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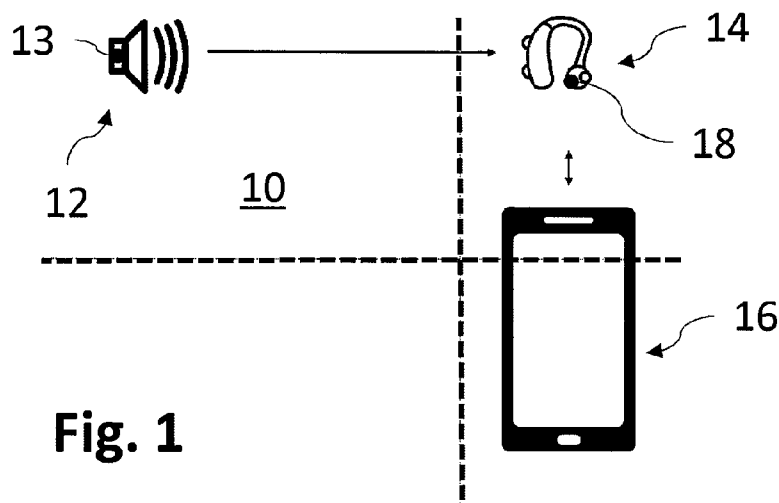


Fig. 1

(57) Abstract: The present invention relates to a method performed in a hearing device (14). The method comprises the steps of: detecting at least one public audio announcement comprised in an analog and/or digital audio signal broadcasted from an audio broadcasting system (12); recording the detected public audio announcement; notifying a user of the hearing device (14) about availability of at least one new unheard public audio announcement; and replaying said public audio announcement on demand.

A METHOD PERFORMED IN A HEARING DEVICE AND AN ARRANGEMENT FOR RECORDING PUBLIC ANNOUNCEMENTS AND REPLAYING ON-DEMAND

TECHNICAL FIELD

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The present invention is related to a method performed in a hearing device as well as to an arrangement comprising an audio broadcasting system and at least one hearing device.

10 BACKGROUND OF THE INVENTION

Hearing devices are typically used to improve the hearing capability or communication capability of a user. A hearing device may pick up the surrounding sound with a microphone
15 of the hearing device, processing the microphone signal thereby taking into account the hearing preferences of the user of the hearing device and providing the processed sound signal into an ear canal of the user via a miniature loudspeaker, commonly referred to as a receiver.

20

A hearing device may also receive public announcements played or rather reproduced from one or a plurality of loudspeakers installed in outdoor public places, e.g. a market place, a local park, etc., or a public building,
25 e.g. a railway-station, an airport, a lounge of a theatre, etc.

Public announcements reproduced via loudspeakers are difficult to understand by hearing impaired people. One of a plurality of reasons is the delimited frequency bandwidth of commonly used loudspeakers, a noisy environment per se, and adverse acoustical properties of the environment resulting in unfavorable acoustical reflections, e.g. at the station platform of a suburban railway-station, etc.

10 When such announcement is transmitted via a means dedicated to hearing impaired people, such as via an inductive hearing loop, the user often misses parts of the broadcasted acoustic information. The reason for this is that the hearing device user first needs to be aware that an announcement is being made in order to switch to a hearing device program dedicated to loudspeaker messages. In other cases, the hearing device user could unfortunately skip the public announcement due to the user is busy at dealing with other tasks, e.g. making a telephone call, studying his diary, checking emails on his smartphone, speaking to people, etc. Skipping a portion or all of a public announcement places the hearing device user in a disadvantageous situation since this missed public announcement could be related to the information that a scheduled train departs from another station platform, etc. Summarized, information important for the hearing device user can be lost or skipped, which places the user in a disadvantageous situation.

Document DE 196 11 980 C1 discloses a hearing device in which an audio signal received within a time window is temporary buffered. However, disadvantageously, the signal is stored temporary and cannot be reproduced according to hearing device user demands. Hence, important messages can be lost.

It is therefore an object of the present invention to provide a method performed in a hearing device permitting the user of the hearing device to perceive public announcements. It is a further object of the invention to propose an arrangement comprising an audio broadcasting system and at least one hearing device adapted to perform such method.

15

SUMMARY OF THE INVENTION

The present invention is directed to a method performed in a hearing device, wherein said method comprises the steps of detecting at least one public audio announcement comprised in an analog and/or digital audio signal broadcasted from an audio broadcasting system, recording the detected public audio announcement, notifying a user of the hearing device about availability of at least one new unheard public audio announcement, and replaying said public audio announcement on demand.

The inventive method allows proper recognition of public audio announcements as well as reproducing respective announcements triggered by user's demands. The detecting step comprises analog audio signal detection of a public audio announcement reproduced via a loudspeaker, commonly known from a railway station scenario. Additionally or as an option, the public audio announcement can be comprised in a digital audio signal broadcasted from a transmitter to the hearing device which can convert the signal to an acoustic information. Hence, the hearing device is able to detect any kind of public audio announcement transmitted via the audio broadcasting system for hearing impaired people, e.g. inductive loops, frequency modulation (FM), Bluetooth, etc. Subsequently, the detected public audio announcement is recorded in order to allow reproducing thereof on user's demand. Subsequently or simultaneously, the hearing device user is provided with a notification about the availability of one or more new unheard public audio announcement(s). Based on the notification, the hearing device user is allowed to replay said public audio announcement at each time desired or rather on demand.

In a further embodiment the public audio announcement is detected from the audio signal by at least one of:

- identifying an analog and/or digital identifier signal in the audio signal, wherein said identifier signal is associated with the public audio announcement; and
- analyzing digital signal meta data in said audio signal.

The above mentioned detecting step can be referred as

automatic signal detection and analysis. The hearing device detects analog and/or digital audio signal broadcasted either through inductive hearing loops, frequency modulation (FM) or via digital wireless technologies such as Bluetooth. The hearing device can detect the public audio announcement from the audio signal by means of identifying an analog and/or digital identifier signal in said audio signal. Additionally or as an option, the above mentioned detection can be realized by analyzing digital signal meta data in said audio signal.

In a further embodiment said identifier signal is played at least at the beginning of the public audio announcement. Hence, public audio announcement detection is highly reliable. Additionally, a further identifier signal associated with the ending of the public audio announcement can be played at least at the end of the public audio announcement. This further (ending) identifier signal can be different from the identifier signal played at the beginning of the public audio announcement. The recording of the public audio announcement can be stopped in response to the detection of this further (ending) identifier signal. Therefore, the beginning as well as the ending of the public audio announcement can be detected properly.

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In a further embodiment the detected public audio announcement is recorded in a storage means comprised by the hearing device and/or a first remote device operatively coupled to the hearing device. Therefore, proper recording

can be ensured. Recording the detected public audio announcement in the first remote device allows to omit the provision of a respective storage means in the hearing device itself. In other words, the hearing device does not
5 need to be equipped with a storage means used for recording the detected public audio announcements. Therefore, hearing device space can be saved resulting in reduced size of the hearing device which is an important issue. Further, costs can be saved since small sized storage means dedicated to
10 be installed in hearing devices are very expensive. The first remote device can be coupled to the hearing device by means of a wireless connection. For example, the hearing device and the first remote device can be coupled to each other via a Bluetooth connection. Possible remote devices
15 include a smartphone, a smartwatch or other wearable and/or handheld devices.

In a further embodiment the user is notified about the availability of the at least one new unheard public audio
20 announcement by means of at least one of: an acoustic indication acoustically transmitted to the user from a loudspeaker comprised by the hearing device and/or a second remote device; a viewable indication showing the user a notification displayed on a screen of the second remote
25 device; and a haptic indication output to the user from the second remote device. The second remote device can comprise the above mentioned first remote device or can be comprised thereof. Preferably, the first and second remote devices are integral or rather one and the same device. The second

remote device can be any wearable and/or handheld device, e.g. a smartphone, a smartwatch, a public digital assistant (PDA), etc. The viewable indication can be displayed on the screen of a smartwatch worn by the user. This feature
5 allows to omit provision of an acoustic indication. The above mentioned haptic indication can be provided to the user by means of a smartwatch as well as any other wearable or handheld device. This haptic indication can be the joggling of a rocking means comprised by the respective
10 device.

In a preferred embodiment the step of replaying said public audio announcement on demand comprises receiving an input of the user instructing to replay said public audio
15 announcement. Therefore, the user is able to play the available public audio announcements by using controls of the hearing device, a smartphone, a smartwatch, an app or another wearable or handheld device, for example.

20 In a preferred embodiment said input of the user is received from a user interface comprised by the hearing device and/or the second remote device. Hence, the user is allowed to reproduce a respective public audio announcement whenever the user wants to do so.

25

In a preferred embodiment the hearing device is a hearing aid. The hearing aid is adapted to compensate the hearing loss of the user. The hearing aid comprises a microphone

for picking up sound from the environment and a processor for processing said sound. Such an individual sound modification may also be applied to public audio announcement during replay. The individual sound
5 modification may comprise frequency dependent amplification, dynamic compression or frequency compression of a part of the spectrum. The sound modification may depend on the acoustical situation.

10 In a further embodiment the microphone signal of the hearing aid is attenuated or muted during the playing of the public announcement. Since the replay is initiated by the user this is indicative for a preference of the user to listen to the public announcement instead of the ambient
15 sound. The hearing aid may even be operated in an active noise cancelling mode in order to further improve the perception of the public announcement. This is advantageous when the user is in a noisy environment such as a public train station.

20

The above mentioned object is also solved by an arrangement comprising an audio broadcasting system and at least one hearing device to be worn by a user, wherein said audio broadcasting system comprises broadcasting means for
25 broadcasting at least one analog and/or digital audio signal comprising at least one public audio announcement, and said hearing device comprises detection means for detecting the at least one public audio announcement comprised in the analog and/or digital audio signal,

notifying means for notifying the user about availability of at least one new unheard public audio announcement, and a loudspeaker for replaying said public audio announcement to the user on demand.

5

The audio broadcasting system can be installed in a public environment, for example a railway-station, an airport centre, a theatre, etc. The hearing device can be any device worn by a hearing impaired people. The inventive
10 arrangement detects public audio announcements transmitted through said audio broadcasting system, automatically stores said announcements detected, notifies the user that new unheard announcements are available, and replays them on demand. Hence, the hearing device user won't miss any
15 part of the public audio announcement or rather the full public audio announcement. The hearing device user is allowed to replay the announcement in appropriate situations, i.e. in situations in which the user is not busy at dealing with other tasks or is talking to other
20 people.

In an embodiment the arrangement further comprises at least one storage means for recording the detected public audio announcement. The storage means can be any medium, e.g. a
25 memory, which is adapted to record audio data.

In an embodiment of the proposed arrangement the at least one storage means is comprised by the hearing device and/or

at least one first remote device operatively coupled to the hearing device. The first remote device can be any wearable and/or handheld device, i.e. any device a user is familiar with. One example is a smartphone which comprises a storage
5 means having high data capacity. This feature allows to omit provision of the hearing device with a storage means. This feature allows to reduce size and weight of the hearing device as well as to reduce costs thereof. The connection between the hearing device and the first remote
10 device can be established by means of a Bluetooth connection.

In an embodiment of the proposed arrangement the detection means comprises at least one of an identification means for
15 identifying an analog and/or digital identifier signal in said audio signal, wherein said identifier signal is associated with the public audio announcement, and analyzing means for analyzing digital signal meta data in said audio signal.

20

In an embodiment of the proposed arrangement the notifying means comprises at least one of: at least one loudspeaker for acoustically transmitting an acoustic indication to the user, display means for showing a notification displayed on
25 a screen of the display means, and haptic means for outputting a haptic indication to the user.

In an embodiment of the proposed arrangement the notifying means is comprised by the hearing device and/or at least one second remote device operatively coupled to the hearing device.

5

In an embodiment the arrangement further comprises a user interface for receiving an input of the user instructing to replay the public audio announcement.

- 10 In an embodiment of the proposed arrangement the user interface is comprised by the hearing device and/or the second remote device.

- 15 In a preferred embodiment the hearing device is a hearing aid. The hearing aid is adapted to compensate the hearing loss of the user. The hearing aid comprises a microphone for picking up sound from the environment and a processor for processing said sound. It is expressively pointed out that any combination of the above mentioned embodiments is
20 subject of further possible embodiments. Only those embodiments are excluded that would result in a contradiction.

BRIEF DESCRIPTION OF THE DRAWINGS

25

The present invention is further described with reference to accompanying drawings jointly illustrating various

exemplary embodiments which are to be considered in connection with the following detailed description. What is shown in the figures is the following:

5 Fig. 1 is a schematic view of an arrangement according to an embodiment of the invention;

Fig. 2 shows a flow diagram illustrating steps performed in a method according to an embodiment of the
10 invention; and

Fig. 3 shows an exemplary notification displayed on a display of a remote device comprised by the inventive arrangement.

15

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows an arrangement 10 comprising an audio broadcasting system 12 having at least one loudspeaker 13.
20 The arrangement further comprises a hearing device 14 and a first remote device 16, e.g. a smartphone. The audio broadcasting system 12 transmits analog and/or digital audio signal via the loudspeaker 13 comprising at least one public audio announcement, wherein said public audio
25 announcement can be detected by the hearing device 14. The detected public audio announcement can be recorded in a storage means comprised by the hearing device 14 itself or

in a storage means comprised by the first remote device 16. The arrangement 10 notifies the hearing device user that at least one new unheard audio announcement is available. The hearing device user can decide to start listening to the unheard public audio announcement at any time, even when the public audio announcement is still being transmitted by the audio broadcasting system 12 via the loudspeaker 13. The user can be notified acoustically about availability of the at least one new unheard public audio announcement by transmitting an acoustic indication to the user. In a further example, the user can be notified by means of a notification displayed on the screen of the first remote device 16. In a further example the user can be notified by means of a haptic indication output from the first remote device 16. While the first remote device 16 is shown to be a smartphone, the first remote device 16 can be any handheld and/or wearable device. The first and second remote devices mentioned above can be different remote devices or one and the same remote device, such as the remote device 16 as shown in Fig. 1. The audio announcement is replayed to the user by means of a loudspeaker 18 comprised by the hearing device 14.

Fig. 2 shows a flow diagram of the method performed in the hearing device 14 as shown in Fig. 1. In a step S10 the hearing device receives an analog and/or digital audio signal broadcasted from the loudspeaker 13 of the audio broadcasting system 12 as shown in Fig. 1. In a step S12 the hearing device analyses the audio signal in view of

public audio announcements. In a step S14 of the method, based on the analysis performed in step S12, a decision is made whether the audio signal comprises at least one public audio announcement or not. This decision is performed by
5 identifying an analog and/or digital identifier signal in the audio signal, wherein said identifier signal is associated with the public audio announcement. In a further example, the decision is made by analysing digital signal meta data comprised in said audio signal. It is to be noted
10 that the identifier signal is played at least at the beginning of the public audio announcement. If no identifier signal is perceived or rather detected by the hearing device, in a step S16 the audio signal is not recorded. In case of said identifier signal is perceived by
15 the hearing device, in a step S18 the user is notified about the availability of at least one new unheard public audio announcement.

This notification can comprise an acoustic indication
20 acoustically transmitted to the user of the hearing device from a loudspeaker thereof and/or a remote device. In a further example, the notification is a viewable indication showing the user a notification displayed on a screen of a remote device. In a further example, the notification is a
25 haptic indication output to the user from the remote device. Concurrently or subsequently, in a step S20, the public audio announcement is recorded in a storage means comprised by the hearing device and/or the remote device operatively coupled to the hearing device. Further, in a

step S22 the public audio announcement is made available for the hearing device user. In other words, this step allows the user to replay said public audio announcement on demand. In doing so, the user inputs an instruction to
5 replay said public audio announcement. This instruction signal can be received from a user interface comprised by the hearing device, i.e. by pushing a button of the hearing device. In a further example, the instruction of the user is received from the remote device, i.e. by pushing a
10 button of the remote device or by touching a viewable button displayed on a display of the remote device. The remote devices mentioned above can be different remote devices or one and the same remote device. The remote device can be a handheld device, e.g. a smartphone, etc.,
15 or a wearable device, e.g. a smartwatch, etc.

Fig. 3 illustrates the remote device 16 comprising a display which displays an exemplary notification according to an embodiment of the inventive method. In the shown
20 example, the remote device 16 is a smartphone. The remote device 16 can be comprised by the inventive arrangement 10 as shown in Fig. 1. The display shows or rather notifies the user about availability of five new unheard public audio announcements perceived in a railway-station. Said
25 public audio announcements have been detected from an analog and/or digital audio signal broadcasted from an audio broadcasting system of the railway-station. Said unheard public audio announcements are ready to be reproduced via a loudspeaker comprised by the hearing

device, for example the hearing device 14 as shown in Fig. 1.

The unheard public audio announcements can be indexed in order to allow for categorization. The index can be followed by a time index, respectively, indicating the time elapsed since the unheard public audio announcements has been received or rather detected. In the shown example, the index "Zurich HB / Track 5 - 3 minutes ago" notifies the user about an unheard public audio announcement perceived three minutes ago relating to a train connection serviced on track 5. By pushing the virtual index (touching the touchscreen of the smartphone) the user can reproduce the relating public audio announcement. The user can fast-forward the audio announcement by moving a displayed button along a displayed time-track. The reproduced audio announcement can provide the user with an information concerning the above mentioned train-connection, for example a delay of the train, a cancellation of the train-connection or a change of the station-platform. Advantageously, each of said unheard public audio announcements can be reproduced by the user on demand.

Claims

1. A method performed in a hearing device (14), wherein said method comprises the steps of:

5 detecting at least one public audio announcement
 comprised in an analog and/or digital audio signal
 broadcasted from an audio broadcasting system (12);
 recording the detected public audio announcement;
 notifying a user of the hearing device (14) about
10 availability of at least one new unheard public audio
 announcement; and
 replaying said public audio announcement on demand.

2. The method according to claim 1, wherein the public
15 audio announcement is detected from the audio signal by at
 least one of:

 identifying an analog and/or digital identifier signal
 in said audio signal, wherein said identifier signal is
 associated with the public audio announcement; and
20 analyzing digital signal meta data in said audio
 signal.

3. The method according to claim 2, wherein said identifier
 signal is played at least at the beginning of the public
25 audio announcement.

4. The method according to one of the preceding claims,
wherein the detected public audio announcement is recorded
in a storage means comprised by the hearing device (14)
and/or a first remote device (16) operatively coupled to
5 the hearing device (14).

5. The method according to one of the preceding claims,
wherein the user is notified about the availability of the
at least one new unheard public audio announcement by means
10 of at least one of:

an acoustic indication acoustically transmitted to the
user from a loudspeaker (18) comprised by the hearing
device (14) and/or a second remote device (16);

15 a viewable indication showing the user a notification
displayed on a screen of the second remote device (16);
and

a haptic indication output to the user from the second
remote device (16).

20 6. The method according to claim 5, wherein the step of
replaying said public audio announcement on demand
comprises receiving an input of the user instructing to
replay said public audio announcement.

25 7. The method according to claim 6, wherein said input of
the user is received from a user interface comprised by the
hearing device (14) and/or the second remote device (16).

8. The method according to one of the preceding claims,
wherein the hearing device (14) is a hearing aid.

5 9. The method according to claim 8, wherein the microphone
signal of the hearing aid is attenuated or muted during the
playing of the public announcement.

10. An arrangement (10) comprising an audio broadcasting
10 system (12) and at least one hearing device (14) to be worn
by a user, wherein:

said audio broadcasting system (12) comprises:

15 broadcasting means (13) for broadcasting at least one
analog and/or digital audio signal comprising at least
one public audio announcement; and

said hearing device (14) comprises:

detection means for detecting the at least one public
audio announcement comprised in the analog and/or
digital audio signal;

20 notifying means for notifying the user about
availability of at least one new unheard public audio
announcement; and

a loudspeaker (18) for replaying said public audio
announcement to the user on demand.

25

11. The arrangement (10) according to claim 10, further comprising at least one storage means for recording the detected public audio announcement.

5 12. The arrangement (10) according to claim 11, wherein the at least one storage means is comprised by the hearing device (14) and/or at least one first remote device (16) operatively coupled to the hearing device (14).

10 13. The arrangement (10) according to one of claims 10 to 12, wherein the detection means comprises at least one of:
identification means for identifying an analog and/or digital identifier signal in said audio signal, wherein said identifier signal is associated with the public
15 audio announcement, and
analyzing means for analyzing digital signal meta data in said audio signal.

14. The arrangement (10) according to one of claims 10 to
20 13, wherein the notifying means comprises at least one of:
at least one loudspeaker (18) for acoustically transmitting an acoustic indication to the user;
display means for showing a notification displayed on a screen of the display means; and
25 haptic means for outputting a haptic indication to the user.

15. The arrangement (10) according to claim 14, wherein the
notifying means is comprised by the hearing device (14)
and/or at least one second remote device (16) operatively
5 coupled to the hearing device (14).

16. The arrangement (10) according to one of claims 10 to
15, further comprising a user interface for receiving an
input of the user instructing to replay the public audio
10 announcement.

17. The arrangement (10) according to claim 16, wherein the
user interface is comprised by the hearing device (14)
and/or the second remote device (16).
15

18. The arrangement (10) according to one of claims 10 to
17, wherein the hearing device (14) is a hearing aid.

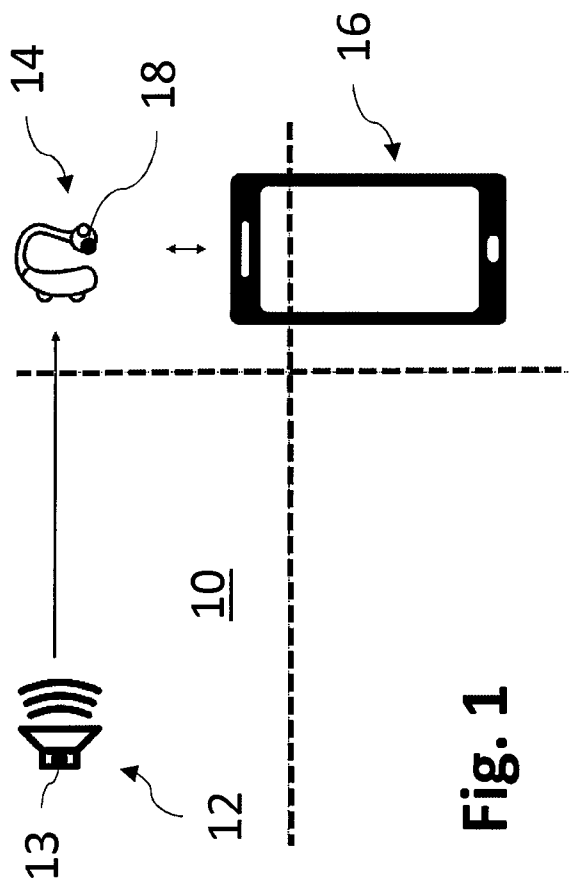


Fig. 1

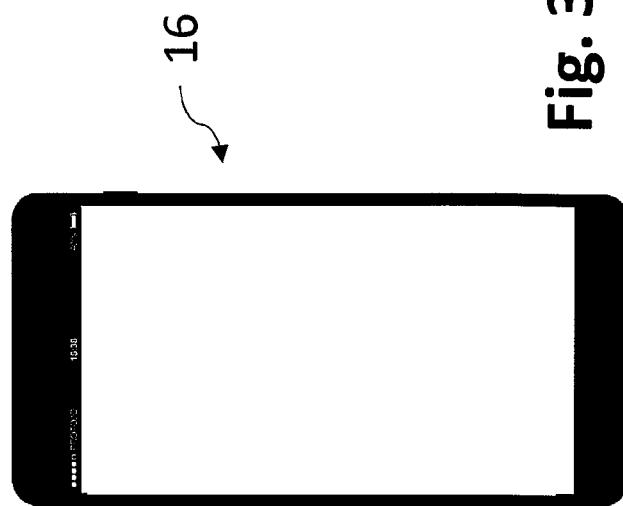


Fig. 3

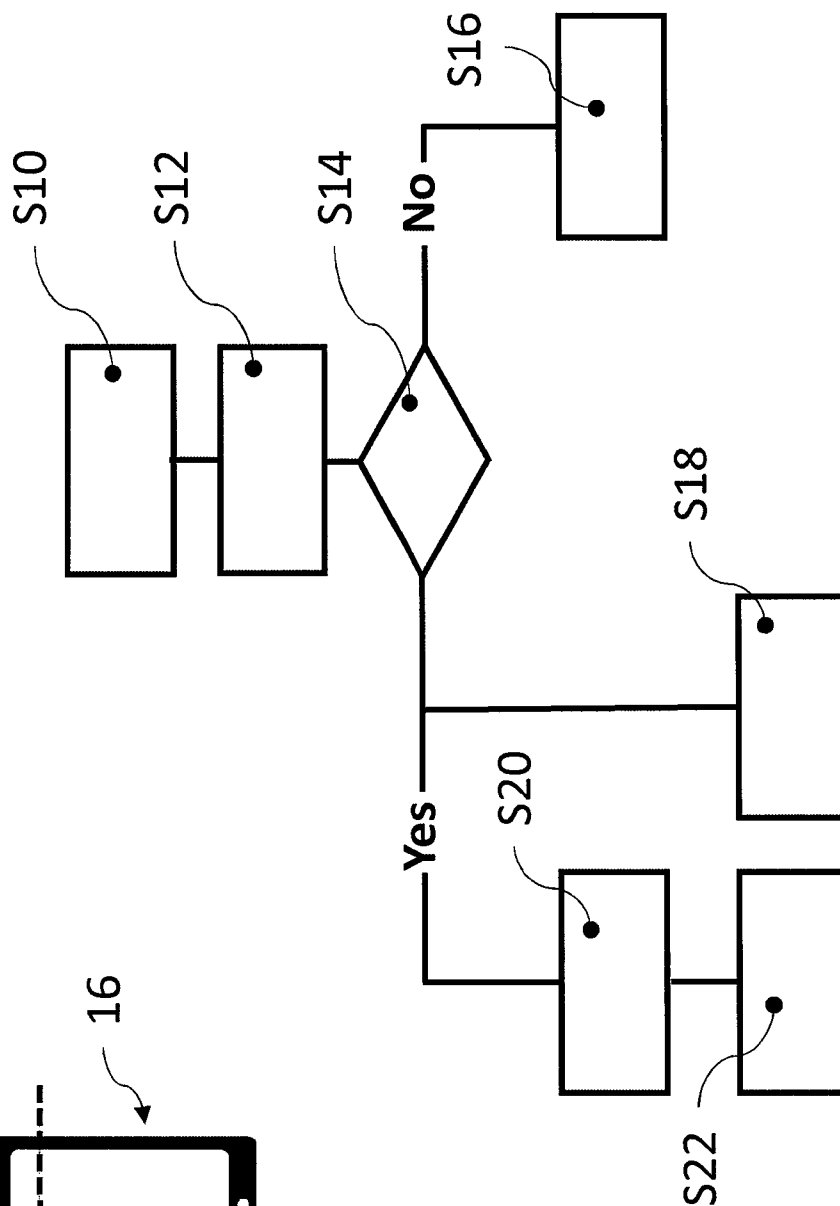


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/055335

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04R1/10 H04R25/00 H04R27/00
ADD. G08B3/10 G08B5/22 G08B6/00

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)

H04R G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-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.
Y	US 2014/064511 A1 (DESAI VISHRUTI R [US]) 6 March 2014 (2014-03-06) paragraph [0039] - paragraph [0045] paragraphs [0048], [0052] - paragraph [0053] paragraph [0055] - paragraph [0056] paragraph [0062] - paragraph [0065] paragraph [0077] - paragraph [0080] paragraphs [0082], [0085] figures 2, 4, 6, 11, 16 -----	1-18
Y	US 6 876 835 B1 (MARKO PAUL D [US] ET AL) 5 April 2005 (2005-04-05) column 1, line 33 - line 36 column 2, line 25 - line 32 column 7, line 6 - line 19 ----- -/--	1-18



Further documents are listed in the continuation of Box C.



See patent family annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 2010/119100 A1 (DEVINE JEFFERY SHANE [US]) 13 May 2010 (2010-05-13) paragraphs [0001], [0008], [0021] paragraph [0025] - paragraph [0030] figures 2-4 -----	1-18
A	US 6 839 446 B2 (BLUMENAU TREVOR I [US]) 4 January 2005 (2005-01-04) column 2, line 42 - column 4, line 27 figure 3 -----	1-18

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Information on patent family members

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