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(54) Title: THIEF ALERT SYSTEM USING A CAMERA

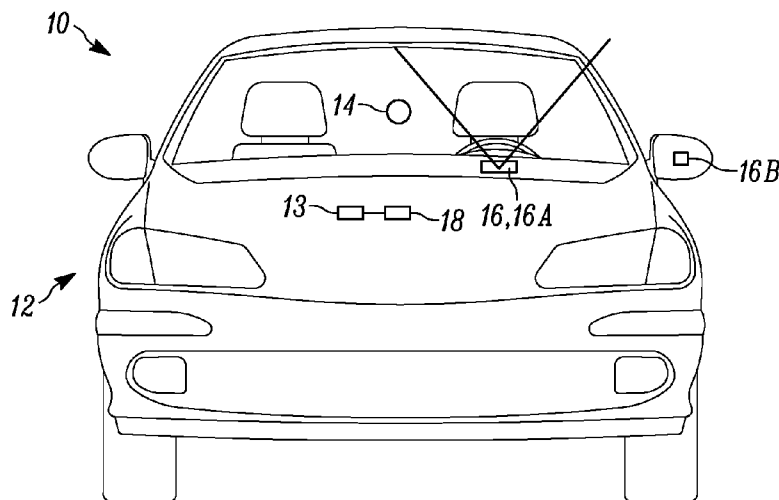


FIG. 1

(57) Abstract: A thief alert system (12) and method for a vehicle (10) includes monitoring the vehicle with a plurality of sensors (14) to detect undesired access to the vehicle. At least one image of a passenger compartment of the vehicle is captured with a camera (16). The at least one image is sent to a remote communication device with a wireless communication system of the vehicle.



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THIEF ALERT SYSTEM USING A CAMERA

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. provisional patent application No. 62/268,740, filed December 17, 2015, which is hereby incorporated by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to automotive vehicles, and more particularly to safety systems for automotive vehicles.

BACKGROUND

[0003] An automotive vehicle may include sensor arrays and cameras mounted to the vehicle to detect objects in the area around the vehicle for various safety systems for the vehicle and the driver. The vehicle utilizes the sensors and cameras to detect objects in the vehicle path. The various safety systems utilize the data to provide warnings to the driver and to initiate safety vehicle responses to minimize and/or avoid collisions.

[0004] Additional sensors and cameras may also be mounted to the vehicle to sense and record the driver and other objects and features within the passenger compartment. The internally facing sensors and cameras may be used for safety functions, driver comfort features, entertainment, etc.

[0005] The background description provided herein is for the purpose of generally presenting the context of the disclosure. Work of the presently

named inventors, to the extent it is described in this background section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present disclosure.

BRIEF SUMMARY

[0006] In one exemplary embodiment, a method of providing a thief alert system for a vehicle includes determining if a vehicle ignition is in an off position, the vehicle is locked, and a key is not proximate to the vehicle. The method also includes enabling the thief alert system. The method further includes monitoring the vehicle with a plurality of sensors to detect undesired access to the vehicle. The method also includes capturing at least one image of a passenger compartment with a camera for the vehicle. The at least one image is sent to a remote communication device with a wireless communication system of the vehicle.

[0007] A thief alert system, according to one exemplary embodiment, includes a plurality of sensors to monitor the vehicle. An electronic control unit is connected to the plurality of sensors to detect undesired entry to the vehicle. The electronic control unit is configured with instructions for determining if a vehicle ignition is in an off position, the vehicle is locked, and a key is not proximate to the vehicle. The electronic control unit is also configured with instructions to enable the thief alert system. The electronic control unit is further configured with instructions to monitor the vehicle with the plurality of sensors to detect undesired access to the vehicle. The electronic control unit also is configured with

instructions to capture at least one image of a passenger compartment with a camera for the vehicle and send the at least one image to a remote communication device with a wireless communication system of the vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present disclosure will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0009] FIG. 1 is a schematic front view of a vehicle having a thief alert system according to one exemplary embodiment;

[0010] FIG. 2 is a schematic rear view of the vehicle of FIG. 1 having the thief alert system;

[0011] FIG. 3 is a schematic first side view of the vehicle of FIGS. 1-2 having the thief alert system; and

[0012] FIG. 4 is a schematic second side view of the vehicle of Figs. 1-3 having the thief alert system.

DETAILED DESCRIPTION

[0013] The following description is merely exemplary in nature and is in no way intended to limit the disclosure, its application, or uses. For purposes of clarity, the same reference numbers will be used in the drawings to identify similar elements. Figures 1-4 are schematic illustrations of a vehicle 10 having a thief alert system 12. The thief alert system 12 preferably incorporates other existing vehicle 10 systems and may be utilize the same sensors and components, as described below.

[0014] The thief alert system 12 may be connected to other systems for the vehicle 10, including a telematics system 13. The thief alert system 12 utilizes sensors 14 located at various points around the vehicle 10. The sensors 14 may include, but are not limited to, crash impact sensors, door alarm sensors, door open sensors, and presence detection sensors in seats.

[0015] The thief alert system 12 also includes at least one inwardly facing camera 16 which may be mounted in a vehicle instrument panel 16A, on a rear view display, or in another location which is able to capture the driver's image, in particular the face or eyes. The camera(s) 16 may be used for another vehicle system (not labeled), such as a system for monitoring driver attentiveness. Other cameras 16B may also be positioned to capture the area in proximity to the passenger compartment, such as a camera for viewing the side and/or blind spot of the vehicle 10.

[0016] The thief alert system 12 also has an electronic control unit ("ECU") 18. The ECU 18 may be an independent, dedicated component or may also be used by another vehicle system, such as the driver attentiveness system or the telematics system 13. The ECU 18 is in communication with and receives input from the various sensors 14 and/or the cameras 16, 16B. The sensors 14 and camera(s) 16, 16B may be located separately or together at various locations. One skilled in the art would be able to determine which sensors 14 and cameras 16, 16B and the locations of the sensors 14 and cameras 16, 16B that may provide useful information to the thief alert system 12. The thief alert system 12 uses the sensor 14 information reported to the ECU 18 to detect if

someone is trying to or has broken into the vehicle 10. For example, the ECU 18 may use any one or a combination of: an alert by crash impact sensors in forcing the door open, door alarm sensors, door open sensors, presence detection sensors in seats, etc.

[0017] The ECU 18 may determine whether the vehicle 10 is turned off and locked. Typically, if the ignition is on the vehicle 10 is running and the thief alert system 12 is not yet required. Alternately, the thief alert system 12 may be initiated when a vehicle 10 is in running if undesired entry by another person is detected, e.g., a window is broken without other impact to indicate a crash.

[0018] In one exemplary embodiment, the ECU 18 enables the thief alert system 12 at least when the vehicle 10 is turned off, locked, and presence of the key is not detected. The ECU 18 places the sensors 14 in standby mode. Standby mode is used to preserve power for the thief alert system 12 while keeping the sensors 14 available for sensing objects and providing information.

[0019] The thief alert system 12 may be disabled in various circumstances, such as by request of the vehicle operator. The ECU 18 checks that the hardware associated with the thief alert system 12 is ready for operation. If the hardware is not ready the thief alert system 12 discontinues. The hardware check includes determining if there is sufficient battery voltage (V_{Batt}) to run the system, check for malfunction in the sensors 14, etc.

[0020] The thief alert system 12 uses the sensor 14 information reported to the ECU 18 to detect if someone is trying to or has broken into the vehicle 10. In one exemplary embodiment, the thief alert system 12 alerts the

driver of the vehicle 10 of such a condition. The thief alert system 12 may alert the operator of the vehicle by sending a text, email, etc., from the vehicle 10 using the communication system 13. The communication may include a still picture and/or options to watch video feed from the camera(s) 16, 16B. The thief alert system 12 will take a still picture of the image at predetermined intervals for a predetermined amount of time, e.g., every eight seconds for two minutes, or may take a video capture for a predetermined amount of time, e.g., for two minutes.

[0021] In another exemplary embodiment, the image capture may occur until the sensors 14 and/or camera(s) 16, 16B detect that the thief is no longer in or proximate to the vehicle 10. In yet another embodiment, the image capture may occur until the vehicle owner deactivates the system 12. The system 12 may be controlled, activated, and/or deactivated from the vehicle 10 or from a remote communication device (not shown), such as a smart phone and/or a key fob. Additionally, the vehicle owner may be able to control the camera(s) 16 to take a picture when desired, pan, zoom, etc., from the vehicle 10 or from the remote communication device.

[0022] If the ECU 18 determines that a predetermined amount of time has passed since the thief was proximate to the vehicle 10, or the vehicle owner deactivates the camera(s) 16, the thief alert system 12 will return to standby mode. However, thief alert system 12 will reactivate if circumstances indicate that the thief has returned. Additionally, the ECU 18 may also send signals to deter the thief from the vehicle 10 such as sending a signal to flash the exterior

lights for the vehicle 10, sound the horn, etc. Activating such warning may occur separate from any car alarm systems which may or may not have been triggered by the thief.

[0023] The driver may have the ability to override or deactivate the thief alert system 12 as desired. For example, to save battery power at the end of a battery life. The thief alert system 12 may also automatically disengage under certain circumstances, such as when sufficient battery power is not available. The image(s) captured by the camera(s) 16 may also be saved to a memory (not shown) for the vehicle 10, the system 12, and/or the remote communication device. The vehicle owner may use the thief alert system 12 to provide information to insurance, police, and/or other agencies in the case of theft of the vehicle 10.

[0024] While the best modes for carrying out the invention have been described in detail the true scope of the disclosure should not be so limited, since those familiar with the art to which this invention relates will recognize various alternative designs and embodiments for practicing the invention within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A method of providing a thief alert system for a vehicle comprising:
determining if a vehicle ignition is in an off position, the vehicle is locked and a key is not proximate to the vehicle;
enabling the thief alert system;
monitoring the vehicle with a plurality of sensors to detect undesired access to the vehicle;
capturing at least one image of a passenger compartment with a camera for the vehicle; and
sending the at least one image to a remote communication device with a wireless communication system of the vehicle.
2. The method of claim 1, further comprising providing an external warning, wherein the external warning is one of of: flashing the exterior lights of the vehicle, and sounding a horn for the vehicle.
4. The method of claim 1, further comprising capturing an image of an area proximate to the passenger compartment.

5. The method of claim 1, wherein the plurality of sensors include at least one of: crash impact sensors, door lock sensors, door alarm sensors, door open sensors, and presence detection sensors.

6. The method of claim 1, wherein sending the image further comprises sending at least one still image.

7. The method of claim 1, wherein sending the image further comprises sending a video stream.

8. The method of claim 7, wherein the video stream is a live stream from the vehicle.

9. The method of claim 1, wherein monitoring the vehicle with the plurality of sensors further comprises placing the thief alert system in standby mode to preserve battery power for the vehicle.

10. The method of claim 1, further comprising disabling the thief alert system with an electronic control unit for the vehicle.

11. The method of claim 10, wherein disabling the thief alert system further comprises when at least one of: a predetermined amount of time has passed, a predetermined amount of time has passed since the sensors have

detected the undesired presence is still proximate to the vehicle, the battery power is insufficient to operate the system, the vehicle owner has disabled the system and there is a sensor failure.

12. A thief alert system comprising:

a plurality of sensors to monitor the vehicle; and

an electronic control unit connected to the plurality of sensors to detect undesired entry to the vehicle, wherein the electronic control unit is configured with instructions for;

determining if a vehicle ignition is in an off position, the vehicle is locked and a key is not proximate to the vehicle;

enabling the thief alert system;

monitoring the vehicle with the plurality of sensors to detect undesired access to the vehicle;

capturing at least one image of a passenger compartment with a camera for the vehicle; and

sending the at least one image to a remote communication device with a wireless communication system of the vehicle.

13. The thief alert system of claim 12, wherein the electronic control unit is further configured with instructions for providing an external warning, wherein the external warning is one of: flashing the exterior lights of the vehicle, and sounding a horn for the vehicle.

14. The thief alert system of claim 12, wherein the electronic control unit is further configured with instructions for capturing an image of an area proximate to the passenger compartment.

15. The thief alert system of claim 12, wherein the plurality of sensors include at least one of: crash impact sensors, door lock sensors, door alarm sensors, door open sensors, and presence detection sensors.

16. The thief alert system of claim 12, wherein sending the image further comprises sending at least one still image.

17. The thief alert system of claim 16, wherein sending the image further comprises sending a video stream.

18. The thief alert system of claim 17, wherein the video stream is a live stream from the vehicle.

19. The thief alert system of claim 12, wherein monitoring the vehicle with the plurality of sensors further comprises placing the thief alert system in standby mode to preserve battery power for the vehicle.

20. The thief alert system of claim 12, wherein the electronic control unit is further configured with instructions for disabling the thief alert system when

at least one of: a predetermined amount of time has passed, a predetermined amount of time has passed since the sensors have detected the undesired presence is still proximate to the vehicle, the battery power is insufficient to operate the system, the vehicle owner has disabled the system and there is a sensor failure.

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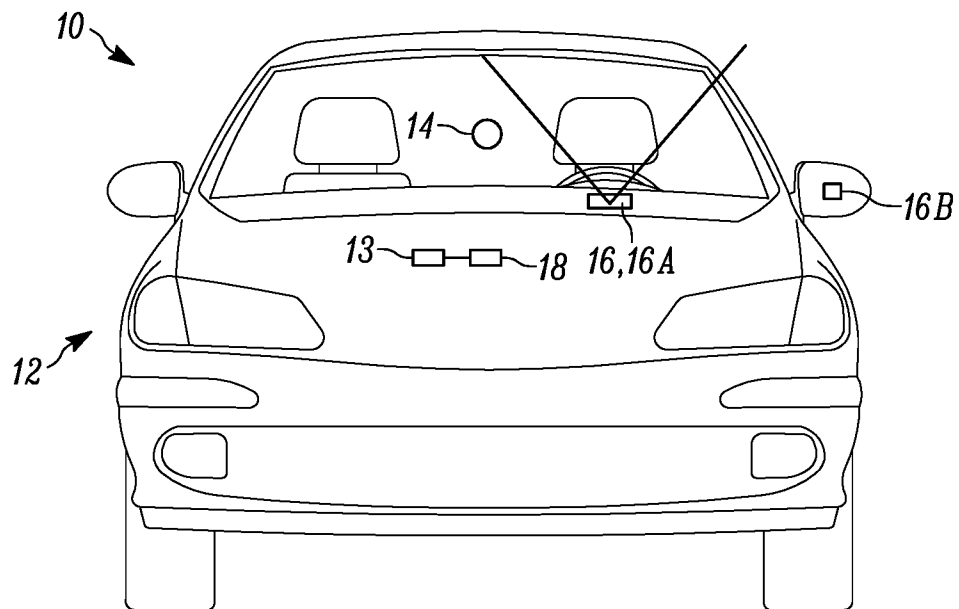


FIG. 1

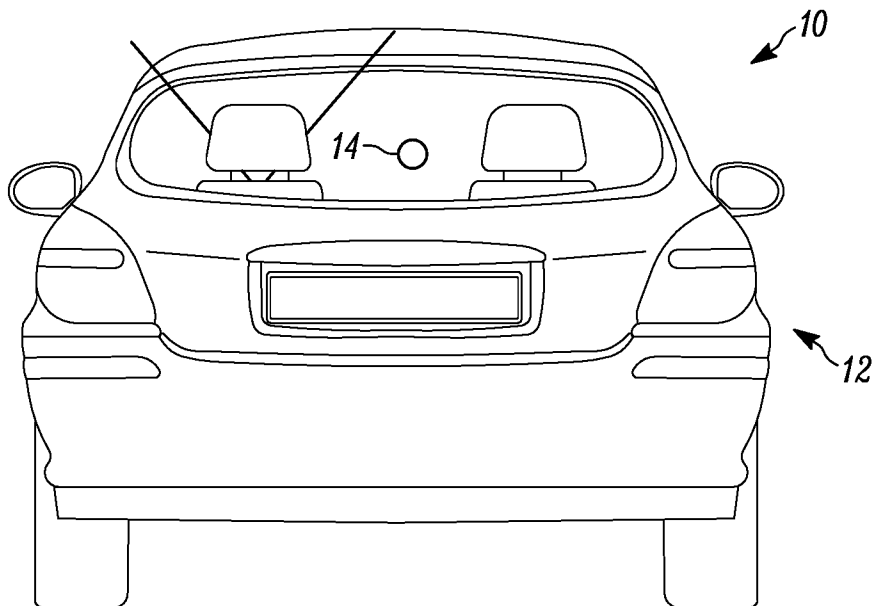


FIG. 2

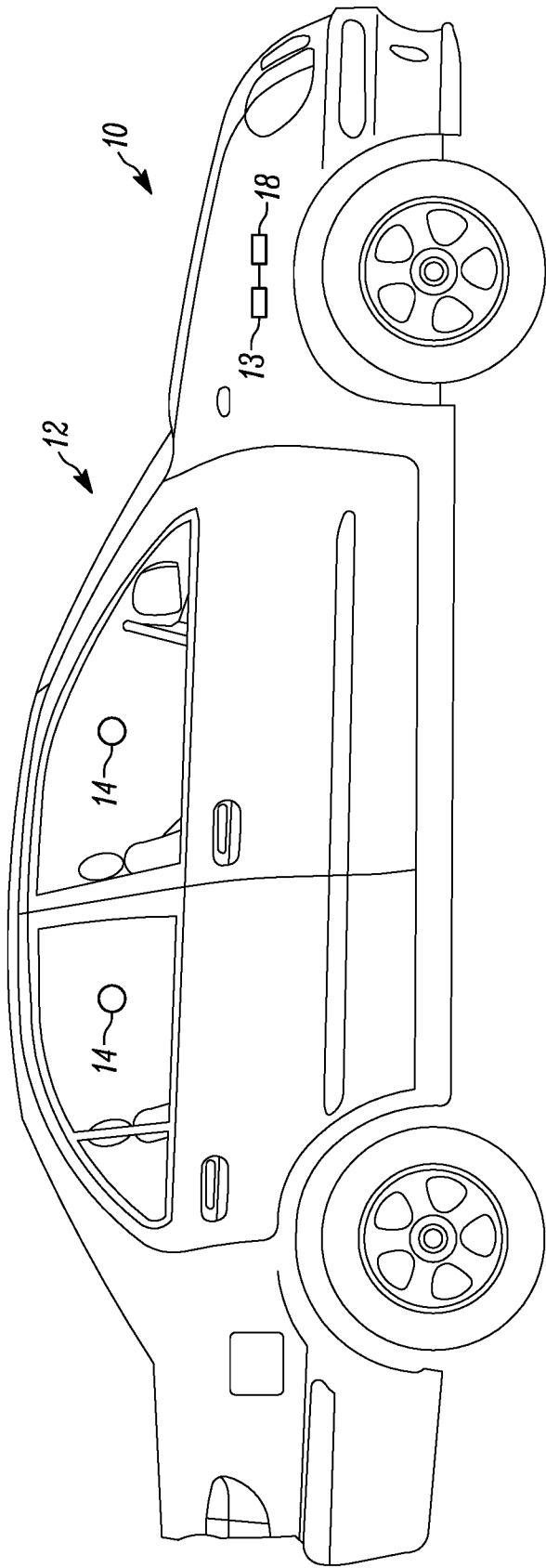


FIG. 3

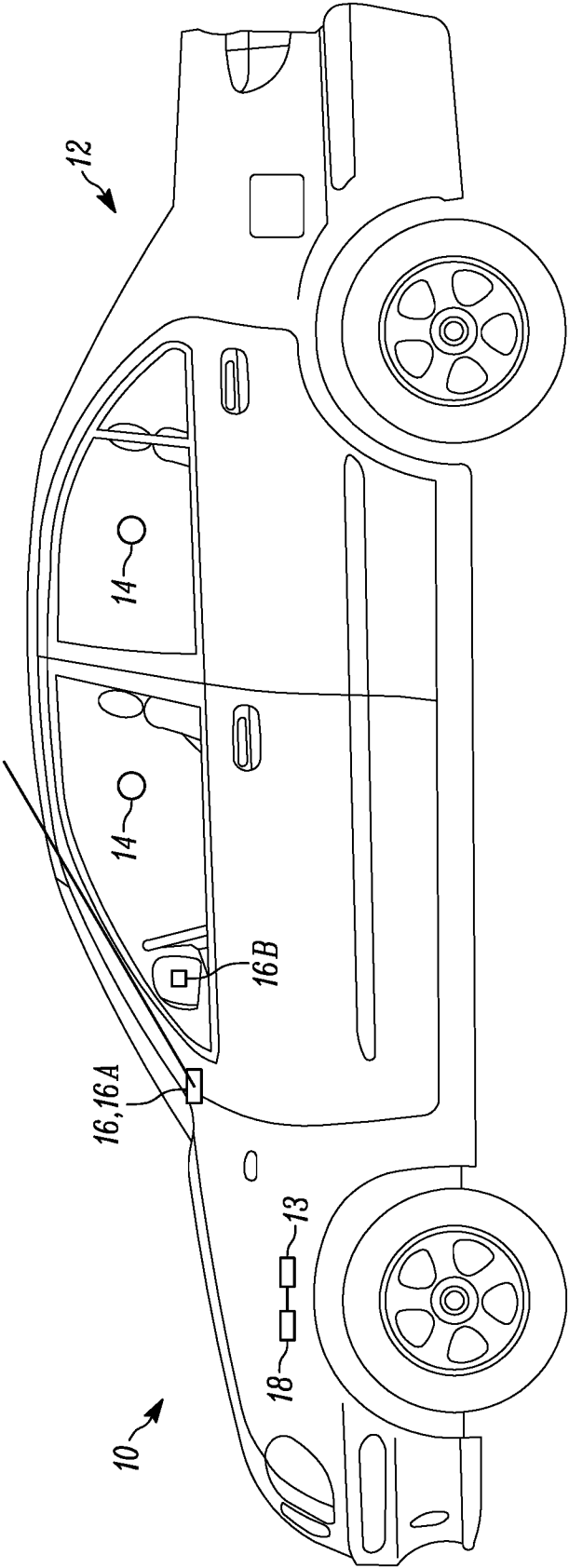


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. B60R25/31 B60R25/10 B60R25/102 B60R25/30 G08B13/08
G08B13/196

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 G08B

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

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X	WO 2012/049693 A1 (KUMAR VIPIN [IN]) 19 April 2012 (2012-04-19) abstract; figure page 7, lines 21-27 ----- -/-	1,2, 6-13, 16-20



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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07/03/2017

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/065075

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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