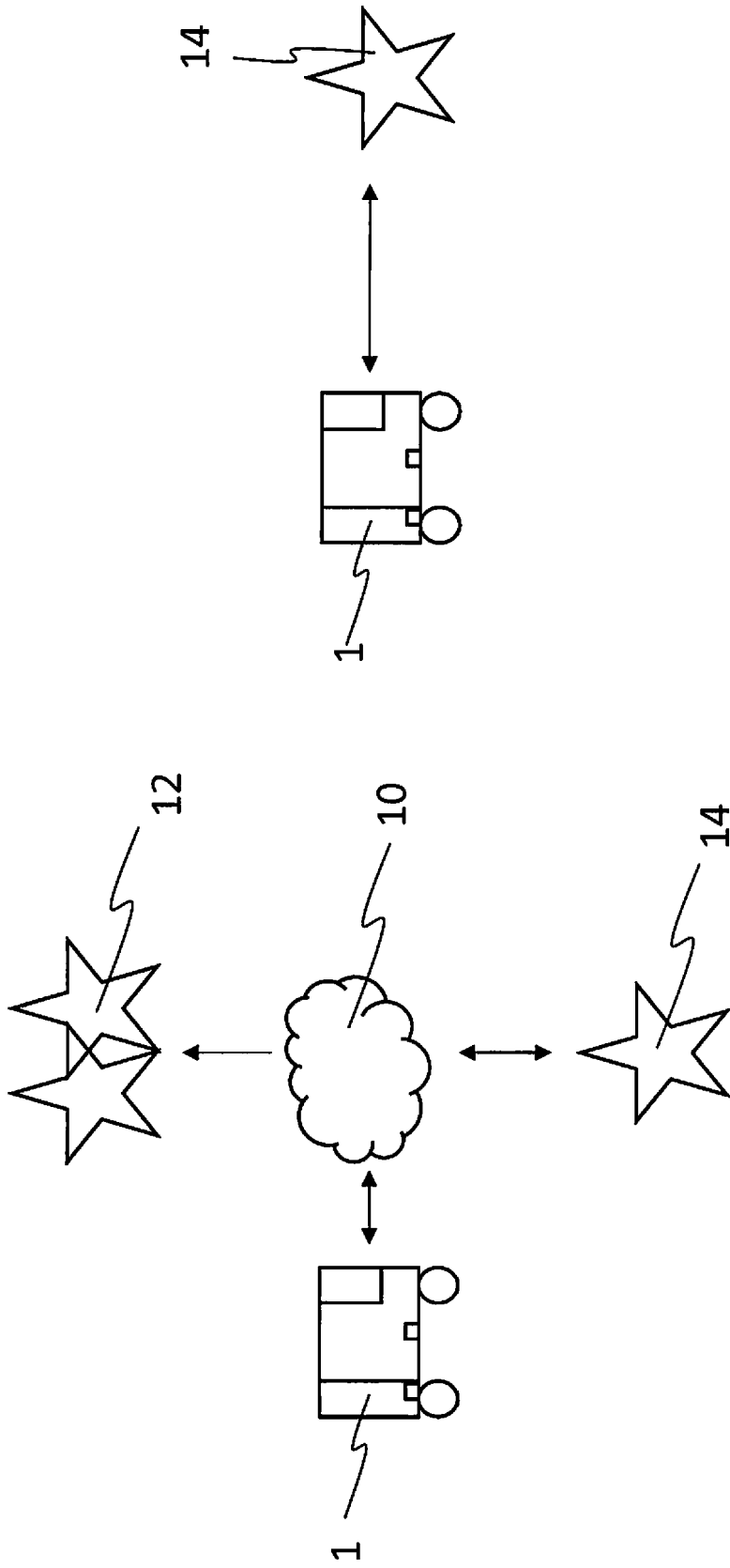


Fig. 2

Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 17 20 4309

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X	US 9 315 152 B1 (MAESTAS TOM [US] ET AL) 19 April 2016 (2016-04-19)	1,2,6,7, 9,10,12, 14,15	INV. G08B21/22
Y	* figures 3a,3b,5 *	3,4,8,13	
A	* paragraphs [0012], [0017], [0024], [0025], [0051], [0054] *	5,11	
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Y	* figures 32,33 * * paragraphs [0189], [0190] *	3,4,13	
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X	US 2008/165251 A1 (O'KERE DAVID MCSCOTT [US]) 10 July 2008 (2008-07-10) * claims 1,16 * * figure 1 * * paragraph [0015] *	1,15	TECHNICAL FIELDS SEARCHED (IPC)
Y	WO 2016/182962 A1 (FLIR SYSTEMS [US]) 17 November 2016 (2016-11-17) * page 34, lines 22-25 * * page 41, lines 3-5 *	8	B60R B60N E05B B60H G08B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 May 2018	Examiner Coffa, Andrew
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 20 4309

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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02-05-2018

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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