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(54) **Device for control and connection via cable by remote control of two or more apparatuses**

(57) A device for control and connection via cable by remote control of two or more apparatuses, comprising at least one infrared sensor (A), characterized in that, by way of a circuit (100), the demodulated infrared signal is

brought, by cable (300), to one or more level translator circuits (200) in which the conversion of the level of the demodulated signal is performed, thus making it usable by the microprocessor of the receiving apparatus to be controlled.

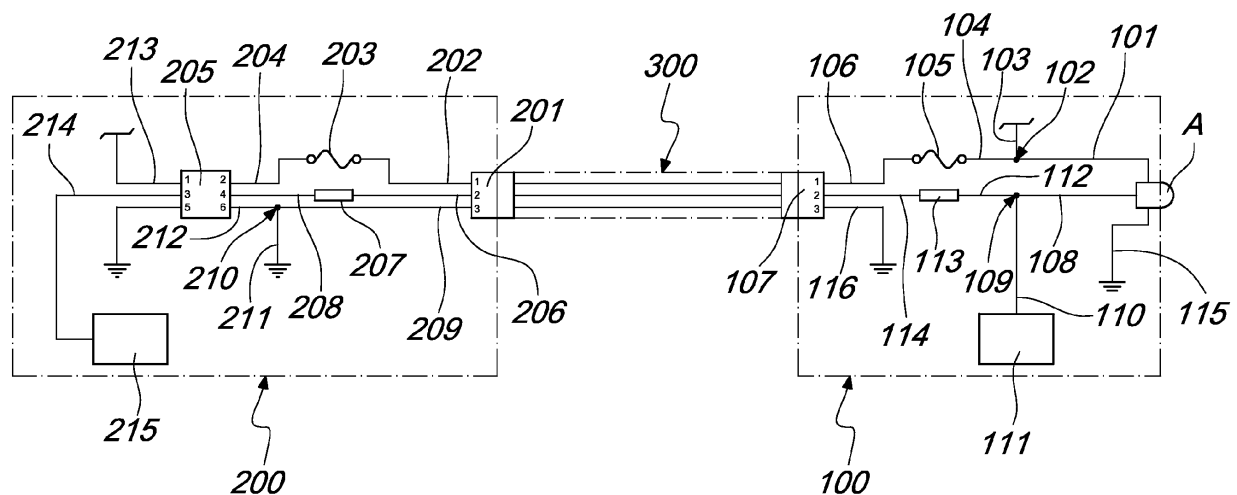


Fig. 1

Description

[0001] The invention relates to a device for the control, by remote control, via cable, of a plurality of apparatuses using a single input sensor for the infrared signal.

[0002] In the field of control of a plurality of devices with a single remote control, applications are known, such as for example those described in documents US5917631, TW200906081 and US20040153699, which are capable of converting the infrared signal of a remote control to match the various standards of the receiving apparatuses. Moreover, the devices described in US2005/285750 and US2004/155809 are known, but such applications involve the use of a microcontroller or of a processor in order to perform operations of transcodification or processing of the signal.

[0003] Such devices moreover have costs and applications which limit their use. Universal remote controls are also known which are capable of converting the infrared signal to the standard required for switching on and managing the apparatuses. These devices are not however capable of managing a plurality of apparatuses in which a single apparatus is installed in view, usually the television, while the other apparatuses, such as DVD player, decoder, audio systems and the like, are arranged inside containers such as cabinets or items of furniture or in particular locations, i.e. behind barriers that render the passage of the infrared signal impossible.

[0004] Moreover, reception of infrared is difficult in the presence of intense light sources, as can happen in a camper van or in environments with large windows. Apparatuses located proximate to strong light sources are, in fact, disturbed in reception of the infrared signal.

[0005] The aim of the present invention is to provide a device for control and connection via cable which is capable of bringing the signal to a plurality of apparatuses, even if these are not directly reachable by the signal of their remote control.

[0006] The device for control and connection via cable by remote control of two or more apparatuses comprises an infrared sensor which, by means of a circuit, brings the demodulated infrared signal via cable to one or more circuits in which the level conversion of the demodulated infrared signal is performed, thus making it usable by the microprocessor of the receiving apparatus.

[0007] The invention thus performs an exclusive level conversion since no protocol transcodification is performed.

[0008] With the invention the data transmitted by the remote control to the infrared sensor of the primary apparatus, usually the television, are simultaneously transmitted both to the circuit connected to the sensor and its microprocessor and to the circuit, connected via cable, of the subordinate apparatus, such as for example a DVD player, a decoder, an audio system or other, similar apparatuses, each one with its own microprocessor. The two microprocessors thus interpret the command according to the protocol implemented in their program of

read-only instructions, i.e. in their firmware, using RC-5, RC- 6, NEC, CIR or similar protocols, and proceed on the basis of how they have been programmed.

[0009] Further aims and advantages of the invention will become more apparent from the following detailed description, taken together with the accompanying drawings of sheets 1, 2, 3, 4 and 5 which illustrate, for the purposes of non-limiting example only, the invention.

[0010] More precisely, Figure 1 is a diagram of the invention with a single unidirectional level translator circuit.

Figure 2 is a schematic diagram of the invention provided with a multiple unidirectional level translator circuit.

Figure 3 is a diagram of the invention with a bidirectional level translator circuit.

Figure 4 is a diagram of the invention with a bidirectional level translator circuit and with status checking. Figure 5 is a perspective view of a television which is connected to an apparatus inside an item of furniture and, thus, not directly reachable by the infrared signal, with the device that is the subject matter of the invention connecting the two apparatuses.

[0011] In a preferred but not exclusive embodiment, the device for control and connection via cable by remote control of two or more apparatuses comprises at least one infrared sensor A which, by way of the circuit 100, brings the demodulated infrared signal through the cable 300 to one or more level translator circuits 200 in which the conversion of the level of the demodulated signal is performed, thus making it usable by the microprocessor of the receiving apparatus to be controlled.

[0012] The circuit 100 is constituted by an electrical cable 101 which is connected to the infrared sensor A, with connection 102 to the power supply cable 103 for the infrared and, by an electrical cable 104, to a fuse 105 which is connected in turn, with an electrical cable 106, to the connector 107. The infrared connector A is connected, by an electrical cable 108 of the infrared signal of the television or of the primary apparatus, to a connection 109 for connecting by cable 110 to the microprocessor 111 of the television or of the primary apparatus.

[0013] The connection 109 is connected by an electrical cable 112 to a resistor 113 and, subsequently, to an electrical cable 114 in order to be connected to the connector 107. The infrared sensor A is, moreover, connected, by an electrical cable 115, to the ground of the television or of the primary apparatus.

[0014] Finally, the connector 107 is connected, by a cable 116, to the ground of the television or of the primary apparatus.

[0015] The circuit 200 is a level translator circuit, constituted by a connector 201 of the receiving apparatus and by an electrical cable 202 which is connected to a fuse 203 which, via an electrical cable 204, provides the level translator device 205 with the input voltage level

from which to perform the level translation of the demodulated infrared signal.

[0016] The connector 201, moreover, is connected by an electrical cable 206 to a resistance 207 and, by way of an additional electrical cable 208, to the voltage level translator device 205.

[0017] The connector 201 is connected, via an electrical cable 209, to a connection 210, with an electrical cable 211 to the ground of the receiving apparatus and, with an electrical cable 212, to the voltage level translator device 205.

[0018] The voltage level translator device 205 is connected by an electrical cable 213 to the power supply voltage of the receiving apparatus, which is the voltage toward which to perform the level translation of the demodulated infrared signal.

[0019] The level translator device 295, moreover, is connected, by an electrical cable 214, to the microprocessor 215 of the receiving apparatus and by an electrical cable 216 to the ground of the receiving apparatus.

[0020] Between the circuit 100 and the circuit 200 a cable 300 is arranged. This cable is a bus cable for demodulated infrared signals.

[0021] The device of the present invention can, moreover, be provided with one or more circuits 200N which are connected in series by way of connections 217, 218 and 219 which are connected to the electrical cables 202, 206 and 209 and to the electrical cables 220, 221 and 222 so as to have an additional connector 201A available for serial connection by way of an additional cable 300N to another circuit 200NA which is similar to the first.

[0022] By repeating the electrical diagram it is possible, moreover, to connect a plurality of circuits 200N which are similar to the circuit 200 and are connected by cables 300N similar to the cable 300.

[0023] The device of the present invention is of the single or multiple unidirectional type, i.e. from one input source of the infrared signal it brings the signal to one or more voltage level translator circuits for control and connection via cable of two or more apparatuses, based on the requirements of the apparatuses to be connected.

[0024] In a further embodiment of the inventive concept the invention can be provided with bidirectional transmission between the apparatuses, using bidirectional level translator devices.

[0025] In this manner the microprocessors of the apparatuses can input commands in the bus cable for demodulated infrared signals.

[0026] In this case all the infrared lines, i.e. the bus cables for demodulated infrared signals, are brought in parallel from the subordinate apparatuses, i.e. from the apparatuses that are slaved to the primary, or master, apparatus.

[0027] The circuit of the primary apparatus performs the level conversion necessary in order to propagate the infrared signals to the microprocessor of the primary apparatus and from this to all the microprocessors of the subordinate apparatuses.

[0028] In this manner the commands demodulated by any one of the infrared sensors are propagated to all the apparatuses of the system according to their voltage levels.

[0029] The infrared sensors are optional since in order for the system to operate it is sufficient that either one of the subordinate apparatuses or the primary apparatus be provided with an infrared sensor.

[0030] The invention is thus constituted by a plurality of circuits 100N, which are similar to the circuit 100 and arranged in parallel, in which the infrared signal is transmitted via cable by a corresponding number of cables 300N for infrared signals, similar to the cable 300.

[0031] The plurality of circuits 100N constitutes the set of subordinate circuits, i.e. the slave circuits of the apparatuses.

[0032] The cables 300N connect corresponding circuits 200NB, which are similar to the circuit 200NA, except of course for the shunt connections for connection in series.

[0033] In these circuits, instead, the electrical cable 214 of the first circuit 200NB is connected to connection 223.

[0034] The connection connects, by a cable 224, an infrared sensor 225.

[0035] This sensor is optional as is the electrical cable 224 for connection.

[0036] As previously described the infrared sensors of the slave circuits are also optional: it is sufficient for a single apparatus to be provided with one for the input infrared signal.

[0037] The connection 223, via electrical cable 226, connects to a further connection 227.

[0038] This connection is connected to the various cables 214A and 214B of the respective circuits 200NB of which there are the same number as there are apparatuses to be controlled.

[0039] By means of the connection 227, via electrical cable 228, the primary microprocessor 229 is connected.

[0040] The plurality of cards 200 each one for the primary processor 229 constitute the set of primary circuits, i.e. of the master circuits of the apparatuses.

[0041] The circuits can be replicated, according to the requirements of the apparatuses to be controlled, into multiple circuits 200NB.

[0042] The device according to the invention can, moreover, have an electrical cable 230 for connection to the data bus for demodulated infrared signals of the cable 301N such as to constitute a transmission line of the signal that transports the information about the on/off status of the subordinate apparatus, i.e. of the slave apparatus.

[0043] The status of the apparatus is, typically, taken from the driving line of the LED that indicates whether the apparatus is powered up or powered down.

[0044] To this end there is a connection with an electrical cable 231 to the driving line of the LED A'.

[0045] The electrical cable 230 is connected to the connector 201 and from this, by a cable 232, to a resistor 233.

[0046] The electrical cable 234 connects the resistor 233 to the voltage level translator device 235.

[0047] Finally, via the electrical cable 236 the translator is connected to the primary microprocessor 237, i.e. the master microprocessor.

[0048] In this manner the master microprocessor 237 is aware of the on/off status of the subordinate microprocessor.

[0049] The electrical layout described in this embodiment can be replicated for every apparatus to be controlled, i.e. for a corresponding number of circuits 100NC which are similar to the circuit 100 in which the demodulated infrared signal is brought to the circuits 200NC, based on the needs of the apparatuses to be controlled.

[0050] Moreover, the primary microprocessor 237, by being aware of the status of the secondary microprocessors, can execute complex operations such as sending the command to power up to all the apparatuses that are powered down.

[0051] The usefulness of the device in this embodiment is constituted by the fact that usually there is a single command to alternately control the powering up or powering off of the apparatuses, thus not being aware of the on/off status of each apparatus means it is not possible to ensure its actual powering up or down.

[0052] Thus by way of the circuits 100NC, 200NC and the cables 301NC a circuit is provided with checking of the on/off status of each single apparatus.

[0053] In operation the invention is powered up by way of an infrared remote control which operates any one infrared sensor A where, over one or more circuits 100 or similar 100N of each connected apparatus, the demodulated infrared signal is brought by way of one or more cables 300 or similar 300N or 301N to one or more circuits 200 or similar 200N, in which the level conversion of the demodulated infrared signal is performed thus making it usable by one or more microprocessors 215 and equivalent 215A of each apparatus connected in series or a primary, i.e. master, microprocessor 229 or 237.

[0054] The device of the present invention is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0055] All the details may be substituted by other, technically equivalent elements within the scope of protection encompassed by the claims.

[0056] The disclosures in Italian Patent Application No. BO2011A000740 from which this application claims priority are incorporated herein by reference.

[0057] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A device for control and connection via cable by remote control of two or more apparatuses comprising at least one infrared sensor (A), **characterized in that**, by way of a circuit (100), the demodulated infrared signal is brought, by cable (300), to one or more level translator circuits (200) in which the conversion of the level of the demodulated signal is performed, thus making it usable by the microprocessor of the receiving apparatus to be controlled.
2. The device for control and connection via cable by remote control of two or more apparatuses according to claim 1, **characterized in that** the circuit (100) or a plurality of circuits (100N) brings or bring the demodulated infrared signal by cables (300N) to circuits (200N, 200NA, 200NB) for controlling the connected apparatuses.
3. The device for control and connection via cable by remote control of two or more apparatuses according to claims 1 and 2, **characterized in that** the circuits (200, 200NA) are unidirectional level translator circuits.
4. The device for control and connection via cable by remote control of two or more apparatuses according to claims 1 and 2, **characterized in that** the circuit (200NB) is a bidirectional level translator circuit.
5. The device for control and connection via cable by remote control of two or more apparatuses according to claims 1, 2 and 4, **characterized in that** the circuits (100NC, 200NC) connected by cables (301N) constitute a circuit for checking the on/off status of each single connected apparatus.

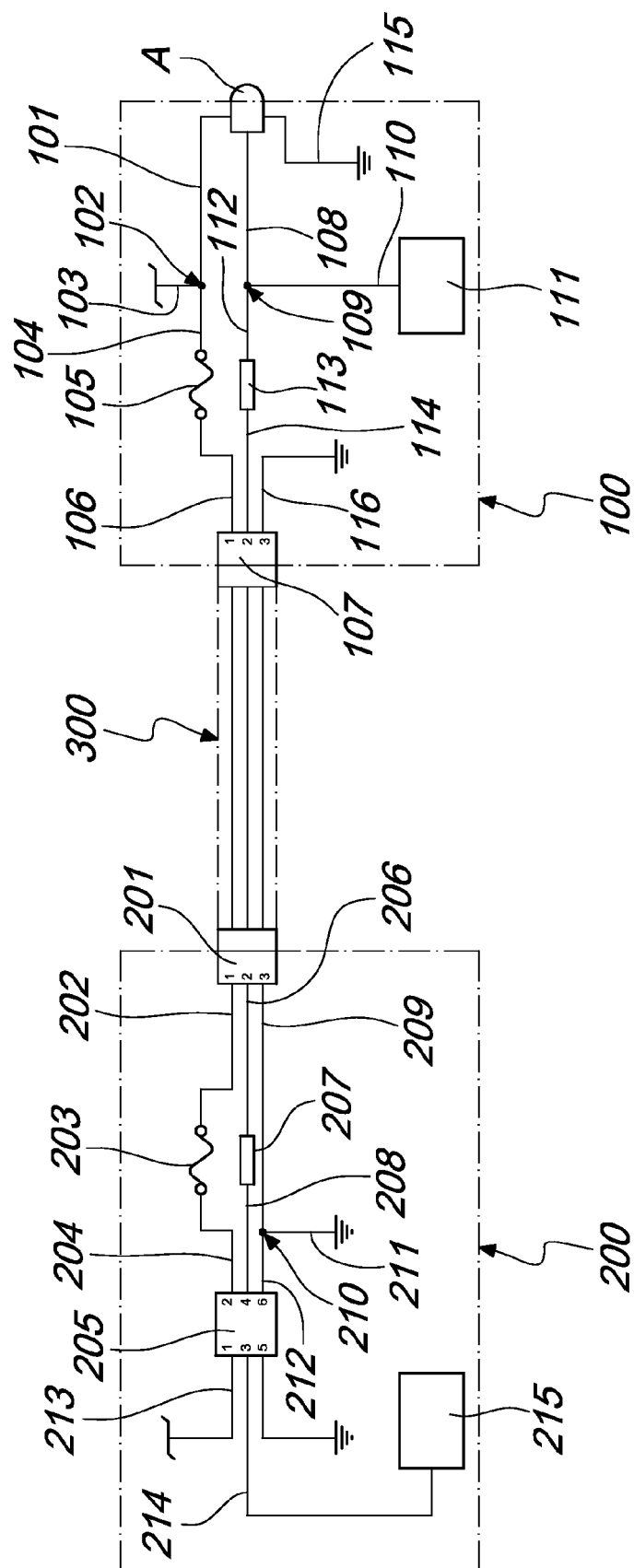
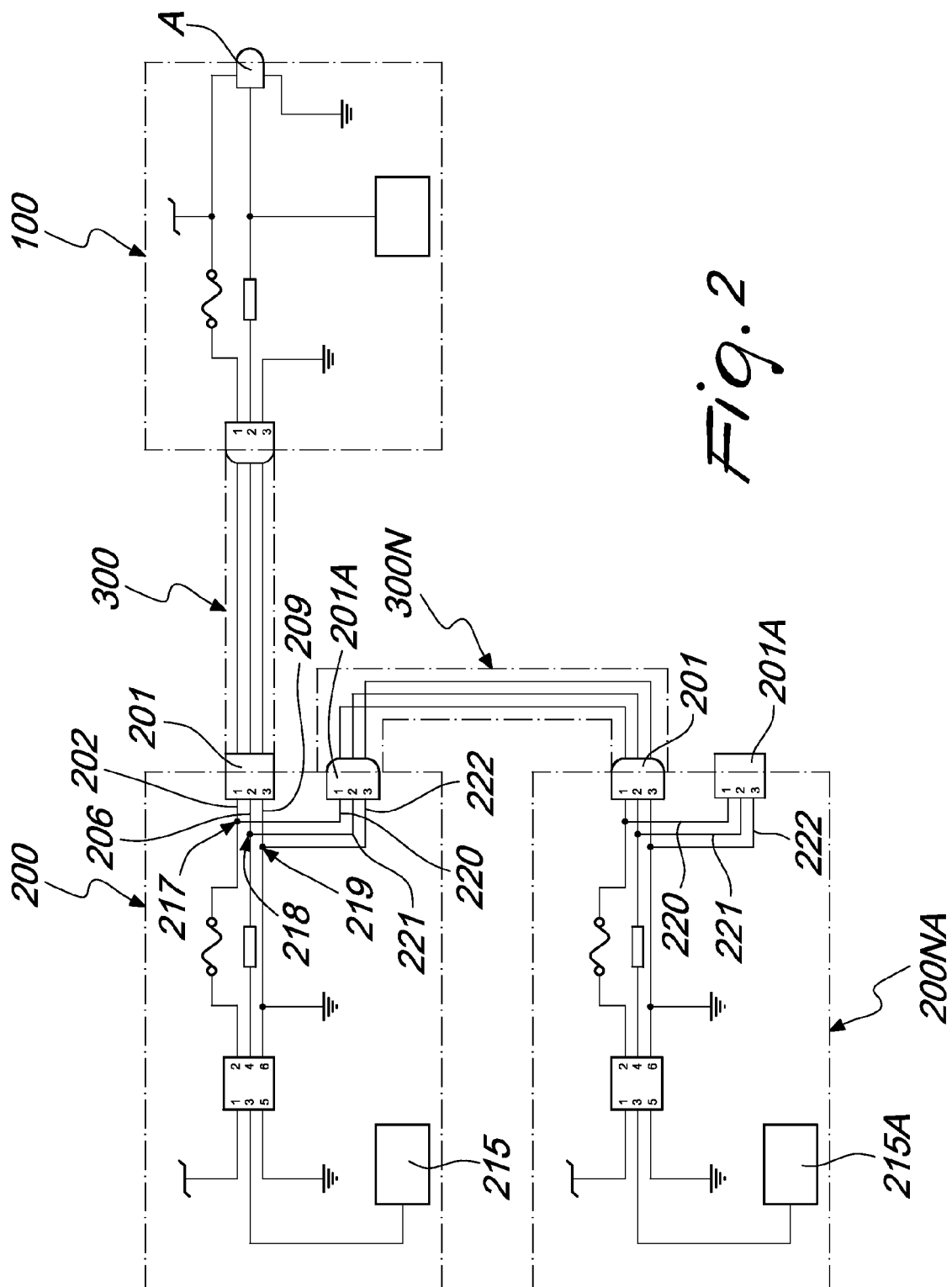
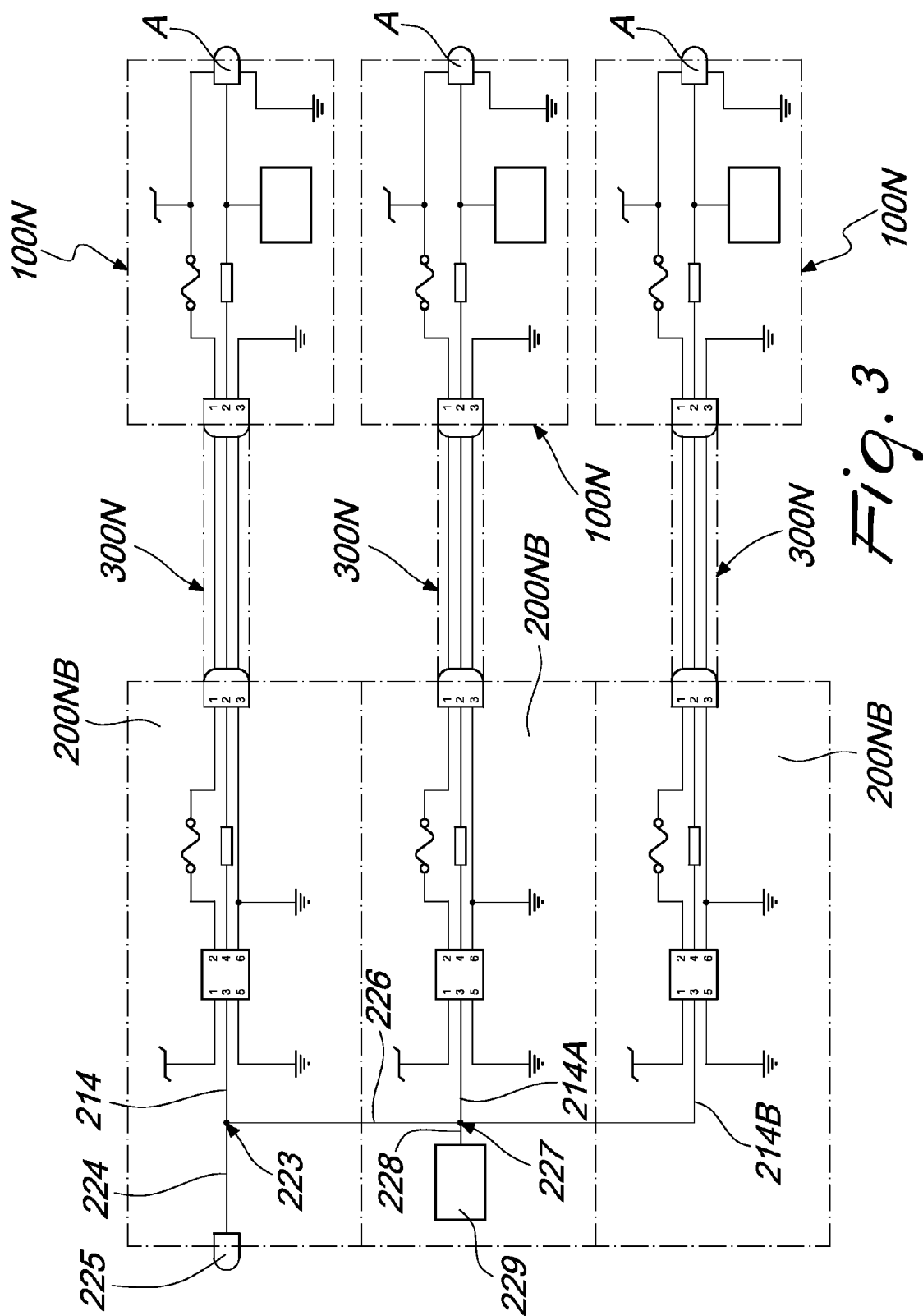


Fig. 1





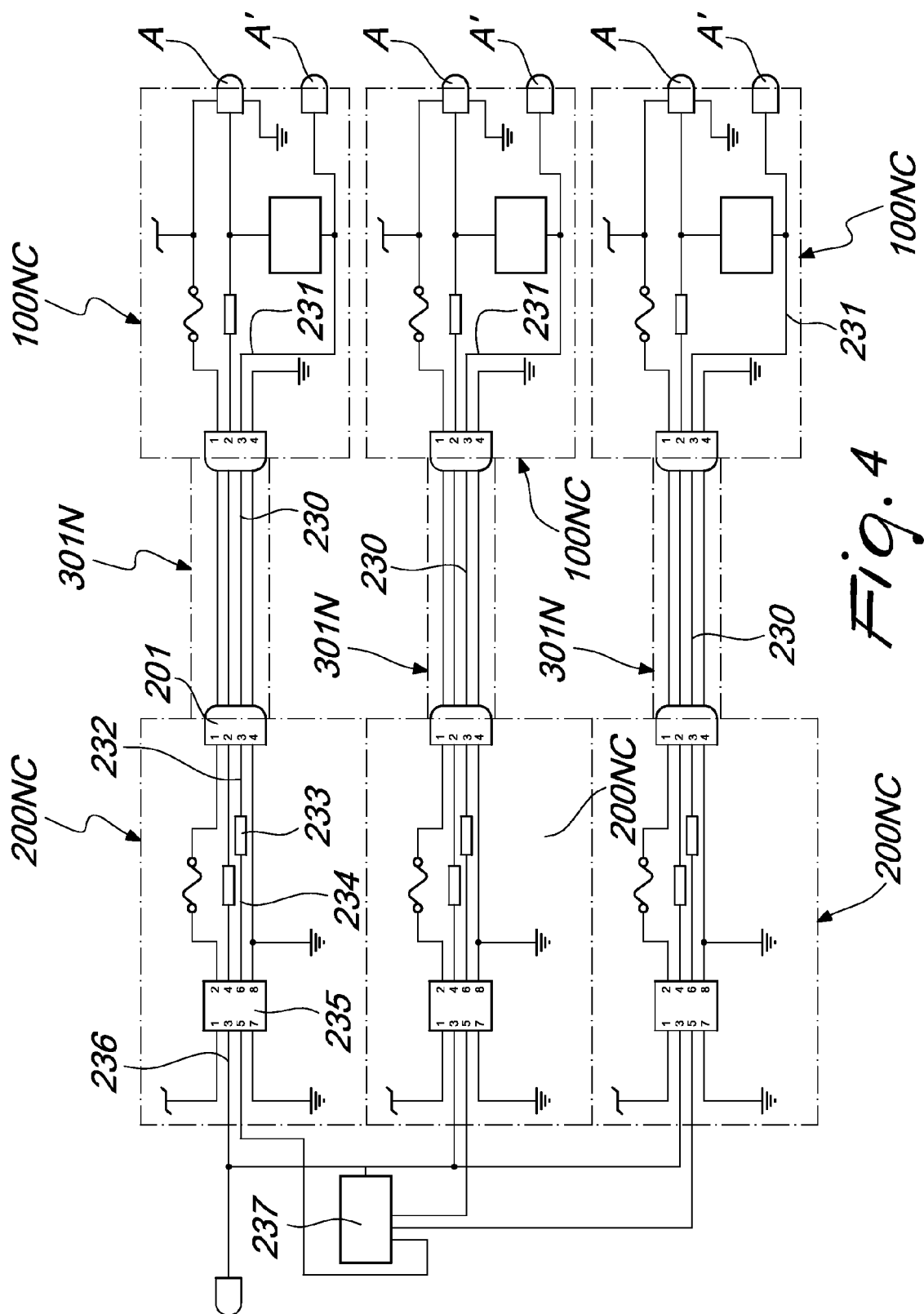


Fig. 4

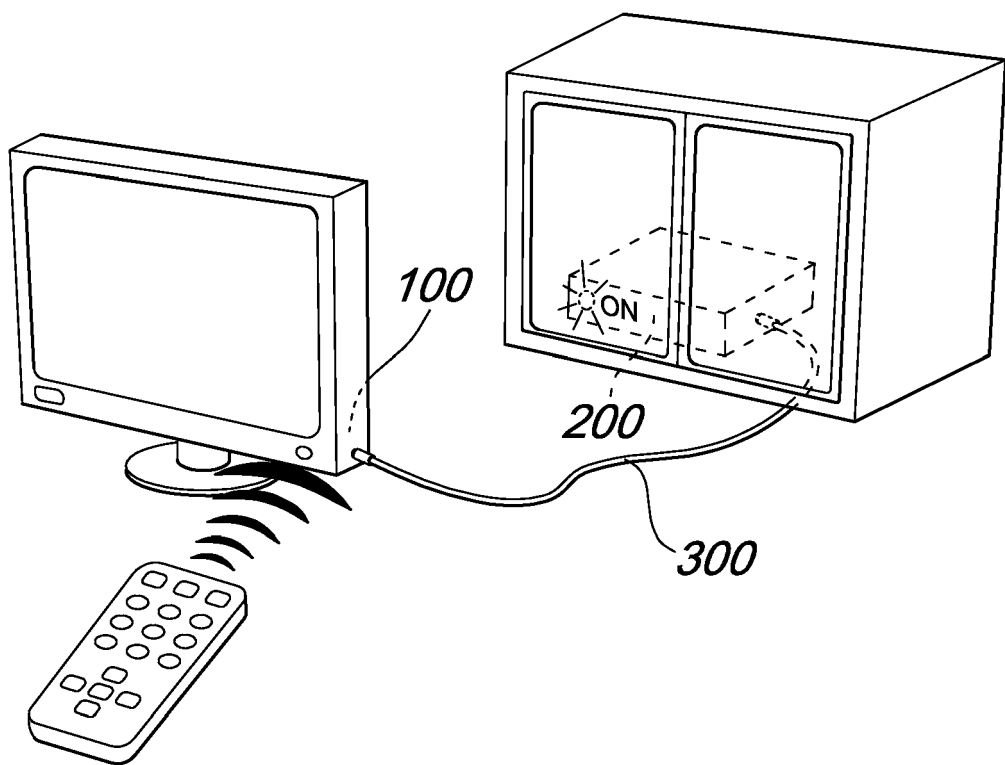


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 12 19 7787

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 January 2013	Examiner Pham, Phong
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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28-01-2013

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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