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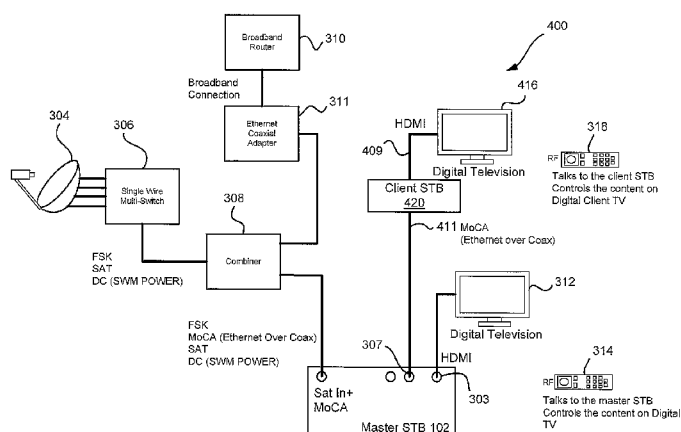
(54) **Title:** SYSTEM AND METHOD FOR REMOTE CONTROL AUTOMATIC PAIRING

FIG. 4

(57) **Abstract:** A system and method for RF remote control automatic pairing are provided. The present disclosure relates to changing the "pairing operation" of a remote control device (318) (e.g., an RF remote control device) from a master or gateway set top box (102) to a client, slave, or remote location set top box (420). The system and method provide for determining (606) if a client device is added to a network, the client device used for receiving content from a gateway device through the network, transmitting (608) a signal to the client device if it is determined that the client device has been added, the signal indicating that the client device should initiate a pairing operation with a remote control device, and initiating an unpairing (614) of the gateway device with the remote control device after the pairing of the client device with the remote control device.

SYSTEM AND METHOD FOR REMOTE CONTROL AUTOMATIC PAIRING

CROSS-TO RELATED APPLICATION

5 This application claims the benefit of U.S. Provisional Application Serial No. 62/003,722, filed on May 28, 2014, which is incorporated by reference herein its entirety.

TECHNICAL FIELD

10 The present disclosure generally relates to digital content systems and methods for controlling components of such systems, and more particularly, to a system and method for remote control automatic pairing.

BACKGROUND

15 Home entertainment systems, including television, media centers and mobile devices, are converging with the Internet and providing access to a large number of available sources of content, such as video, movies, TV programs, music, etc. To provide this large volume of content to a plurality of users, for example, in a residence, multiple devices such as televisions may be provided in a single location. Each television may be provided in a different room of the residence so that different
20 users may view different content such as movies, TV programs, etc.

Typically, each television will require a set top box to receive signals from a television service provider, such as satellite and cable television providers. Each set top box may additionally require some type of input device, such as a remote control
25 device, to operate the set top box and navigate through the content. Typically, each remote control device is paired to a specific set top box. When the set top box needs replacement, for example, upon repair of the set top box, upon upgrading the set top box, or upon upgrading to a digital television, the associated remote control device will be need to be paired to the new set top box. In some instances, this is a laborious
30 task for the end user.

Therefore, a need exists for techniques for automatically pairing a remote control device to a set top box with little or no input from a user.

SUMMARY

According to one aspect of the present disclosure, a method for changing the operation of a remote control device used with a gateway device is provided. The method includes determining if a client device is added to a network, the client device
5 used for receiving content from a gateway device through the network, transmitting a signal to the client device if it is determined that the client device has been added, the signal indicating that the client device should initiate a pairing operation with a remote control device, and initiating an unpairing of the gateway device with the remote control device after the pairing of the client device with the remote control device.

10 According to another aspect of the present disclosure, a gateway device coupled to a network is provided. The gateway device is configured to provide content to the network, wherein the gateway device includes a controller configured to determine if a client device is added to the network, the client device used for
15 receiving content from the gateway device, and an external communication interface configured to transmit a signal to the client device if it is determined that the client device has been added, the signal indicating that the client device should initiate a pairing operation with the remote control device. The controller further initiates an unpairing with the remote control device after the pairing of the client device with the
20 remote control device.

BRIEF DESCRIPTION OF THE DRAWINGS

25 These, and other aspects, features and advantages of the present disclosure will be described or become apparent from the following description of the embodiments, which is to be read in connection with the accompanying drawings.

In the drawings, wherein like reference numerals denote similar elements
30 throughout the views:

FIG. 1 is a block diagram of an exemplary system for receiving signals in accordance with the present disclosure;

FIG. 2A is a perspective view of an exemplary remote controller in accordance with an embodiment of the present disclosure;

FIG. 2B is a perspective view of a touch panel or interface in accordance with the present disclosure;

FIG. 3 illustrates an exemplary embodiment of a system for receiving signals where at least two remote control devices are paired to a master or gateway set top box in accordance with the present disclosure;

FIG. 4 illustrates an exemplary embodiment of a system for receiving signals where at least two remote control devices are paired to separate corresponding devices in accordance with the present disclosure;

FIG. 5 is a block diagram of an exemplary system for automatic pairing of a remote control device in accordance with the present disclosure; and

FIG. 6 is a flowchart of an exemplary method for automatic pairing of a remote control device in accordance with an embodiment of the present disclosure.

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

DESCRIPTION OF EMBODIMENTS

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.

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 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 pedagogical 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 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 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 system components and/or circuitry embodying the principles of the disclosure. Similarly, it will be appreciated that any flow charts, flow diagrams, state transition diagrams, pseudocode, 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", "module" 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.

5 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
10 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
15 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
20 that can provide those functionalities are equivalent to those shown herein.

 Initially, systems for receiving a signal and providing content to a user will be described. Subsequently, methods for automatic pairing of a remote control device in accordance with embodiments of the present disclosure will then be detailed.
25 Further, although the embodiments described below primarily relate to signals provided by either a satellite or terrestrial signal service provider, one skilled in the art could easily adapt the present embodiments encompassing the principles of the present disclosure to operate with signals from a cable, digital subscriber line (DSL), or other signal service provider that is used in conjunction with a home network signal
30 distribution system.

 Turning now to the drawings and referring initially to FIG. 1, an exemplary embodiment of a system 100 for receiving signals using aspects of the present

disclosure is shown. System 100 primarily receives signals from one or more satellites as well as multiple television broadcast transmission sites. The signals are provided by one or more service providers and represent broadcast audio and video programs and content. System 100 is described as including components that reside
5 both inside and outside a user's premises. It is important to note that one or more components in system 100 may be moved from inside to outside the premises. Further, one or more components may be integrated with a display device, such as a television or display monitor (not shown). In either case, several components and interconnections necessary for complete operation of system 100 are not shown in
10 the interest of conciseness, as the components not shown are well known to those skilled in the art.

An outdoor unit (ODU) 101 receives signals from satellites and from terrestrial transmission towers through an over the air and/or near earth orbit communications
15 link. ODU 101 is connected to set top box 102. Within set top box 102, the input is connected to filter 103. Filter 103 connects to three signal processing paths. A first path includes tuner 105, link circuit 106, and transport decoder 108 connected together serially. A second path includes tuner 110, link circuit 112, and transport decoder 114 connected together serially. A third path includes MoCA circuit 134
20 which further connects to controller 116. The outputs of transport decoder 108 and transport decoder 114 each connect to controller 116. Controller 116 connects to security interface 118, external communication interface 120, user panel 122, remote control transceiver 124, audio/video output 126, power supply 128, memory 130, and ODU control 132. External communication interface 120, remote control transceiver
25 124, audio/video output 126, and power supply 128 provide external interfaces for the set top box 102. ODU control 132 also connects to the filter 103.

Satellite signal streams, each containing a plurality of channels, are received by ODU 101. ODU 101 includes a dish for capturing and focusing the propagated
30 radio wave from the atmosphere onto one or more antennas contained within a structure known as a low noise block converter (LNB). ODU 101 may be configured to receive the signal streams from satellite transponders located on one or more satellites. In a preferred embodiment, two sets of sixteen channels are received by ODU 101, and converted, using one or more LNBs to a frequency range of 950

Megahertz (MHz) to 2,150 MHz, referred to as L-band. ODU 101 also includes a terrestrial antenna for receiving over the air broadcasts. In a preferred embodiment, ODU 101 includes a multiple element antenna array for receiving ISDBT signals in the frequency range from 170 MHz to 800 MHz.

5

ODU 101 provides a converted signal stream to the set top box 102 through radio frequency (RF) co-axial cable. The converted signal stream is provided to filter 103. In a preferred embodiment, filter 103 operates as a multiplex filter with up to three separate filter sections or interfaces. The frequency response properties of filter 103 may include a separate highpass filter and lowpass filter such that the frequency passbands of each do not overlap. The arrangement, often referred to as a diplexer or diplex filter, allows for a separation, through signal filtering, of the incoming satellite signal and/or MoCA signal from the terrestrial signal and/or MoCA signal. In a preferred embodiment, the low pass filter frequency response pass band ends at a frequency below 900 MHz. The low pass filter portion allows a MoCA signal in a frequency range from 475 MHz to 625 MHz as well as a terrestrial signal in the frequency range from 170 MHz to 800 MHz to pass through to subsequent blocks while attenuating, or not passing through, a satellite signal in a frequency range from 950 MHz to 2,150 MHz. The high pass filter portion operates in an opposite manner passing the MoCA signal, in the frequency range around 1100 MHz, along with the satellite signal through and attenuating cable or terrestrial broadcast signal. The high pass filter portion may also filter any electrical supply or communication signals provided to the ODU 101. An additional bandpass filter circuit may be provided to further process MoCA signals and provide the signals as an output to a home MoCA network or for processing in set top box 102. Other embodiments may be possible and some of these embodiments are described in further detail below. Filter 103 may also include surge or transient voltage protection devices.

The output signal from the high pass filter portion of filter 103 is provided to a first signal path containing a tuner 105, a link circuit 106, and a transport decoder 108 connected in a serial fashion. The output signal from the low pass filter portion of the filter 103 is provided to a second signal path. The second signal path also contains a tuner 110, a link circuit 112, and a transport decoder 114 connected in a serial

fashion. Each processing path may perform similar processing on the filtered signal streams, the processing being specific to the transmission protocol used.

5 Tuner 105 processes the split signal stream by selecting or tuning one of the channels provided from a satellite service provider in the highpass filtered signal stream to produce one or more baseband signals. Tuner 105 contains circuits (e.g., amplifiers, filters, mixers, and oscillators) for amplifying, filtering and frequency converting the satellite signal stream. Tuner 105 typically is controlled or adjusted by link circuit 106. Alternately, tuner 105 may be controlled by another controller, such
10 as controller 116, which will be described later. The control commands include commands for changing the frequency of an oscillator used with a mixer in tuner 105 to perform the frequency conversion.

15 Tuner 110 processes the lowpass filtered signal stream by selecting or tuning one of the terrestrial or cable broadcast channels in the split signal stream to produce one or more baseband signals. Tuner 110 contains circuits (e.g., amplifiers, filters, mixers, and oscillators) for amplifying, filtering and frequency converting the signal stream. Tuner 110 may controlled or adjusted in a manner similar to that described earlier for tuner 105.

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Typically, the baseband signals at the output of tuner 105 or tuner 110 may collectively be referred to as the desired received signal and represent one satellite channel selected out of a group of channels that were received as the input signal stream. Although the signal is described as a baseband signal, this signal may
25 actually be positioned at a frequency that is only near to baseband.

The one or more baseband signals from the satellite service provider are provided to link circuit 106 through tuner 105. Link circuit 106 typically contains the processing circuits needed to convert the one or more baseband signals into a digital
30 signal for demodulation by the remaining circuitry of link circuit 106. In one embodiment, the digital signal may represent a digital version of the one or more baseband signals. In another embodiment, the digital signal may represent the vector form of the one or more baseband signals. Link circuit 106 also demodulates and performs error correction on the digital signal from the satellite service provider to

produce a transport signal. The transport signal may represent a data stream for one program, often referred to as a single program transport streams (SPTS), or it may represent multiple program streams multiplexed together, referred to as a multiple program transport stream (MPTS).

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The one or more baseband signals from the broadcast service provider are provided to link circuit 112 through tuner 110. Link circuit 112 typically contains the processing circuits needed to convert the one or more baseband signals into a digital signal for demodulation by the remaining circuitry of link circuit 112 in a manner similar to link circuit 106 described earlier. Link circuit 112 also demodulates, performs broadcast channel equalization error correction on the digital signal from the broadcast service provider to produce a transport signal. As described earlier, the transport signal may represent a data stream for one program or it may represent multiple program streams multiplexed together.

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The transport signal from link circuit 106 is provided to transport decoder 108. Transport decoder 108 typically separates the transport signal, which is provided as either a SPTS or MPTS, into individual program streams and control signals. Transport decoder 108 also decodes the program streams, and creates audio and video signals from these decoded program streams. In one embodiment, transport decoder 108 is directed by user inputs or through a controller such as controller 116 to decode only the one program stream that has been selected by a user and create only one audio and video signal corresponding to this one decoded program stream. In another embodiment, transport decoder 108 may be directed to decode all of the available program streams and then create one more audio and video signals depending on user request.

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The transport signal from link circuit 112 is similarly provided to transport decoder 114. Transport decoder 114 decodes the program streams, and creates audio and video signals from these decoded program streams as directed by user inputs or a controller in a manner similar to that described earlier for transport decoder 108.

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The audio and video signals, along with any necessary control signals, from both transport decoder 108 and transport decoder 114 are provided to controller 116. Controller 116 manages the routing and interfacing of the audio, video, and control signals and, further, controls various functions within set top box 102. For example, 5 the audio and video signals from transport decoder 108 may be routed through controller 116 to an audio/video (A/V) output 126. A/V output 126 supplies the audio and video signals from set top box 102 for use by external devices (e.g., televisions, display monitors, and computers). It is to be appreciated that the audio/video output 126 may include more than one physical output connector, e.g., an analog output, a 10 high definition multimedia (HDMI) output, etc. Also, the audio and video signals from transport decoder 114 may be routed through controller 116 to memory block 130 for recording and storage.

Memory block 130 may contain several forms of memory including one or 15 more large capacity integrated electronic memories, such as static random access memory (SRAM), dynamic RAM (DRAM), or hard storage media, such as a hard disk drive or an interchangeable optical disk storage system (e.g., compact disk drive or digital video disk drive). Memory block 130 may include a memory section for storage of instructions and data used by controller 116 as well as a memory section 20 for audio and video signal storage. Controller 116 may also allow storage of signals in memory block 130 in an alternate form (e.g., an MPTS or SPTS from transport decoder 108 or transport decoder 114).

Controller 116 is also connected to an external communications interface 120. 25 External communication interface 120 may provide signals for establishing billing and use of the service provider content. External communications interface 120 may include a phone modem for providing phone connection to a service provider. External communications interface 120 may also include an interface for connection to an Ethernet network and/or to home wireless communications network. The 30 Ethernet network and/or home wireless network may be used for communicating data, audio, and/or video signals and content to and from other devices connected to the Ethernet network and/or home wireless network (e.g., other media devices in a home). In one embodiment, the external communications interface 120

communicates data, audio, and/or video signals and content to and from at least one client device, e.g., a client set top box.

Controller 116 also connects to a security interface 118 for communicating
5 signals that manage and authorize use of the audio/video signals and for preventing unauthorized use. Security interface 118 may include a removable security device, such as a smart card. User control is accomplished through user panel 122, for providing a direct input of user commands to control the set top box and remote control transceiver 124, for sending and receiving commands to and from an external
10 remote control device. Although not shown, controller 116 may also connect to the tuners 105, 110, link circuits 106, 112, and transport decoders 108, 114 to provide initialization and set-up information in addition to passing control information between the blocks. Finally, power supply 128 typically connects to all of the blocks in set top box 102 and supplies the power to those blocks as well as providing power to any of
15 the elements needing power externally, such as the ODU 101.

Controller 116 also controls ODU control 132. ODU control 132 provides signaling and power supply electrical power back to the ODU 101 through filter 103. ODU control 132 provides these signals and power onto the co-axial cable(s) running
20 between ODU 101 and set top box 102. In one embodiment, the ODU control 132 receives input control signals from controller 116 and provides different DC voltage levels to specific portions of the ODU 101 to provide a certain signal stream containing a set of programs or content to filter 103 and further to tuner 105 and tuner 110. In another embodiment, the ODU control 132 receives inputs from controller
25 116 and also from link circuit 106 and link circuit 112 and provides DC voltage levels and a separate tuning control signal to ODU 101 using low frequency carrier based frequency shift keying modulation. Controller 116 also may send control commands to disable ODU controller 130 from providing either direct current (DC) voltages or control signals to ODU 101.

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MoCA circuit 134 amplifies and processes the MoCA signal both for reception and transmission. As described above the MoCA interface permits communications of audio and video signals in a home network and may operate bi-directionally. MoCA circuit 134 includes a low noise amplifier for improving reception performance

of a MoCA signal received by signal receiving device 100 from another network connected device. The received and amplified signal is tuned, demodulated, and decoded. The decoded signal may be provided to a number of other circuits, including audio and video outputs as well as a mass storage device (e.g., hard disk drive, optical drive, and the like), not shown. Additionally, MoCA circuit 134 generates and formats the MoCA transmit signal using audio and video content available in signal receiving device, including content received from the input (e.g., satellite signal) and content from the mass storage device. MoCA circuit 134 also includes a power amplifier for increasing the transmitted signal level of the MoCA signal sent by signal receiving device 100 to another network connected device. Adjustment of the receive signal amplification as well as the transmit signal amplification in MoCA circuit 134 may be controlled by controller 116.

It should be appreciated by one skilled in the art that the blocks described inside set top box 102 have important interrelations, and some blocks may be combined and/or rearranged and still provide the same basic overall functionality. For example, transport decoder 108 and transport decoder 114 may be combined and further integrated along with some or all of the functions of controller 116 into a System on a Chip (SoC) that operates as the main controller for set top box 102. Further, control of various functions may be distributed or allocated based on specific design applications and requirements. As an example, link circuit 106 may provide control signals to ODU control 132 and no connection may exist between link circuit 112 and ODU control 132.

Further, it should be appreciated although ODU 101 includes both a dish and LNB for use with satellite signals and a terrestrial antenna, other embodiments may use separate structures. In some embodiments, the satellite dish and LNB and included in one structure and the terrestrial antenna is part of a second structure. The outputs of both satellite dish/LNB structure and terrestrial antenna are combined using a signal combining circuit and provided to set top box 102.

Although set top box 102 is described above as receiving a single converted signal stream, set top box 102 may also be configured to receive two or more separate converted signal streams supplied by ODU 101 in some modes of

operation. Operation in these modes may include additional components including switches and/or further tuning and signal receiving components, not shown. Additionally, set top 102 may be configured to operate as a home gateway or master device that interfaces signals between an external service provider and client devices
5 connected to a home network. Further, set top box 102 may be designed to operate only on the home network as a client device using the MoCA, Ethernet or home wireless network interfaces described above. In this case, the elements associated with operation with the ODU 101 as well as either the MoCA and/or Ethernet network may be removed from set top box 102.

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To operate effectively, the set top box 102 of the present disclosure employs an input device such as a remote control device to input commands, make selections, etc. Alternatively, a mouse device, a remote control with navigation features, or gesture based remote control may also be used, as will be described below.

15

In one embodiment, the input device is a remote control device, with a form of motion detection, such as a gyroscope or accelerometer, which allows the user to move a cursor freely about a screen or display. An exemplary hand-held angle-sensing remote control 200 is illustrated in FIG. 2A. Remote controller 200 includes a
20 thumb button 202, positioned on the top side of controller 200 so as to be selectively activated by a user's thumb. Activation of thumb button 202 will also be referred to as a "click," a command often associated with activation or launch of a selected function. Controller 200 further includes a trigger button 204, positioned on the bottom side of controller 200 so as to be selectively activated by a user's index (or
25 "trigger") finger. Activation of trigger button 204 will also be referred to as a "trigger," and angular movement (i.e. pitch, yaw and/or roll) of the controller 200 while the trigger is depressed will be referred to as a "trigger-drag." A trigger-drag command is often associated with movement of a cursor, virtual cursor or other indication of the user's interactive position on the display, such as a change of state (i.e., a highlighted
30 or outlined cell), and is commonly used to navigate in and select entries from the interactive display. Additionally, a plurality of buttons 206 are provided for entering numbers and/or letters. In one embodiment, the plurality of buttons 206 are configured similar to a telephone-type keypad.

The use of a hand-held angle-sensing remote controller provides for a number of types of user interaction. When using an angle-sensing controller, changes in yaw map to left-and-right motions, changes in pitch map to up-and-down motions and changes in roll map to rotational motions along a longitudinal axis of the controller. These inputs are used to define gestures and the gestures, in turn, define specific contextual commands. As such, a combination of yaw and pitch can be used to define any 2-dimensional motion, such as a diagonal, and a combination of yaw, pitch and roll can be used to define any 3-dimensional motion, such as a swing.

To further enhance the user experience and to facilitate the display of, and navigation around, a database such as a movie library, a touch panel device 220 may be interfaced to the set top box 102 as shown in FIG. 2B. The touch panel device 220 allows operation of the set top box 102 based on hand movements, or gestures, and actions translated through the panel into commands for the receiving device. In one embodiment, the touch panel 220 may simply serve as a navigational tool to navigate a collection of items such as movie posters. In other embodiments, the touch panel 220 will additionally serve as the display device allowing the user to more directly interact with the navigation through the display of content.

It is to be appreciated that at least some of the components described above in relation to FIGS. 1-2 will form an apparatus and/or system for automatic paring with a remote control device.

Referring to FIG. 3, an exemplary embodiment of a system 300 for receiving signals where at least two remote control devices are paired to a master or gateway set top box in accordance with the present disclosure is illustrated. In FIG. 3, an outdoor unit (ODU) 304 receives a signal and provides the signal to a single wire multi-switch 306. The single wire multi-switch 306 selects which of a plurality of transponders is to be used and outputs the selected signal to a satellite source signal combiner 308. A router 310 receives broadband communication signals and transmits the broadband communication signals to the combiner 310 via an Ethernet coaxial adapter 311. The combiner 310 receives the satellite source and broadband

communication signals and combines the inputs to generate a MoCA compliant signal which is fed to the master or gateway set top box (STB) 102. As described above in relation to FIG. 1, the master set top box 102 provides content to various devices. FIG. 3 illustrates a two room viewing installation wherein the broadcast
5 signal is provided by a satellite provider; however, other television service providers may be employed, e.g., a cable television service provider, and more than two televisions may be utilized.

In FIG. 3, the master set top box 102 is configured as a master server or
10 gateway. The set top box 102 is coupled to display device 312, e.g., a high definition television, via an audio/video output 126 and corresponding connector 303, e.g., a HDMI output port. Remote control device 314 is paired to master set top box 102 and controls the content displayed on display device 312. Master set top box 102 further includes an analog output 305 which is coupled to a second display device 316, e.g.,
15 an analog television. A second remote control device 318 is paired to the master set top box 102 for controlling the content displayed on the second display device 316. It is to be appreciated that the remote control devices 314, 318 are configured to send commands to the master set top box 102 for controlling operation thereof, for example, changing a channel of programming being displayed, activating a digital
20 video recorder (DVR) function, navigating a library of stored content, etc. The remote control devices may be configured in the form factor described above in relation to FIGS. 2A and 2B, although other form factors are contemplated for use by the present disclosure. Additionally, the remote control devices 314, 318 use radio frequency (RF) transmissions operating under one or more standards including, but
25 not limited to, Bluetooth Audio/Video Remote Control Profile (AVRCP), ZigBee Radio Frequency for Consumer Electronics (RF4CE), Z-Wave, etc. However, other wireless communication protocols may be used such as WiFi, infrared, etc.

Referring to FIG. 4, an exemplary embodiment of a system 400 for receiving
30 signals where at least two remote control devices are paired to separate corresponding devices in accordance with the present disclosure is illustrated. FIG. 4 represents the situation where a user of the system 300 in FIG. 3 upgrades the analog television 316 to a digital television 416. In the system 400, a digital client set top box 420 is provided to control operation of the digital television 416 and provide

content to the digital television 416 via digital output 409, e.g., a HDMI output. The client set top box 420 is coupled to the master or gateway set top box 102 via a MoCA compliant transmission medium 411, i.e., a broadcast network. In one embodiment, the transmission medium 411 is coupled to the master or gateway set top box 102 via the external communication interface 120 and a compatible connector 307 (e.g., an Ethernet port, a registered jack (RJ) type 45 connector, etc). Components of system 400 that are labeled the same as components of system 300 perform substantially the same function and their description will not be repeated for conciseness.

Instead of providing a new remote control device for digital client set top box 420, the remote control device 318 will be unpaired from the master or gateway set top box 102 and paired to digital client set top box 420. A method for automatic pairing of a remote control device in accordance with the present disclosure will now be described in relation to FIGS. 5 and 6, where FIG. 5 is a block diagram of a digital client set top box illustrating system components for automatic pairing of a remote control device and FIG. 6 is a flow chart illustrating an exemplary method for automatic pairing of a remote control device.

Referring to FIG. 5, the digital client set top box 420 includes an external communication interface 520 for interfacing with the master or gateway set top box 102 over the broadcast network, i.e., the MoCA compliant transmission medium. Controller 516 controls the content provided to the digital television 416 via audio/video output 509 and communications to remote control device 318 via transceiver 524. A memory 530 is provided for storing executable instructions and at least one identification code of a remote control device. In one embodiment, the memory 530 stores programming codes for a remote control device.

The remote control device 318 includes a controller 542 configured to receive commands from a user via input device 546 disposed on a housing of the remote control device 318 and output such commands to the digital set top box 420 via transceiver 540. It is to be appreciated that transceiver 540 may receive commands or instructions from the master or gateway set top box 102 and/or the digital set top box 420. A memory 544 is provided for storing executable instructions and an

identification code of a remote control device 318. A power supply 548, e.g., a battery, provides power to the transceiver 540, controller 542, memory 544 and input device 546 as needed.

5 Referring to FIG. 6, initially in step 602, the client set top box 420 is coupled to the master or gateway set top box 102 via the external communication interface 520 over the broadcast network. Next, in step 604, the master set top box 102 is cycled off and on to detect the presence of the client set top box 420 on the broadcast network. The controller 116 of the master set top box 102 recognizes the client set
10 top box, step 606. It is to be appreciated that the recognition of the client set top box 420 by the controller 116 of the master or gateway set top box 102 may be by autodiscovery in accordance with the Digital Living Network Alliance (DLNA) standard. For example, in the DLNA standard, Universal Plug and Play (UPnP) protocols are employed to assign an IP address to a new client device, via AutoIP as
15 defined in the UPnP Device Architecture, and then, using Simple Service Discovery Protocol (SSDP), the new client device broadcasts its services to other devices on the network to be discovered by the other devices. However, other protocols may be employed. In certain embodiments, the cycling of the master set top box 102 may not be necessary and therefore, step 604 may be optional.

20

Once the master set top box 102 has recognized the client set top box 420, the external communication interface 120 of the master set top box 102 transmits a signal to the client set top box 420 to enter into a pairing mode, step 608. In one embodiment, the signal sent to the client set top box 420 includes an identification
25 code of the remote control device 318. Next, in step 610, the remote control transceiver 124 of the master set top box 102 transmits a signal to the remote control device 318 to also enter a pairing mode. In one embodiment, the remote control device 318 retrieves from memory 544 a unique identification code and, during the pairing operation, transmits the identification code to the client set top box 420. The
30 client set top box 420 then determines if the code received from the master set top box 102 matches the code received from the remote control device 318. If the two codes match, the pairing operation will proceed.

In one embodiment, after the master or gateway set top box 102 transmits a signal to the client set top box 420 to enter into a pairing mode in step 608, the client set top box 420 outputs for display on the digital television 416 an indication to a user that the client set top box 420 is in a pairing mode. Subsequently, the client set top box 420 will prompt the user to provide an input to the remote control device 318, e.g., requesting the user to select a predetermined key on the remote control device. The client set top box 420 then acknowledges and outputs for display on the digital television 416 that it has received a signal from a remote control device to be paired with the client set top box 420. The pairing operation will then proceed as below. It is to be appreciated that in this embodiment, the master set top box 102 will not send a signal for pairing to the remote control device 318 and step 610 may be omitted.

In step 612, the client set top box 420 determines if the pairing operation is complete. If the pairing operation is complete, the client set top box 420 displays on the digital television 416 that the pairing operation was successful, step 614. Otherwise, the client set top box 420 outputs for display on the digital television 416 that the pairing operation was unsuccessful, step 616. Upon a successful pairing operation, at step 614, the client set top box 420 may also transmit a signal to the external communication interface 120 of the master or gateway set top box 102 that the pairing operation was successful. Further, at step 614, the controller 116 of the master set top box 102 will then unpair from the remote control device 318.

In one embodiment, the pairing operation may include the client set top box 420 programming the remote control device 318 for use thereof. In this embodiment, the controller 516 of the client set top box 420 retrieves from memory 530 programming codes for the remote control device 318. The programming codes are transmitted via the transceiver 524 to the remote control device 318. The transceiver 540 of the remote control device 318 receives the programming codes and the controller 542 stores the programming codes in memory 544 for use when commanding the client set top box 420.

The principles of the present disclosure may also be applied to the replacement of an existing client set top box. In one embodiment, while pairing information (e.g., a unique identifier code or other identification as used by RF4CE) is

typically stored in the client set top box for the pairing of a remote control device to that set top box, this pairing information may also be sent and stored in the master or gateway set top box. In this embodiment, the master set top box can be used to update a replacement client set top box. For example, if the master set top box
5 recognizes a new client set top box is on the network, the master set top box can send a notification to the client set top box to output for display a message such as, "Is this a replacement device?" After the prompt, the user enters an input on the client set top box (e.g., press the OK button on client set top box) affirming that it is a replacement. The client set top box then sends to the master set top box a request
10 to send the identification information. The new client set top box is then paired to the previous remote control device. It is also possible, as an alternative, to have the master set top box recognize the new client set top box, determine which previous client set top box is not active or otherwise on the network and send the stored identification for this previous client set top box to the new client set top box. The
15 master set top box may also request that the new client set top box output for display a prompt to confirm that the pairing of this remote is correct.

A system, apparatus, and method for RF remote control automatic pairing are described herein. The present disclosure relates to changing the "pairing operation"
20 of a remote control device (e.g., an RF remote control device) from a master or gateway set top box to a client, slave, or remote location set top box. The system, apparatus, and method provide for determining whether a client set top box has been added for use with a gateway set top box where the remote control device at the location for the client set top box was previously used for controlling (or "paired" to)
25 the gateway set top box. If the gateway set top box determines that a client set top box has been added, the gateway set top box sends a command to the client set top box to "pair" that remote control device to the client set top box. The system, apparatus, and method optionally include a manual or automatic operation for pairing and for indicating success or failure of the pairing operation.

30 It is to be appreciated that the various features shown and described are interchangeable, that is a feature shown in one embodiment may be incorporated into another embodiment.

Although embodiments which incorporate the teachings of the present disclosure have been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings. Having described preferred embodiments of a system, apparatus, and
5 method for automatic pairing of a remote control device (which are intended to be illustrative and not limiting), it is noted that modifications and variations can be made by persons skilled in the art in light of the above teachings. It is therefore to be understood that changes may be made in the particular embodiments of the disclosure disclosed which are within the scope of the disclosure as outlined by the
10 appended claims.

WHAT IS CLAIMED IS:

1. A method, comprising:
determining (606) if a client device is added to a network, the client device
5 used for receiving content from a gateway device through the network;
transmitting (608) a signal to the client device if it is determined that the client
device is added, the signal indicating that the client device should initiate a pairing
operation with a remote control device; and
initiating an unpairing of the gateway device with the remote control device
10 after the pairing of the client device with the remote control device.
2. The method of claim 1, further comprising transmitting (610) a second signal to
the remote control device, the second signal indicating that the remote control device
should initiate a pairing operation with the client device.
15
3. The method of claim 1, wherein the determining (606) if the client device is
added to the network is performed using an auto-discovery function.
4. The method of claim 3, wherein the auto-discovery function is in accordance
20 with the Digital Living Network Alliance (DLNA) standard.
5. The method of claim 1, wherein the gateway device is paired with the remote
control device before the client device initiates the pairing with the remote control
device.
25
6. The method of claim 1, further comprising upon pairing of the client device with
the remote control device, outputting (614) a message for display on a display device
coupled to the client device that the pairing operation is complete.
- 30 7. The method of claim 1, further comprising receiving a signal from the client
device that the pairing operation is complete.

8. The method of claim 1, further comprising outputting a prompt for display on a display device coupled to the client device, the prompt requesting an input from the remote control device.

5 9. The method of claim 1, further comprising transmitting an identification code of the remote control device to the client device.

10. The method of claim 1, further comprising transmitting programming codes to the remote control device from the client device.

10

11. A gateway device (102), comprising:

a controller (116) configured to determine if a client device (420) is added to the network, the client device (420) used for receiving content from the gateway device (102); and

15 an external communication interface (120) configured to transmit a signal to the client device (420) if it is determined that the client device (420) is added, the signal indicating that the client device (420) should initiate a pairing operation with the remote control device (318),

20 wherein the controller (116) further initiates an unpairing with the remote control device after the pairing of the client device with the remote control device.

12. The gateway device (102) of claim 11, further comprising a remote control transceiver (124) configured to transmit a second signal to the remote control device (318), the second signal indicating that the remote control device (318) should initiate
25 a pairing operation with the client device (420).

13. The gateway device (102) of claim 11, wherein the controller (116) is configured to determine if the client device (420) is added to the network using an auto-discovery function.

30

14. The gateway device (102) of claim 13, wherein the auto-discovery function is in accordance with a Digital Living Network Alliance (DLNA) protocol.

15. The gateway device (102) of claim 11, wherein the gateway device is paired with the remote control device before the client device initiates the pairing with the remote control device.

5 16. The gateway device (102) of claim 11, wherein upon pairing of the client device with the remote control device, the client device outputs a message for display that the pairing operation is complete.

10 17. The gateway device (102) of claim 11, wherein the external communication interface (120) receives a signal from the client device (420) that the pairing operation is complete.

15 18. The gateway device (102) of claim 11, wherein the client device outputs a prompt for display on a display device, the prompt requesting an input from the remote control device (318).

19. The gateway device (102) of claim 11, wherein the external communication interface (120) transmits an identification code of the remote control device (318) to the client device (420).

20

20. The gateway device (102) of claim 1, wherein the external communication interface (120) is further configured to transmit programming codes to the remote control device (318) from the client device (420).

25 21. A gateway device (102), comprising:
means for determining (116) if a client device (420) is added to a network including a gateway device (102), the client device (420) used for receiving content from the gateway device (102);
means for transmitting (120) a signal to the client device (420) if it is
30 determined that the client device (420) is added, the signal indicating that the client device (420) should initiate a pairing operation with the remote control device (318);
and
means for initiating an unpairing with the remote control device after the pairing of the client device with the remote control device.

22. The gateway device (102) of claim 21, further comprising means for transmitting (124) a second signal to the remote control device (318), the second signal indicating that the remote control device (318) should initiate a pairing operation with the client device (420).

23. The gateway device (102) of claim 21, wherein the determining if the client device is added to the network (606) is performed using an auto-discovery function.

24. The gateway device (102) of claim 23, wherein the auto-discovery function is in accordance with a Digital Living Network Alliance (DLNA) standard.

25. The gateway device (102) of claim 21, wherein the gateway device (102) is paired with the remote control device before the client device initiates the pairing with the remote control device.

26. The gateway device (102) of claim 21, wherein upon pairing of the client device with the remote control device, the client device outputs a message for display that the pairing operation is complete.

27. The gateway device (102) of claim 21, further comprising means for receiving a signal from the client device that the pairing operation is complete.

28. The gateway device (102) of claim 21, wherein the client device outputs a prompt for display on a display device, the prompt requesting an input from the remote control device (318).

29. The gateway device (102) of claim 21, further comprising means for transmitting an identification code of the remote control device to the client device.

30. The gateway device (102) of claim 21, further comprising means for transmitting programming codes to the remote control device from the client device.

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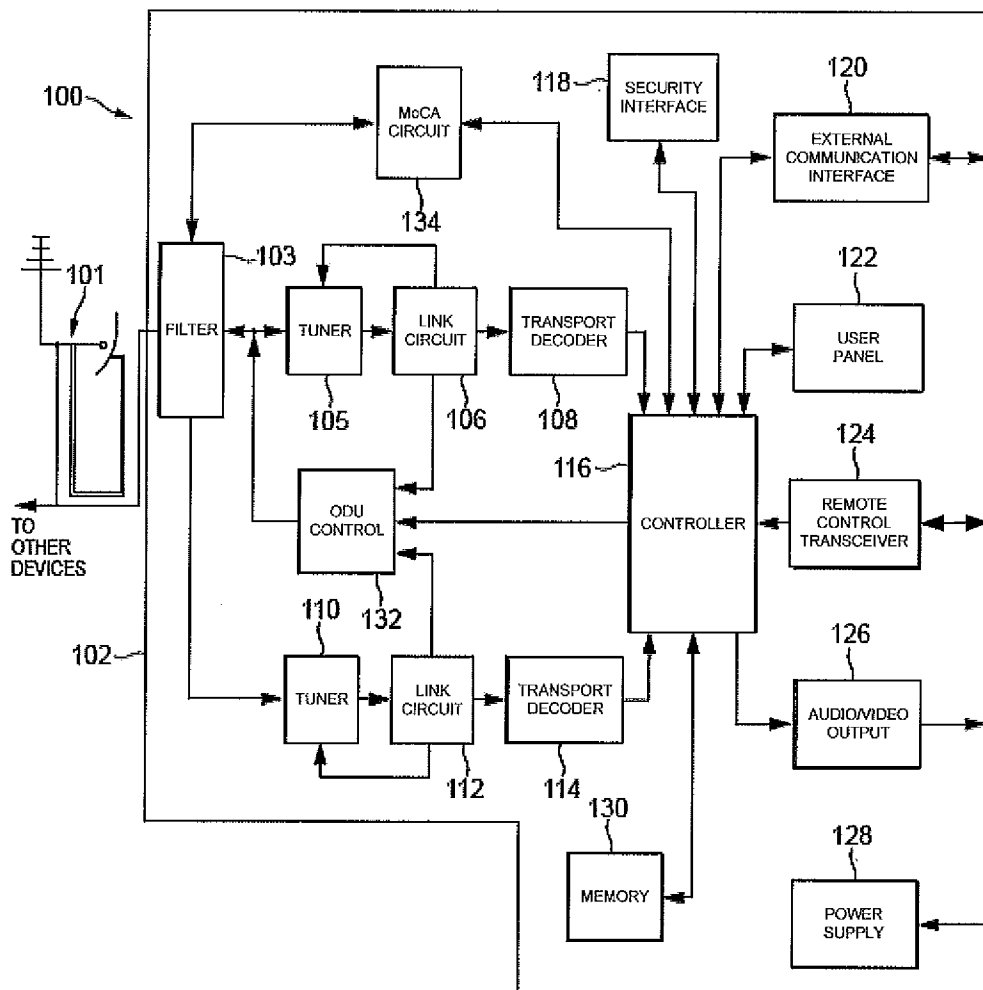


FIG. 1

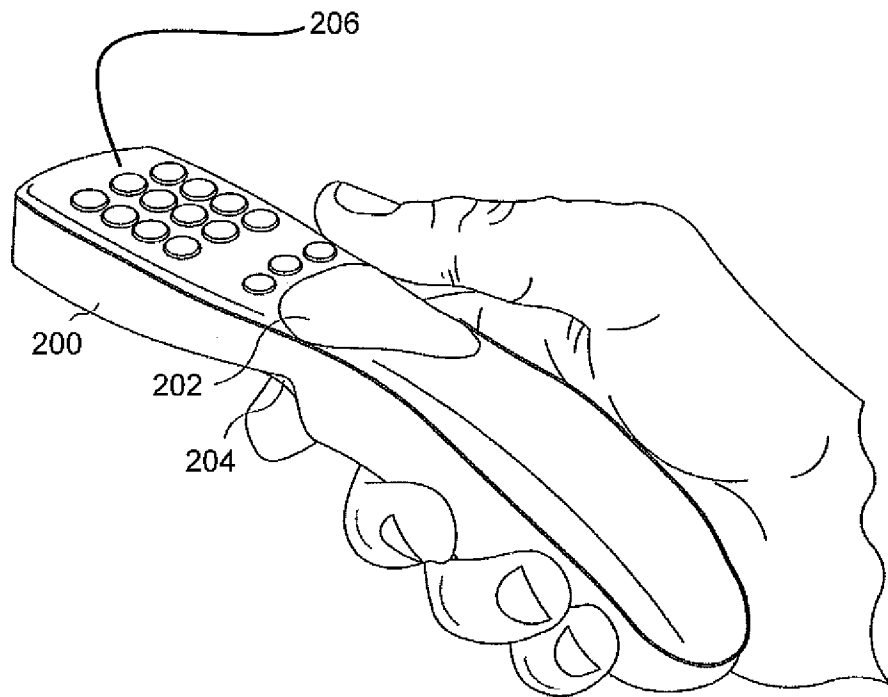


FIG. 2A

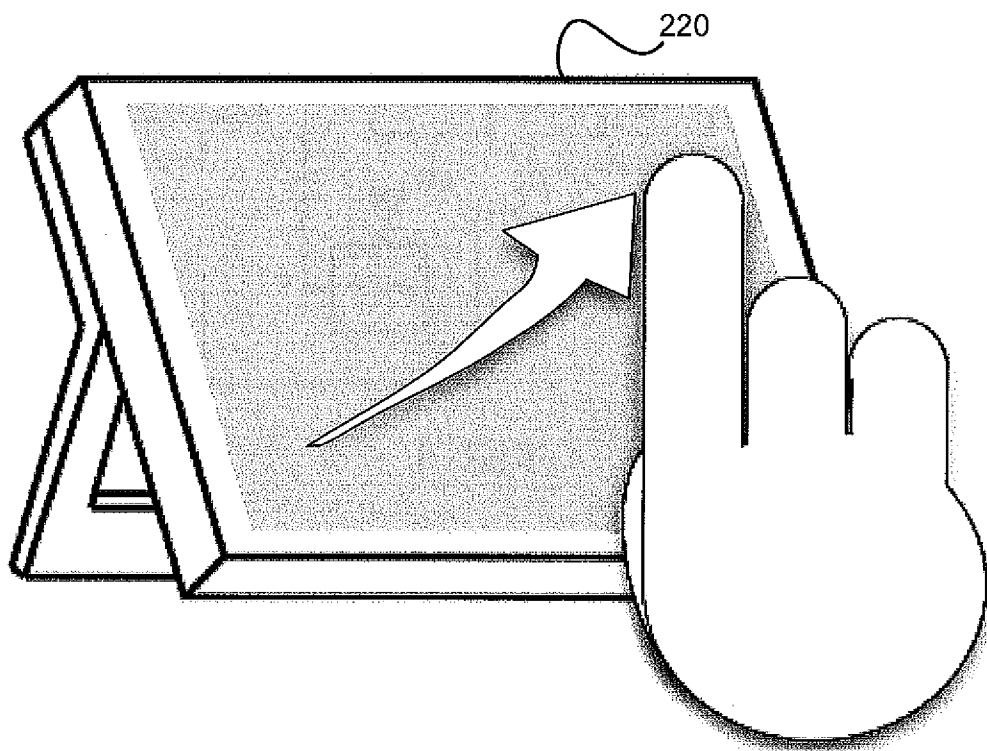


FIG. 2B

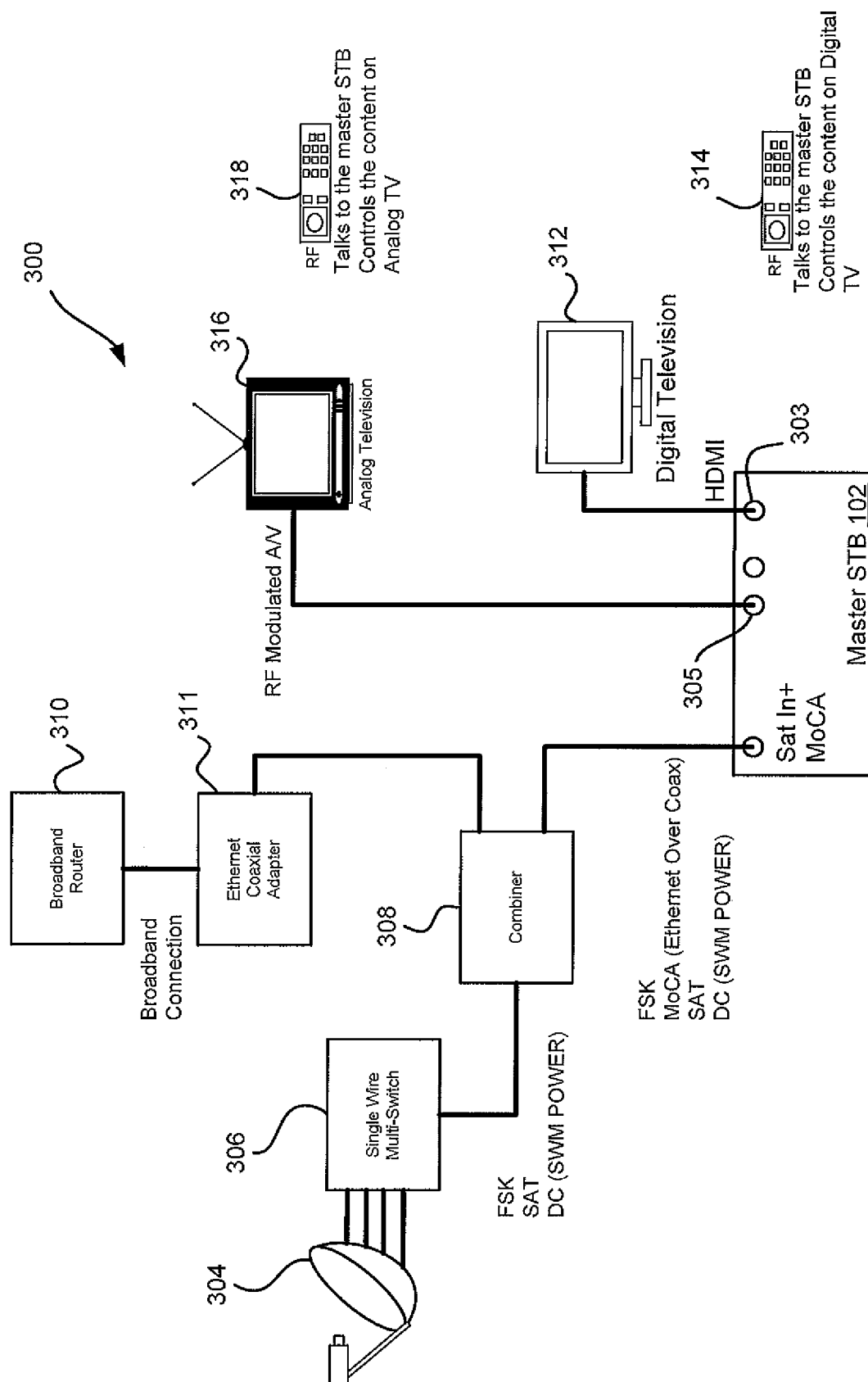


FIG. 3

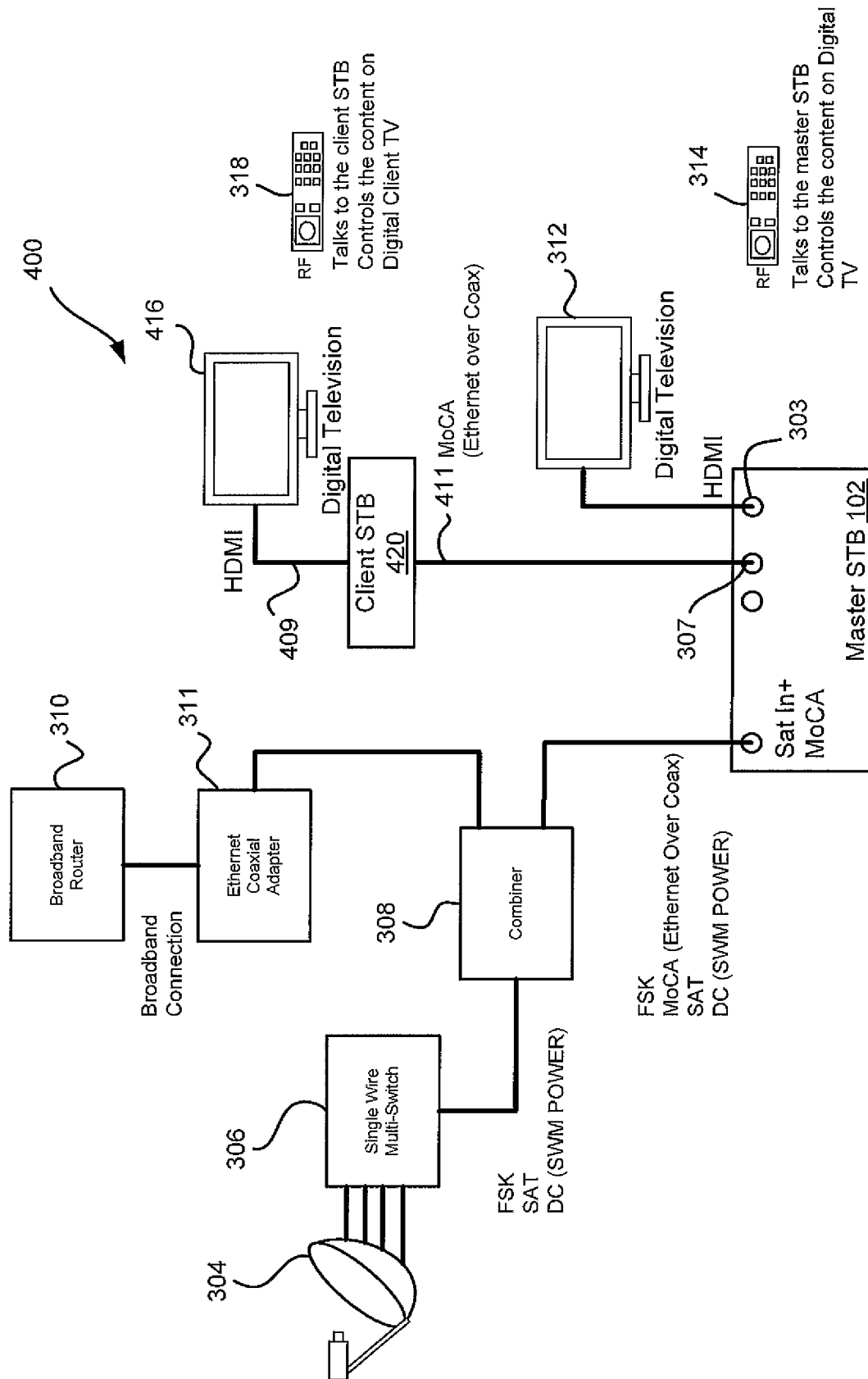
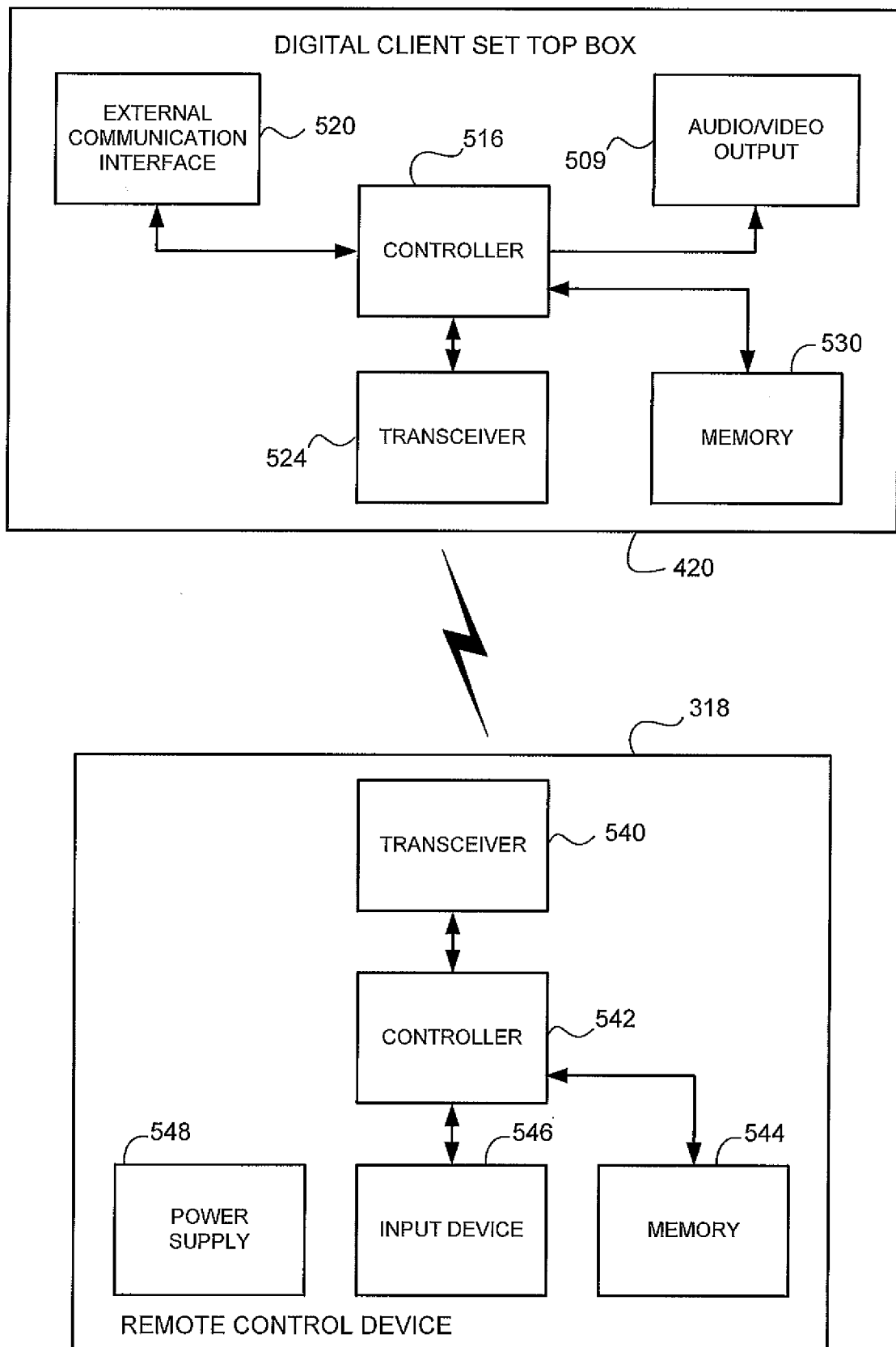


FIG. 4



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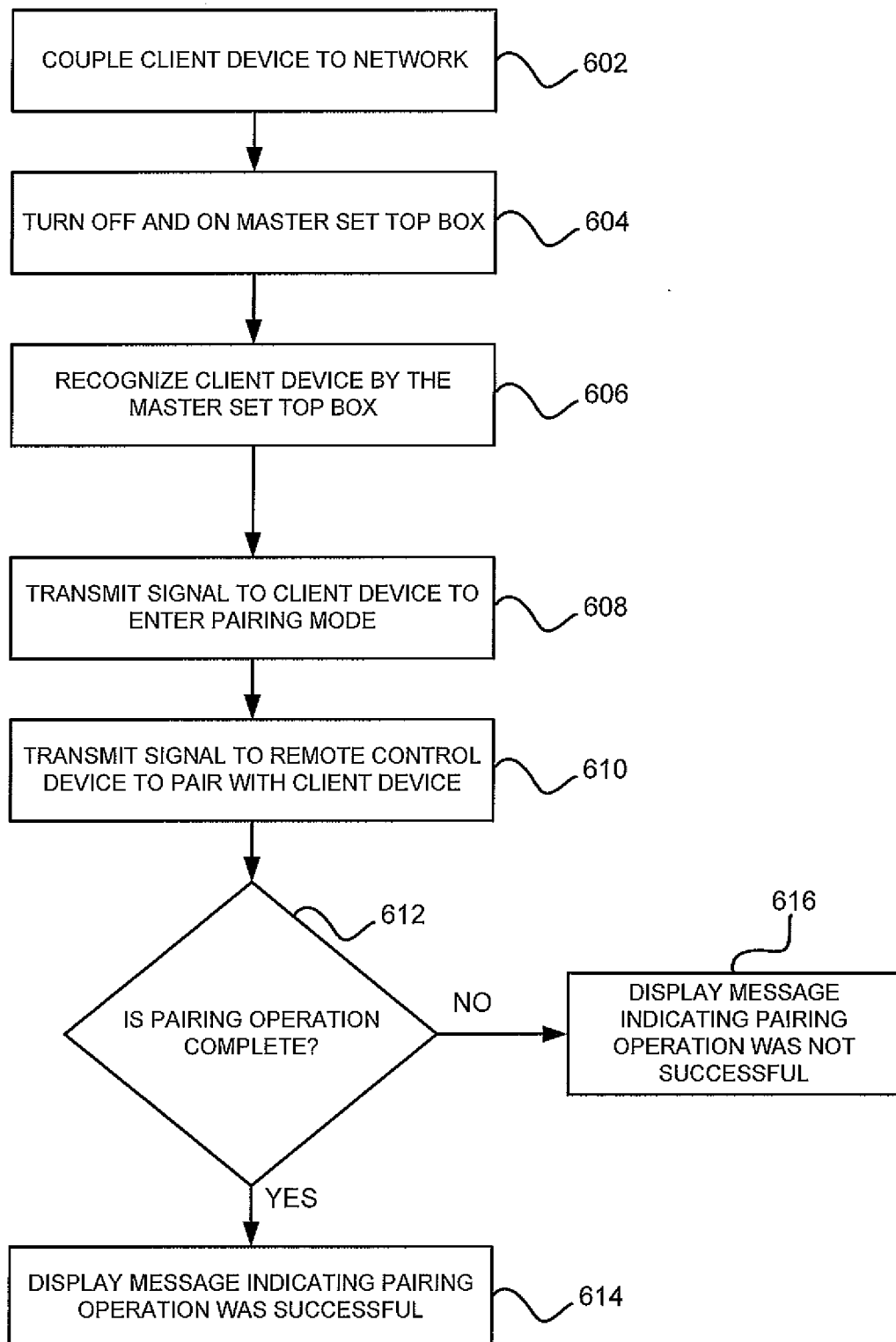


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/032798

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N21/422 H04N21/436
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/093962 A1 (BRUHN CHRISTOPHER [US] ET AL) 18 April 2013 (2013-04-18) paragraph [0022] - paragraph [0035]; figures 1-4	1-30
X	US 2012/208419 A1 (DOMMES HENRIK [DE]) 16 August 2012 (2012-08-16) paragraph [0025] - paragraph [0046] paragraph [0067] - paragraph [0102] figures 1-21	1-30
X	US 2013/117384 A1 (MARTCH HENRY GREGG [US]) 9 May 2013 (2013-05-09) paragraph [0012] - paragraph [0047]; figures 1-5	1-30
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

Date of the actual completion of the international search

31 July 2015

Date of mailing of the international search report

10/08/2015

Name and mailing address of the ISA/

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Authorized officer

Marzal-Abarca, X

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/032798

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Antonio Wells: "Google TV Remote Android App Review", 20 December 2010 (2010-12-20), XP055009834, Retrieved from the Internet: URL:http://www.androidtapp.com/google-tv-remote/ [retrieved on 2011-10-18] the whole document -----	1-30

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2015/032798

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		EP 2487286 A1	15-08-2012
		US 2012208419 A1	16-08-2012

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		CN 103988522 A	13-08-2014
		EP 2777293 A1	17-09-2014
		TW 201338504 A	16-09-2013
		US 2013117384 A1	09-05-2013
		WO 2013070515 A1	16-05-2013
