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(54)

INFRARED REMOTE CONTROL RANGE EXTENDER

(57) The present invention refers a system and a method for extending range of a remote control (5). The system comprises of at least an electronic device (1), a remote control (5), a first transceiver unit (4), a second transceiver unit (3) and an infrared (IR) receiver. The IR receiver (2) is provided in the electronic device (1) for receiving the IR signal. The remote control (5) transmits first IR signal (6) to the first transceiver unit (4) for controlling the electronic device (1). From the first transceiver

unit (4) a second IR signal (7) is transmitted to the second transceiver unit (3). From the second transceiver unit (3) a third IR signal (8) is transmitted to the IR receiver (2) thereby to extend the range of IR remote control (5). The second transceiver unit (3) also detects whether the IR signal from the remote control (5) reached the IR receiver (2) or not and transmits accordingly the IR signal from the second transceiver unit (3).

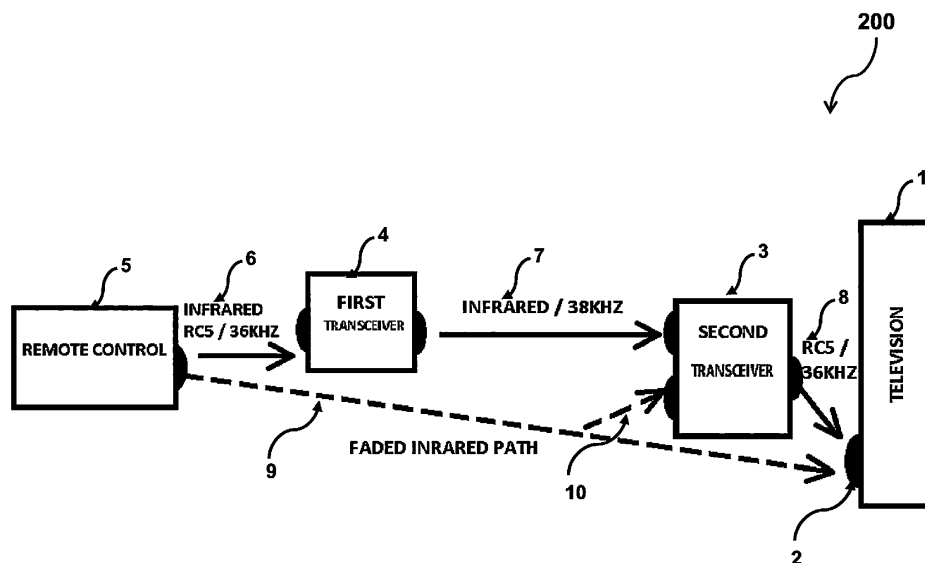


Fig. 2

Description

[0001] This invention refers to a system for extending range of a remote control according to claim 1, and a method according to claim 5.

Background of the Invention

[0002] Consumer Electronics devices (for example Television sets, Set-Top boxes, DVR's) generally controlled by a remote control system which uses Infrared (IR) signals. The Infrared remote works well for moderate distances however its performance declines when the distance increases. Further, in some cases controller devices suffer from controlling problems due to range issues. Hence, there exists a need for a remote control range extender for increasing the control area.

[0003] Prior art document US20060210278A1 discloses remote operation of local or distant infrared-controllable and non-infrared-controllable devices. US20060210278A1 further discloses a system for operating infrared-controllable apparatus, said system comprising a remote control comprising circuitry for sending infrared signals; first apparatus comprising circuitry for receiving first infrared signals from said remote control, circuitry for decoding data from said first infrared signals, and circuitry for sending said data over a communications network; and second apparatus comprising circuitry for receiving said data over said communications network and circuitry for sending second infrared signals associated with said received data to said infrared-controllable apparatus.

[0004] In this prior art document, the second apparatus that is second extender device which transmits the repeated IR signal to the electronics device has no capability to detect whether the actual IR signal reached the IR receiver or not. If the both command signals from remote control and second extender device reached the IR receiver, then the electronics device might get unnecessary control data.

Object of the Invention

[0005] It is therefore the object of the present invention to provide a system, in particular a system for extending range of a remote control, and a method that has a better efficiency and increase the performance compared to the known devices and methods.

Description of the Invention

[0006] The before mentioned object is solved by a system for extending range of a remote control according to claim 1. The system for extending range of a remote control according to the present invention preferably comprises at least one electronic device, a remote control, a first transceiver unit, a second transceiver unit and an infrared (IR) receiver. The IR receiver is provided in the

electronic device for receiving the IR signal. The remote control can be configured for transmitting first IR signal with an original carrier frequency to the first transceiver unit for controlling the electronic device. The first transceiver unit can be configured for receiving first IR signal from the remote control and converting the first IR signal to a second IR signal by changing the original carrier frequency with a different carrier frequency. The first transceiver unit further can be configured for transmitting the second IR signal to the second transceiver unit. The second transceiver unit can be configured for receiving the second IR signal from the first transceiver unit and converting the second IR signal to a third IR signal by changing the received carrier frequency with the original carrier frequency. The second transceiver unit can be further configured for checking whether the first IR signal reached the IR receiver or not before transmitting the third IR signal. The second transceiver unit further configured for transmitting the third IR signal to the IR receiver in case the first IR signal not reached the IR receiver.

[0007] This solution is beneficial since such a system for extending range of a remote control can extend IR remote control working range and also prevents the electronics device from getting unnecessary control data twice from extender and remote control.

[0008] The system can be implemented for any consumer electronic device which utilizes IR signals for controlling the electronic device.

[0009] Further preferred embodiments are subject-matter of dependent claims and/or of the following specification parts.

[0010] According to a preferred embodiment of the present invention the second transceiver unit can be further configured for preventing transmission of the third IR signal to the electronic device in case the first IR signal reached the electronic device. The electronics device may include but is not limited to TV, audio system, DVD, set-up box, consumer electronics which are controlled by the remote control and so on. The system transmits the signals in the form of infrared waves.

[0011] The before mentioned object is also solved by a method for extending range of a remote control according to claim 5. Said method preferably comprises the steps: transmitting first infrared (IR) signal with an original carrier frequency to a first transceiver unit for controlling an electronic device, receiving first IR signal from the remote control at the first transceiver unit, converting the first IR signal to a second IR signal by changing the original carrier frequency with a different carrier frequency, transmitting the second IR signal from the first transceiver unit to the second transceiver unit, receiving the second IR signal at the second transceiver unit from the first transceiver unit and converting the second IR signal to a third IR signal by changing the received carrier frequency with the original carrier frequency.

[0012] According to a further embodiment of the present invention the method further comprising the

steps of checking whether the first IR signal reached the IR receiver or not before transmitting the third IR signal from the second transceiver unit, transmitting the third IR signal to the IR receiver in case the first IR signal not reached the IR receiver and preventing transmission of the third IR signal from the second transceiver unit to the IR receiver in case the first IR signal reached the IR receiver.

[0013] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which components of the invention are exemplarily illustrated. Components of the devices and method according to the inventions, which match at least essentially with respect to their function, can be marked with the same reference sign, wherein such components do not have to be marked or described in all figures.

[0014] The invention is just exemplarily described with respect to the attached figures in the following.

Brief Description of the Drawings

[0015]

Fig. 1 illustrates a general flow diagram of application of the system in TV, according to the present invention;

Fig. 2 illustrates the block diagram of the system for extending range of a remote control, according to the present invention; and

Fig. 3 illustrates a method for extending range of a remote control, according to the present invention.

Detailed Description of the Drawings

[0016] Fig. 1 illustrates a general flow diagram 100 of application of the system in TV, according to the present invention. The system for extending the range of a remote control 5 according to the present invention preferably comprises an electronic device 1 for example TV, a remote control 5, a first transceiver unit 4, a second transceiver unit 3 and an infrared (IR) receiver 2. The IR receiver 2 is provided in the electronic device 1 for receiving the IR signal. The remote control 5 transmits first IR signal 6 with an original carrier frequency to the first transceiver unit 4 for controlling the electronic device 1. From the first transceiver unit 4 a second IR signal 7 (for example 38KHz) is transmitted to the second transceiver unit 3, after changing the original carrier frequency with a different carrier frequency. From the second transceiver unit 3 a third IR signal 8 is transmitted to the IR receiver 2 after changing the different carrier frequency to the original carrier frequency. Thus the range of the IR remote control 5 can be increased by the first and second transceiver (or extender).

[0017] Fig. 2 illustrates the block diagram of the system 200 for extending the range of a remote control 5, according to the present invention. The system for extending range of a remote control 5 according to the present invention preferably comprises at least one electronic device 1, a remote control 5, a first transceiver unit 4, a second transceiver unit 3 and infrared (IR) receiver 2. The IR receiver 2 is provided in the electronic device 1 for receiving the IR signal. The remote control 5 can be configured for transmitting first IR signal 6 with an original carrier frequency to the first transceiver unit 4 for controlling the electronic device 1. The first IR signal 6 reaches the first transceiver unit 4 and part of the IR signal 10 from the remote control 5 may also reach the IR receiver 2 with weak signal strength. Hence, the IR signal faded 9 away in a travelling path by losing the strength. Many times the IR signal from the remote control 5 cannot reach the IR receiver 2.

[0018] According to a preferred embodiment of the present invention, the first transceiver unit 4 can be configured for receiving first IR signal 6 (for example 36KHz) from the remote control 5 and converting the first IR signal 6 to a second IR signal 7 (for example 38KHz) by changing the original carrier frequency with a different carrier frequency. The first transceiver unit 4 further can be configured for transmitting the second IR signal 7 to the second transceiver unit 3. The second transceiver unit 3 can be configured for receiving the second IR signal 7 from the first transceiver unit 4 and converting the second IR signal 7 to a third IR signal 8 by changing the received carrier frequency with the original carrier frequency. The second transceiver unit 3 can be further configured for checking whether the first IR signal 6 reached the IR receiver 2 or not before transmitting the third IR signal 8. The second transceiver unit 3 further configured for transmitting the third IR signal 8 (for example 36KHz) to the IR receiver 2 in case the first IR signal 6 not reached the IR receiver 2.

[0019] Fig. 3 illustrates a method 300 for extending range of a remote control 5, according to the present invention. The method for extending range of a remote control 5 comprising the steps of:

at block 11, the first infrared (IR) signal is transmitted with an original carrier frequency to a first transceiver unit 4 for controlling an electronic device 1;

at block 12, the first IR signal 6 from the remote control 5 is received at the first transceiver unit 4;

at block 13, the first IR signal 6 is converted to a second IR signal 7 by changing the original carrier frequency with a different carrier frequency;

at block 14, the second IR signal 7 from the first transceiver unit 4 is transmitted to the second transceiver unit 3;

at block 15, the second IR signal 7 is received at the second transceiver unit 3 from the first transceiver unit 4;

at block 16, the second IR signal 7 is converted to a third IR signal 8 by changing the received carrier frequency with the original carrier frequency;

at block 17, the second transceiver unit 3 can check whether the first IR signal 6 reached the IR receiver 2 or not before transmitting the third IR signal 8;

at block 18, the third IR signal 8 is transmitted to the IR receiver 2 in case the first IR signal 6 not reached the IR receiver 2; and

at block 19, the transmission of the third IR signal 8 from the second transceiver unit 3 is prevented to reach the IR receiver 2 in case the first IR signal 6 reached the IR receiver 2.

[0020] Thus, the present invention refers to a system and a method for extending range of a remote control 5. The system comprises of at least an electronic device 1, a remote control 5, a first transceiver unit 4, a second transceiver unit 3 and an infrared (IR) receiver. The IR receiver 2 is provided in the electronic device 1 for receiving the IR signal. The remote control 5 transmits first IR signal 6 to the first transceiver unit 4 for controlling the electronic device 1. From the first transceiver unit 4 a second IR signal 7 is transmitted to the second transceiver unit 3. From the second transceiver unit 3 a third IR signal 8 is transmitted to the IR receiver 2 thereby to extend the range of IR remote control 5. The second transceiver unit 3 also detects whether the IR signal from the remote control 5 reached the IR receiver 2 or not and transmits accordingly the IR signal from the second transceiver unit 3.

List of reference numbers

[0021]

- 1 electronic device
- 2 IR receiver
- 3 second transceiver unit
- 4 first transceiver unit
- 5 remote control
- 6 first IR signal
- 7 second IR signal
- 8 third IR signal
- 9 faded IR signal path
- 10 part of the faded IR signal
- 11 transmitting first infrared (IR) signal with an original carrier frequency from a remote control to a first transceiver unit
- 12 receiving the first IR signal from the remote control unit at the first transceiver unit

- 13 converting the first IR signal to a second IR signal at the first transceiver unit
- 14 transmitting the second IR signal from the first transceiver unit to the second transceiver unit
- 15 receiving the second IR signal from the first transceiver unit at the second transceiver unit
- 16 converting the second IR signal to a third IR signal at the second transceiver unit
- 17 checking whether the first IR signal reached the IR receiver or not
- 18 transmitting the third IR signal to the IR receiver in case the first IR signal not reached the IR receiver
- 19 preventing transmission of the third IR signal to the IR receiver in case the first IR signal reached the IR receiver

Claims

- 1. A system for extending range of a remote control comprises of
 - at least one electronic device (1), a remote control (5), a first transceiver unit (4), a second transceiver unit (3) and an infrared (IR) receiver (2);
 - wherein the IR receiver (2) is provided in the electronic device (1) for receiving the IR signal;
 - wherein the remote control (5) is configured for transmitting first IR signal (6) with an original carrier frequency to the first transceiver unit (4) for controlling the electronic device (1);
 - wherein the first transceiver unit (4) is configured for receiving first IR signal (6) from the remote control (5) and converting the first IR signal (6) to a second IR signal (7) by changing the original carrier frequency with a different carrier frequency;
 - wherein the first transceiver unit (4) is further configured for transmitting the second IR signal (7) to the second transceiver unit (3);
 - wherein the second transceiver unit (3) is configured for receiving the second IR signal (7) from the first transceiver unit (4) and converting the second IR signal (7) to a third IR signal (8) by changing the received carrier frequency with the original carrier frequency;
 - characterized in that**
 - wherein the second transceiver unit (3) is further configured for checking whether the first IR signal (6) reached the IR receiver (2) or not before transmitting the third IR signal (8); and
 - wherein the second transceiver unit (3) is configured for transmitting the third IR signal (8) to the IR receiver (2) in case the first IR signal (6) not reached the IR receiver (2).
- 2. The system for claim 1, wherein the second transceiver unit (3) is further configured for preventing transmission of the third IR signal (8) to the IR receiver (2) in case the first IR signal (6) reached the IR receiver (2).

3. The system for claim 1, wherein the electronics device (1) includes TV, audio system, DVD, set-up box, consumer electronics which are controlled by the remote control (5).
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4. The system for claim 1, wherein the system transmits the signals in the form of infrared waves.
5. A method for extending range of a remote control comprising the steps of:
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- transmitting first infrared (IR) signal with an original carrier frequency to a first transceiver unit (4) for controlling an electronic device (1);
receiving first IR signal (6) from the remote control (5) at the first transceiver unit (4);
15 converting the first IR signal (6) to a second IR signal (7) by changing the original carrier frequency with a different carrier frequency;
transmitting the second IR signal (7) from the first transceiver unit (4) to the second transceiver unit (3);
20 receiving the second IR signal (7) at the second transceiver unit (3) from the first transceiver unit (4); and
25 converting the second IR signal (7) to a third IR signal (8) by changing the received carrier frequency with the original carrier frequency.
6. The method of claim 5, wherein the method further comprising the steps of:
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- checking whether the first IR signal (6) reached the IR receiver (2) or not before transmitting the third IR signal (8) from the second transceiver unit (3);
35 transmitting the third IR signal (8) to the IR receiver (2) in case the first IR signal (6) not reached the IR receiver (2); and
40 preventing transmission of the third IR signal (8) from the second transceiver unit (3) to the IR receiver (2) in case the first IR signal (6) reached the IR receiver (2).
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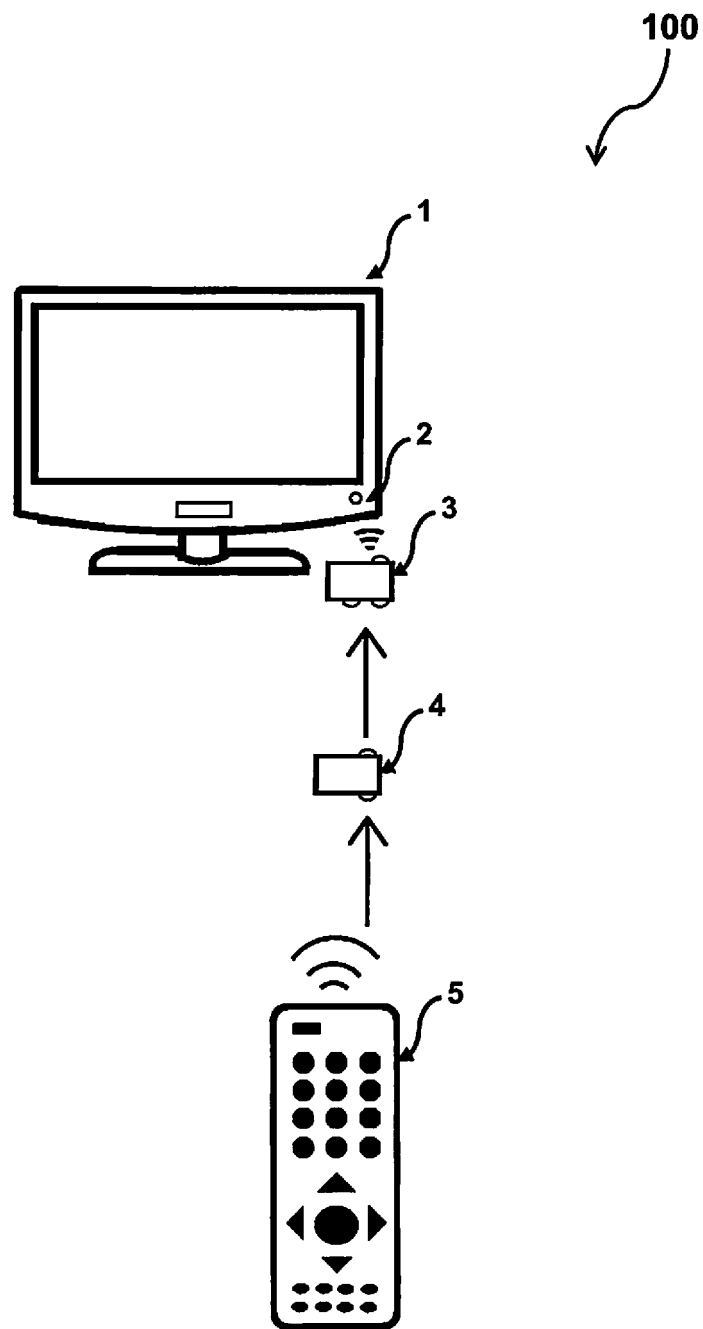


Fig. 1

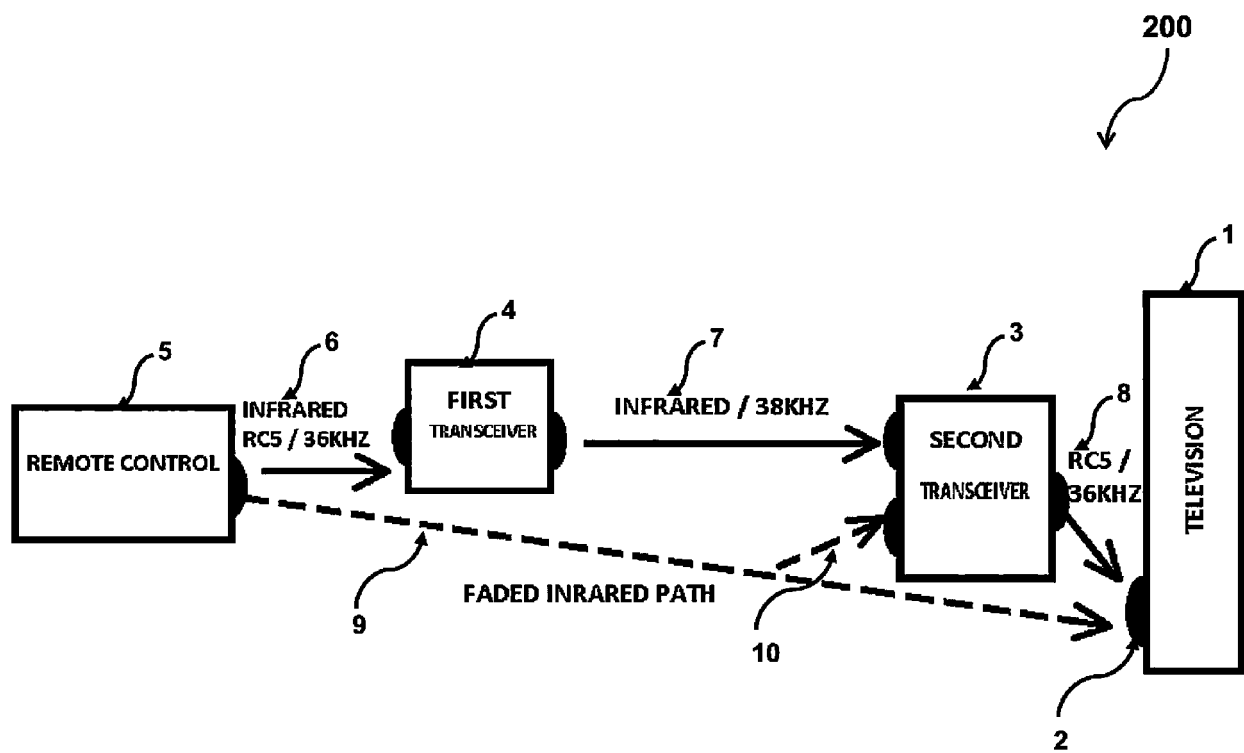
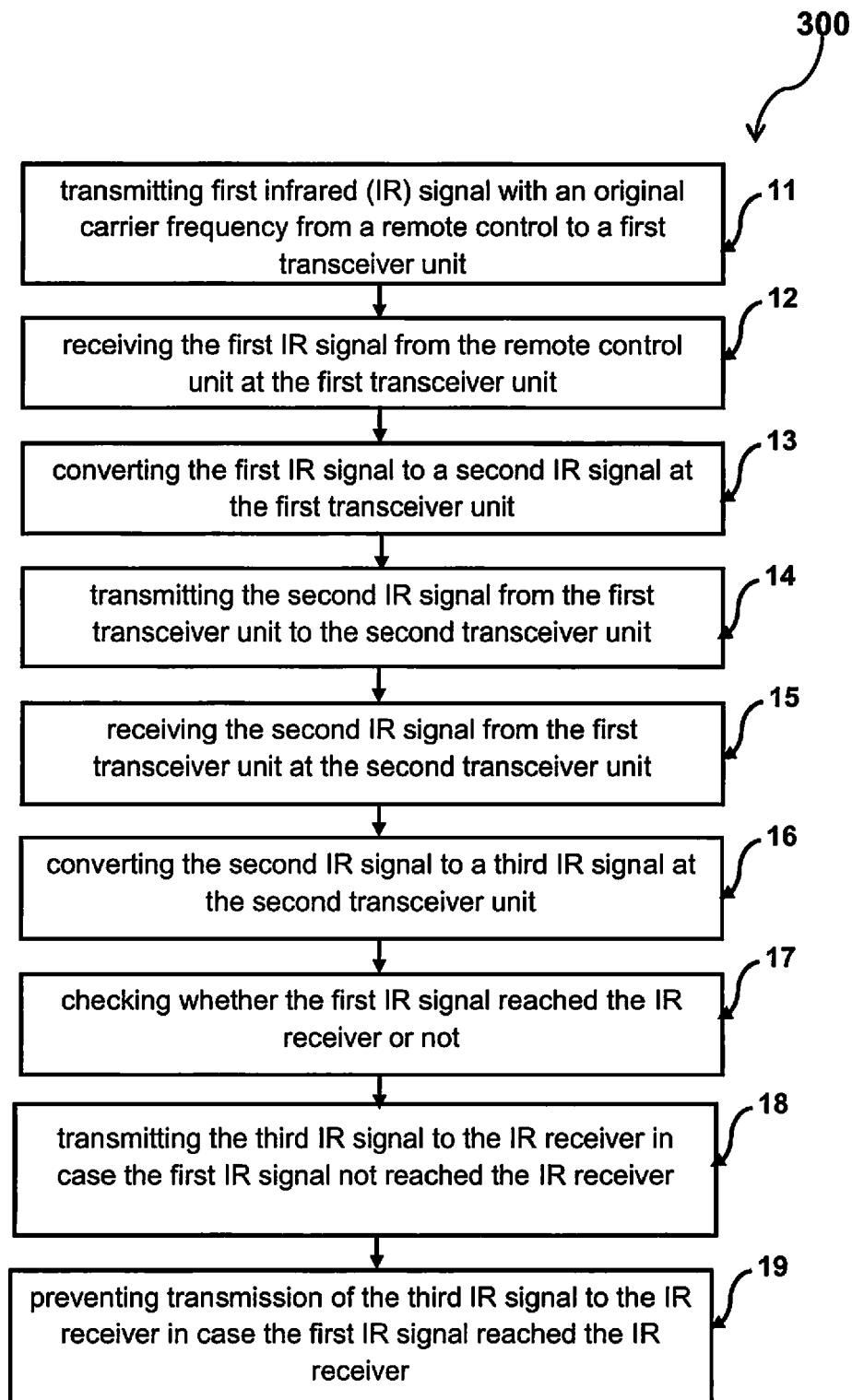


Fig. 2

**Fig. 3**



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 3089

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

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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