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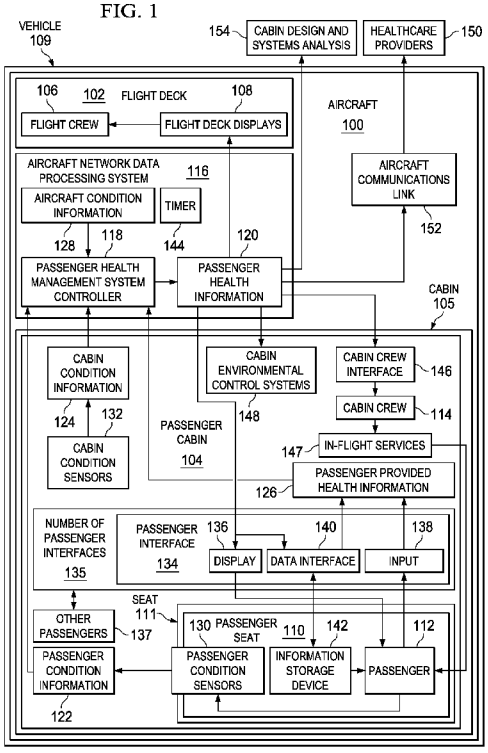
[Continued on next page]

(54) Title: AIRCRAFT PASSENGER HEALTH MANAGEMENT

FIG. 1



(57) Abstract: A method and apparatus for managing health of a passenger on an aircraft. A physiological condition of the passenger seated in a seat in a cabin in the aircraft is monitored using a passenger condition sensor to provide passenger condition information. An environmental condition in the cabin is monitored using a cabin condition sensor to provide cabin condition information. The passenger condition information and the cabin condition information are processed to provide passenger health information. The passenger health information is displayed to the passenger.

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AIRCRAFT PASSENGER HEALTH MANAGEMENT

BACKGROUND

The present disclosure relates generally to systems and methods for identifying and improving the health and comfort of passengers on aircraft and other vehicles.

Aircraft manufacturers, airlines, and other operators of commercial and other aircraft may recognize the desirability of being able to cater to the comfort and well-being of air travelers. As a result, aircraft may be designed to include various systems and aircraft operators may provide various services that are intended to support the health and comfort of passengers on the aircraft.

For example, aircraft may include equipment for monitoring and controlling the environmental conditions in an aircraft cabin. In some aircraft, equipment may be provided that allows passengers to adjust environmental conditions at their own seats in the aircraft cabin to some degree. Airlines also may provide various services for supporting the health and comfort of passengers on an aircraft. For example, an airline may provide an in-flight food service. Many current commercial and other aircraft may include equipment that may allow the crew of an aircraft to provide an on-demand response to medical emergencies on the aircraft. The systems and services that currently are provided to support the health and comfort of passengers on an aircraft may be designed for a broad range of passengers.

Accordingly, it would be beneficial to have a method and apparatus that takes into account one or more of the issues discussed above as well as possibly other issues.

SUMMARY

An illustrative embodiment of the present disclosure provides a method for managing health of a passenger on an aircraft. A physiological condition of the passenger seated in a seat in a cabin in the aircraft is monitored using a passenger condition sensor to provide passenger condition information. An environmental condition in the cabin is monitored using a cabin condition sensor to provide cabin condition information. The passenger condition information and the cabin condition

information are processed to provide passenger health information. The passenger health information is displayed to the passenger.

Another illustrative embodiment of the present disclosure provides an apparatus comprising a passenger condition sensor, a cabin condition sensor, a controller, and a passenger interface. The passenger condition sensor is configured to monitor a physiological condition of a passenger seated in a seat in a cabin in an aircraft to provide passenger condition information. The cabin condition sensor is configured to monitor an environmental condition in the cabin to provide cabin condition information. The controller is configured to receive the passenger condition information and the cabin condition information and to process the passenger condition information and the cabin condition information to provide passenger health information. The passenger interface is configured to display the passenger health information to the passenger.

Another illustrative embodiment of the present disclosure provides another method for managing health of a passenger on an aircraft. A physiological condition of the passenger in a cabin in the aircraft is monitored using a passenger condition sensor to provide passenger condition information. An environmental condition in the cabin is monitored using a cabin condition sensor to provide cabin condition information. Passenger provided health information is received as input from the passenger. The passenger condition information, the cabin condition information, and the passenger provided health information are processed to provide passenger health information.

The features, functions, and benefits may be achieved independently in various embodiments of the present disclosure or may be combined in yet other embodiments in which further details can be seen with reference to the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the illustrative embodiments are set forth in the appended claims. The illustrative embodiments, however, as well as a preferred mode of use, further objectives, and features thereof will best be understood by reference to the following detailed description of illustrative embodiments of the present disclosure when read in conjunction with the accompanying drawings, wherein:

Figure 1 is an illustration of a block diagram of a passenger health management system in accordance with an illustrative embodiment;

Figure 2 is an illustration of a block diagram of a passenger health management system controller in accordance with an illustrative embodiment;

Figure 3 is an illustration of a block diagram of a passenger interface in accordance with an illustrative embodiment;

Figure 4 is an illustration of a block diagram of passenger condition sensors in accordance with an illustrative embodiment;

Figure 5 is an illustration of a block diagram of cabin condition sensors in accordance with an illustrative embodiment;

Figure 6 is an illustration of a flowchart of a process for passenger health management in accordance with an illustrative embodiment; and

Figure 7 is an illustration of a block diagram of a data processing system in accordance with an illustrative embodiment.

DETAILED DESCRIPTION

The different illustrative embodiments recognize and take into account a number of different considerations. "A number", as used herein with reference to items, means one or more items. For example, "a number of different considerations" means one or more different considerations.

The different illustrative embodiments recognize and take into account that an airline or other operator of aircraft may both improve customer satisfaction and realize desirable cost savings by being more responsive to the health and comfort concerns of aircraft passengers. However, the information that aircraft operators may need to improve the comfort and well-being of passengers in an aircraft cabin may not currently be available.

The different illustrative embodiments recognize and take into account that an increasing number of smart applications available on the Internet and mobile devices enable individuals to keep track of information related to their health and well-being. However, no such capability exists for passengers during air travel.

The impact of aircraft passenger health issues on commercial airline operations may become more significant as the number of aircraft travelers and the number of flights taken by those travelers increases. Anticipated increases in the ages

of aircraft passengers may further affect commercial airline operations because the health and comfort of older passengers may be more likely to be affected by aircraft cabin conditions.

The different illustrative embodiments recognize and take into account that desired improvements in aircraft passenger well-being may be achieved by the introduction of new features in aircraft cabin design, flight crew operations, or both. Making these improvements may benefit airlines by both increasing customer satisfaction and reducing airline operating costs. Thus, the illustrative embodiments provide systems and methods for obtaining and using aircraft passenger health information and aircraft cabin condition information to make such desired improvements in aircraft passenger well-being.

Turning first to **Figure 1**, an illustration of a block diagram of a passenger health management system is depicted in accordance with an illustrative embodiment. In this illustrative example, a passenger health management system may be a system for managing the health of a passenger on aircraft **100**. Aircraft **100** may be any type of aircraft that is configured for carrying passengers. Aircraft **100** may be operated by an airline, a military organization, or any other private or government entity.

Aircraft **100** may include flight deck **102** and passenger cabin **104**. Passenger cabin **104** may or may not be separated from flight deck **102** by a wall, door, or other structure or combination of structures. Passenger cabin **104** may be on the same level of aircraft **100** as flight deck **102** or on a different level of aircraft **100** from flight deck **102**. Flight deck **102** also may be referred to as a cockpit of aircraft **100**.

For example, without limitation, flight deck **102** may include an area located near the front of aircraft **100**. Flight deck **102** may include various controls that enable flight crew **106** to control the operation of aircraft **100**. In another example, without limitation, flight crew **106** may include a pilot, a copilot, a navigator, other personnel, or various combinations of personnel for controlling the operation of aircraft **100** from flight deck **102**.

Flight deck **102** may include flight deck displays **108**. Flight deck displays **108** may be a number of displays in this illustrative example. Flight deck displays **108** may include any number of devices or systems for displaying various types of information for use by flight crew **106**. The location of flight deck **102** on aircraft **100**, the composition of flight crew **106**, the number and types of devices and systems used

to implement flight deck displays **108**, and the types of information displayed to flight crew **106** may depend on various factors including, for example, without limitation, the type of aircraft **100**, the operations to be performed by aircraft **100**, specific flight or mission requirements, or other factors or various combinations of factors.

Aircraft **100** is an example of vehicle **109** in which passenger health management in accordance with an illustrative embodiment may be implemented. Vehicle **109** may be any vehicle that is configured for carrying passengers through the air, in space, on land, on the surface of water, under water, or in any other operating environment or combinations of environments. For example, without limitation, vehicle **109** may be a ferry or other vehicle configured for carrying passengers over water, a bus or other vehicle configured for carrying passengers over land, or another type of vehicle configured for carrying passengers in another operating environment or combinations of environments.

Passenger cabin **104** is the part of aircraft **100** in which a number of passengers may be seated during flight of aircraft **100**. Passenger cabin **104** is one example of cabin **105** on aircraft **100**. For example, without limitation, a crew rest area or other area may be another example of cabin **105** on aircraft **100** in which a number of passengers may be seated during a flight. In this example, the passengers also may be members of flight crew **106** of aircraft **100**.

Passenger cabin **104** may include a number of passenger seats. For example, passenger cabin **104** may include passenger seat **110**. Passenger seat **110** is one example of seat **111** on aircraft **100**. For example, without limitation, seat **111** may be a seat for a member flight crew **106** of aircraft **100** or for another passenger on aircraft **100**. Passenger **112** may be seated in passenger seat **110** during operation of aircraft **100**.

Cabin crew **114** may work in passenger cabin **104** during operation of aircraft **100**. For example, cabin crew **114** may include any number of individuals that are trained to provide for the safety and comfort of passenger **112** during the operation of aircraft **100**. Cabin crew **114** may include the same or different individuals as flight crew **106**.

Aircraft **100** also may include aircraft network data processing system **116**. Aircraft network data processing system **116** may include a number of data processing systems and other devices for performing various functions on aircraft **100**. Aircraft

network data processing system **116** may be part of a network that provides for the exchange of data between data processing systems and other devices that may be located throughout aircraft **100**.

Passenger health management system controller **118** may be implemented on aircraft network data processing system **116**. Alternatively, passenger health management system controller **118** may be implemented, in whole or in part, on a data processing system that is separate from, but in communication with, aircraft network data processing system **116**. For example, the data processing system may be implemented at passenger seat **110**. In any case, in accordance with an illustrative embodiment, passenger health management system controller **118** is configured to receive information related to the health of passenger **112** from various sources on aircraft **100** and to process that information to provide passenger health information **120**.

Passenger health information **120** may be distributed and used in various ways to improve the health and well-being of passenger **112**. In accordance with an illustrative embodiment, passenger health management system controller **118** may be configured to receive passenger condition information **122**, cabin condition information **124**, passenger provided health information **126**, aircraft condition information **128**, or other types of information that may be related to the health of passenger **112**, or various combinations of such information. Passenger condition information **122** may be provided to passenger health management system controller **118** by various passenger condition sensors **130**. For example, passenger condition sensors **130** may include various sensors for sensing various physiological conditions of passenger **112**. Passenger condition sensors **130** may be located in passenger seat **110**, not in passenger seat **110** but near passenger **112** in passenger cabin **104**, or both.

Cabin condition information **124** may be provided to passenger health management system controller **118** from cabin condition sensors **132**. Cabin condition sensors **132** may include a number of sensors for identifying various environmental conditions in passenger cabin **104** that may affect the health of passenger **112**. Cabin condition sensors **132** may include sensors for identifying general cabin conditions of passenger cabin **104** as a whole, or conditions at specific portions of passenger cabin **104**. For example, without limitation, cabin condition sensors **132** may be positioned and configured to identify cabin conditions at or near passenger seat **110**.

Passenger condition sensors **130** and cabin condition sensors **132** may together form a monitoring system for a passenger health management system in accordance with an illustrative embodiment. The modalities of passenger condition sensors **130** and cabin condition sensors **132** may be selected based on the individual characteristics of passenger **112** and of passenger cabin **104** that are desired to be monitored.

The granularity of passenger condition information **122** and cabin condition information **124** that is provided by passenger condition sensors **130** and cabin condition sensors **132**, respectively, may be selected based on the ways in which passenger health information **120** provided by the passenger health management system is to be used. For example, without limitation, the granularity of passenger condition information **122** and cabin condition information **124** that is provided by passenger condition sensors **130** and cabin condition sensors **132** may be selected based on the desired services to be provided to passenger **112** in passenger cabin **104**.

In one example, sensors placed in a single seat in passenger cabin **104** may be used to provide monitoring for that seat, the environment around that seat, or both. Sensors placed in all of the passenger seats in passenger cabin **104** may be used to provide health related information for individual passengers. In this case, services provided to passengers in passenger cabin **104** may be tailored for each individual passenger. As another example, sensors may be placed in passenger cabin **104** to monitor health related information for a group of passengers. Aggregated health information for a group of passengers in passenger cabin **104** may be used to provide services tailored to the average passenger within the monitored group of passengers.

As a further example, sensors may be placed to monitor health related information for passengers in a number of seats in passenger cabin **104** that are assigned to specific groups of passengers. These seats may be located in specially designated areas in passenger cabin **104**. For example, without limitation, passengers wishing to check their health conditions may use these specially designated seats for an assigned maximum period of time during a flight.

Passenger provided health information **126** may include information related to the health of passenger **112** that is provided to passenger health management system controller **118** by passenger **112**. For example, passenger provided health information **126** may include information identifying specific health

conditions or concerns of passenger **112**. For example, without limitation, passenger provided health information **126** may be used to indicate if passenger **112** has any past or current illness or other health condition, allergies, dietary preferences, or other information related to the health and well-being of passenger **112** that may be provided by passenger **112**.

Passenger **112** may provide passenger provided health information **126** to passenger health management system controller **118** using passenger interface **134**. Passenger interface **134** may include display **136**, input **138**, and data interface **140**. For example, without limitation, passenger interface **134** may be implemented, in whole or in part, as part of an in-flight entertainment system that is provided to passenger **112** on aircraft **100**. Passenger interface **134** may be provided on the back of the seat in front of passenger seat **110**, attached to passenger seat **110**, or in any other appropriate location or number of locations for use by passenger **112** when passenger **112** is seated in passenger seat **110**. Passenger interface **134** is one of number of passenger interfaces **135** that may be provided on aircraft **100**. For example, number of passenger interfaces **135** may be provided for passenger **112** and for other passengers **137** on aircraft **100**.

Display **136** may include any device for displaying information to passenger **112**. For example, display **136** may be used to present a graphical user interface to passenger **112** that prompts passenger **112** to enter passenger provided health information **126**. Input **138** may include any device that is configured to allow passenger **112** to enter information manually into passenger interface **134**. For example, without limitation, input **138** may be provided by a touch screen display. Passenger **112** may provide passenger provided health information **126** by entering such information manually via input **138**.

Data interface **140** may be configured to provide for the exchange of data between passenger interface **134** and information storage device **142**. For example, information storage device **142** may be any portable device for storing information that is brought on board aircraft **100** by passenger **112**. For example, without limitation, information storage device **142** may be a portable memory device, a portable communication device, such as a cellular telephone, a portable data processing device, such as a laptop or tablet computer, or another information storage device **142** that may be brought on board aircraft **100** by passenger **112**. Data interface **140** may be

configured to provide for the wireless exchange of information between passenger interface **134** and information storage device **142**, to provide for the exchange of information between information storage device **142** and data interface **140** via a hardware connection, or both.

Passenger provided health information **126** may be stored on information storage device **142**. In this case, passenger **112** may provide passenger provided health information **126** to passenger health management system controller **118** by connecting information storage device **142** to data interface **140** and uploading passenger provided health information **126** from information storage device **142** to passenger health management system controller **118** via data interface **140** of passenger interface **134**.

Aircraft condition information **128** may include any other information related to the operation of aircraft **100** that may affect the health or comfort of passenger **112**. Aircraft condition information **128** may be provided to passenger health management system controller **118** via any appropriate source of such information. Aircraft condition information **128** may be provided from information sources on board aircraft **100**, off board aircraft **100**, or both. For example, without limitation, aircraft condition information **128** may include information identifying the phase of flight of aircraft **100**, weather or other environmental conditions, the time of day of a flight, whether aircraft **100** is experiencing any emergency conditions, whether the flight of aircraft **100** is behind or ahead of schedule, or any other aircraft condition information **128** that may affect the health of passenger **112**, or any combination of such information.

Passenger condition information **122**, cabin condition information **124**, passenger provided health information **126**, and aircraft condition information **128** received by passenger health management system controller **118** may be processed to provide passenger health information **120**. Passenger health information **120** may be derived by combining the information received by passenger health management system controller **118** in various ways and analyzing the combination of such data. For example, passenger health management system controller **118** may use timer **144** to time stamp the various types of information related to the health of passenger **112** as that information is received by passenger health management system controller **118**.

Passenger health management system controller **118** may then use the time stamped data to identify various relationships between the received information.

From this received information, passenger health management system controller **118** may automatically diagnose health conditions of passenger **112**. The diagnosis of health conditions that is performed by passenger health management system controller **118** may include automatically identifying health conditions of interest for passenger **112**.

The ways in which various types of health related information are combined by passenger health management system controller **118** may depend upon the ways in which passenger health information **120** is to be used. Passenger health management system controller **118** also may format passenger health information **120** as appropriate for the ways in which passenger health information **120** is to be used.

Passenger health information **120** may be distributed for various uses. For example, passenger health information **120** provided by passenger health management system controller **118** may include health information that is specifically related to passenger **112**. Passenger health information **120** may be provided to passenger interface **134** and presented to passenger **112** on display **136**. Personalized passenger health information **120** of this type also may be made available for passenger **112** to download into information storage device **142** via data interface **140**.

Passenger health information **120** also may be displayed to other passengers **137** via number of passenger interfaces **135**. For example, without limitation, other passengers **137** may include a number of companions that are traveling with passenger **112**. Passenger **112** may indicate, via input **138**, that passenger **112** approves the providing of passenger health information **120** for passenger **112** to other passengers **137**.

Passenger health information **120** also may be provided to cabin crew interface **146**. For example, cabin crew interface **146** may include a display device, audio system, or both. Passenger health information **120** may include an indication of a health condition of interest for passenger **112** on cabin crew interface **146**. Cabin crew **114** may then respond as appropriate. For example, based on passenger health information **120** provided on cabin crew interface **146**, cabin crew **114** may provide in-flight services **147** to passenger **112** that satisfy the particular health and comfort needs of passenger **112**.

In a similar way, passenger health information **120** may be provided for display on flight deck displays **108**. Flight crew **106** may then take appropriate action in response to any indicated passenger health condition of interest or other information provided as part of passenger health information **120** presented on flight deck displays **108**.

In accordance with an illustrative embodiment, passenger health information **120** may be provided to and used by cabin environmental control systems **148**. Cabin environmental control systems **148** may be configured to automatically control various environmental conditions in passenger cabin **104** in response to passenger health information **120**.

Passenger health information **120** also may be provided to users off board aircraft **100**. Such users may be authorized by passenger **112** to receive passenger health information **120**. For example, during a flight, passenger health information **120** may be provided to healthcare providers **150** on the ground. Passenger health information **120** may be provided to healthcare providers **150**, or other authorized users of such information, via aircraft communications link **152**. For example, without limitation, aircraft communications link **152** may include a terrestrial radio link, satellite radio link, or an airborne network link to the ground system and the Internet. For example, if passenger **112** experiences a health condition of interest during a flight, passenger health information **120** for passenger **112** may be provided to healthcare providers **150** to improve the ability of healthcare providers **150** to help cabin crew **114** and flight crew **106** respond appropriately to such a condition.

Passenger health information **120** also may be used for cabin design and systems analysis **154**. For example, passenger health information **120** from a number of flights may be analyzed to determine the relationship between current cabin designs and the operation of current cabin systems as well as the health and well-being of passengers on aircraft **100** during various operating conditions. This analysis may be used to develop improved cabin designs and systems that may be implemented to improve the well-being and comfort of future aircraft passengers.

The illustration of **Figure 1** is not meant to imply physical or architectural limitations to the manner in which different illustrative embodiments may be implemented. Other components in addition to, in place of, or both in addition to and in place of the ones illustrated may be used. Some components may be unnecessary in

some illustrative embodiments. Also, the blocks are presented to illustrate some functional components. One or more of these blocks may be combined or divided into different blocks when implemented in different illustrative embodiments.

Turning now to **Figure 2**, an illustration of a block diagram of a passenger health management system controller is depicted in accordance with an illustrative embodiment. In this example, passenger health management system controller **200** is an example of one implementation of passenger health management system controller **118** in **Figure 1**. Passenger health management system controller **200** may include information receiver **202**, information processor **204**, information formatter **206**, information distributor **208**, and privacy controller **210**.

Information receiver **202** is configured to receive various types of information that may be related to the health of a passenger on an aircraft or other vehicle. For example, without limitation, information receiver **202** may be configured to receive passenger condition information **212**, passenger provided health information **214**, cabin condition information **216**, aircraft condition information **218**, or other information related to the health of a passenger. As discussed above, passenger condition information **212** may include information related to the physiological condition of a passenger that is provided by various passenger condition sensors. Passenger provided health information **214** may include health related information that is provided by the passenger. Cabin condition information **216** may include information related to environmental conditions in a passenger cabin that may be provided by various cabin condition sensors.

Information received by information receiver **202** may be processed by information processor **204** to provide passenger health information **220**. The way in which the information is processed by information processor **204** may be defined by various rules and may be based on the way in which passenger health information **220** is to be used.

For example, information processor **204** may include information combiner **219**. Information combiner **219** may be configured to combine passenger condition information **212** with other information received by information receiver **202** to provide passenger health information **220** that presents an integrated view of passenger health in relation to the passenger environment. For example, without limitation, information combiner **219** may be configured to combine passenger condition information **212** with

cabin condition information **216** to provide passenger health information **220** that presents a view of the health of a passenger in relation to the environmental conditions in the passenger cabin.

Passenger health information **220** may include indications of health conditions **221**. For example, information processor **204** may be configured to perform health condition diagnosis **223**. Information processor **204** may be configured to perform health condition diagnosis **223** by comparing the health information for a particular passenger to definitions of possible health conditions as provided in health condition database **222**. An indication of health conditions **221** may be included in passenger health information **220** in response to a determination by health condition diagnosis **223** that a passenger is experiencing, or is likely to experience, a particular health condition of interest.

Passenger health information **220** derived by information processor **204** from the received health information may be formatted by information formatter **206**. Information formatter **206** may be configured to format passenger health information **220** in an appropriate manner for the way in which passenger health information **220** is to be used. For example, without limitation, information formatter **206** may include display generator **224**. Display generator **224** may be configured to generate an appropriate display of passenger health information **220** for presentation to a passenger, aircraft crew member, or other appropriate user of such information.

Passenger health information **220**, as formatted by information formatter **206**, may be distributed to various authorized users by information distributor **208**. Passenger health information **220** may be distributed by information distributor **208** in real time, or near real time, as such information is generated by information processor **204** and formatted by information formatter **206**. Alternatively, or additionally, passenger health information **220** may be stored in information storage **226** for distribution to authorized users by information distributor **208** at a later time. For example, without limitation, passenger health information **220** may be retrieved from information storage **226** and distributed by information distributor **208** in response to a request for such information, at a scheduled time, or both.

For example, without limitation, information distributor **208** may be configured to provide passenger health information **220** to passenger interface **228**, cabin crew interface **230**, flight deck display **232**, cabin environmental control systems

234, healthcare providers **236**, cabin design and systems analysis **238,** other users of such information, or various combinations of users of such information.

Passenger health information **220** may be provided to passenger **229** via passenger interface **228**. Passenger **229** may be the passenger whose health is described by passenger health information **220**. As another example, passenger **229** may be another passenger to whom the passenger whose health is described by passenger health information **220** has given permission to receive passenger health information **220**.

Passenger health information **220** may be provided to aircraft crew **231** via cabin crew interface **230** and flight deck display **232**. Aircraft crew **231** may include cabin crew **233** and flight deck crew **235**. Passenger health information **220** may be provided to cabin crew **233** via cabin crew interface **230**. Passenger health information **220** may be provided to flight deck crew **235** via flight deck display **232**.

The security of information received, processed, and distributed by passenger health management system controller **200** may be controlled by privacy controller **210**. Privacy controller **210** may include functionality that is implemented at appropriate points in information receiver **202**, information processor **204**, information formatter **206**, information distributor **208**, or other appropriate points or combinations of points in passenger health management system controller **200**.

Privacy controller **210** may be configured to control the privacy of the health related information received, processed, and distributed by passenger health management system controller **200** in accordance with privacy rules **240**.

Privacy rules **240** may include system rules **242** and passenger rules **244**. System rules **242** may include privacy rules **240** that are applied generally to information received, processed, and distributed by passenger health management system controller **200**. System rules **242** may be controlled by the operator of an aircraft or other vehicle. For example, system rules **242** may include operator defined rules, as well as rules for protecting the privacy of health related information as provided by governmental regulation.

Passenger rules **244** may include privacy rules **240** that are defined for individual passengers. For example, individual passengers may grant or deny permission to use their personal health information in any particular way or to provide their personal health information to any particular user. Passenger rules **244** may

indicate such passenger preferences for the use and distribution of their passenger health information.

Privacy controller **210** may implement various functions for protecting the privacy of the health information received, processed, and distributed by passenger health management system controller **200**. For example, without limitation, such functions may include data encryption **246**, data aggregation **248**, other privacy controls **250**, and various combinations of such controls. Data aggregation **248** may include combining health information for a number of passengers in a manner such that the association between health information and the identity of particular individual passengers cannot be determined from passenger health information **220**, but in a manner such that the potential benefit of passenger health information **220** for various purposes is maintained.

Turning now to **Figure 3**, an illustration of a block diagram of a passenger interface is depicted in accordance with an illustrative embodiment. In this example, passenger interface **300** is an example of one implementation of passenger interface **134** in **Figure 1**. For example, without limitation, passenger interface **300** may be implemented, in whole or in part, as part of in-flight entertainment system **302** for providing information and entertainment to a passenger on an aircraft. In accordance with an illustrative embodiment, passenger interface **300** includes display **304**, input **306**, and data interface **308**.

Display **304** may include any device for displaying information to a passenger. For example, without limitation, display **304** may include a touch screen display or another type of display device, or various combinations of display devices. For example, without limitation, display **304** may be configured to display graphical user interface **310** to a passenger. Graphical user interface **310** may be configured to allow a passenger to interact with a passenger health management system in accordance with an illustrative embodiment.

Various types of information may be presented to a passenger on display **304**. Such information may be presented to a passenger on display **304** as a part of graphical user interface **310**, separate from graphical user interface **310**, or both. For example, without limitation, information that may be presented to a passenger on display **304** may include system information **312**, system instructions **314**, permission request **316**, passenger provided health information request **318**, passenger health

information **320**, other information **322**, or various different types of information in various combinations. System information **312** may include information that describes a passenger health management system in accordance with an illustrative embodiment. System instructions **314** may include information explaining how a passenger may interact with and use the passenger health management system. Permission request **316** may include a request for a passenger to grant or deny permission to access the personal health information of the passenger in the passenger health management system. The response of the passenger to permission request **316** may be used to establish privacy rules that may be applied by the passenger health management system to control the privacy of the health information of the passenger in the manner identified by the passenger. Passenger provided health information request **318** may include a request for the passenger to enter information related to the health of the passenger. Passenger health information **320** may include information concerning the health of the passenger and may be obtained and updated in real time or near real time by passenger health management system. For example, passenger health information **320** may include information obtained from passenger condition sensors and other sources of passenger related information.

Input **306** may include any device that allows a passenger to input information manually into the passenger health management system. For example, without limitation, input **306** may be implemented, along with display **304**, as touch-screen display **324**. Alternatively, or additionally, input **306** may include a keyboard, keypad, or other input devices **325** that are configured to allow the passenger to enter information into the passenger health management system manually.

For example, without limitation, information that may be provided from the passenger to the passenger health management system via input **306** may include passenger privacy rules **326**, passenger provided health information **327**, other information **328**, or various combinations of such information. Passenger privacy rules **326** may be entered in response to permission request **316**. Passenger provided health information **327** may be provided via input **306** in response to passenger provided health information request **318**.

Input **306** also may be configured to receive display controls **330** from the passenger. Display controls **330** may include interactions by the passenger with input

306 to control what information is presented on display **304**, how information is presented on display **304**, or both.

Data interface **308** may be configured to provide an interface between a passenger information storage device and the passenger health management system. For example, data interface **308** may include wireless **332**, hardware interface **334**, or both. Data interface **308** may be configured to allow a passenger to upload information from their information storage device to the passenger health management system via the data interface **308**. For example, without limitation, data interface **308** may be configured to allow a passenger to upload passenger provided health information **336** into the passenger health management system from the information storage device of the passenger via data interface **308**. Data interface **308** also may be configured to allow a passenger to download information from the passenger health management system to the information storage device of the passenger via data interface **308**. For example, without limitation, data interface **308** may be configured to allow a passenger to download passenger health information **338** or other information from the passenger health management system to the information storage device of the passenger via data interface **308**.

Passenger interface **300** may include speaker **339** and microphone **340**. In accordance with an illustrative embodiment, information that may be displayed on display **304** may be presented to a passenger in audible form via speaker **339**. A passenger may provide information to a passenger health management system, such as the information provided via input **306** as described above, by speaking into microphone **340**. Appropriate speech recognition technology may be used to convert such information provided by speaking into microphone **340** into an appropriate data format for processing by the passenger health management system.

Turning now to **Figure 4**, an illustration of a block diagram of passenger condition sensors is depicted in accordance with an illustrative embodiment. In this example, passenger condition sensors **400** are examples of passenger condition sensors **130** in **Figure 1**.

Passenger condition sensors **400** may include in-seat sensors **402**, near passenger sensors **404**, or both. In-seat sensors **402** may be located in or on the seat of the passenger. Near passenger sensors **404** may not be positioned in or on the

passenger seat, but may be positioned near the passenger to obtain desired passenger condition information.

Passenger condition sensors **400** may include various physiological condition sensors **406**. Physiological condition sensors **406** may be configured to identify various physiological conditions of a passenger. For example, without limitation, physiological conditions that may be identified by physiological condition sensors **406** may include body temperature **408**, heart rate **410**, respiration rate **412**, body position **414**, body movement **416**, oxygen level **418**, hydration level **420**, blood sugar level **422**, other physiological conditions **424**, or various combinations of physiological conditions.

Turning now to **Figure 5**, an illustration of a block diagram of cabin condition sensors is depicted in accordance with an illustrative embodiment. In this example, cabin condition sensors **500** is an example of cabin condition sensors **132** in **Figure 1**.

Cabin condition sensors **500** identify environmental conditions in a passenger cabin that may affect passenger health. For example, cabin condition sensors **500** may identify general cabin conditions **502** throughout a passenger cabin. Alternatively, or additionally, cabin condition sensors **500** may include sensors for identifying such environmental conditions in portions of cabin **504**. In one example, cabin condition sensors **500** may identify the environmental conditions in the passenger cabin for seat specific **506** portions of cabin **504**.

Cabin condition sensors **500** may include a variety of sensor devices for identifying various environmental conditions in the passenger cabin that may be relevant to passenger health. For example, without limitation, cabin condition sensors **500** may include temperature sensor **508**, air quality sensor **510**, pressure sensor **512**, sound sensor **514**, vibration sensor **516**, acceleration sensor **518**, light sensor **520**, humidity sensor **522**, other cabin condition sensor **524**, or various combinations of sensors for identifying various combinations of environmental conditions in the passenger cabin.

Turning now to **Figure 6**, an illustration of a flowchart of a process for passenger health management is depicted in accordance with an illustrative embodiment. The process may begin by receiving passenger condition information (operation **602**), receiving cabin condition information (operation **604**), receiving passenger provided health information (operation **606**), and receiving aircraft condition

information (operation **608**). The various types of information received in operations **602**, **604**, **606**, and **608** may be processed to identify passenger health information (operation **610**). The passenger health information then may be formatted (operation **612**) as appropriate for the manner in which the passenger health information will be used. The passenger health information then may be distributed for use (operation **614**). In this example, operations **602**, **604**, **606**, **608**, **610**, **612**, and **614** may be performed by passenger health management system controller **118** in **Figure 1**.

Distributed passenger health information may be displayed on a passenger interface (operation **616**). The passenger may review the passenger health information as displayed (operation **618**). The passenger also may download the displayed passenger health information onto an information storage device (operation **620**), with the process terminating thereafter.

Distributed passenger health information also may be displayed on a cabin crew interface (operation **622**). The cabin crew may take appropriate action in response to the passenger health information presented on the cabin crew interface (operation **624**) with the process terminating thereafter. For example, without limitation, action taken by the cabin crew in operation **624** may include appropriate actions for improving the well-being or comfort of the passenger.

Passenger health information also may be displayed on a flight deck display (operation **626**). The flight crew may take appropriate action in response to the displayed information (operation **628**), with the process terminating thereafter.

The distributed passenger health information also may be used to automatically control the cabin environment (operation **630**) with the process terminating thereafter.

The distributed passenger health information also may be transmitted to healthcare providers on the ground (operation **632**) with the process terminating thereafter.

Distributed passenger health information also may be used to analyze cabin design and the operation of cabin systems (operation **634**). This analysis may be used to develop improved cabin designs and systems (operation **636**), with the process terminating thereafter.

Privacy controls may be applied (operation **638**) during any operation in the process. The privacy controls applied in operation **638** may include various controls

for protecting personal health information as such information is processed and used throughout the process. The privacy controls applied in operation **638** may, for example, implement various privacy rules that define how personal health information may be handled and used.

One or more of the illustrative embodiments provide a capability to monitor the physiological characteristics of individual passengers in an aircraft cabin. Personal passenger health information may be derived from the monitored physiological characteristics and used to generate personalized passenger health reports. Such personalized passenger health reports may be generated securely and delivered in a secure manner to the passenger and other authorized persons.

In accordance with an illustrative embodiment, the cabin environment experienced by a passenger at the seat of the passenger during a flight is captured. The passenger is able to view real time health information on an in-flight entertainment screen and obtain nutrition and other suggestions to improve the well-being of the passenger during a flight. The passenger may be able to retrieve health data collected during a flight onto a personal storage device or computer through an interface on or near the seat of the passenger. One or more of the illustrative embodiments may enable a passenger to communicate health information to a healthcare provider and interact with the provider to obtain an assessment and advice during a flight.

One or more of the illustrative embodiments may enable a cabin crew to better serve passengers on an aircraft, to improve aircraft passenger well-being, and to improve airline cost savings and performance. For example, one or more of the illustrative embodiments may be used to obtain personal passenger health information that may be used to support timely and accurate decision making by aircraft crew members. One or more of the illustrative embodiments provide a capability for an aircraft flight crew to cater to the specific needs of individual passengers in an aircraft cabin. For example, personal passenger health information obtained in accordance with an illustrative embodiment may enable an airborne flight crew to provide passenger-specific health and nutrition services.

One of more of the illustrative embodiments may enable a comparison between a passenger health profile and a cabin environment profile generated from passenger condition sensors and cabin sensors, respectively, located in or near a seat.

Such a comparison may yield insights into the interactions between the cabin environment and individual characteristics of passengers.

One or more of the illustrative embodiments may provide new techniques to protect the privacy of passenger health data collected and shared by aircraft systems and off-board systems.

Personal passenger health information obtained in accordance with an illustrative embodiment also may be used for research on the impact of the aircraft cabin environment on passenger health. This research may lead to changes in aircraft cabin design, operation, or both to improve the impact of the cabin environment on passenger health.

Turning now to **Figure 7**, an illustration of a block diagram of a data processing system is depicted in accordance with an illustrative embodiment. In this example, data processing system **700** is an example of one implementation of a data processing system for implementing passenger health management system controller **118** in **Figure 1**.

In this illustrative example, data processing system **700** includes communications fabric **702**. Communications fabric **702** provides communications between processor unit **704**, memory **706**, persistent storage **708**, communications unit **710**, input/output (I/O) unit **712**, and display **714**. Memory **706**, persistent storage **708**, communications unit **710**, input/output (I/O) unit **712**, and display **714** are examples of resources accessible by processor unit **704** via communications fabric **702**.

Processor unit **704** serves to run instructions for software that may be loaded into memory **706**. Processor unit **704** may be a number of processors, a multi-processor core, or some other type of processor, depending on the particular implementation. Further, processor unit **704** may be implemented using a number of heterogeneous processor systems in which a main processor is present with secondary processors on a single chip. As another illustrative example, processor unit **704** may be a symmetric multi-processor system containing multiple processors of the same type.

Memory **706** and persistent storage **708** are examples of storage devices **716**. A storage device is any piece of hardware that is capable of storing information, such as, for example, without limitation, data, program code in functional form, and other suitable information either on a temporary basis or a permanent basis. Storage devices **716** also may be referred to as computer readable storage devices in these

examples. Memory **706**, in these examples, may be, for example, a random access memory or any other suitable volatile or non-volatile storage device. Persistent storage **708** may take various forms, depending on the particular implementation.

For example, persistent storage **708** may contain one or more components or devices. For example, persistent storage **708** may be a hard drive, a flash memory, a rewritable optical disk, a rewritable magnetic tape, or some combination of the above. The media used by persistent storage **708** also may be removable. For example, a removable hard drive may be used for persistent storage **708**.

Communications unit **710**, in these examples, provides for communications with other data processing systems or devices. In these examples, communications unit **710** is a network interface card. Communications unit **710** may provide communications through the use of either or both physical and wireless communications links.

Input/output unit **712** allows for input and output of data with other devices that may be connected to data processing system **700**. For example, input/output unit **712** may provide a connection for user input through a keyboard, a mouse, and/or some other suitable input device. Further, input/output unit **712** may send output to a printer. Display **714** provides a mechanism to display information to a user.

Instructions for the operating system, applications, and/or programs may be located in storage devices **716**, which are in communication with processor unit **704** through communications fabric **702**. In these illustrative examples, the instructions are in a functional form on persistent storage **708**. These instructions may be loaded into memory **706** for execution by processor unit **704**. The processes of the different embodiments may be performed by processor unit **704** using computer-implemented instructions, which may be located in a memory, such as memory **706**.

These instructions are referred to as program instructions, program code, computer usable program code, or computer readable program code that may be read and executed by a processor in processor unit **704**. The program code in the different embodiments may be embodied on different physical or computer readable storage media, such as memory **706** or persistent storage **708**.

Program code **718** is located in a functional form on computer readable media **720** that is selectively removable and may be loaded onto or transferred to data

processing system **700** for execution by processor unit **704**. Program code **718** and computer readable media **720** form computer program product **722** in these examples. In one example, computer readable media **720** may be computer readable storage media **724** or computer readable signal media **726**.

Computer readable storage media **724** may include, for example, an optical or magnetic disk that is inserted or placed into a drive or other device that is part of persistent storage **708** for transfer onto a storage device, such as a hard drive, that is part of persistent storage **708**. Computer readable storage media **724** also may take the form of a persistent storage, such as a hard drive, a thumb drive, or a flash memory, that is connected to data processing system **700**. In some instances, computer readable storage media **724** may not be removable from data processing system **700**.

In these examples, computer readable storage media **724** is a physical or tangible storage device used to store program code **718** rather than a medium that propagates or transmits program code **718**. Computer readable storage media **724** is also referred to as a computer readable tangible storage device or a computer readable physical storage device. In other words, computer readable storage media **724** is a media that can be touched by a person.

Alternatively, program code **718** may be transferred to data processing system **700** using computer readable signal media **726**. Computer readable signal media **726** may be, for example, a propagated data signal containing program code **718**. For example, computer readable signal media **726** may be an electromagnetic signal, an optical signal, and/or any other suitable type of signal. These signals may be transmitted over communications links, such as wireless communications links, optical fiber cable, coaxial cable, a wire, and/or any other suitable type of communications link. In other words, the communications link and/or the connection may be physical or wireless in the illustrative examples.

In some illustrative embodiments, program code **718** may be downloaded over a network to persistent storage **708** from another device or data processing system through computer readable signal media **726** for use within data processing system **700**. For instance, program code stored in a computer readable storage medium in a server data processing system may be downloaded over a network from the server to data processing system **700**. The data processing system providing program code **718**

may be a server computer, a client computer, or some other device capable of storing and transmitting program code **718**.

The different components illustrated for data processing system **700** are not meant to provide architectural limitations to the manner in which different embodiments may be implemented. The different illustrative embodiments may be implemented in a data processing system including components in addition to and/or in place of those illustrated for data processing system **700**. Other components shown in **Figure 7** can be varied from the illustrative examples shown. The different embodiments may be implemented using any hardware device or system capable of running program code. As one example, data processing system **700** may include organic components integrated with inorganic components and/or may be comprised entirely of organic components excluding a human being. For example, a storage device may be comprised of an organic semiconductor.

In another illustrative example, processor unit **704** may take the form of a hardware unit that has circuits that are manufactured or configured for a particular use. This type of hardware may perform operations without needing program code to be loaded into a memory from a storage device to be configured to perform the operations.

For example, when processor unit **704** takes the form of a hardware unit, processor unit **704** may be a circuit system, an application specific integrated circuit (ASIC), a programmable logic device, or some other suitable type of hardware configured to perform a number of operations. With a programmable logic device, the device is configured to perform the number of operations. The device may be reconfigured at a later time or may be permanently configured to perform the number of operations. Examples of programmable logic devices include, for example, a programmable logic array, a programmable array logic, a field programmable logic array, a field programmable gate array, and other suitable hardware devices. With this type of implementation, program code **718** may be omitted, because the processes for the different embodiments are implemented in a hardware unit.

In still another illustrative example, processor unit **704** may be implemented using a combination of processors found in computers and hardware units. Processor unit **704** may have a number of hardware units and a number of processors that are configured to run program code **718**. With this depicted example,

some of the processes may be implemented in the number of hardware units, while other processes may be implemented in the number of processors.

In another example, a bus system may be used to implement communications fabric **702** and may be comprised of one or more buses, such as a system bus or an input/output bus. Of course, the bus system may be implemented using any suitable type of architecture that provides for a transfer of data between different components or devices attached to the bus system.

Additionally, communications unit **710** may include a number of devices that transmit data, receive data, or both transmit and receive data. Communications unit **710** may be, for example, a modem or a network adapter, two network adapters, or some combination thereof. Further, a memory may be, for example, memory **706**, or a cache, such as that found in an interface and memory controller hub that may be present in communications fabric **702**.

The flowcharts and block diagrams described herein illustrate the architecture, functionality, and operation of possible implementations of systems, methods, and computer program products according to various illustrative embodiments. In this regard, each block in the flowcharts or block diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function or functions. It should also be noted that, in some alternative implementations, the functions noted in a block may occur out of the order noted in the figures. For example, the functions of two blocks shown in succession may be executed substantially concurrently, or the functions of the blocks may sometimes be executed in the reverse order, depending upon the functionality involved.

The description of the different illustrative embodiments has been presented for purposes of illustration and description and is not intended to be exhaustive or to limit the embodiments in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. Further, different illustrative embodiments may provide different benefits as compared to other illustrative embodiments. The embodiment or embodiments selected are chosen and described in order to best explain the principles of the embodiments, the practical application, and to enable others of ordinary skill in the art to understand the disclosure for various

embodiments with various modifications as are suited to the particular use contemplated.

CLAIMS:

What is claimed is:

1. A method for managing health of a passenger (112) on an aircraft (100), comprising:

monitoring a physiological condition of the passenger (112) seated in a passenger seat (110) in a passenger cabin (104) in the aircraft (100) using a passenger condition sensor to provide passenger condition information (122);

monitoring an environmental condition in the passenger cabin (104) using a cabin condition sensor to provide cabin condition information (124);

processing the passenger condition information (122) and the cabin condition information (124) to provide passenger health information (120); and

displaying the passenger health information (120) to the passenger (112).

2. The method of claim 1, wherein the passenger condition sensor is located in the passenger seat (110).

3. The method of claim 1, wherein the physiological condition of the passenger (112) is selected from body temperature (408), heart rate (410), respiration rate (412), body position (414), body movement (416), oxygen level (418), hydration level (420), and blood sugar level (422).

4. The method of claim 1, wherein the cabin condition sensor is selected from a temperature sensor, an air quality sensor, a pressure sensor, a sound sensor, a vibration sensor, an acceleration sensor, a light sensor, and a humidity sensor.

5. The method of claim 1, wherein processing the passenger condition information (122) and the cabin condition information (124) comprises automatically diagnosing a health condition of the passenger (112) and including an indication of the health condition in the passenger health information (120).

6. The method of claim 1 further comprising displaying the passenger health information (120) to one of another passenger on the aircraft (100), a cabin crew (114), and a flight crew (106).

7. The method of claim 1 further comprising transmitting the passenger health information (120) off-board the aircraft (100).

8. The method of claim 1 further comprising using the passenger health information (120) to change automatically the environmental condition in the passenger cabin (104).

9. The method of claim 1 further comprising applying privacy controls to control the privacy of the passenger condition information (122).

10. An apparatus, comprising:

a passenger condition sensor configured to monitor a physiological condition of a passenger (112) seated in a passenger seat (110) in a passenger cabin (104) in an aircraft (100) to provide passenger condition information (122);

a cabin condition sensor configured to monitor an environmental condition in the passenger cabin (104) to provide cabin condition information (124);

a controller configured to receive the passenger condition information (122) and the cabin condition information (124) and to process the passenger condition information (122) and the cabin condition information (124) to provide passenger health information (120); and

a passenger interface (134) configured to display the passenger health information (120) to the passenger (112).

11. The apparatus of claim 10, wherein the passenger condition sensor is located in the passenger seat (110).

12. The apparatus of claim 10, wherein the passenger condition sensor is configured to monitor a physiological condition of the passenger (112) selected from body temperature (408), heart rate (410), respiration rate (412), body position (414), body movement (416), oxygen level (418), hydration level (420), and blood sugar level (422).

13. The apparatus of claim 10, wherein the cabin condition sensor is selected from one of a temperature sensor, an air quality sensor, a pressure sensor, a sound sensor, a vibration sensor, an acceleration sensor, a light sensor, and a humidity sensor.

14. The apparatus of claim 10, wherein the controller is configured to process the passenger condition information (122) and the cabin condition information (124) to automatically diagnose a health condition of the passenger (112) and to include an indication of the health condition in the passenger health information (120).

15. The apparatus of claim 10, wherein the passenger interface (134) is configured to receive passenger (112) provided health information as input from the passenger (112) and the controller is configured to receive the passenger (112) provided health information from the passenger interface (134) and to process the passenger (112) provided health information to provide the passenger health information (120).

16. The apparatus of claim 10, wherein the passenger interface (134) is configured to provide a data interface (140) for providing the passenger health information (120) to an information storage device (142) provided by the passenger (112).

17. A method for managing health of a passenger (112) on an aircraft (100), comprising:

monitoring a physiological condition of the passenger (112) in a passenger cabin (104) in the aircraft (100) using a passenger condition sensor to provide passenger condition information (122);

monitoring an environmental condition in the passenger cabin (104) using a cabin condition sensor to provide cabin condition information (124);

receiving passenger (112) provided health information as input from the passenger (112); and

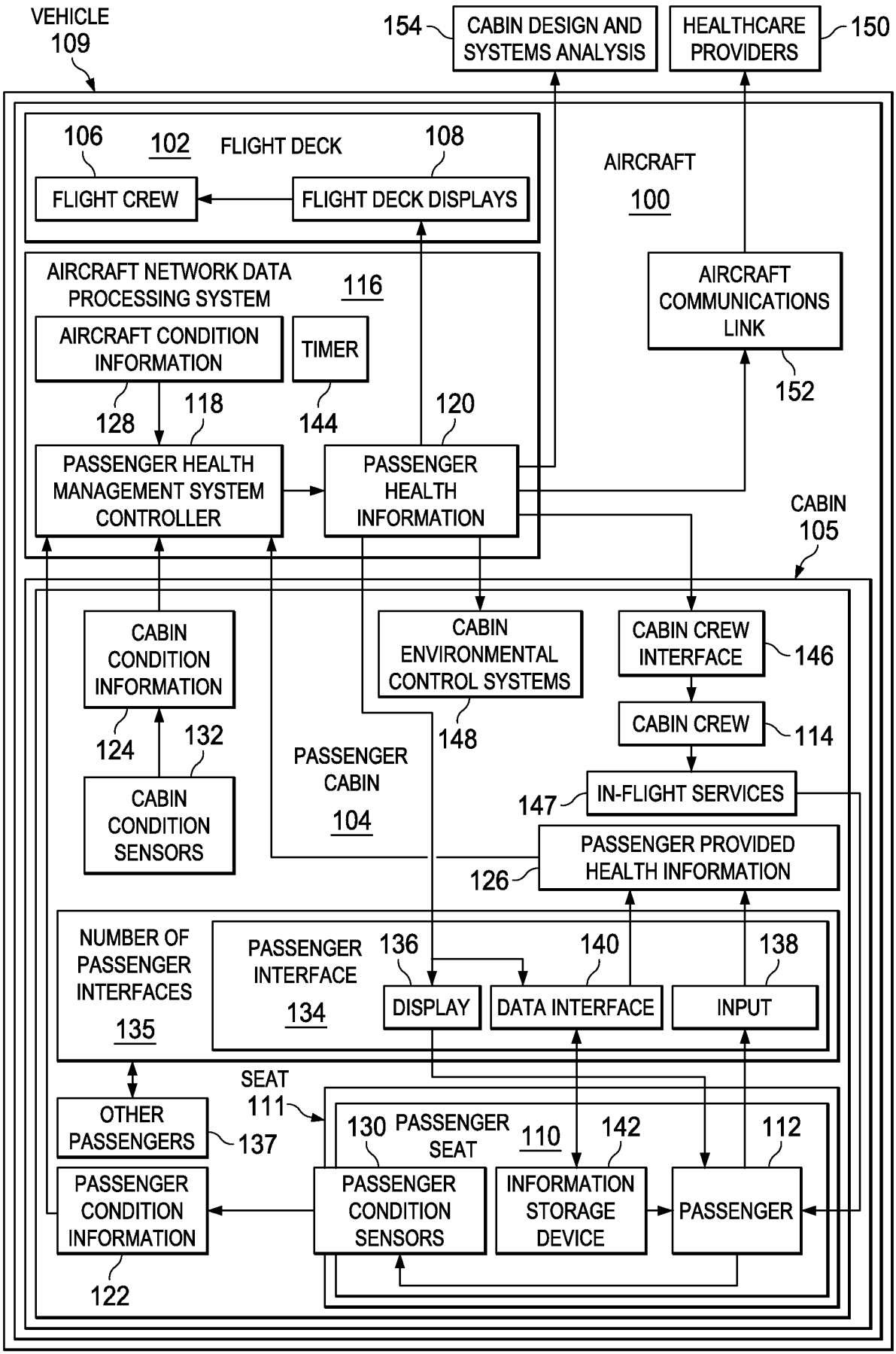
processing the passenger condition information (122), the cabin condition information (124), and the passenger (112) provided health information to provide passenger health information (120).

18. The method of claim 17 further comprising applying privacy controls to control the privacy of the passenger condition information (122) and the passenger (112) provided health information.

19. The method of claim 18, wherein applying the privacy controls comprises aggregating the passenger condition information (122) for a plurality of passengers.

20. The method of claim 17 further comprising using the passenger health information (120) to change automatically the environmental condition in the passenger cabin (104).

FIG. 1


VEHICLE
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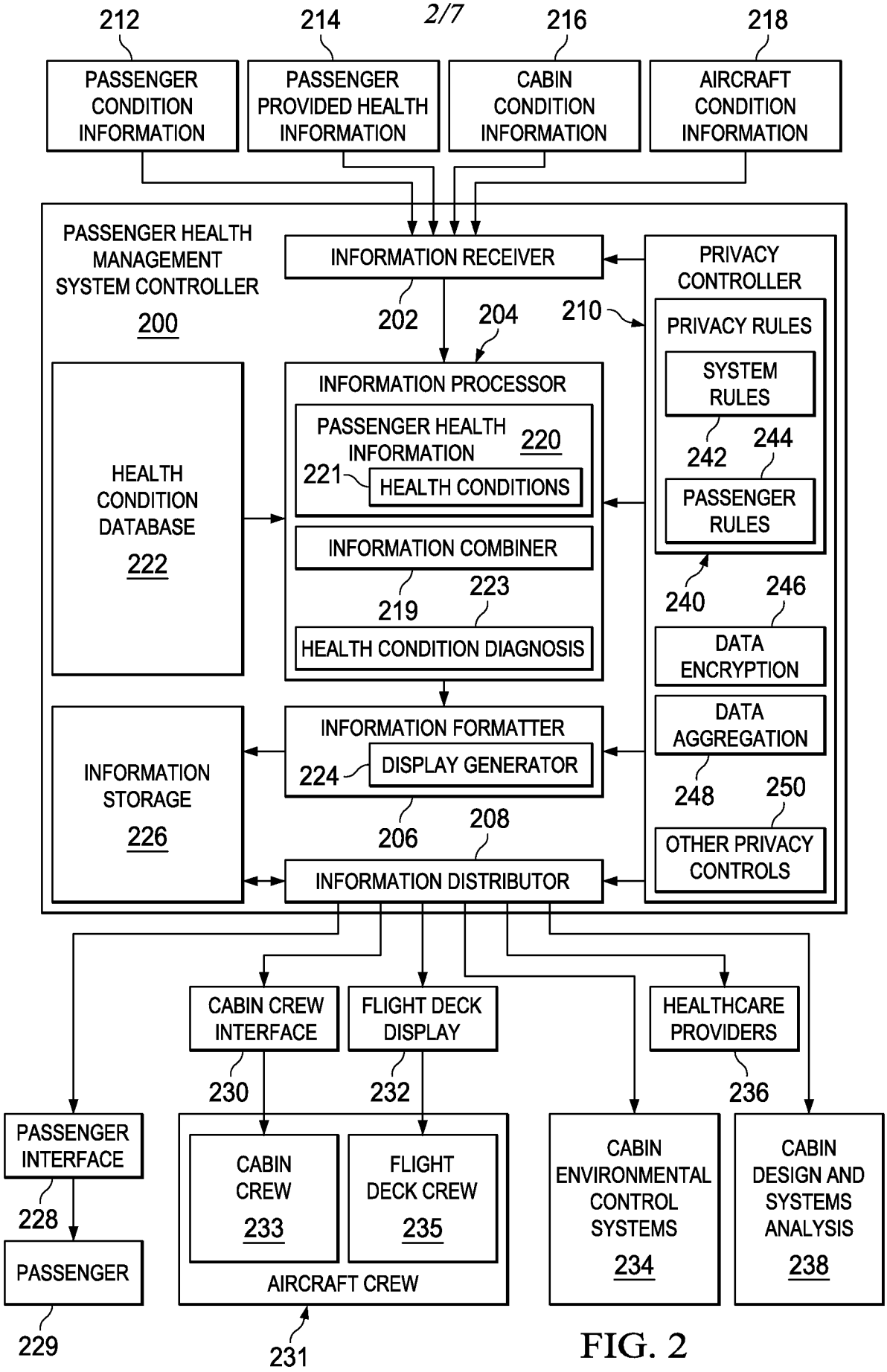
154
CABIN DESIGN AND SYSTEMS ANALYSIS
HEALTHCARE PROVIDERS
150
106
102
FLIGHT DECK
108
FLIGHT CREW
FLIGHT DECK DISPLAYS
AIRCRAFT
100
AIRCRAFT NETWORK DATA PROCESSING SYSTEM
116
AIRCRAFT CONDITION INFORMATION
TIMER
AIRCRAFT COMMUNICATIONS LINK
152
128
118
144
120
PASSENGER HEALTH MANAGEMENT SYSTEM CONTROLLER
PASSENGER HEALTH INFORMATION
CABIN
105
CABIN CONDITION INFORMATION
CABIN ENVIRONMENTAL CONTROL SYSTEMS
CABIN CREW INTERFACE
146
124
132
148
CABIN CREW
114
PASSENGER CABIN
104
147
IN-FLIGHT SERVICES
CABIN CONDITION SENSORS
PASSENGER PROVIDED HEALTH INFORMATION
126
NUMBER OF PASSENGER INTERFACES
135
PASSENGER INTERFACE
134
136
140
138
DISPLAY
DATA INTERFACE
INPUT
SEAT
111
OTHER PASSENGERS
137
130
PASSENGER SEAT
110
142
112
PASSENGER CONDITION INFORMATION
PASSENGER CONDITION SENSORS
INFORMATION STORAGE DEVICE
PASSENGER
122


212
214
216
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PASSENGER CONDITION INFORMATION
PASSENGER PROVIDED HEALTH INFORMATION
CABIN CONDITION INFORMATION
AIRCRAFT CONDITION INFORMATION
PASSENGER HEALTH MANAGEMENT SYSTEM CONTROLLER
200
INFORMATION RECEIVER
202
204
210
PRIVACY CONTROLLER
PRIVACY RULES
SYSTEM RULES
242
244
PASSENGER RULES
240
246
DATA ENCRYPTION
DATA AGGREGATION
248
250
OTHER PRIVACY CONTROLS
INFORMATION PROCESSOR
PASSENGER HEALTH INFORMATION
220
221
HEALTH CONDITIONS
INFORMATION COMBINER
219
223
HEALTH CONDITION DIAGNOSIS
HEALTH CONDITION DATABASE
222
INFORMATION FORMATTER
224
DISPLAY GENERATOR
206
208
INFORMATION DISTRIBUTOR
INFORMATION STORAGE
226
CABIN CREW INTERFACE
FLIGHT DECK DISPLAY
HEALTHCARE PROVIDERS
230
232
236
PASSENGER INTERFACE
228
PASSENGER
229
CABIN CREW
233
FLIGHT DECK CREW
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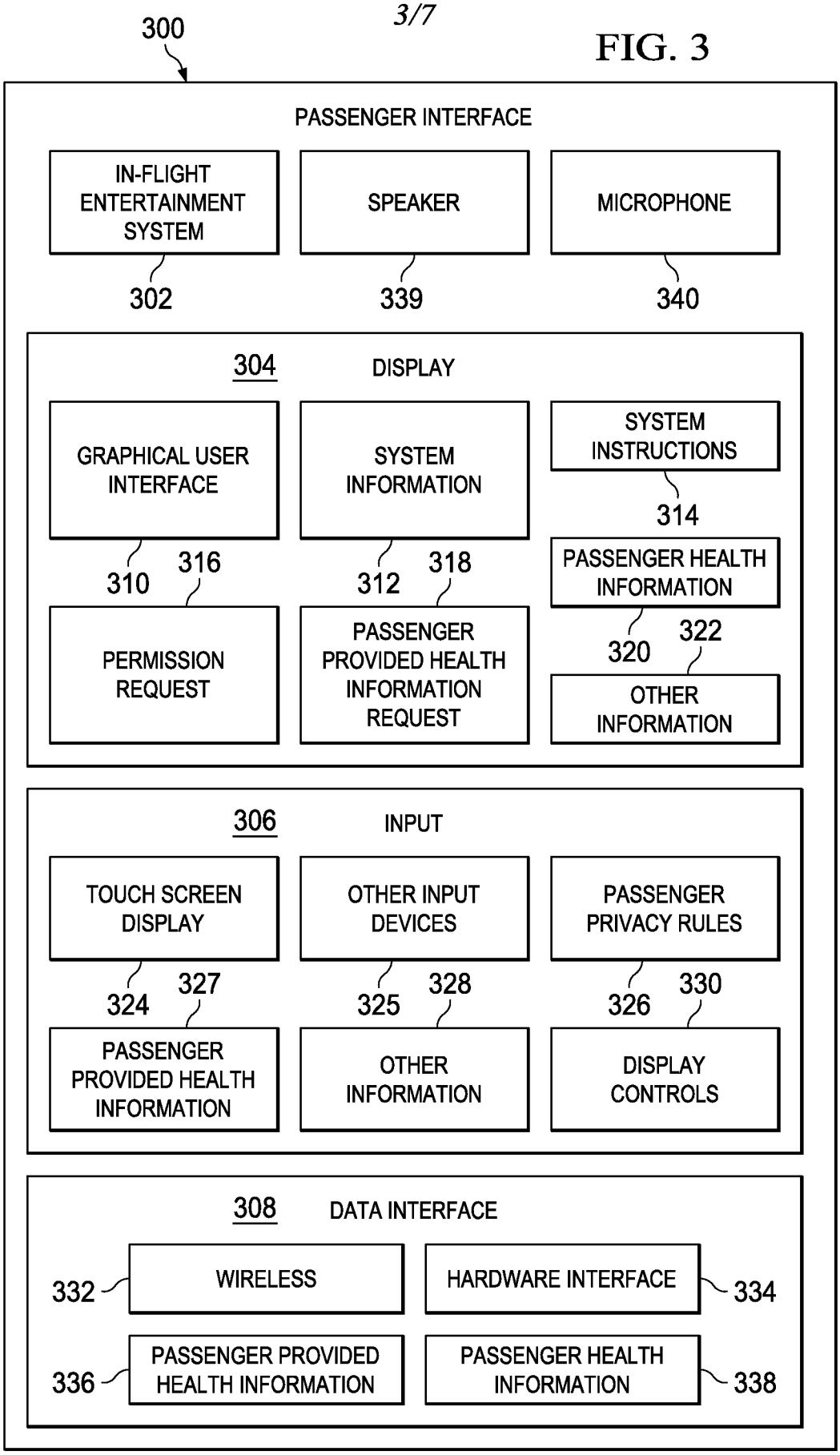
AIRCRAFT CREW
231
CABIN ENVIRONMENTAL CONTROL SYSTEMS
234
CABIN DESIGN AND SYSTEMS ANALYSIS
238

FIG. 2

FIG. 3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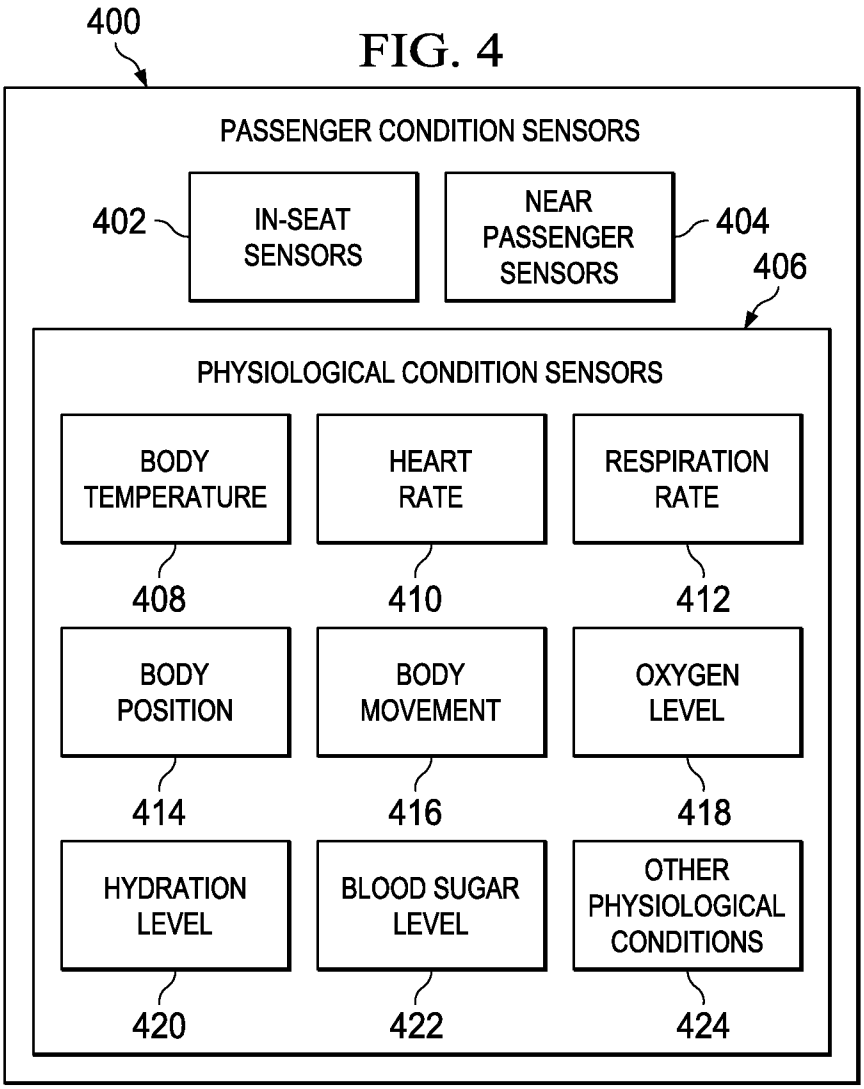
PASSENGER INTERFACE
IN-FLIGHT ENTERTAINMENT SYSTEM
302
SPEAKER
339
MICROPHONE
340
304
DISPLAY
GRAPHICAL USER INTERFACE
310
316
PERMISSION REQUEST
SYSTEM INFORMATION
312
318
PASSENGER PROVIDED HEALTH INFORMATION REQUEST
SYSTEM INSTRUCTIONS
314
PASSENGER HEALTH INFORMATION
320
322
OTHER INFORMATION
306
INPUT
TOUCH SCREEN DISPLAY
324
327
PASSENGER PROVIDED HEALTH INFORMATION
OTHER INPUT DEVICES
325
328
OTHER INFORMATION
PASSENGER PRIVACY RULES
326
330
DISPLAY CONTROLS
308
DATA INTERFACE
332
WIRELESS
HARDWARE INTERFACE
334
336
PASSENGER PROVIDED HEALTH INFORMATION
PASSENGER HEALTH INFORMATION
338

FIG. 4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PASSENGER CONDITION SENSORS
402
IN-SEAT SENSORS
NEAR PASSENGER SENSORS
404
406
PHYSIOLOGICAL CONDITION SENSORS
BODY TEMPERATURE
HEART RATE
RESPIRATION RATE
408
410
412
BODY POSITION
BODY MOVEMENT
OXYGEN LEVEL
414
416
418
HYDRATION LEVEL
BLOOD SUGAR LEVEL
OTHER PHYSIOLOGICAL CONDITIONS
420
422
424

FIG. 5

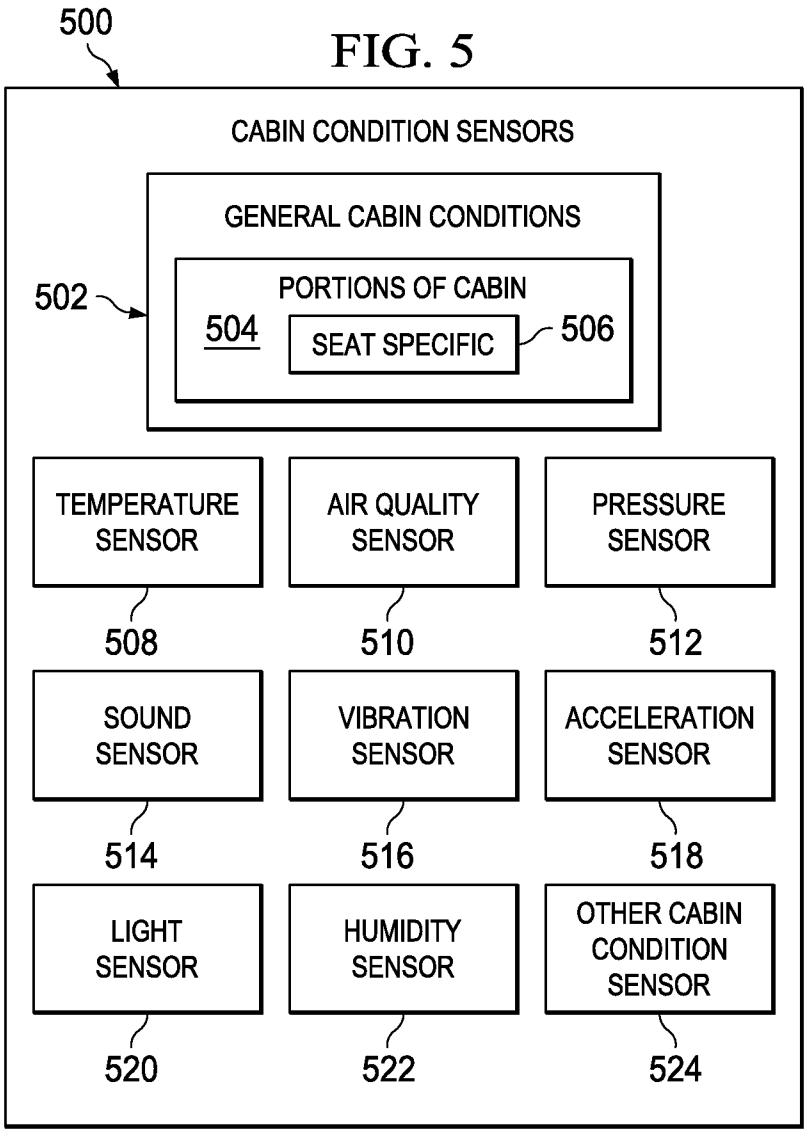

500
CABIN CONDITION SENSORS
GENERAL CABIN CONDITIONS
502
PORTIONS OF CABIN
504
SEAT SPECIFIC
506
TEMPERATURE SENSOR
AIR QUALITY SENSOR
PRESSURE SENSOR
508
510
512
SOUND SENSOR
VIBRATION SENSOR
ACCELERATION SENSOR
514
516
518
LIGHT SENSOR
HUMIDITY SENSOR
OTHER CABIN CONDITION SENSOR
520
522
524

FIG. 6

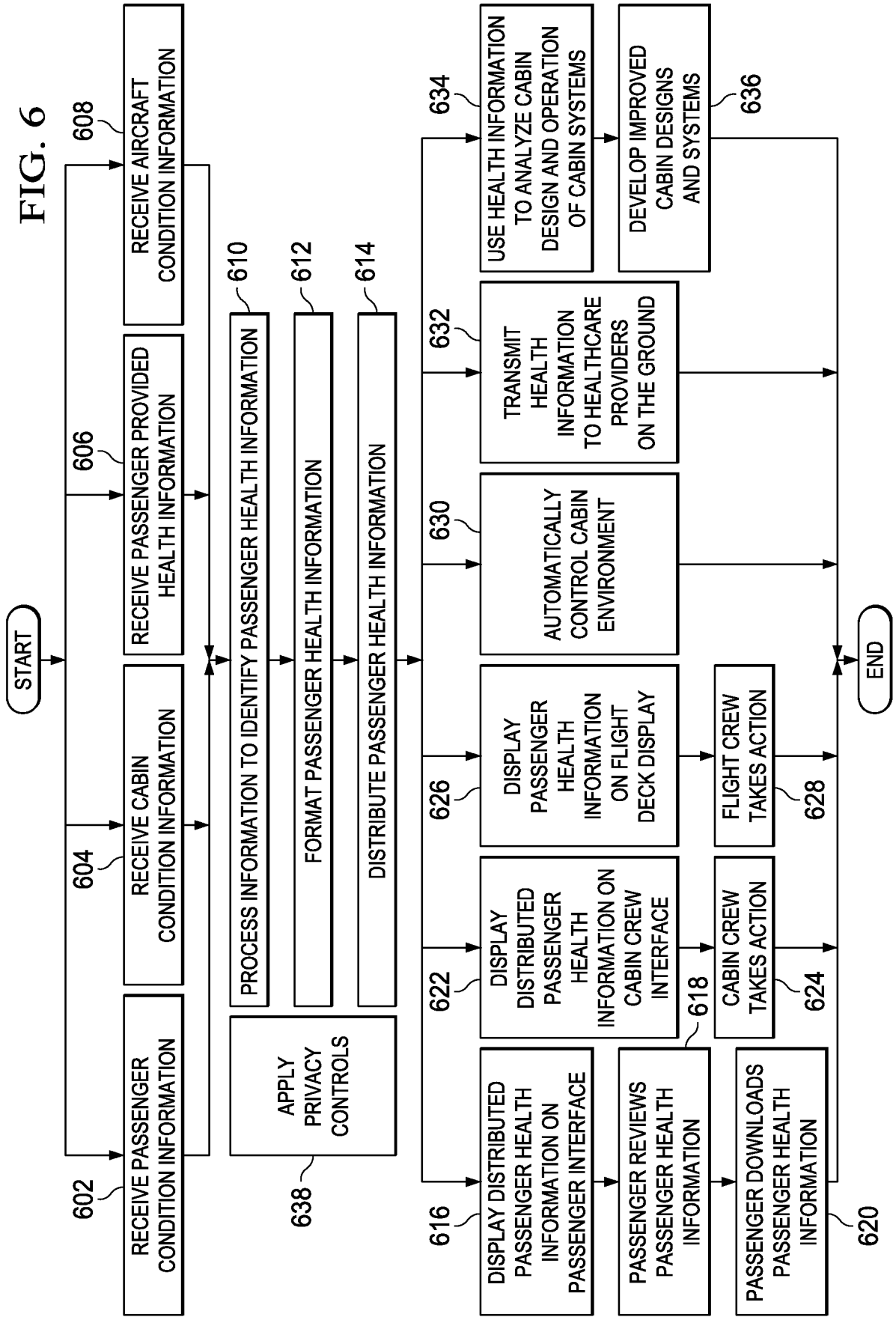
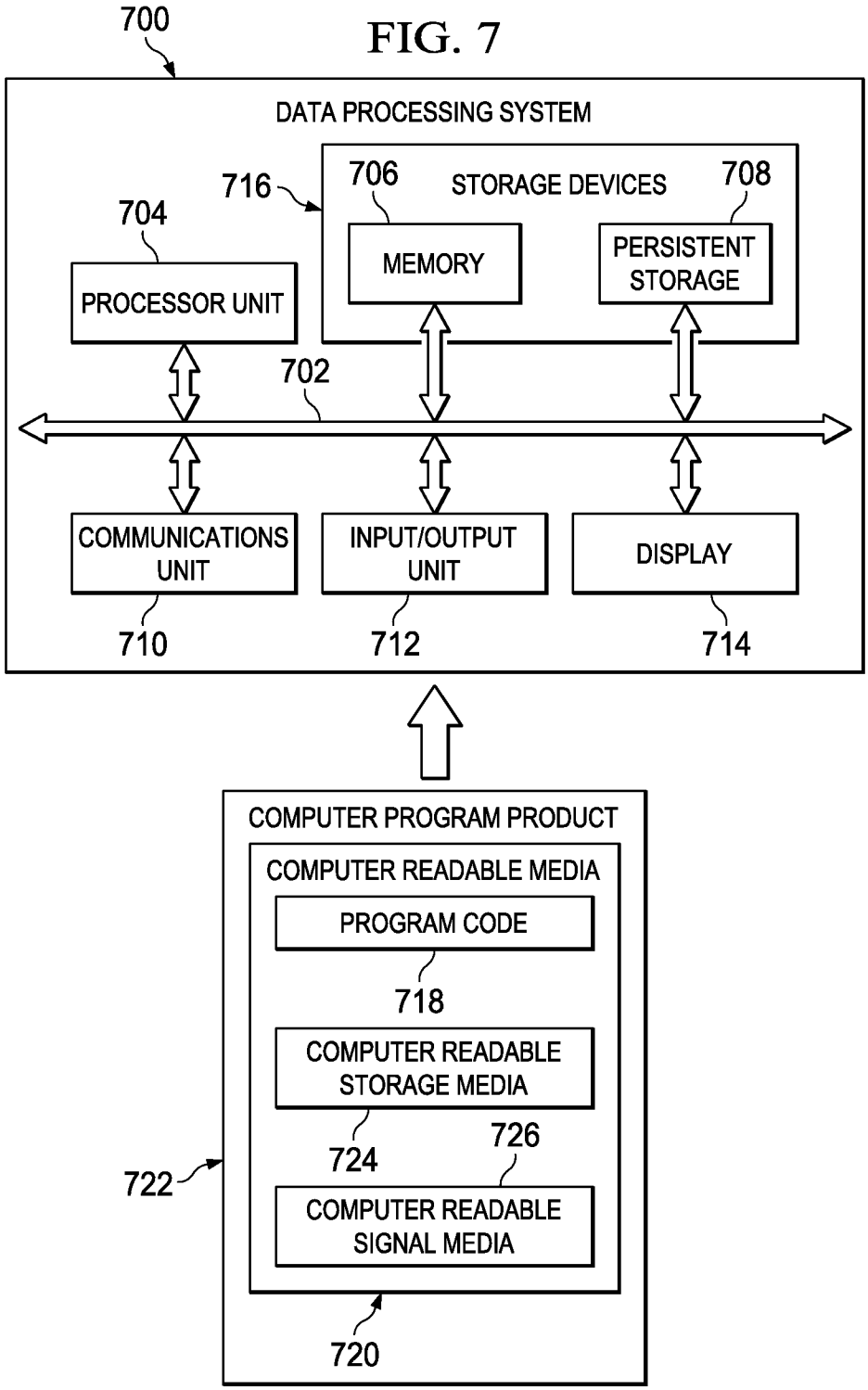

START
RECEIVE PASSENGER CONDITION INFORMATION
602
RECEIVE CABIN CONDITION INFORMATION
604
RECEIVE PASSENGER PROVIDED HEALTH INFORMATION
606
RECEIVE AIRCRAFT CONDITION INFORMATION
608
PROCESS INFORMATION TO IDENTIFY PASSENGER HEALTH INFORMATION
610
FORMAT PASSENGER HEALTH INFORMATION
612
DISTRIBUTE PASSENGER HEALTH INFORMATION
614
APPLY PRIVACY CONTROLS
638
DISPLAY DISTRIBUTED PASSENGER HEALTH INFORMATION ON PASSENGER INTERFACE
616
PASSENGER REVIEWS PASSENGER HEALTH INFORMATION
618
PASSENGER DOWNLOADS PASSENGER HEALTH INFORMATION
620
DISPLAY DISTRIBUTED PASSENGER HEALTH INFORMATION ON CABIN CREW INTERFACE
622
CABIN CREW TAKES ACTION
624
DISPLAY PASSENGER HEALTH INFORMATION ON FLIGHT DECK DISPLAY
626
FLIGHT CREW TAKES ACTION
628
AUTOMATICALLY CONTROL CABIN ENVIRONMENT
630
TRANSMIT HEALTH INFORMATION TO HEALTHCARE PROVIDERS ON THE GROUND
632
USE HEALTH INFORMATION TO ANALYZE CABIN DESIGN AND OPERATION OF CABIN SYSTEMS
634
DEVELOP IMPROVED CABIN DESIGNS AND SYSTEMS
636
END

FIG. 7


700
DATA PROCESSING SYSTEM
716
706
STORAGE DEVICES
708
704
MEMORY
PERSISTENT STORAGE
PROCESSOR UNIT
702
COMMUNICATIONS UNIT
INPUT/OUTPUT UNIT
DISPLAY
710
712
714
COMPUTER PROGRAM PRODUCT
COMPUTER READABLE MEDIA
PROGRAM CODE
718
COMPUTER READABLE STORAGE MEDIA
724
726
722
COMPUTER READABLE SIGNAL MEDIA
720

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/032573

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F19/00 A61B5/00 B64D11/06
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)
G06F A61B B64D

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	US 2010/036269 A1 (FERREN BRAN [US] ET AL) 11 February 2010 (2010-02-11) abstract figures 8, 23-26 paragraphs [0091], [0099] - [0109], [0118] paragraphs [0132] - [0149]	1-20
A	US 2010/168527 A1 (ZUMO LAWRENCE A [US] ET AL) 1 July 2010 (2010-07-01) abstract paragraphs [0002], [0025], [0028]	1,2,7, 10,11
A	WO 03/022142 A2 (BOEING CO [US]) 20 March 2003 (2003-03-20) abstract	1,7

-/--

[X] Further documents are listed in the continuation of Box C.

[X] 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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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 May 2013	28/05/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Philips, Petra

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/032573

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 228 735 A2 (DEUTSCHE TELEKOM AG [DE]) 15 September 2010 (2010-09-15) paragraphs [0003], [0006]	1,9, 17-19
A	US 2009/243895 A1 (MITCHELL BRADLEY J [US] ET AL) 1 October 2009 (2009-10-01) paragraphs [0005], [0043]	1,8,17, 20

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Information on patent family members

International application No
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		EP 1432347 A2	30-06-2004
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		WO 03022142 A2	20-03-2003
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		WO 2009123774 A1	08-10-2009