



(51) International Patent Classification:  
*G08C 23/04* (2006.01)

(21) International Application Number:  
PCT/EP2015/075940

(22) International Filing Date:  
6 November 2015 (06.11.2015)

(25) Filing Language: English

(26) Publication Language: English

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(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,  
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,  
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,  
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PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,  
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,  
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,  
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,  
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,  
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,  
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,  
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: IMAGE DISPLAY DEVICE PROVIDED WITH A MULTI-ANGULAR IR RECEIVING UNIT

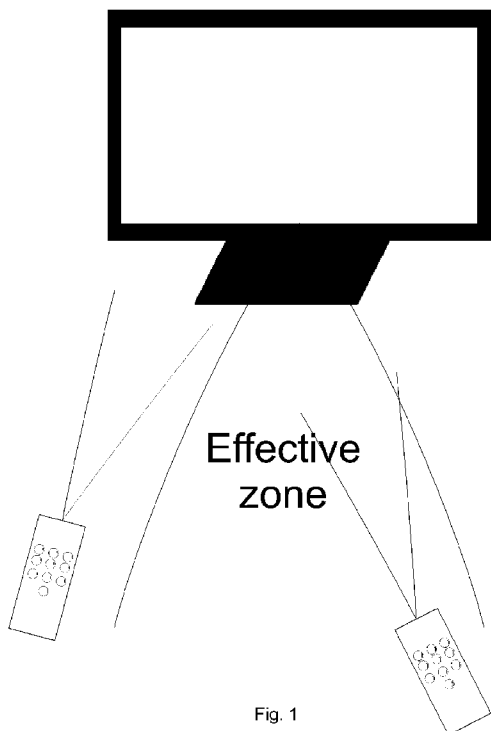


Fig. 1

(57) Abstract: The present invention relates to an image display device equipped with a multi-angular IR receiver in communication with a remote control of an image display device. The present invention more particularly relates to an image display device comprising a multi-point IR receiving unit for receiving signals from a remote control, the multi-point IR receiving unit in electrical connection with a control unit of the image display device.

**Description****IMAGE DISPLAY DEVICE PROVIDED WITH A MULTI-ANGULAR IR RECEIVING UNIT**

- [0001] The present invention relates to an image display device equipped with a multi-angular IR receiver in communication with a remote control of an image display device.
- [0002] Digital and interactive TV systems provide a comprehensive amount of TV features enriching every day. Considering the fact that a large number of television and multimedia services are being made available to consumers today, image display devices are provided with distinct features to enable a more satisfactory viewing experience for users.
- [0003] A remote control is a control device of an electronic device such as a television set or other home appliance, providing operation of the device wirelessly from a certain distance. A remote control typically allows remote operation of devices instead of direct operation of control buttons.
- [0004] Remote controls are conventionally IR devices which send digitally-coded pulses of infrared radiation to control various functions such as power, volume or other features. Remote controls are therefore wireless handheld control units with a plurality of buttons effecting adjustment of certain settings such as broadcast channel, volume etc.
- [0005] Among others, one of the prior art disclosures in the technical field of the present invention may be referred to as KR100260496, which discloses a method and apparatus for controlling a composite video system to enable a user to operate a remote control by enabling a remote control to transmit a selection code which selects a specific external device to a television receiver, and by enabling the television receiver to display a function mode for the specific external device on a screen. A television receiver is equipped with an IR code transmission unit which transmits a code of a determined function mode as infrared rays under the control of a control unit. The control unit controls an OSD generation unit according to a selection code received and inputted from an IR code receiving unit. The control unit displays a function mode of an external device on a screen of a CRT. In case that a user selects a relevant function mode, a code for the

mode is transmitted through the IR code transmitting unit.

- [0006] The present invention, on the other hand, provides a multi-angular IR receiver suitable for communicating with a remote control of an image display device such that the IR receiver position is readaptable on the frame of the image display device for allowing operation of the remote control in accordance with the user's location information.
- [0007] The present invention therefore provides an image display device having a multi-angular IR receiver system suitable for communicating with a remote control irrespective of whether the remote control's position changes or not as provided by the characterizing features defined in Claim 1.
- [0008] Primary object of the present invention is hence to provide a multi-point IR signal receiving system for an image display device ensuring uninterrupted communication between the remote control and the multi-point IR signal receiving system according to the invention.
- [0009] The present invention proposes an image display device with a multi-point IR receiving unit whose position is changeable in accordance with the position of a remote control. The remote control is accordingly kept within an effective communication zone of the multi-point IR receiving unit by moving the latter on a frame portion of the image display device along a two-dimensional frame area thereof.
- [0010] Alternatively, the multi-point IR signal receiving unit's position is automatically determined by way of detecting a non-audible sound wave generated by the remote control. An audio processing unit continuously remains in scanning mode to detect the specific non-audible sound wave generated by the remote control. Initiated as such, the multi-point IR signal receiving unit's position is then subsequently changed to correspond to different effective zones until a verification data transmitted by the remote control is receivable.
- [0011] Accompanying drawings are given solely for the purpose of exemplifying an image display device equipped with a multi-point IR signal receiving system whose advantages over prior art were outlined above and will be explained in brief hereinafter.
- [0012] The drawings are not meant to delimit the scope of protection as identified

in the claims nor should they be referred to alone in an effort to interpret the scope identified in the claims without recourse to the technical disclosure in the description of the present invention.

[0013] Fig. 1 demonstrates a schematic view of an image display device with a multi-angle IR receiver unit having an effective zone to communicate with a remote control according to the present invention.

[0014] Fig. 2 demonstrates a general flow diagram for the manual configuration of the multi-angle IR receiver unit position according to the present invention.

[0015] Fig. 3 demonstrates a schematic view of the image display device with a plurality of adaptable effective zones of the multi-angle IR receiver unit according to the present invention.

[0016] Fig. 4 demonstrates a general flow diagram for the automatic calibration procedure of the multi-angle IR receiver unit position according to the present invention.

[0017] The present invention proposes an image display device comprising a multi-point, multi-angle or in general a multi-direction Infrared (IR) signal receiving unit in communication with a control unit conventionally effective in controlling various functions of the image display device. Additionally, the remote control according to the present invention is capable of transferring its location information to the image display device as will be delineated hereinafter. A movement imparting means, typically a small electric motor moves the multi-angle IR receiver unit in a guided manner along a two-dimensional frame area of the image display device so that the remote control can communicate with the image display device irrespective of its position while it remains within a dynamically changed effective zone for communication with the multi-angle IR receiver unit.

[0018] A memory unit in communication with the control unit stores location information of the remote control which is within the detection range of the multi-angle IR receiver unit. The user can manually reconfigure the detection zone of the multi-point IR receiver unit so that it will be able to receive IR signals within another effective zone. This is especially advantageous in the event that the image display device is viewed in a very large room such as a commercial food-serving space where a

plurality of viewers is present. Therefore, the multi-point IR receiver unit's physical position on the frame of the image display device can be changed by the movement imparting means so that the image display device can be remotely controlled from different points in the room. Alternatively, in a similar very large environment where more than one image display device is present, each multi-point IR receiver unit's position can be separately configured such that only one image display device is controllable at one point in the room, therefore avoiding undesired interference between different image display devices controllable by a single remote control as can be the case.

- [0019] The multi-point IR signal receiving unit is relocatable by means of the movement imparting means so as to be selectively guided along two axes perpendicular to each other so that different effective zones as demonstrated in Fig. 3 can be created. The movement imparting means typically is a small electric motor effecting two-axis displacement of the multi-point IR signal receiving unit. Therefore, continuous control of the image display device independent from the location of the user can be ensured.
- [0020] When a viewer is positioned outside the effective operation zone of the multi-point IR signal receiving unit, the user may manually change the position of the multi-point IR signal receiving unit so as to adapt its sweeping angle to receive signals from the remote control. In order for manually configuring the position and therefore the effective zone of the multi-point IR signal receiving unit, the user may select a specific area in the room as divided into a plurality of viewing or control zones in front of the image display device as shown in Fig. 3. Each zone is defined with its coordinates on two axes on the frame of the image display device so that the multi-point IR signal receiving unit's location is changed on the horizontal and vertical axes to be targeting different effective zones. Therefore, when the user specifies the desired effective zone corresponding to his viewing location, the control unit effectuates operation of the movement imparting means to take the multi-point IR signal receiving unit to the specified coordinates on the bottom part of the image

display device frame. In sum, the multi-point IR signal receiving unit is displaceable a certain amount both vertically and horizontally along the lower part of the frame. Preferably, the multi-point IR signal receiving unit is displaceable only horizontally, i.e. in parallel to the lower edge of the image display device.

- [0021] According to an alternative embodiment of the present invention, the multi-point IR signal receiving unit's position on the frame can be automatically determined in response to a non-audible sound wave generated by the remote control to initiate a position calibration procedure. The position calibration procedure is initiated by the user by way of pressing a dedicated button on the remote control and an audio processing unit of the image display device in the form of a frequency range scanning unit continuously remaining in scanning mode, upon detecting the specific non-audible sound, the control unit initiates calibration of the multi-point IR signal receiving unit by changing its position progressively until a verification data is receivable.
- [0022] When a verification data sent by the remote control is received by the multi-point IR signal receiving unit, its position is maintained until a further automatic calibration operation is initiated by the user. The image display device does not initiate the calibration operation if the multi-point IR signal receiving unit has an already effective zone, that is, if the remote control is already within an active zone. In this case, the multi-point IR signal receiving unit remains stationary.
- [0023] If the multi-point IR signal receiving unit cannot detect the verification signal in a first position corresponding to a certain viewing zone, it is subsequently moved to neighboring positions until the continuously transmitted verification signal is received and the active zone is thereby determined.
- [0024] The control unit may typically initiate certain calibration methods to be implemented by the user to ameliorate the operating angles swept by the multi-point IR system. Therefore, boundaries of the individual zones can be accurately determined to be recalibrated later at any time.
- [0025] The calibration operation can be cancelled anytime by the user through

pressing the same button or another dedicated button.

- [0026] In summary, the present invention proposes an image display device comprising a multi-point IR receiving unit for receiving signals from a remote control, the multi-point IR receiving unit in electrical connection with a control unit of the image display device.
- [0027] In one embodiment of the present invention, the control unit processes location information of a remote control in the manner that a movement imparting means is operated to displace the multi-point IR receiving unit whereby the remote control is kept within an effective communication zone with the multi-point IR receiving unit of the image display device.
- [0028] In a further embodiment of the present invention, the multi-point IR receiver unit's physical position on a frame portion of the image display device is changeable by the movement imparting means.
- [0029] In a further embodiment of the present invention, the movement imparting means selectively configures effective zone of the multi-point IR signal receiving unit in the form of a specific area of a room divided into a plurality of viewing or control zones in front of the image display device.
- [0030] In a further embodiment of the present invention, the movement imparting means is an electric motor moving the multi-angle IR receiver unit in a guided manner to relocate the same along a two-dimensional frame area of the image display device so as to be selectively guided along two axes perpendicular to each other.
- [0031] In a further embodiment of the present invention, each effective zone corresponds to coordinates on two axes on the frame of the image display device and the multi-point IR signal receiving unit's location is changed on the horizontal and/or vertical axes on the bottom part of the image display device frame to be targeting different effective zones.
- [0032] In a further embodiment of the present invention, the multi-point IR signal receiving unit is displaceable only horizontally in parallel to the lower edge of the image display device.
- [0033] In a further embodiment of the present invention, the multi-point IR signal receiving unit's position is automatically determined in response to a non-audible sound wave generated by the remote control to initiate a

position calibration procedure.

- [0034] In a further embodiment of the present invention, the position calibration procedure is initiatable by means of the remote control, pressing a dedicated button on the same.
- [0035] In a further embodiment of the present invention, an audio processing unit of the image display device in the form of a frequency range scanning unit continuously remains in scanning mode to detect the specific non-audible sound wave generated by the remote control.
- [0036] In a further embodiment of the present invention, upon detecting the specific non-audible sound, the control unit initiates calibration of the multi-point IR signal receiving unit by changing its position until a verification data is receivable.
- [0037] In a further embodiment of the present invention, when a verification data transmitted by the remote control is received by the multi-point IR signal receiving unit, its position is maintained until a further automatic calibration operation is initiated.
- [0038] In a further embodiment of the present invention, the image display device does not initiate the calibration operation if the multi-point IR signal receiving unit has an already effective zone within which communication with the remote control is active.
- [0039] In a further embodiment of the present invention, if the multi-point IR signal receiving unit cannot detect the verification signal in a first position corresponding to a certain viewing zone, it is subsequently moved to neighboring positions corresponding to other viewing zones until the continuously transmitted verification data is received and the effective zone is determined.
- [0040] Therefore, the present invention advantageously addresses situations where the image display device is viewed in a very large room such as a commercial food-serving space where a plurality of viewers is present whereby the image display device can be remotely controlled from different points in the room or where more than one image display device is present in a similar room whereby each multi-point IR receiver unit's position can be separately configured such that only one image display

device is controllable at one point in the room.

## Claims

1. An image display device comprising a multi-point IR receiving unit for receiving signals from a remote control, the multi-point IR receiving unit being in electrical connection with a control unit of the image display device, **characterized in that** the control unit processes location information of a remote control in the manner that a movement imparting means is operated to displace the multi-point IR receiving unit whereby the remote control is kept within an effective communication zone with the multi-point IR receiving unit of the image display device.
2. An image display device as in Claim 1, **characterized in that** the multi-point IR receiver unit's physical position on a frame portion of the image display device is changeable by the movement imparting means.
3. An image display device as in Claim 2, **characterized in that** the movement imparting means selectively configures effective zone of the multi-point IR signal receiving unit in the form of a specific area of a room divided into a plurality of viewing or control zones in front of the image display device.
4. An image display device as in Claim 3, **characterized in that** the movement imparting means is an electric motor moving the multi-angle IR receiver unit in a guided manner to relocate the same along a two-dimensional frame area of the image display device so as to be selectively guided along two axes perpendicular to each other.
5. An image display device as in Claim 4, **characterized in that** each effective zone corresponds to coordinates on two axes on the frame of the image display device and the multi-point IR signal receiving unit's location is changed on the horizontal and/or vertical axes on the bottom part of the image display device frame to be targeting different effective zones.
6. An image display device as in Claim 5, **characterized in that** the multi-point IR signal receiving unit is displaceable only horizontally in parallel to the lower edge of the image display device.
7. An image display device as in any one of preceding claims, **characterized in that** the multi-point IR signal receiving unit's position is automatically determined in response to a non-audible sound wave generated by the remote

control to initiate a position calibration procedure.

8. An image display device as in Claim 7, **characterized in that** the position calibration procedure is initiatable by means of the remote control, pressing a dedicated button on the same.
9. An image display device as in Claim 8, **characterized in that** an audio processing unit of the image display device in the form of a frequency range scanning unit continuously remains in scanning mode to detect the specific non-audible sound wave generated by the remote control.
10. An image display device as in Claim 9, **characterized in that** upon detecting the specific non-audible sound, the control unit initiates calibration of the multi-point IR signal receiving unit by changing its position until a verification data is receivable.
11. An image display device as in Claim 10, **characterized in that** when a verification data transmitted by the remote control is received by the multi-point IR signal receiving unit, its position is maintained until a further automatic calibration operation is initiated.
12. An image display device as in Claim 10 or 11, **characterized in that** the image display device does not initiate the calibration operation if the multi-point IR signal receiving unit has an already effective zone within which communication with the remote control is active.
13. An image display device as in Claim 10, 11 or 12, **characterized in that** if the multi-point IR signal receiving unit cannot detect the verification signal in a first position corresponding to a certain viewing zone, it is subsequently moved to neighboring positions corresponding to other viewing zones until the continuously transmitted verification data is received and the effective zone is determined.

Fig. 1

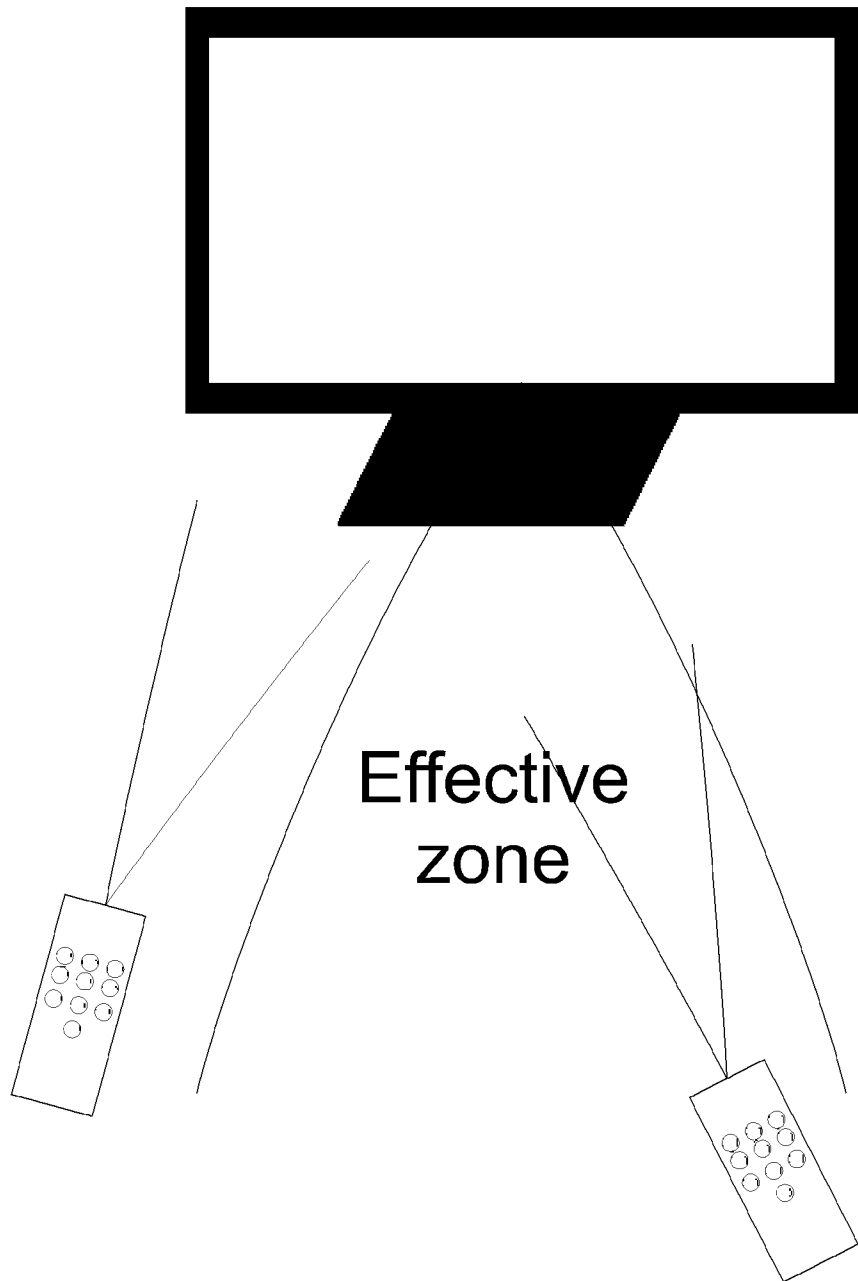


Fig. 2

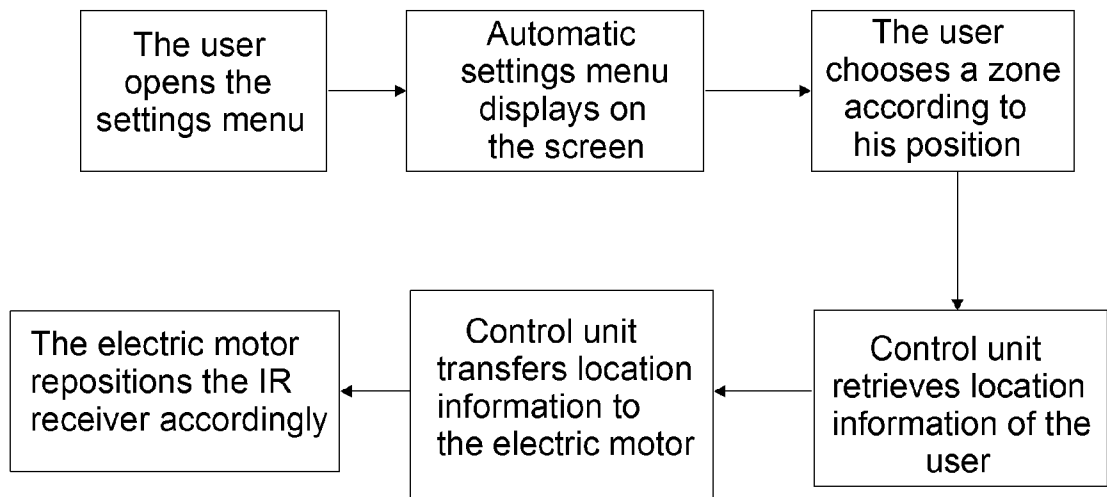
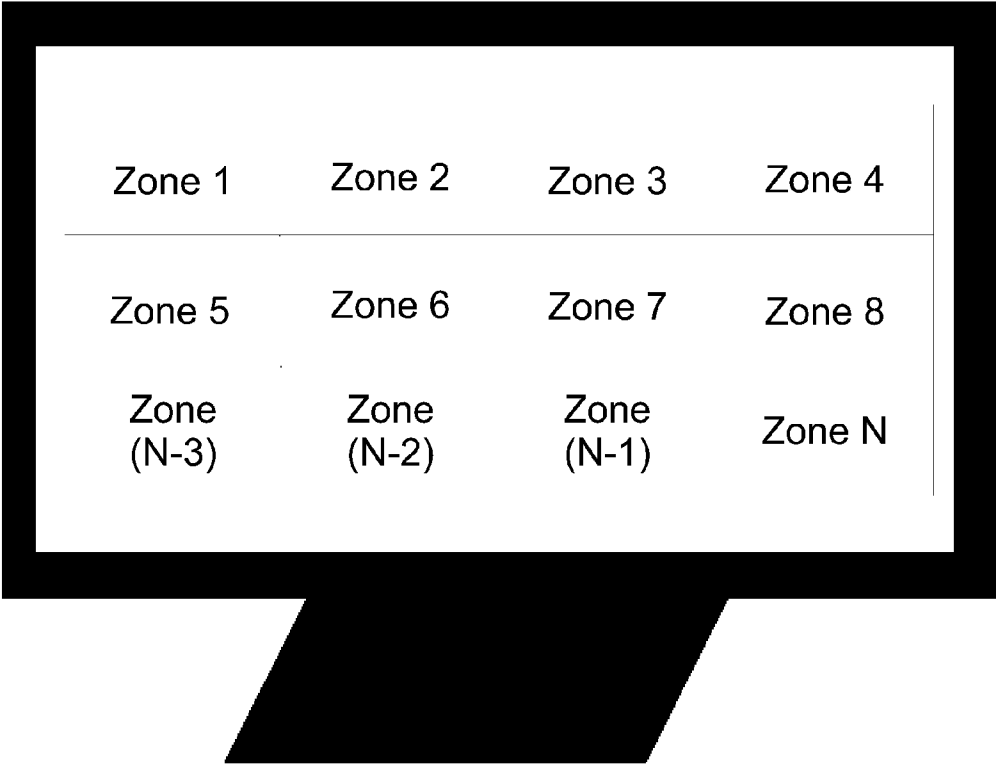


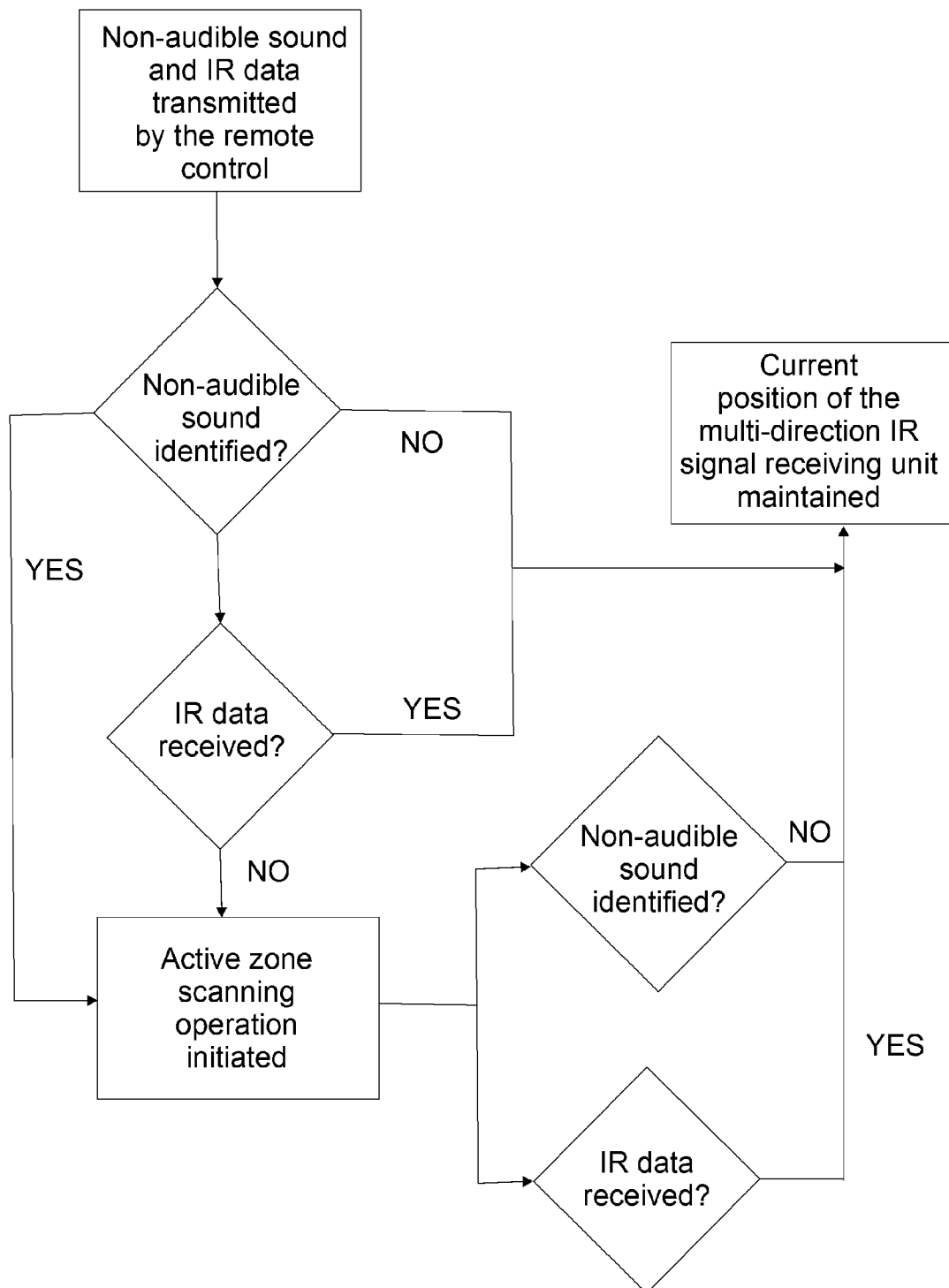
Fig. 3



The image shows a computer monitor with a thick black frame and a black base. The screen displays a table with four columns and three rows. The table is enclosed in a thin black border. The first row contains 'Zone 1', 'Zone 2', 'Zone 3', and 'Zone 4'. The second row contains 'Zone 5', 'Zone 6', 'Zone 7', and 'Zone 8'. The third row contains 'Zone (N-3)', 'Zone (N-2)', 'Zone (N-1)', and 'Zone N'. A horizontal line is positioned between the first and second rows. A vertical line is positioned between the third and fourth columns.

|            |            |            |        |
|------------|------------|------------|--------|
| Zone 1     | Zone 2     | Zone 3     | Zone 4 |
| Zone 5     | Zone 6     | Zone 7     | Zone 8 |
| Zone (N-3) | Zone (N-2) | Zone (N-1) | Zone N |

Fig. 4



# INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2015/075940

A. CLASSIFICATION OF SUBJECT MATTER  
INV. G08C23/04  
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)  
G08C

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 5 383 043 A (SU CHIH-HAI [TW])<br>17 January 1995 (1995-01-17)<br>column 1, line 6 - line 22<br>column 1, line 48 - column 2, line 22<br>----- | 1                     |



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

29 July 2016

Date of mailing of the international search report

05/08/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
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## INTERNATIONAL SEARCH REPORT

### Information on patent family members

International application No

PCT/EP2015/075940

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| US 5383043                                | A                   | 17-01-1995                 | NONE                |
| -----                                     |                     |                            |                     |