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(54) **Wireless configuration and diagnostics of fire devices**

(57) A method of operating a fire detection system includes arranging one or more fire devices. Each fire device includes a base portion fixed in a location and a replaceable device portion installed to the base portion. The device portion is configured to detect fire and/or smoke or to perform other fire detection system functions. A radio frequency identification (RFID) tag is affixed to

the base portion or to the replaceable device portion. The RFID tag uniquely identifies a location of the fire device. A transceiver is located at the device portion to receive a signal from the RFID tag. A diagnostic tool wirelessly communicates with the fire device through the transceiver.

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Description

BACKGROUND

[0001] The subject matter disclosed herein relates to fire detection systems. More particularly, the present disclosure relates to systems for addressing devices of fire detection systems and applications of the addressing and configuration systems.

[0002] Fire devices often require periodic testing, diagnostic evaluations and/or updating or repair. In present fire detection systems, these functions are accomplished by physically connecting a diagnostic tool to the individual fire devices via a wired connection and performing the necessary task before moving to the next fire device and repeating the process. This method presents several problems. In particular, the connection port or communication wires are typically not easily accessible once the fire device is installed meaning that in many cases, the device must be removed from the base to connect the diagnostic tool to the device. In a facility with many fire devices this process can be time consuming and costly.

BRIEF SUMMARY

[0003] In one embodiment, a method of operating a fire detection system includes arranging one or more fire devices. Each fire device includes a base portion fixed in a location and a replaceable device portion installed to the base portion. The device portion is configured to detect fire and/or smoke. A radio frequency identification (RFID) tag is affixed to the base portion or to the replaceable device portion. The RFID tag uniquely identifies a location of the fire device. A transceiver is located at the device portion to receive a signal from the RFID tag. A diagnostic tool wirelessly communicates with the fire device through the transceiver.

[0004] Additionally or alternatively, in this or other embodiments commands and/or data received from the diagnostic device are stored at the transceiver.

[0005] Additionally or alternatively, in this or other embodiments communication between the transceiver and the diagnostic device occurs with or without electrically powering the transceiver.

[0006] Additionally or alternatively, in this or other embodiments the saved commands are executed when electrical power is applied to the fire device.

[0007] Additionally or alternatively, in this or other embodiments the diagnostic tool performs configuration, maintenance or test functions on the selected fire devices.

[0008] Additionally or alternatively, in this or other embodiments the transceiver is a portion of the RFID tag.

[0009] Additionally or alternatively, in this or other embodiments the wireless communication relates to receipt, installation, commissioning, maintenance and/or servicing of the fire device.

[0010] In another embodiment a fire device includes a

base portion fixed in a location and a replaceable device portion installed to the base portion. The device portion is configured to detect fire and/or smoke. A radio frequency identification (RFID) tag is affixed to the base portion or to replaceable device portion. The RFID tag uniquely identifies a location of the fire device in a structure. A transceiver is positioned at the device portion to receive a signal from the RFID tag. The transceiver is operably connected to a control system. The fire device is configured to wirelessly connect to a diagnostic device via the transceiver.

[0011] Additionally or alternatively, in this or other embodiments the transceiver is configured to store commands and data received from the diagnostic device.

[0012] Additionally or alternatively, in this or other embodiments communication between the transceiver and the diagnostic device occurs without electrically powering the transceiver.

[0013] Additionally or alternatively, in this or other embodiments the RFID tag includes a programmed unique address to uniquely identify the location of the fire device.

[0014] Additionally or alternatively, in this or other embodiments the transceiver is configured to read the unique address.

[0015] Additionally or alternatively, in this or other embodiments the transceiver is a portion of the RFID tag.

[0016] In yet another embodiment, A fire detection system includes a plurality of fire devices arranged in an array. Each fire device includes a base portion fixed in a location and a replaceable device portion installed to the base portion. The device portion is configured to detect fire and/or smoke. A radio frequency identification (RFID) tag is affixed to the base portion or to the replaceable device portion. The RFID tag uniquely identifies a location of the fire device. A transceiver is located at the device portion to receive a signal from the RFID tag. Each fire device is configured to wirelessly communicate with a diagnostic tool through the transceiver.

[0017] Additionally or alternatively, in this or other embodiments communication between the transceiver and the diagnostic device occurs without electrically powering the transceiver.

[0018] These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The subject matter, which is regarded as the invention, is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the invention are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic view of an embodiment of a fire detection system;

FIG. 2 is a partial cross-sectional view of an embodiment of a fire device;

FIG. 3 is a perspective view of an embodiment of a base for a fire device;

FIG. 4 is a schematic view of an operational mode of an embodiment of a fire detection system; and

FIG. 5 is a schematic view of another operational mode of an embodiment of a fire detection system.

The detailed description explains embodiments of the invention, together with advantages and features, by way of example with reference to the drawing.

DETAILED DESCRIPTION

[0020] Shown in FIG. 1 is a schematic view an embodiment of a fire detection system 10 for, for example, a building 12 or a portion of a building. The system 10 includes a plurality of fire devices 14 arranged in an array 16 in the building 12, each fire device 14 configured to detect fire, smoke and/or other properties in the area near the fire device's location in the array 16. The fire devices 14 are connected to a central control panel 18. In some embodiments, the fire detection system 10 is connected with, for example, a fire department 20 to communicate a status of the fire detection system 10 and/or sound an alarm in the case of a fire.

[0021] Shown in FIG. 2 is a partial cross-sectional view of the fire device 14. Some fire devices 14 includes a base 22 fixed to the building 12, and a replaceable device 24 installed to and connected to the base 22, and in communication with the control panel 18. The base 22 or the device 24 includes a passive radio frequency identification (RFID) element, or RFID tag 26 secured thereto. The RFID tag 26 contains a programmed unique address and/or other information, utilized by the control panel 18 to define the location and the configuration of the fire device 14 in the array 16 and to facilitate communication between the control panel 18 and the fire device 14. The device 24 includes an RFID circuit 28, which is an active element connected to and capable of communicating with the RFID tag 26 to read the address and configuration parameters on the RFID tag 26. The RFID circuit 28 is also connected to and communicates with the control panel 18. The RFID tag 26 acts as a transmitter, while the RFID circuit 28 acts as a transceiver. In the cases where the tag 26 is located in the device 24, the tag 26 and the transceiver are in the same circuitry.

[0022] Referring now to FIG. 3, the base 22 is shown. The base 22 could include a tag location 30, such as a recess or ridge, to assist in locating the RFID tag 26 in the base 22. The tag location 30 assures that the RFID tag 26 is placed such that the RFID circuit 28 can read the RFID tag 26 when the device 24 is installed to the

base 22. For an installation of an array 16 of fire devices 14 in a building 10, in some embodiments, the RFID tags 26 could be preprogrammed at a manufacturing facility and distributed to an installer in, for example, sheets or rolls with the associated addresses. The installer will place the appropriate RFID tag 26 in each base 22 before installing the device 24 to the base 22. Referring again to FIG. 2, the device 24 is positioned such that an antenna of the RFID circuit 28 is in close proximity, in some embodiments at a minimum distance along the same vertical axis relative to the RFID tag 26 thereby simplifying the design and optimizing communication between the RFID tag 26 and the RFID circuit 28. If the device 24 needs to be replaced, the RFID tag 26 remains fixed to the base 22, so the RFID circuit 28 in the replacement device 24 will read the same RFID tag 26. Keeping the RFID tag 26 with the base 22 allows for a reduction in installation time of the system 10 and improved management of installations. Further, addressing errors occurring during maintenance or service are eliminated. Other information, such as a type of device 24 that is supposed to be installed in a particular location, may be stored in the RFID tag 26 further reducing installation and/or maintenance errors. In addition, the RFID circuit 28 may be utilized to communicate and report data stored in the device 24 to the control panel 18 for maintenance, service or calibration purposes. In addition, the RFID circuit 26 may be utilized to store manufacturing data during manufacture of the device 24.

[0023] Alternatively the tag 26 can be located at the device 24 itself. The address of the device 24 in this case will be programmed using an external tool via RFID communication. No reader will be installed on the device 24 in this case. The rest of functionality is the same as in the previous point.

[0024] Referring now to FIG. 4, in some embodiments the device 24 includes a communication bus 32 operably connected to the RFID circuit 28. The RFID circuit 28 is configured to communicate wirelessly with a diagnostic tool 34 and/or application during maintenance or diagnostic operation of the system 10. The communication bus 32 is able to transmit information between the RFID circuit 28 and a main microcontroller 36 of the device 24. The RFID circuit 28 enables communication and transfer of data between the device 24 and the diagnostic tool 34 whether the system 10 and/or the device 24 is powered or unpowered. With the device 24 unpowered, the RFID circuit 28 memory is available through the RFID circuit 28 and may be accessed by the tool 34 and/or device 24. The RFID circuit 28 circuit memory may be updated even if device 24 is unpowered. When the device 24 is powered next, the device 24 will receive the information from the RFID circuit 28 and act accordingly.

[0025] The wireless connectivity, especially when unpowered, provides several benefits to customers, from receipt of the devices 24 to installation, commissioning, maintenance and servicing of the devices 24. For example, via communication between the RFID circuit 28 and

the diagnostic tool 34, the customer can check received devices 24 and compare to a list of purchased devices 24 to ensure accurate shipments. Further, the customer can perform initial configuration tasks on the devices 24 prior to installing and/or powering the devices 24 in the building 10. Further, as stated above, the wireless communication allows for access to device functions during installation and servicing of the devices 24, such as test and diagnostic functions, control panel 18 communications functions, cloning of device 24 configurations and the ability to apply the cloned configuration to other devices 24, thus reducing installation and servicing time and expense considerably.

[0026] Referring to FIG. 5, the antenna 30 of the RFID circuit 28 can detect signals 36 of RFID tags 26 in the vicinity of the antenna 30. In the case of an alarm, the antenna 30 and RFID circuit 28 of the device 24 will detect the signals 36 from personnel RFID tags 46, such as those embedded in identification cards carried by personnel in vicinity 40 of the antenna 30. In some embodiments, the vicinity 40 is a circular area having a diameter of a number of meters covering the maximum distance between two devices 24 in a fire installation. The RFID circuit 28 communicates the signal 36 to the control panel 18 along with the address of the fire device 14 where the signal 36 has been detected, allowing the system 10 to identify a location or locations where a person is located in the building 10. This information may be sent to a selected communication device 42, such as smartphone, personal computer or tablet, and/or to a building management system (not shown) and may be utilized to direct evacuation and/or rescue operations.

[0027] While the invention has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

Claims

1. A method of operating a fire detection system comprising:

arranging one or more fire devices, each fire device including:

a base portion fixed in a location;
a replaceable device portion installed to the

base portion, the device portion configured to detect fire and/or smoke;
a radio frequency identification (RFID) tag affixed to the base portion or to the replaceable device portion, the RFID tag uniquely identifying a location of the fire device; and
a transceiver disposed at the device portion to receive a signal from the RFID tag; and

wirelessly communicating with the one or more fire devices via a diagnostic tool through the transceiver.

2. The method of Claim 1, further comprising storing commands and/or data received from the diagnostic tool at the transceiver.
3. The method of Claims 1 or 2, wherein communication between the transceiver and the diagnostic tool occurs without electrically powering the transceiver.
4. The method of Claims 2 or 3, further comprising executing the commands stored at the transceiver when electrical power is applied to the fire device.
5. The method of any of Claims 1-4, wherein the diagnostic tool performs configuration, maintenance or test functions on the selected fire devices.
6. The method of any of Claims 1-5, wherein the transceiver is a portion of the RFID tag.
7. The method of any of Claims 1-6, wherein the wireless communication relates to receipt, installation, commissioning, maintenance and/or servicing of the fire device.
8. A fire device comprising:
 - a base portion fixed in a location;
 - a replaceable device portion installed to the base portion, the device portion configured to detect fire and/or smoke;
 - a radio frequency identification (RFID) tag affixed to the base portion or the replaceable device portion, the RFID tag uniquely identifying a location of the fire device in a structure; and
 - a transceiver disposed at the device portion to receive a signal from the RFID tag, the transceiver operably connected to a control system; wherein the fire device is configured to wirelessly connect to a diagnostic tool via the transceiver.
9. The fire device of Claim 8, wherein the transceiver is configured to store commands and data received from the diagnostic tool.

10. The fire device of Claims 8 or 9, wherein communication between the transceiver and the diagnostic tool occurs without electrically powering the transceiver. 5
11. The fire device of any of Claims 8-10, wherein the RFID tag includes a programmed unique address to uniquely identify the location of the fire device.
12. The fire device of Claim 11, wherein the transceiver is configured to read the unique address. 10
13. The fire device of any of Claims 8-12, wherein the transceiver is a portion of the RFID tag. 15
14. A fire detection system comprising:
- a plurality of fire devices arranged in an array,
each fire device including: 20
- a base portion fixed in a location;
a replaceable device portion installed to the
base portion, the device portion configured
to detect fire and/or smoke;
a radio frequency identification (RFID) tag 25
affixed to the base portion or to the replace-
able device portion, the RFID tag uniquely
identifying a location of the fire device; and
a transceiver disposed at the device portion
to receive a signal from the RFID tag; 30
- wherein each fire device is configured to wire-
lessly communicate with a diagnostic tool
through the transceiver. 35
15. The fire detection system of Claim 14, wherein communication between the transceiver and the diagnostic tool occurs without electrically powering the transceiver. 40

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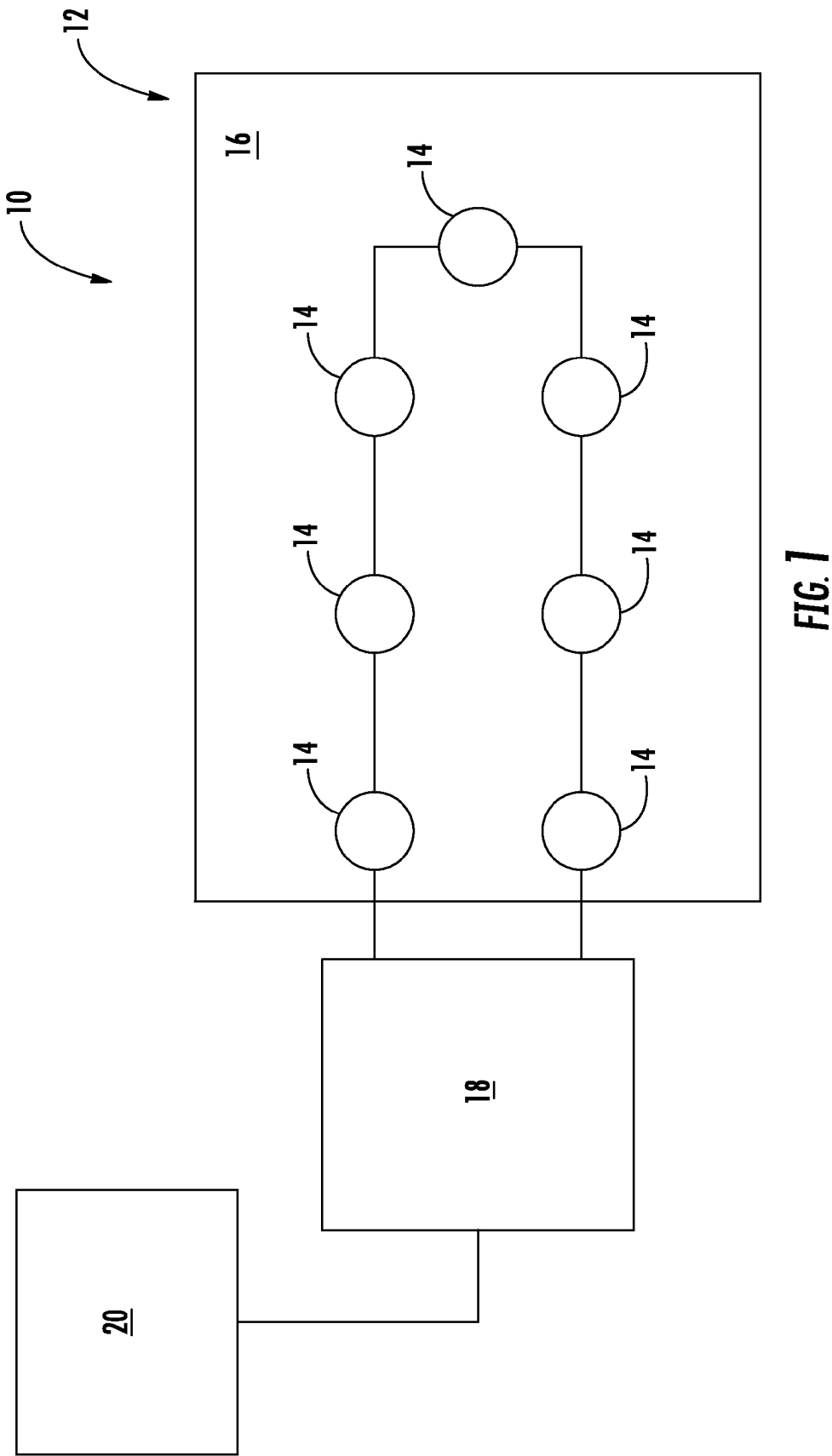


FIG. 1

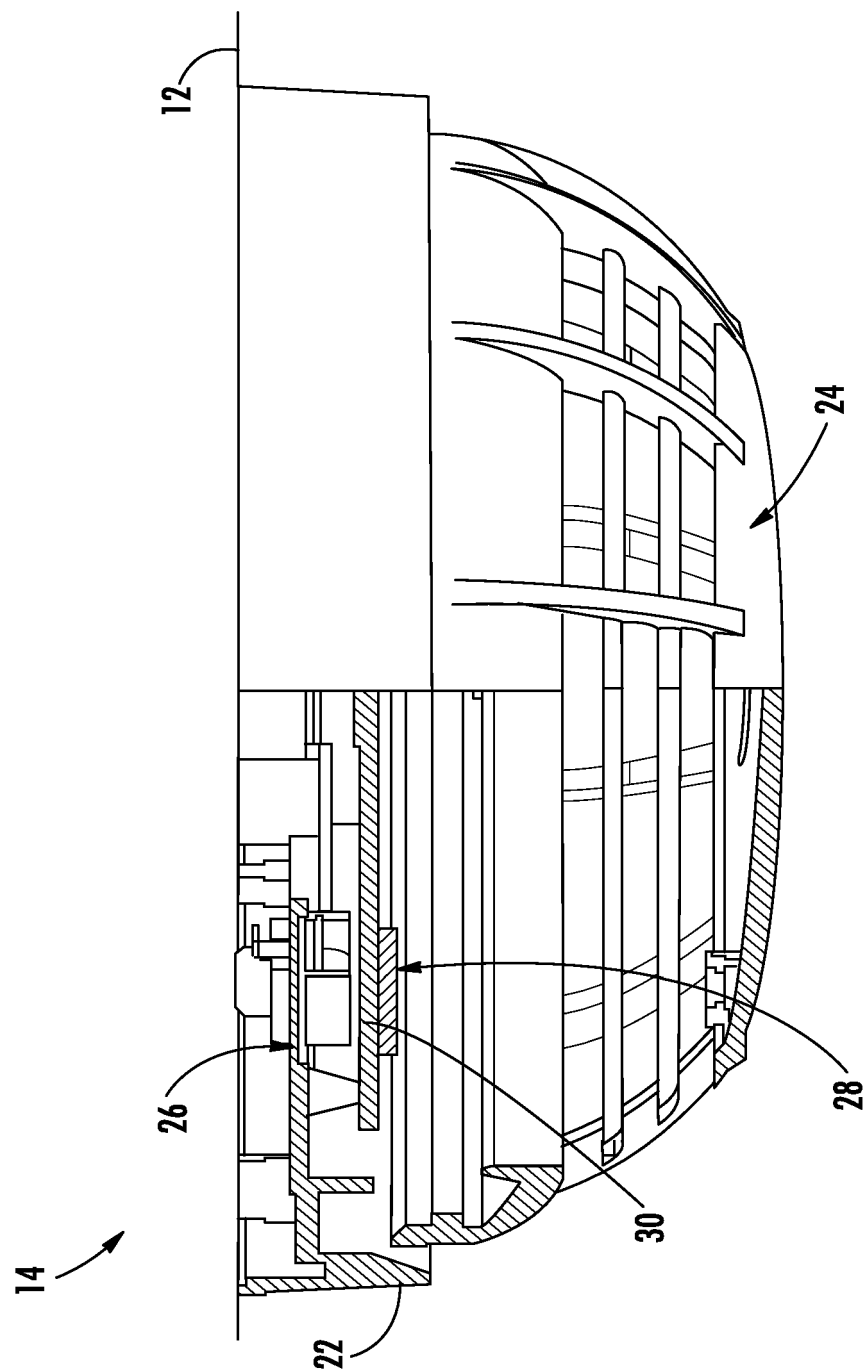


FIG. 2

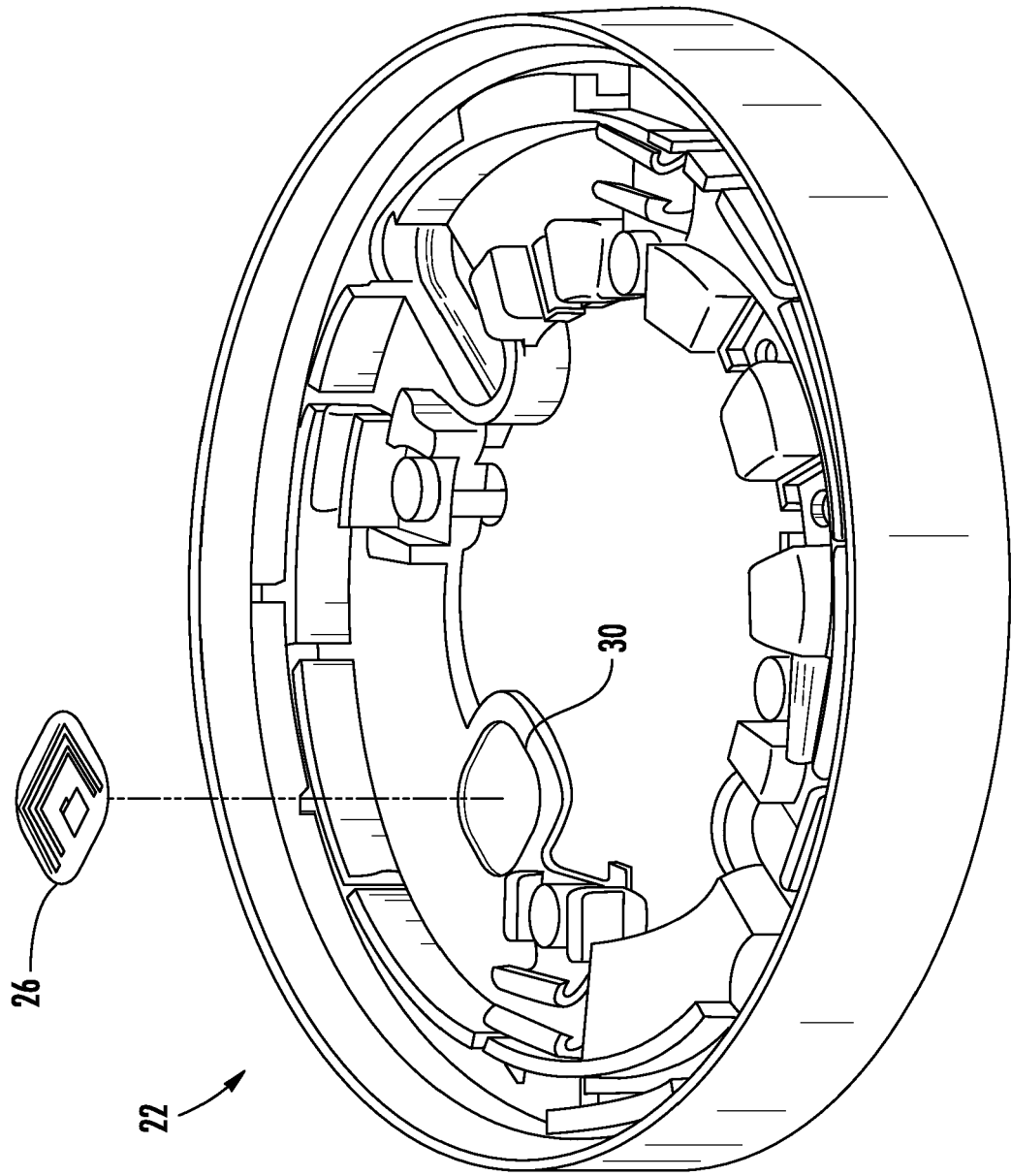


FIG. 3

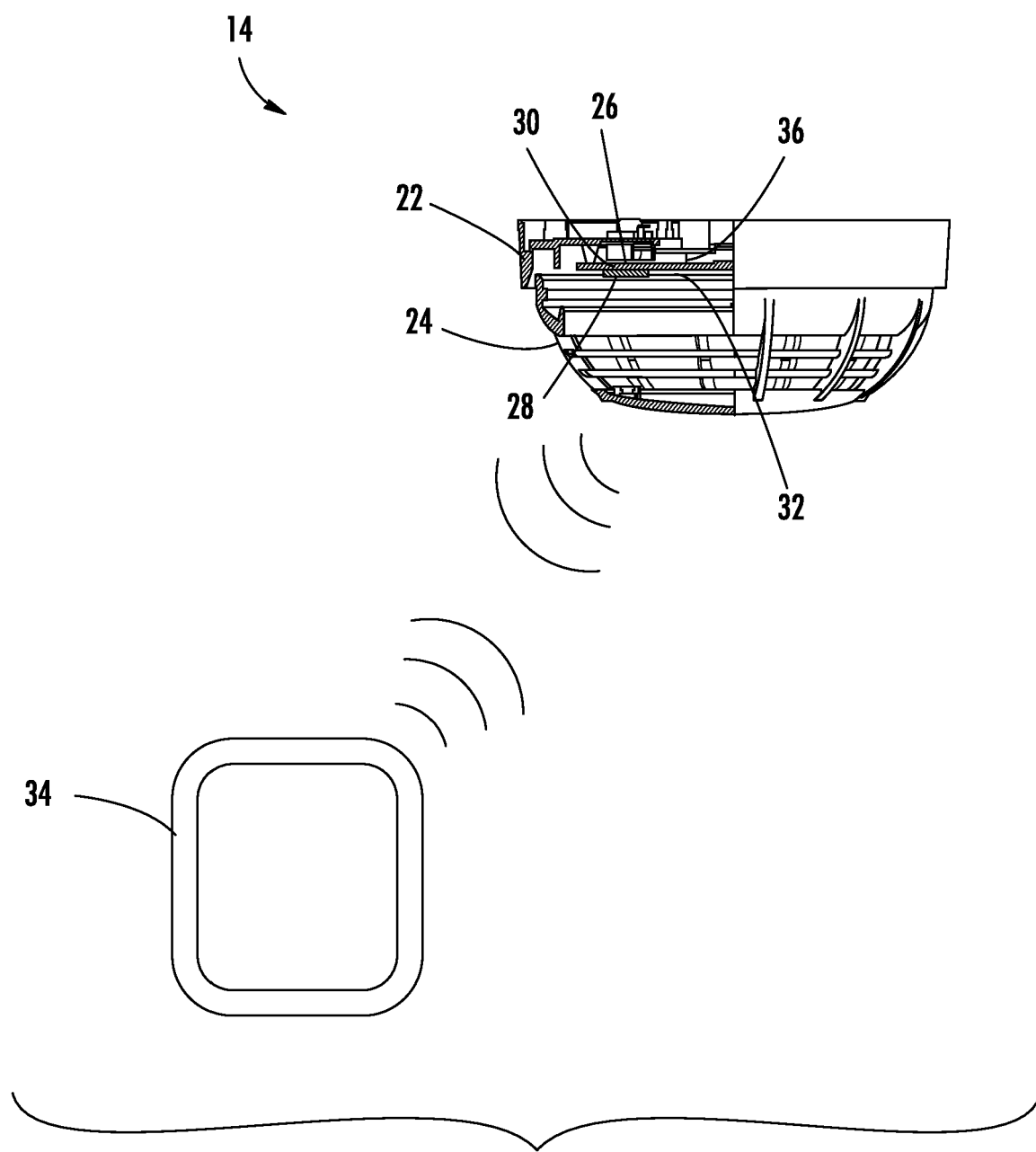


FIG. 4

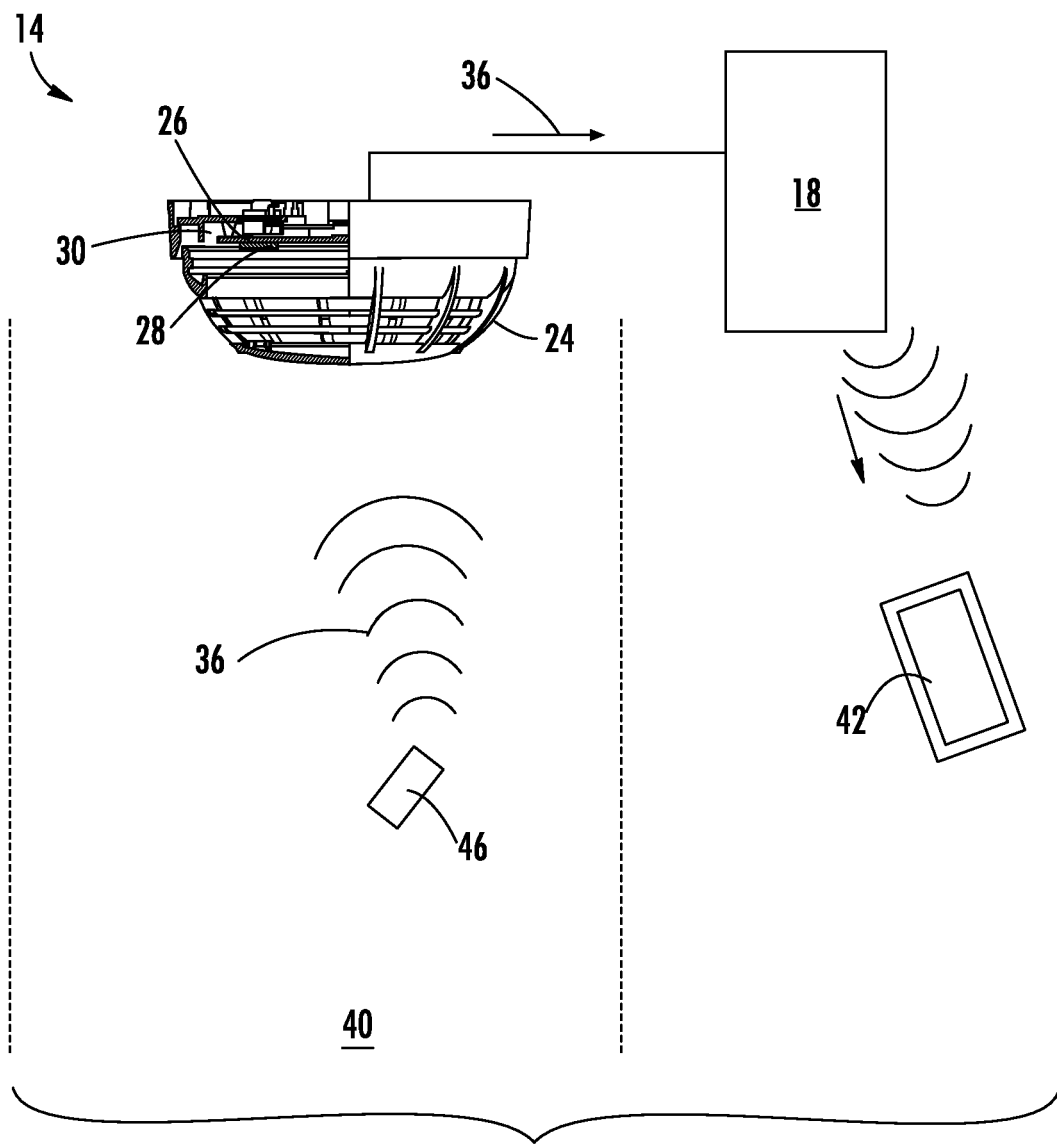


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 14 38 2321

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Place of search The Hague		Date of completion of the search 4 February 2015	Examiner de la Cruz Valera, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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