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(54) Hearing device wherein communication is initiated using a near field communication tag with power management and associated method

(57) The present invention relates to a hearing device or hearing aid with improved power management and associated method. A hearing device is disclosed, the hearing device comprising a housing; a first antenna; a first wireless communication unit coupled to the first antenna and configured to receive and/or send first data via the first antenna; a near field communication tag comprising a second antenna and configured to receive and/or send second data via the second antenna; and a processing unit coupled to the first wireless communication unit and the near field communication tag. The hearing device is configured to detect a first activation of the near field communication tag and activate the first wireless communication unit upon detection of the first activation.

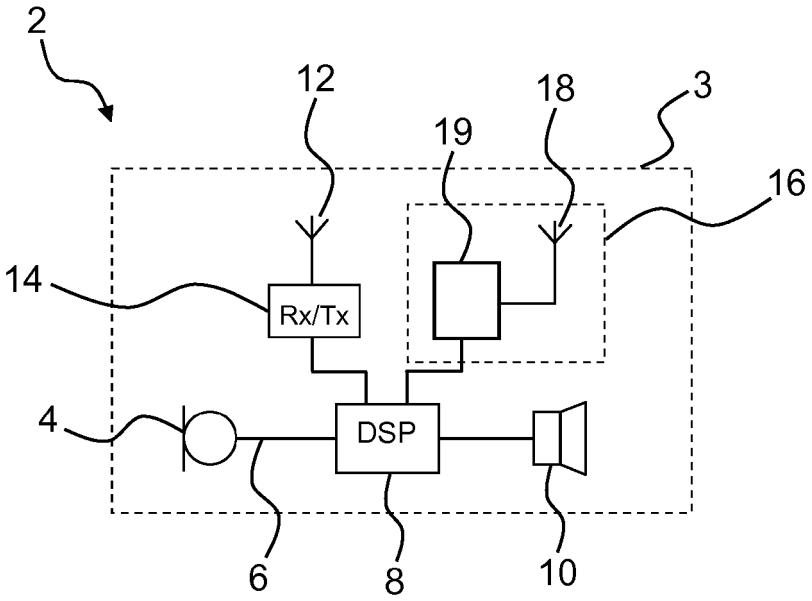

Fig. 1

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Description

[0001] The present invention relates to a hearing device or hearing aid with improved power management and associated method. In particular, the present invention relates to a hearing aid with improved power management to reduce the power consumption during hearing device operation and in particular during hearing device operation with wireless communication.

BACKGROUND

[0002] Wireless communication to and from hearing devices has been increasing in continuation of the developments within wireless communication technology. Typically, wireless communication requires a somewhat tedious and power consuming pairing procedure in order to maintain secure connection management. Further, wireless communication puts a further demand on the limited power resources of the hearing device.

SUMMARY

[0003] Accordingly and despite the known solutions, there is a need for improving power management in a hearing device configured for wireless communication.

[0004] Accordingly, a hearing device is provided, the hearing device comprising a housing, a first antenna, and a first wireless communication unit coupled to the first antenna and configured to receive and/or send first data via the first antenna. Further, the hearing device comprises a near field communication tag comprising a second antenna and configured to receive and/or send second data via the second antenna, and a processing unit coupled to the first wireless communication unit and the near field communication tag. The hearing device is configured to detect a first activation of the near field communication tag. The hearing device may be configured to activate the first wireless communication unit upon detection of the first activation.

[0005] Also disclosed is a method for operating a hearing device comprising a first antenna, a first wireless communication unit, a near field communication tag comprising a second antenna, and a processing unit coupled to the first wireless communication unit and the near field communication tag. The method comprises detecting a first activation of the near field communication tag by an external unit or an accessory device and activating the first wireless communication unit upon detection of the first activation. The method may comprise receiving and/or transmitting first data on the first antenna, e.g. upon detection of the first activation.

[0006] It is an advantage of the present invention that a hearing device with improved power management is provided.

[0007] Further, the hearing device and method enable a more efficient use of battery/power resources by selectively activating radio resources in the hearing device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The above and other features and advantages of the present invention will become readily apparent to those skilled in the art by the following detailed description of exemplary embodiments thereof with reference to the attached drawings, in which:

Fig. 1 schematically illustrates an exemplary hearing device,

Fig. 2 is a flow diagram of an exemplary method according to the invention,

Fig. 3 is a flow diagram of an exemplary method according to the invention,

Fig. 4 is a flow diagram of an exemplary method according to the invention, and

Fig. 5 is a flow diagram of an exemplary method according to the invention.

DETAILED DESCRIPTION

[0009] The figures are schematic and simplified for clarity, and they merely show details which are essential to the understanding of the invention, while other details have been left out. Throughout, the same reference numerals are used for identical or corresponding parts.

[0010] The hearing device may be a headset or a hearing aid. In a hearing aid, the processing unit is configured to adjust the input signal in order to compensate for hearing loss or impairment of the user.

[0011] The hearing device comprises a first antenna coupled to a first wireless communication unit.

[0012] The first wireless communication unit is configured for wireless data communication, and in this respect interconnected with the first antenna for emission and/or reception of an electromagnetic field. The wireless communication unit may comprise a transmitter, a receiver, a transmitter-receiver pair, such as a transceiver, a radio unit, etc. The wireless communications unit may be configured for communication using any protocol as known for a person skilled in the art, including Bluetooth, WLAN standards, manufacture specific protocols, such as tailored proximity antenna protocols, such as proprietary protocols, such as low-power wireless communication protocols, etc.

[0013] The first wireless communication unit may be configured for receiving and/or sending first data at a first frequency. The first wireless communication unit may be configured to, at least in one or more modes of operation, operate only as a receiver, thus further reducing the power consumption of the hearing device.

[0014] The first wireless communication unit may be configured to receive and/or send first data at a first frequency in the range from 800 MHz to 1 GHz and/or from 2.4 GHz to 2.5 GHz.

[0015] The hearing device comprises a near field communication tag. The near field communication tag comprises a second antenna and an electrical circuit connected to the second antenna. The electrical circuit may comprise a memory. Identification data (HD_ID) of the hearing device may be stored in a read-only part of the memory. The memory or at least a part thereof may be configured to enable writing of data into the memory with an accessory device upon activation of the near field communication tag. Hereby, an accessory device is able to send data, such as receiver settings of the first wireless communication unit, to the hearing aid with no or reduced battery power consumption. The processing unit may be configured to retrieve data from the memory, for example via one or more data pins of the near field communication tag.

[0016] The near field communication tag may be configured to receive and/or send second data at a second frequency in the range from 13 MHz to 14 MHz.

[0017] The hearing device may comprise a microphone coupled to the processing unit for conversion of audio into an electrical audio signal that is fed to the processing unit. Further, the hearing device may comprise a receiver coupled to the processing unit for converting the processed audio signal from the processing unit to audio.

[0018] The processing unit is configured for detecting a first activation of the near field communication tag. The processing unit is configured to activate the first wireless communication unit upon detection of a first activation. The near field communication tag may be activated by an accessory device, e.g. a mobile phone, smart phone, key card, remote control unit, comprising an NFC device configured to operate as an initiator generating an RF field.

[0019] The hearing device and method provide a simple user control of radio resources in the hearing device leading to improved power management in the hearing device. Further, the use of a near field communication tag enables utilizing external power, e.g. from an accessory device, for at least a part of the communication, thus reducing the power requirements to the hearing device.

[0020] When the first wireless communication unit is activated, the processing unit outputs a processed audio signal to the receiver. The processed audio signal may be based on the input from the first wireless communication unit and/or the input from the microphone. The receiver converts the processed audio signal from the processing unit into audio.

[0021] The hearing device may be configured to detect a second activation of the near field communication tag after the first activation. The hearing device, e.g. the processing unit, may be configured to deactivate the first wireless communication unit upon detection of the second activation.

[0022] In an exemplary hearing device, the hearing device may be configured to detect a setup activation of the near field communication tag before the first activation. The near field communication tag may be configured to send identification data of the hearing device to an external unit or accessory device upon the setup activation and/or the first activation. Alternatively, or in combination, the hearing device may be configured to set receiver parameters of the first wireless communication unit after detection of the setup activation and/or the first activation, e.g. according to audio system data received via the second antenna.

[0023] Deactivation of the first wireless communication unit may be initiated in several ways. The hearing device, e.g. the processing unit, may be configured to deactivate the first wireless communication unit upon receipt of a termination signal via the first antenna and/or upon end of transmission of first data (for example if no first data has been received for a period of time, e.g. 1 minute). By utilizing the detection of a second activation, the user may be given the ability to deactivate the first wireless communication unit in a simple and easy way.

[0024] The processing unit may be configured to send a reset signal to the near field communication tag upon deactivation of the first wireless communication unit.

[0025] The near field communication tag of the hearing device may be configured for sending second data comprising identification data of the hearing device via the second antenna upon activation, e.g. setup activation and/or first activation, of the near field communication tag. This allows for an external unit or an accessory device to identify the hearing device, and to adjust transmitter/receiver parameters of the external unit or the accessory device accordingly, which in turn reduces the power consumption in the hearing device.

[0026] The near field communication tag may comprise one or more output pins including a first output pin connected

to the processing unit. The near field communication tag may be configured to toggle the first output value on the first output pin between logical "0" and "1" upon each activation of the near field communication tag. The one or more output pins may be connected to the output of a counter that is incremented each time the near field communication tag is activated by an external unit or an accessory device.

[0027] The processing unit may be configured to control the first wireless communication unit based on the output pin value(s) on the one or more output pins of the near field communication tag.

[0028] The processing unit may be configured to activate the first wireless communication unit when the output pin(s) of the near field communication tag has a value indicative of first activation, for example when the first output pin is set to "1" or "0" depending on implementation.

[0029] The processing unit may be configured to deactivate the first wireless communication unit when the output pin(s) of the near field communication tag has a value indicative of second activation, for example when the first output pin or a second output pin is set to "1" or "0" depending on implementation.

[0030] If a termination signal is received by the first antenna, the first wireless communication unit may be deactivated and induce the first output pin to be set to logical "0".

[0031] The processing unit may be configured to send a reset signal to the near field communication tag upon deactivation of the first wireless communication unit. The near field communication tag may be configured to reset the output pin(s) upon receipt of the reset signal.

[0032] The near field communication tag may further be configured to receive second data via the second antenna. The second data may be stored in memory of the near field communication tag and/or transmitted to the processing unit. The second data may comprise primary audio system data for identification of an audio system, wherein the hearing device may be configured to set transmitter/receiver parameters of the first wireless communication unit according to the primary audio system data. A part of the memory, e.g. a first memory, may be a read only memory containing an ID number of the hearing device, and the second memory may be a rewritable memory for storing e.g. the network group ID. The processing unit may be configured to access this memory and relay the information to the first wireless communication unit to connect to the desired channel.

[0033] The primary audio system data may comprise a network group ID for an audio system, and the hearing device may be configured to set transmitter and/or receiver parameters of the first wireless communication unit according to the network group ID.

[0034] The advantage of configuring the near field communication tag to be able to receive second data comprising e.g. a network group ID, is the ability to receive information on a desired audio channel of a plurality of audio channels. Accordingly, an easy and less battery demanding way of setting the first wireless communication unit to receive data from the desired channel is provided.

[0035] The hearing device may be configured to receive secondary audio system data via the first antenna upon activation of the first wireless communication unit. The hearing device may be configured to set transmitter and/or receiver parameters of the first wireless communication unit according to the secondary audio system data. In an exemplary hearing device, this feature may be incorporated by activating the first wireless communication unit when a first activation of the near field communication tag is detected. Upon activation, the first wireless communication unit is configured to receive secondary audio system data on a default channel, and the processing unit or the first wireless communication unit is configured to set receiver parameters of the first wireless communication unit accordingly.

[0036] The hearing device may further be configured to receive first data as audio data from an audio system via the first antenna upon activation of the first wireless communication unit. When configured to receive audio data, the hearing device may be utilized as a headphone e.g. in a cinema, at a presentation, for a phone or a portable music player.

[0037] The method for operating the hearing device comprises detecting a first activation of the near field communication tag by an external unit or an accessory device, and optionally activating the first wireless communication unit upon detection of the first activation.

[0038] It may be desirable to be able to deactivate the first wireless communication unit to save power resources, Thus, the method may comprise detecting a second activation of the near field communication tag by an external unit after the first activation, and deactivating the first wireless communication unit upon detection of the second activation. By utilizing the detection of a second activation, the user may be given the ability in an easy way to deactivate the first wireless communication unit.

[0039] The method may comprise sending second data, e.g. comprising identification data of the hearing device, via the second antenna upon the first activation of the near field communication tag. This allows for another near field communication device to identify the hearing device, and to setup a more efficient pairing of the two devices via the first antenna. Thus the pairing procedure, e.g. with a smartphone, consume less electrical power compared to conventional procedures of pairing.

[0040] The method may comprise receiving second data, e.g. comprising primary audio system data, via the second antenna. Receiving first data on the first antenna may be based on the primary audio system data. The primary audio system data may comprise a network group ID for an audio system, and the method may comprise setting receiver

parameters of the first wireless communication unit according to the network group ID.

[0041] The advantage of receiving second data comprising e.g. a network group ID, is the ability to receive information regarding a desired channel of a plurality of channels or from a desired transmitter of a plurality of transmitters. Thus, an easy and less battery demanding way of setting the first wireless communication unit to receive data from the desired channel(s) or desired transmitter(s) is provided.

[0042] Fig. 1 schematically illustrates an exemplary hearing device. The hearing device 2 comprises a housing 3 accommodating a microphone 4 for converting audio into a converted audio signal 6, and a processing unit 8 connected to the microphone. The processing unit 8 is configured to, at least in a first mode of operation, process the converted audio signal 6. A preprocessing unit and/or an analog-to-digital converter (not shown) may be arranged between the microphone 4 and the processing unit 8. The hearing device comprises a receiver 10 connected to an output of the processing unit 8 for conversion of an output signal of the processing unit into an output audio signal. The hearing device 2 comprises a first antenna 12 and a first wireless communication unit 14 coupled to the first antenna 12 and configured to receive and/or send first data via the first antenna. Further, the hearing device 2 comprises a near field communication tag 16 comprising a second antenna 18 and an electrical circuit 19 connected to the second antenna 18. The near field communication tag 16 is configured to receive and/or send second data via the second antenna 18. The processing unit 8 is coupled/connected to the first wireless communication unit 14, e.g. for receiving and/or sending first data via the first antenna 12. Further, the processing unit 8 is coupled/connected to the near field communication tag 16, e.g. for receiving and/or sending second data via the second antenna 18. The hearing device 2 is configured to detect a first activation of the near field communication tag 16 and activate the first wireless communication unit 14 upon detection of the first activation.

[0043] Fig. 2 shows a flow diagram of an exemplary method for operating a hearing device, e.g. in accordance with the hearing device as described herein. The method 100 comprises detecting a first activation of the near field communication tag by an external unit 102, activating the first wireless communication unit upon detection of the first activation 104, and receiving first data on the first antenna 106.

[0044] Fig. 3 shows a flow diagram of an exemplary method. The method 100' comprises detecting 110 a second activation of the near field communication tag by an external unit or an accessory device after the first activation 108, and deactivating the first wireless communication unit upon detection of the second activation. The hearing aid continues to receive first data 106 if present as long as the first wireless communication unit is activated.

[0045] Fig. 4 shows a flow diagram of an exemplary method 100" in accordance with the invention. The method 100" comprises sending and/or receiving 112 second data, e.g. comprising identification data of the hearing device, via the second antenna, upon detection 104 of the first activation of the near field communication tag.

[0046] Fig. 5 shows a flow diagram of an exemplary method 100"' in accordance with the invention. The method 100"' comprises detecting 114 a setup activation of the near field communication tag and optionally receiving/sending 112 second data via the second antenna upon detection of the setup activation. Upon detection 114 of the setup activation, the method proceeds to setting 116 transmitter and/or receiver parameters of the first radio transmitter. Then the method proceeds to detecting 102 a first activation of the near field communication tag. Detecting 108 the second activation may be replaced or supplemented with detecting receipt of a signal indicative of deactivation via the first antenna.

LIST OF REFERENCES

[0047]

2	hearing device
3	housing
4	microphone
6	converted audio signal
8	preprocessing unit
10	receiver
12	first antenna
14	first wireless communication unit
16	near field communication tag
18	second antenna
19	electrical circuit
100, 100', 100', 100", 100"'	method for operating a hearing device
102	detecting a first activation
104	activating the first wireless communication unit
106	receiving first data
108	detecting a second activation

110	deactivating the first wireless communication unit
112	sending and/or receiving second data
114	detecting a setup activation
116	setting receiver and/or transmitter parameters of the first wireless communication unit

Claims

1. A hearing device comprising:

- a housing;
- a first antenna;
- a first wireless communication unit coupled to the first antenna and configured to receive and/or send first data via the first antenna;
- a near field communication tag comprising a second antenna and configured to receive and/or send second data via the second antenna;
- a processing unit coupled to the first wireless communication unit and the near field communication tag,

wherein the hearing device is configured to detect a first activation of the near field communication tag and activate the first wireless communication unit upon detection of the first activation.

2. Hearing device according to claim 1, wherein the hearing device is configured to detect a second activation of the near field communication tag after the first activation and deactivate the first wireless communication unit upon detection of the second activation.

3. Hearing device according to any of claims 1-2, wherein the near field communication tag is configured for sending second data comprising identification data of the hearing device via the second antenna upon the first activation of the near field communication tag.

4. Hearing device according to any of the preceding claims, wherein the near field communication tag comprises a first output pin connected to the processing unit, wherein the near field communication tag is configured to toggle the first output value on the first output pin between logical "0" and "1" upon each activation of the near field communication tag.

5. Hearing device according to any of the preceding claims, wherein the first wireless communication unit is configured to receive and/or send first data at a first frequency in the range from 800 MHz to 1 GHz and/or from 2.4 GHz to 2.5 GHz.

6. Hearing device according to any of the preceding claims, wherein the near field communication tag is configured to receive and/or send second data at a second frequency in the range from 13 MHz to 14 MHz.

7. Hearing device according to any of the preceding claims, wherein the near field communication tag is configured to receive second data via the second antenna, the second data comprising primary audio system data for identification of an audio system, wherein the hearing device is configured to activate the first wireless communication unit according to the audio system data.

8. Hearing device according to claim 7, wherein the primary audio system data comprises a network group ID for an audio system, and wherein the hearing device is configured to set receiver and/or transmitter parameters of the first wireless communication unit according to the network group ID.

9. Hearing device according to any of the preceding claims, wherein the hearing device is configured to receive secondary audio system data via the first antenna upon activation of the first wireless communication unit, and wherein the hearing device is configured to set receiver and/or transmitter parameters of the first wireless communication unit according to the secondary audio system data.

10. Hearing device according to any of the preceding claims, wherein the hearing device is configured to receive audio data from an audio system via the first antenna upon activation of the first wireless communication unit.

11. Method for operating a hearing device comprising a first antenna, a first wireless communication unit, a near field communication tag comprising a second antenna, and a processing unit coupled to the first wireless communication

unit and the near field communication tag, the method comprising:

- detecting a first activation of the near field communication tag by an external unit, and
- activating the first wireless communication unit upon detection of the first activation, and
- receiving first data on the first antenna.

12. Method according to claim 11, the method comprising detecting a second activation of the near field communication tag by an external unit after the first activation, and deactivating the first wireless communication unit upon detection of the second activation.

13. Method according to any of claims 11-12, the method comprising sending second data comprising identification data of the hearing device via the second antenna upon the first activation of the near field communication tag.

14. Method according to any of claims 11-13, the method comprising receiving second data comprising primary audio system data via the second antenna, and wherein receiving first data on the first antenna is based on the primary audio system data.

15. Method according to claim 14, wherein the primary audio system data comprises a network group ID for an audio system, and wherein the method comprises setting receiver parameters of the first wireless communication unit according to the network group ID.

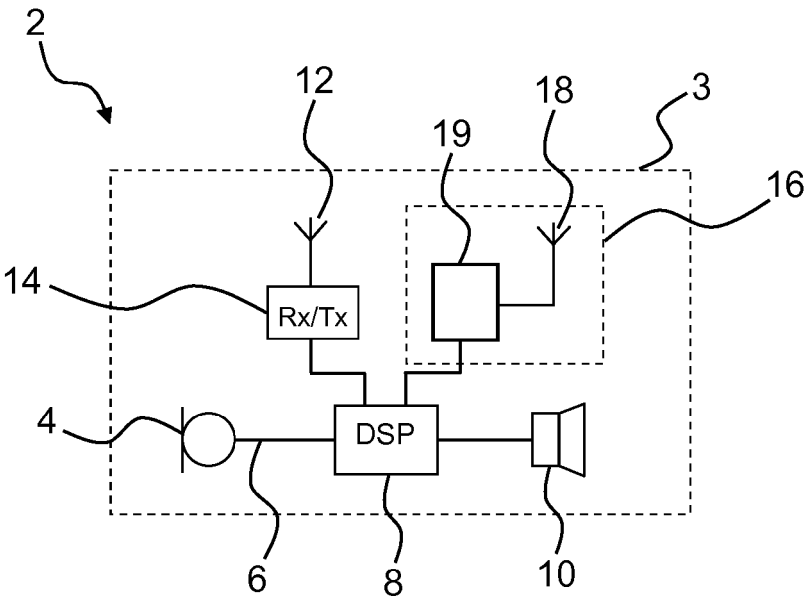
2
12
18
3
19
16
14
Rx/Tx
4
DSP
6
8
10

Fig. 1

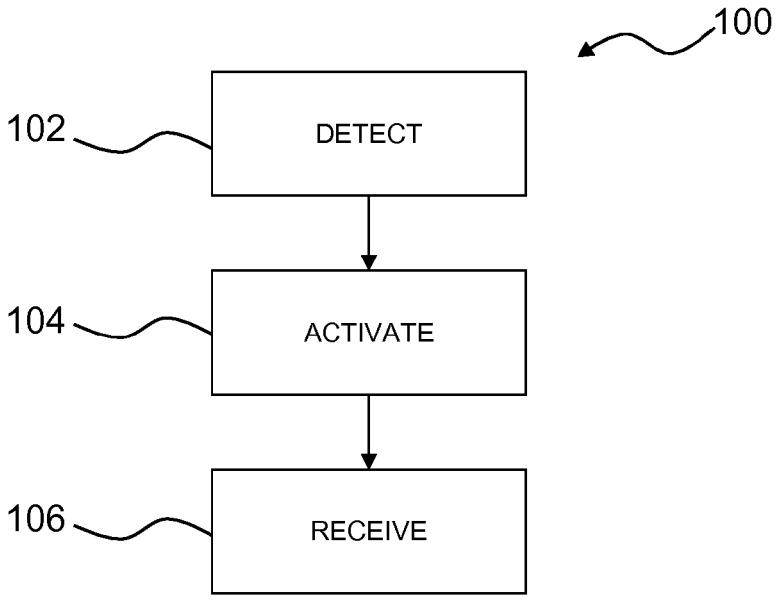
100
102
DETECT
104
ACTIVATE
106
RECEIVE

Fig. 2

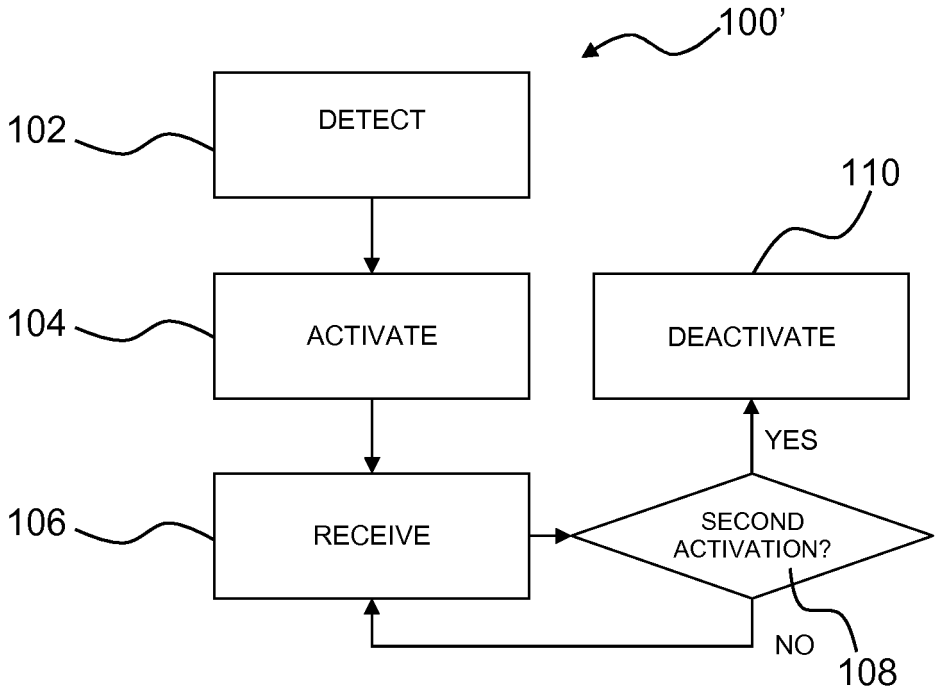
100'
DETECT
102
110
ACTIVATE
104
DEACTIVATE
YES
RECEIVE
106
SECOND ACTIVATION?
NO
108

Fig. 3

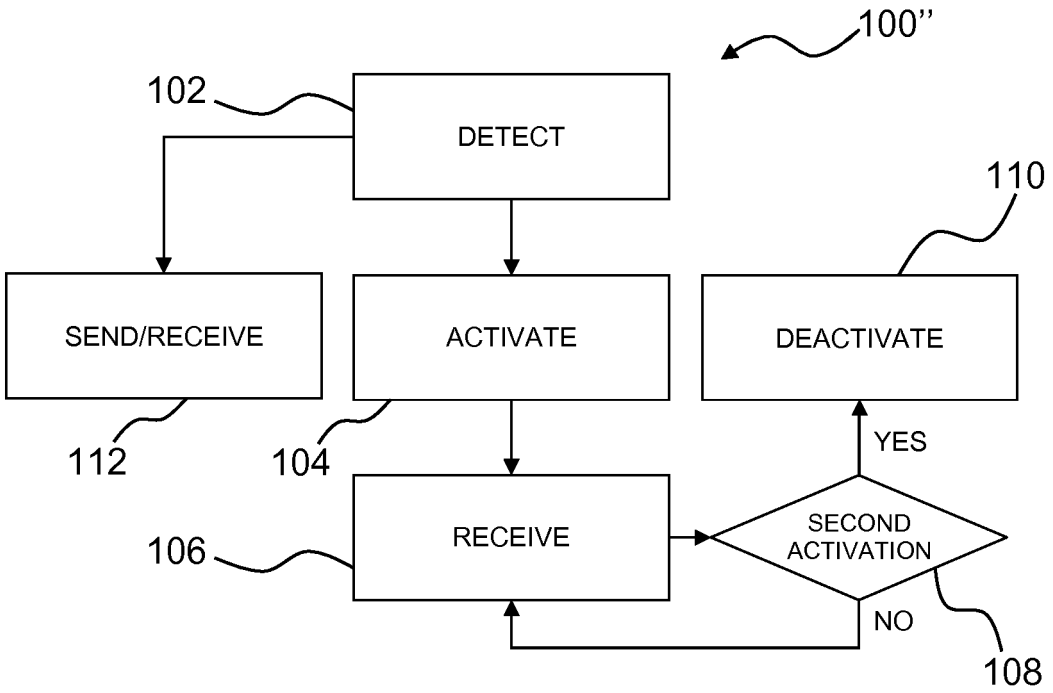
100''
102
DETECT
110
SEND/RECEIVE
ACTIVATE
DEACTIVATE
112
104
YES
RECEIVE
106
SECOND ACTIVATION
NO
108

Fig. 4

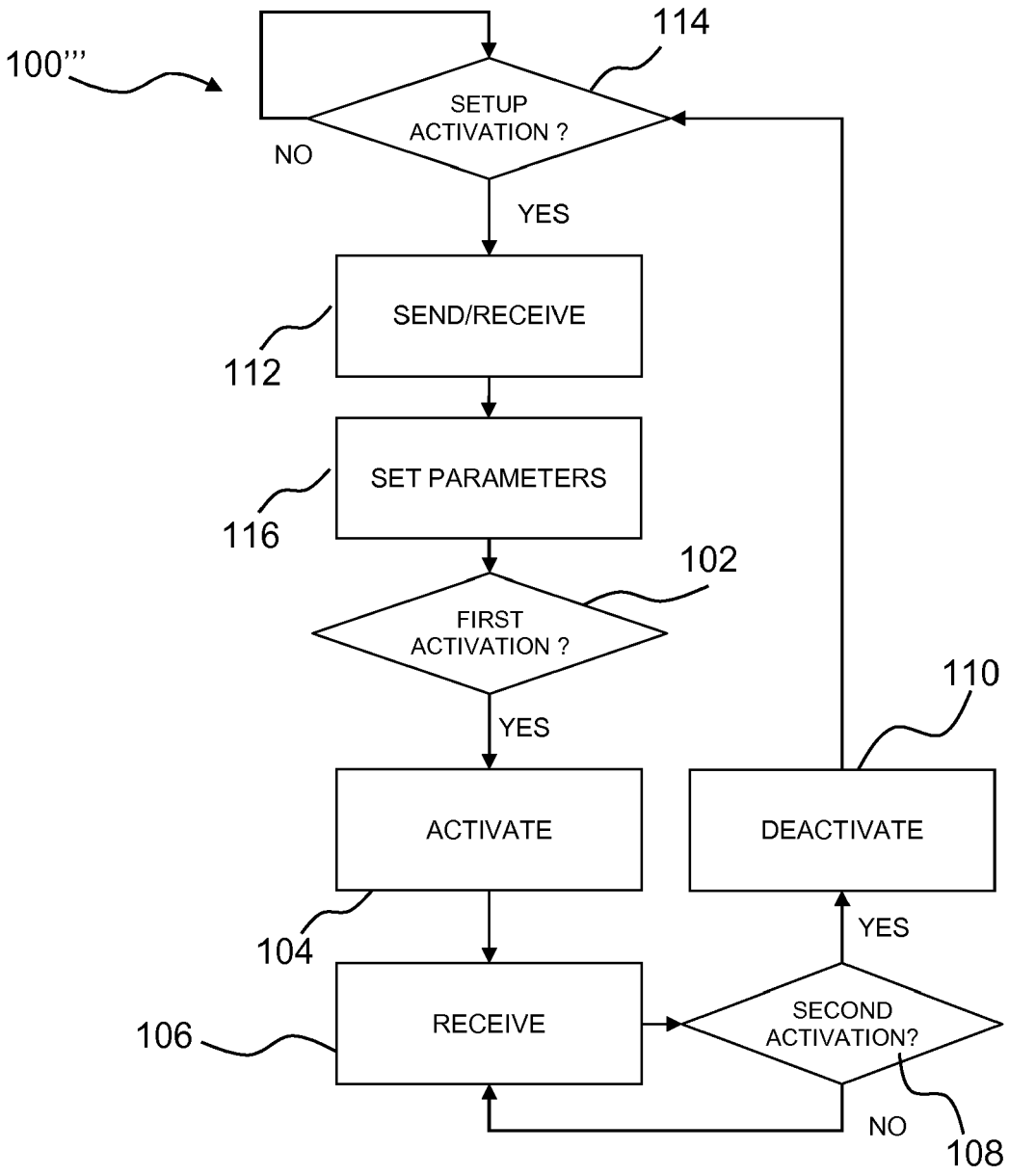
100'''
114
SETUP ACTIVATION ?
NO
YES
SEND/RECEIVE
112
SET PARAMETERS
116
102
FIRST ACTIVATION ?
YES
ACTIVATE
104
RECEIVE
106
SECOND ACTIVATION?
YES
NO
108
DEACTIVATE
110

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 12 19 9457

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A	* abstract; figures 1,2 *	4,5,7-9, 14,15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 June 2013	Will, Robert

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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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
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EPO FORM 1503 03.82 (P04C01)

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EUROPEAN SEARCH REPORT

Application Number
EP 12 19 9457

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 June 2013	Will, Robert

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 19 9457

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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