



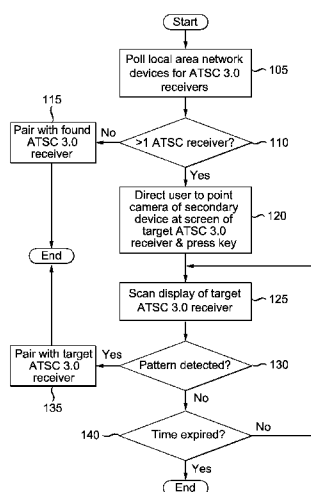
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(54) **Title:** ATSC 3.0 DISPLAY DISCOVERY VIA A MOBILE SECONDARY DEVICE

(57) **Abstract:** A method and secondary device for pairing with a broadcast receiver having network access, including polling a local area network for broadcast receivers having network access, determining if there is more than one broadcast receiver, pairing the secondary device with the located broadcast receiver having network access if there is only one broadcast receiver having network access, directing a user to point a camera of the secondary device at a screen of a targeted broadcast receiver having network access and to press a key of the secondary device, directing the broadcast receivers having network access to display their patterns, scanning screen of target broadcast receiver having network access, determining if a pattern was detected on the screen of the target broadcast receiver having network access and pairing the secondary device with the target broadcast receiver having network access, if the pattern was detected on the broadcast receiver having network access.



ATSC 3.0 DISPLAY DISCOVERY VIA A MOBILE SECONDARY DEVICE

FIELD OF THE INVENTION

The present invention relates to ATSC 3.0 receivers and, in particular, to a method to automatically pair a secondary device with the ATSC 3.0 receiver.

BACKGROUND OF THE INVENTION

In multicast and broadcast applications, data are transmitted from a server to multiple receivers over wired and/or wireless networks. A multicast system as used herein is a system in which a server transmits the same data to multiple receivers simultaneously, where the receivers form a subset of all the receivers up to and including all of the receivers. A broadcast system is a system in which a server transmits the same data to all of the receivers simultaneously. That is, a multicast system by definition can include a broadcast system.

This section is intended to introduce the reader to various aspects of art, which may be related to the present embodiments that are described below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light.

It would be advantageous to have a method to automatically pair a main ATSC 3.0 device with a secondary device such as a tablet or mobile phone. This is especially true if the premises has multiple ATSC 3.0 receivers and multiple secondary devices. Conventionally, pairing is typically done using a manual method by having the user select from a list of devices available on the network.

SUMMARY OF THE INVENTION

The next generation TV standard is currently being developed as ATSC 3.0. This standard includes the capability to communicate between a main device such as a TV and a secondary screen such as a mobile phone or tablet. The new ATSC 3.0 standard also mandates that the ATSC 3.0 receiver has network connectivity. One use of the secondary screen could be to display such things as sporting event statistics while the main event is displayed on the TV. In order to use the secondary screen, the secondary device (second

screen device) must somehow be paired with the TV so that secondary device knows what is playing on the main screen. It is expected that when someone (a user, a viewer) wants to use a secondary device, the user would connect the secondary device to the local area network on which the main device is located. If there is only one main ATSC 3.0 device, then it would be easy to pair this device by simply selecting its network address. However, there may be several main devices on the local network (e.g., several ATSC 3.0 TVs in the home). One method to pair a secondary device would be to list all of the main devices on the network and have the user select the device to which the user wants to pair a particular secondary device. However, it may be difficult for the user to know which of the listed devices is the device with which they want to pair their secondary device. Another method would be to put a watermark in the content which is being played by the main device. The secondary device could then detect the watermark and be able to identify the content that is being displayed. This may be problematic since it requires a large amount of content to be watermarked. In this case, effectively all of the content would have to be watermarked since it could not be known in advance when a user with a secondary device would enter the room and want to pair the secondary device with the ATSC 3.0 receiver. Also, some locally generated content (e.g., program guide) may be displayed, which is not watermarked. An ATSC 3.0 receiver is a broadcast receiver having network access.

A method and secondary device for pairing with a broadcast receiver having network access, including polling a local area network for broadcast receivers having network access, determining if there is more than one broadcast receiver, pairing the secondary device with the located broadcast receiver having network access if there is only one broadcast receiver having network access, directing a user to point a camera of the secondary device at a screen of a targeted broadcast receiver having network access and to press a key of the secondary device, directing the broadcast receivers having network access to display their patterns, scanning screen of target broadcast receiver having network access, determining if a pattern was detected on the screen of the target broadcast receiver having network access and pairing the secondary device with the target broadcast receiver having network access, if the pattern was detected on the broadcast receiver having network access.

While the proposed method is described in terms of an ATSC 3.0 receiver, it is not so limited and any broadcast receiver (e.g., TV) that has a network interface is envisioned as a device that can benefit from the proposed method.

5 BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is best understood from the following detailed description when read in conjunction with the accompanying drawings. The drawings include the following figures briefly described below:

Fig. 1 is a flowchart of an exemplary embodiment of the proposed method for
10 pairing a secondary device (second screen) with a main device (ATSC 3.0 receiver).

Fig. 2 is a block diagram of an exemplary embodiment of the proposed secondary device (second screen).

It should be understood that the drawing(s) are for purposes of illustrating the concepts of the disclosure and is not necessarily the only possible configuration for
15 illustrating the disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present description illustrates the principles of the present disclosure. It will thus be appreciated that those skilled in the art will be able to devise various
20 arrangements that, although not explicitly described or shown herein, embody the principles of the disclosure and are included within its scope.

All examples and conditional language recited herein are intended for educational purposes to aid the reader in understanding the principles of the disclosure and the concepts contributed by the inventor to furthering the art, and are to be construed as being
25 without limitation to such specifically recited examples and conditions.

Moreover, all statements herein reciting principles, aspects, and embodiments of the disclosure, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in
30 the future, i.e., any elements developed that perform the same function, regardless of structure.

Thus, for example, it will be appreciated by those skilled in the art that the block diagrams presented herein represent conceptual views of illustrative circuitry embodying the principles of the disclosure. Similarly, it will be appreciated that any flow charts, flow diagrams, state transition diagrams, pseudo-code, and the like represent various processes which may be substantially represented in computer readable media and so executed by a computer or processor, whether or not such computer or processor is explicitly shown.

The functions of the various elements shown in the figures may be provided through the use of dedicated hardware as well as hardware capable of executing software in association with appropriate software. When provided by a processor, the functions may be provided by a single dedicated processor, by a single shared processor, or by a plurality of individual processors, some of which may be shared. Moreover, explicit use of the term “processor” or “controller” should not be construed to refer exclusively to hardware capable of executing software, and may implicitly include, without limitation, digital signal processor (DSP) hardware, read only memory (ROM) for storing software, random access memory (RAM), and nonvolatile storage.

Other hardware, conventional and/or custom, may also be included. Similarly, any switches shown in the figures are conceptual only. Their function may be carried out through the operation of program logic, through dedicated logic, through the interaction of program control and dedicated logic, or even manually, the particular technique being selectable by the implementer as more specifically understood from the context.

In the claims hereof, any element expressed as a means for performing a specified function is intended to encompass any way of performing that function including, for example, a) a combination of circuit elements that performs that function or b) software in any form, including, therefore, firmware, microcode or the like, combined with appropriate circuitry for executing that software to perform the function. The disclosure as defined by such claims resides in the fact that the functionalities provided by the various recited means are combined and brought together in the manner which the claims call for. It is thus regarded that any means that can provide those functionalities are equivalent to those shown herein.

The proposed method to pair a main device and a secondary device is to use a visual method. In the proposed method, the main device displays a known pattern onto the screen (either a small portion of the screen or the entire screen) for only a few frames. The display of the frames would be fast enough so that it would not be too disruptive to people watching the program, but would be of sufficient duration for the secondary device to detect the pattern. The frames could be should sequentially or spread periodically with the existing program frames. For example, if there were three main ATSC 3.0 receivers, each of the ATSC 3.0 receivers would display a distinctive pattern at the request of the secondary device. The secondary device user would point the devices camera at the desired ATSC 3.0 receiver and capture the pattern that was displayed. The secondary device could then correlate the pattern that it detected with a specific network address and therefore be able to pair with the ATSC 3.0 receiver.

The proposed method provides a method to pair an ATSC 3.0 receiver that is a main device such as a TV with a secondary device such as a cell phone or tablet. The method includes the following steps.

1. The secondary device polls the local area network for any main devices that are ATSC 3.0 receivers.
2. If there is only one, then it is selected and the process stops.
3. If there is more than one main device, then the secondary device user is asked to point the device camera at the display with which a pairing is desired.
4. The secondary device then commands the main device (e.g., ATSC 3.0 receiver) with which the secondary device wants to be paired to display a pattern for a number of frames.
5. The secondary device starts to capture the main display through its camera and looks for a specific pattern. The pattern would be selected so as to minimize the visual disturbance that it would cause to a viewer. This pattern could, for instance, be located in only a corner of the screen, or it could be a simple additive but low level known background noise signal. In any case, the pattern can be can be simple since the only information that needs to be detected is whether the pattern exists (is displayed) or not.
- 6.) When the secondary device detects the pattern, then the secondary device sends a signal to the main device confirming the pairing.

In an alternative embodiment, if the secondary device polls the local area network and there are multiple main devices that are ATSC 3.0 receivers, the secondary device may trigger all of the main devices that are ATSC 3.0 receivers to display a pattern. This could be done in sequence (i.e., one pattern is displayed on TV 1, then on TV 2, etc. or
5 different patterns may be displayed on TV 1, TV 2, etc. but at the same time). The secondary device would determine with which main device a pairing was desired either by the particular pattern the secondary device detected if multiple patterns were used, or by the time at which it detected the pattern if only one pattern was used.

The pattern may be displayed for any number of frames that was required for
10 detection. Pattern display may for one frame or multiple frames. The frames may be in sequence or spaced apart. In any case, the second screen device signals the primary (main) device to display a pattern, which is then captured by the secondary device (second screen) camera. The fewer the frames the better so as to minimize viewing interference.

15 The pattern displayed may be a QR code. The pattern (whatever the pattern is) is only displayed upon demand (command). The pattern may be constructed to blend in with the existing video content being played so that a human would not perceive it when it is being displayed.

Fig. 1 is a flowchart of an exemplary embodiment of the proposed method for
20 pairing a secondary device (second screen) with a main device (ATSC 3.0 receiver). At 105 the secondary device polls the local area network for ATSC 3.0 receivers. At 110 a determination is made if there is more than one ATSC 3.0 receiver available. If there is only one ATSC 3.0 receiver available then at 115 the secondary device (second screen) is paired with the available ATSC 3.0 receiver. If there is more than one ATSC 3.0 receiver
25 available then at 120 the secondary device directs the user to point the camera of the secondary device (second screen) at the screen of the target (desired) ATSC 3.0 receiver and to press a key (such as the record key on the secondary device). The secondary device also directs the ATSC 3.0 receivers via their network connections to display their patterns. At 125 the secondary device scans the display (screen) of the target (desired)
30 ATSC 3.0 receiver. At 130 the secondary device (second screen) determines if a pairing pattern has been detected. If a pairing pattern has been detected then at 135 the secondary

device (second screen) pairs itself with the target device. The secondary device correlates the pattern that it detected with a specific network address and is, therefore, able to pair with the ATSC 3.0 receiver. After 115 or 135 processing ends. If the secondary device (second screen) is not able to detect (correlate) a pairing pattern then at 140 a timer is checked to determine if time for detection has expired. If the detection time has not expired then processing proceeds to 125. If detection time has expired then processing ends.

Fig. 2 is a block diagram of an exemplary embodiment of the proposed secondary device (second screen). The secondary device (second screen) includes a communications interface which is in bi-directional communication with the camera and with the processor. The camera is in bi-directional communication with the processor. The processor is in bi-directional communication with at least one storage area. If there is more than one storage area then one storage area may be used for data and a second storage area may be used to store instructions to directing the operation of the processor. The processor also includes (not shown) a timer. The communications interface of the secondary device polls a local area network for broadcast receivers having network access. The processor determines if there is more than one broadcast receiver having network access and pairs the secondary device with the located broadcast receiver having network access if there is only one broadcast receiver having network access. The processor directs a user to point a camera of the secondary device at a screen of a targeted broadcast receiver having network access and directs the user to press a key of the secondary device. The processor of the secondary device also directs the broadcast receivers having network access to display their patterns. The camera scans a screen of target broadcast receiver having network access. The processor determines if a pattern was detected on the screen of the target broadcast receiver having network access pairs the secondary device with the target broadcast receiver having network access, if the pattern was detected on the broadcast receiver having network access. The processor determines if a timer has expired if the pattern was not detected on the broadcast receiver having network access. The camera ceases to scan if said timer has expired.

It is to be understood that the present invention may be implemented in various forms of hardware, software, firmware, special purpose processors, or a combination thereof. Special purpose processors may include application specific integrated circuits (ASICs), reduced instruction set computers (RISCs) and/or field programmable gate arrays (FPGAs). Preferably, the present invention is implemented as a combination of hardware and software. Moreover, the software is preferably implemented as an application program tangibly embodied on a program storage device. The application program may be uploaded to, and executed by, a machine comprising any suitable architecture. Preferably, the machine is implemented on a computer platform having hardware such as one or more central processing units (CPU), a random access memory (RAM), and input/output (I/O) interface(s). The computer platform also includes an operating system and microinstruction code. The various processes and functions described herein may either be part of the microinstruction code or part of the application program (or a combination thereof), which is executed via the operating system. In addition, various other peripheral devices may be connected to the computer platform such as an additional data storage device and a printing device.

It should be understood that the elements shown in the figures may be implemented in various forms of hardware, software or combinations thereof. Preferably, these elements are implemented in a combination of hardware and software on one or more appropriately programmed general-purpose devices, which may include a processor, memory and input/output interfaces. Herein, the phrase "coupled" is defined to mean directly connected to or indirectly connected with through one or more intermediate components. Such intermediate components may include both hardware and software based components.

It is to be further understood that, because some of the constituent system components and method steps depicted in the accompanying figures are preferably implemented in software, the actual connections between the system components (or the process steps) may differ depending upon the manner in which the present invention is programmed. Given the teachings herein, one of ordinary skill in the related art will be able to contemplate these and similar implementations or configurations of the present invention.

CLAIMS:

1. A method to pair a secondary device with a broadcast receiver having network access, said method comprising:
 - 5 polling a local area network for broadcast receivers having network access;
 - determining if there is more than one broadcast receiver having network access;
 - pairing said secondary device with said located broadcast receiver having network access if there is only one broadcast receiver having network access;
 - 10 directing a user to point a camera of said secondary device at a screen of a targeted broadcast receiver having network access and to press a key of said secondary device;
 - directing said broadcast receivers having network access to display their patterns;
 - 15 scanning screen of target broadcast receiver having network access;
 - determining if a pattern was detected on said screen of said target broadcast receiver having network access; and
 - pairing said secondary device with said target broadcast receiver having network access, if said pattern was detected on said broadcast receiver having network access.
 - 20
2. The method according to claim 1, wherein each broadcast receiver having network access displays a unique pattern.
3. The method according to claim 1, further comprising:
 - 25 determining if a timer has expired if said pattern was not detected on said broadcast receiver having network access; and
 - ceasing to scan if said timer has expired.
4. The method according to claim 1, wherein said broadcast receiver having network access is an ATSC 3.0 compliant receiver.
- 30 5. A secondary device, comprising:

a communications interface, said communications interface polling a local area network for broadcast receivers having network access;

a processor, said processor determining if there is more than one broadcast receiver having network access, said processor in bi-directional communication with said communications interface;

said processor pairing said secondary device with said located broadcast receiver having network access if there is only one broadcast receiver having network access;

said processor directing a user to point a camera of said secondary device at a screen of a targeted broadcast receiver having network access and to press a key of said secondary device, said camera of said secondary device in bi-directional communication with said processor and with said communications interface;

said processor directing said broadcast receivers having network access to display their patterns;

said camera scanning screen of target broadcast receiver having network access;

said processor determining if a pattern was detected on said screen of said target broadcast receiver having network access; and

said processor pairing said secondary device with said target broadcast receiver having network access, if said pattern was detected on said broadcast receiver having network access.

6. The secondary device according to claim 5, wherein each broadcast receiver having network access displays a unique pattern.

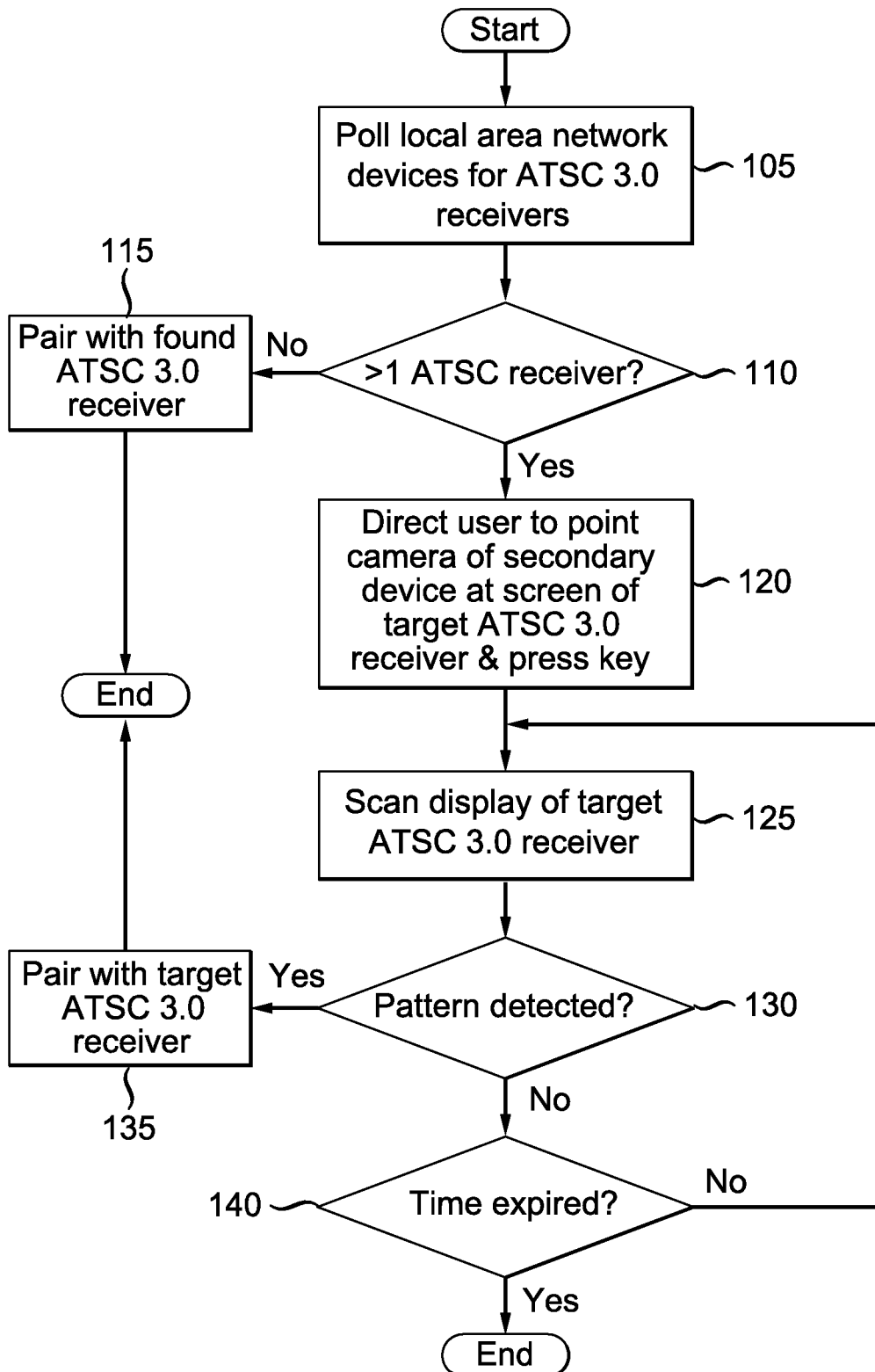
7. The secondary device according to claim 5, further comprising:

said processor determining if a timer has expired if said pattern was not detected on said broadcast receiver having network access; and

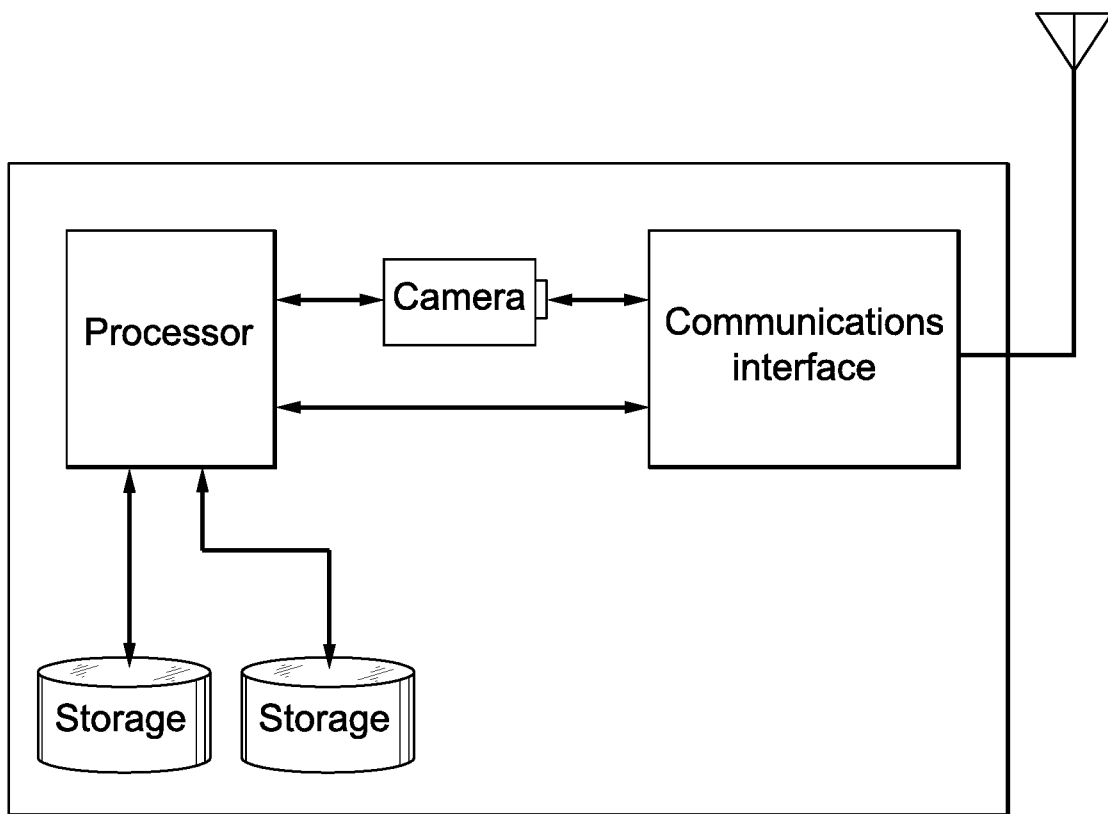
said camera ceasing to scan if said timer has expired.

8. The secondary device according to claim 5, wherein said broadcast receiver having network access is an ATSC 3.0 compliant receiver.

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*FIG. 2*

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/012948

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04H60/80
ADD. H04M1/725

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)
H04M H04H

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	WO 2011/009069 A2 (QUALCOMM INC [US]; GROB MATTHEW S [US]; DIAZ SPINDOLA SERAFIN [US]; WR) 20 January 2011 (2011-01-20) paragraphs [0005], [0006], [0023] - [0028], [0034] - [0046] -----	1-8
A	US 2014/196023 A1 (BOUTHILLIER ROBERT J [US] ET AL) 10 July 2014 (2014-07-10) paragraphs [0020] - [0023], [0051] - [0058]; figure 12 -----	1-8
A	EP 1 551 140 A1 (NOKIA CORP [FI]) 6 July 2005 (2005-07-06) paragraphs [0037] - [0043] -----	1-8



Further documents are listed in the continuation of Box C.



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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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