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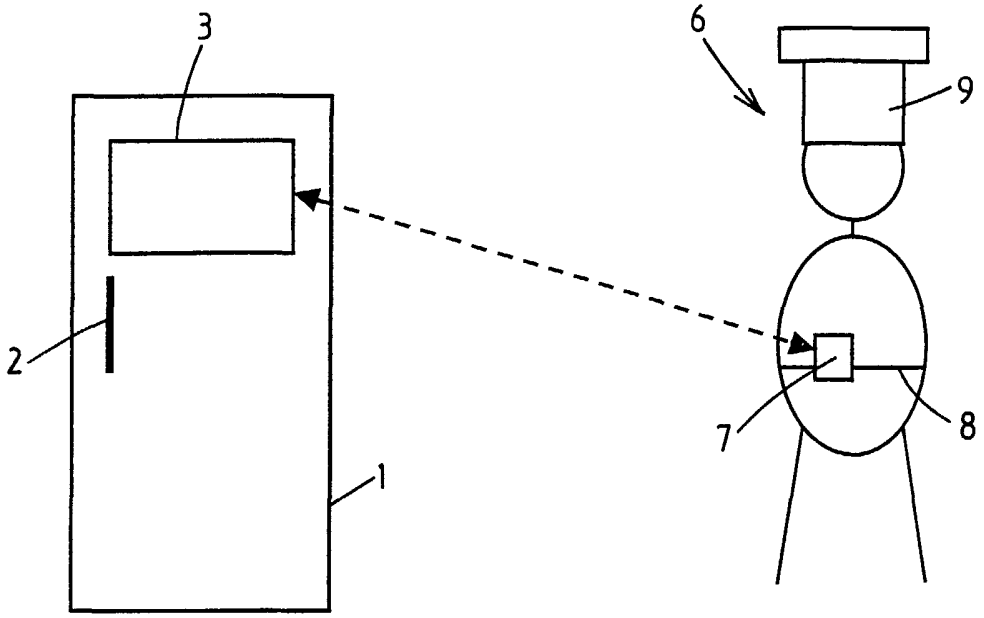
(54) Title: METHOD AND SYSTEM FOR CONTROLLING A RADIO-FREQUENCY DEVICE DEPENDENT ON A DISTANCE TO ANOTHER RADIO-FREQUENCY DEVICE



(57) Abstract: Method and remote control system, including RF devices (3, 7, 11, 12, 13, 19) with RF circuits capable of determining a value of a distance between a first (3, 12, 19) and a second device (7, 11, 18) of the RF devices in which an operation of a device is controlled dependent on said distance value.

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METHOD AND SYSTEM FOR CONTROLLING A RADIO-FREQUENCY DEVICE DEPENDENT ON A DISTANCE TO ANOTHER RADIO-FREQUENCY DEVICE.

The invention relates to a method for controlling a first device which has radio-frequency circuits dependent on a value of a first distance between it and a second device which has radio-frequency circuits, which first distance value is determined on the basis of properties of one or more radio-frequency signals which are transmitted between such devices.

A method and system of the above type are known from practice. For example a method in which a first radio-frequency device is monitored by a parent of a child which carries a second radio-frequency device which transmits a radio-frequency signal, and in which the first device is triggered to an alarm state if the signal is received with a strength below some threshold.

Such prior art method has the disadvantage that every pair of a parent and child requires a system comprising such first and second devices, which makes the method and system complex, expensive and difficult to operate by an average user. In addition, the prior art method and system do not have the possibility to determine a relative position of the two devices with respect to a third device. In particular, the prior art method and system do not provide the possibility to change a display of data, images inclusive, on a device dependent on a distance and/or relative location between it and another device.

It is an object of the invention to solve the drawbacks of the prior art methods.

Said object is obtained in that with the method according to the invention, the devices are arranged in a network having at least one additional third device having radio-frequency circuits, a value of a second distance between the third device and one of the first and second devices is determined on the basis of properties of one or more radio-frequency signals which are transmitted between the third device and said one device of the first and second devices, and the

first distance value is determined dependent on the second distance value.

Since the radio-frequency devices are devices of a network of radio-frequency devices they will most likely be equipped with identical or standard radio-frequency circuits to communicate with each other. This will be the case with networks which are generally known by their following names: Bluetooth (trademark of Telefonaktiebolaget L M Ericsson, Sweden), DECT, Hyperlan2 and HomeRF (trademark of the HomeRF Working Group). These networks provide short range digital communication for small network RF devices replacing conventional cable connections, for example for mobile phones, all kinds of portable personal digital devices, computer devices and home appliances.

Dependent on the radio-frequency circuits of the several radio-frequency devices being identical or not different preferred embodiments are provided according to the invention.

The invention also provides a remote control system, including a first device and a second device which have radio-frequency circuits, in which the first device is controlled dependent on a value of a first distance between the first device and the second device and the first distance value is based on properties of one or more radio-frequency signals which were transmitted and received by the devices, wherein the devices are devices of a network of devices having radio-frequency circuits and comprising at least one additional third device, the third device having means to determine a value of a second distance between it and the first or second device, and the first distance value is determined dependent on the second distance value.

The invention will be described in further detail below with reference to the drawings, in which figs. 1-4 show first to fourth preferred embodiments respectively of a remote control system according to the invention.

Fig. 1 shows schematically a door 1 of, for example, a pantry or refrigerator with a handle 2. At the front of the door 1, approximately at eye height of a standing person, a radio-frequency (RF hereinafter) device 3 is mounted to the door 1. That is, RF device 3 contains RF circuits which are able to communicate with RF circuits of other RF devices. In addition, RF device 3 includes

circuitry to store data and to present data on a display screen at the front thereof.

A human, for example a cook, schematically indicated by numeral 6, may carry another RF device 7, which may be attached to a belt 8 round his waist or clipped to his chef's hat 9. RF circuits of RF device 7 may be identical to the RF circuits of RF device 3. For the remaining devices 3 and 7 may be completely different.

The RF circuits of the devices 3 and 7 can be circuits which are used for communication in Bluetooth (trademark of Telefonaktiebolaget L M Ericsson) network or any other network of this type. Such RF circuits are able to determine a signal strength of a received RF signal and to transmit in response thereto a RF signal by which an increase or decrease of transmission power is requested. Since the strength or level of a received RF signal is dependent on a distance between the transmitter and the receiver of the signal it can be used as value of said distance by one or both RF devices. Even in case the RF circuits of devices 3, 7 are not designed to change transmission power, the strength or level of a received RF signal will give an indication of a distance between the devices 3 and 7.

The operation of the example of the remote control system according to the invention shown in fig. 1 is as follows.

The cook 6 has chosen somehow, for example directly through device 3 or a computer which is connected thereto, to display data about supplies in the pantry, a recipe, orders from a restaurant, status of the orders, etc. The cook 6 may walk around in his kitchen but may find difficulties in reading the data displayed on the screen of device 3 when his distance to device 3 increases. To solve this problem a value of the distance is determined by the RF circuits of one or both devices 3, 7 and possibly communicated by device 7 to device 3. In response to an increased distance value a display magnitude of data, images inclusive, displayed on the device 3 is increased, so that the cook 6 may still be able to read it from greater distance. At the same time the device 3 may alter a method of presentation, layout inclusive, of the data. The same applies, vice versa, upon a decrease of the distance value.

Now that, according to the invention, the cook 6 is able to read the data on a screen of device 3 from greater distance too it

may be more useful than before for the cook to carry a device 7 which is equipped with input means, such as buttons or a microphone attached on his collar, to control a computer, whether part of device 3 or not, from a distance to display other data and/or to control other devices dependent on de displayed data.

It will be clear that fig. 1 shows an example of the use of a remote control system according to the invention only. If device 3 was mounted on a machine and device 7 was carried by an operator of the machine the description would have been basically the same. The same applies if device 3 was a monitor of a personal computer system and device 7 was carried by a user of the computer system, for example by a player of a computer game in which the player may carry device 7 on his head, for example on a headphone. Dependent on the distance of the player with respect to device 3 the presentation of data and even the game itself might be changed. From this it will be understood that the invention is not limited to the control of the presentation of data on a display screen but is applicable for all kinds of control of one or both devices 3 and 7.

Fig. 2 shows three RF devices 11, 12, 13, of which devices 12 and 13 have a fixed distance with respect to each other, which is schematically indicated as the devices 12, 13 being attached by a screw 14 to a common object or base (ground). Device 11 is mobile with respect to devices 12 and 13, which is indicated by open screw hole 15 of device 11. RF devices 11 and 13 are able to determine a distance between them in the way devices 3 and 7 in fig. 1 could. The RF circuits of RF device 13 are able to communicate a value of this distance to RF device 12. Since the distance between devices 12 and 13 is fixed device 12 is then able to calculate the distance between it and device 11. As an alternative, devices 11 or 13 could calculate said distance between devices 11 and 12 and communicate it to device 12. As a further alternative, at least one of the devices 12, 13 is mobile with respect to the other devices and devices 12, 13 are able to determine a value of a distance between them. Since a distance between devices 11 and 13 is identical for any location of device 11 on a circle having device 13 in its centre, the embodiment shown in fig. 2 will be of use only if it is only the distance (radius) between the devices 11 and 13 and not an angle between pairs of RF devices which changes.

The system shown in fig. 3 differs from that of fig. 2 in that devices 11, 12 of fig. 2 have been replaced by mobile RF device 18 and immobile RF device 19 respectively. RF device 18 and RF device 19 are able to determine a value of a distance between them in the same way as devices 3 and 7 of fig. 1 could. The same applies for the pair of RF devices 13 and 18. Since RF devices 13 and 19 are immobile with respect to each other, a distance between them is constant. In addition, the distances of RF device 18 with respect to both other devices 13 and 19 can be determined. From the values of the three distances between the three devices 13, 18, 19 a true location of RF device 18 with respect to RF device 19 can be obtained. This makes it possible to control any device 13, 18, 19 not only dependent on its distance to another device 13, 18, 19 but also from its angular position with respect to connection lines between centres of the devices. This makes the system of fig. 3 more versatile than the systems of figs. 1 and 2.

The system shown in fig. 4 differs from the system shown in fig. 3 only by that all RF devices 13, 18, 19 are mobile, making it even more versatile than the system of fig. 3. In practice the RF circuits of RF devices of the type mentioned before will be identical, which means that the system shown in figs. 3 and 4 can be applied for all situations, with or without the use of values of angles between connection lines between centres of the devices.

It is observed that within the scope of the invention any device 11, 12, 13, 14, 15 may be controlled dependent on a value of a distance between a pair of devices or dependent on values of distances between several pairs of devices. The determination or calculation of distance values could be carried out by a single device, some specific devices or it may be distributed among the devices. It just needs to communicate appropriate intermediate and/or final calculation results among the appropriate device or devices.

CLAIMS

1. Method for controlling a first device (3, 12, 19) which has radio-frequency circuits dependent on a value of a first distance between it and a second device (7, 11, 18) which has radio-frequency circuits, which first distance value is determined on the basis of properties of one or more radio-frequency signals which are transmitted between such devices, **characterized in that** the devices are arranged in a network having at least one additional third device (13) having radio-frequency circuits, a value of a second distance between the third device (13) and one of the first and second devices is determined on the basis of properties of one or more radio-frequency signals which are transmitted between the third device and said one device of the first and second devices, and the first distance value is determined dependent on the second distance value.

2. Method according to claim 1, **characterized in that** a value of a third distance between the third device (13) and the other one of the first and second devices is determined, and the first distance value is determined by a difference between the second distance value and the third distance value.

3. Method according to claim 1, **characterized in that** a value of a third distance between the third device (13) and said other one of the first and second devices is determined, and from the first to third distance values relative angular positions of the first to third devices are calculated.

4. Method according to claim 2 or 3, **characterized in that** the third distance is fixed.

5. Method according to claim 2 or 3, **characterized in that** the third distance value is determined on the basis of properties of one or more radio-frequency signals which are transmitted between the third device and said other one of the first and second devices.

6. Remote control system, including a first device (3, 12 19) and a second device (7, 11, 18) which have radio-frequency circuits, in

which the first device is controlled dependent on a value of a first distance between the first device and the second device and the first distance value is based on properties of one or more radio-frequency signals which were transmitted and received by the devices, **characterized in that** the devices are devices of a network of devices having radio-frequency circuits and comprising at least one additional third device (13), the third device having means to determine a value of a second distance between it and the first or second device, and the first distance value is determined dependent on the second distance value.

7. Remote control system according to claim 6, **characterized in that** the devices have means to determine a value of a third distance between the third device (13) and the other one of the first and second devices and to determine the first distance value by a difference between the second distance value and the third distance value.

8. Remote control system according to claim 6, **characterized in that** the devices have means to determine a value of a third distance between the third device (13) and said other one of the first and second devices and to calculate relative angular positions between the first to third devices from the first to third distance values.

9. Remote control system according to claim 7 or 8, **characterized in that** the third device and said other one of the first and second devices have fixed locations with respect to each other.

10. Remote control system according to claim 7 or 8, **characterized in that** the devices have means to determine the third distance value on the basis of properties of one or more radio-frequency signals which are transmitted between the third device and said other one of the first and second devices.

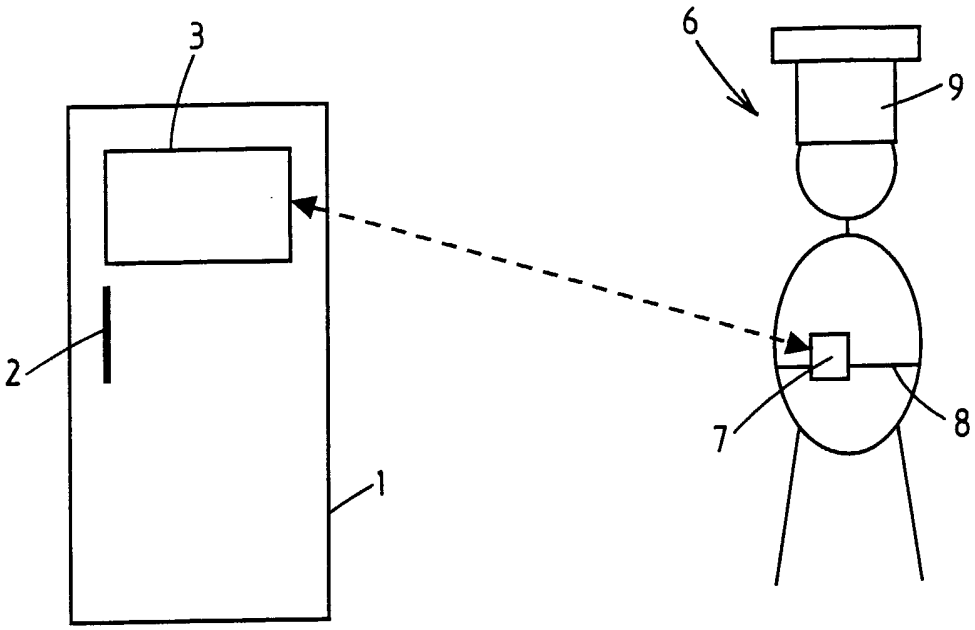

FIG 1

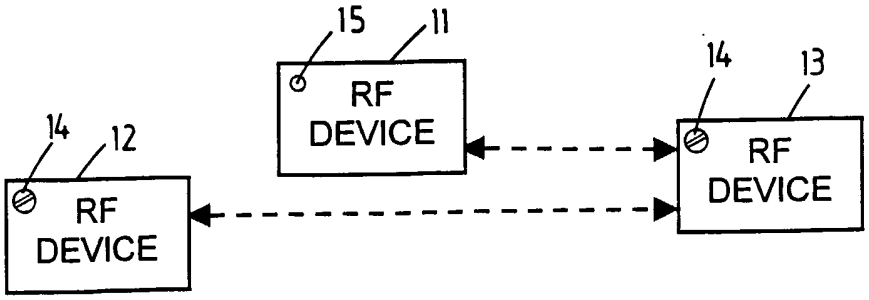

FIG 2

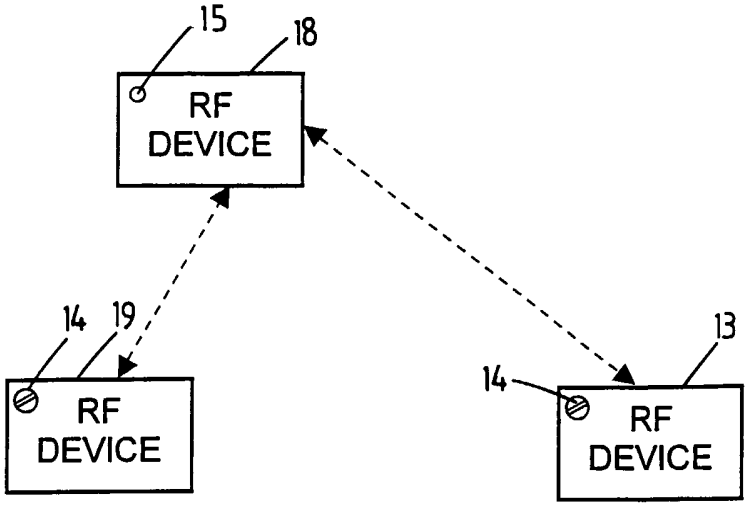
15
18
RF
DEVICE
14
19
RF
DEVICE
13
14
RF
DEVICE

FIG 3

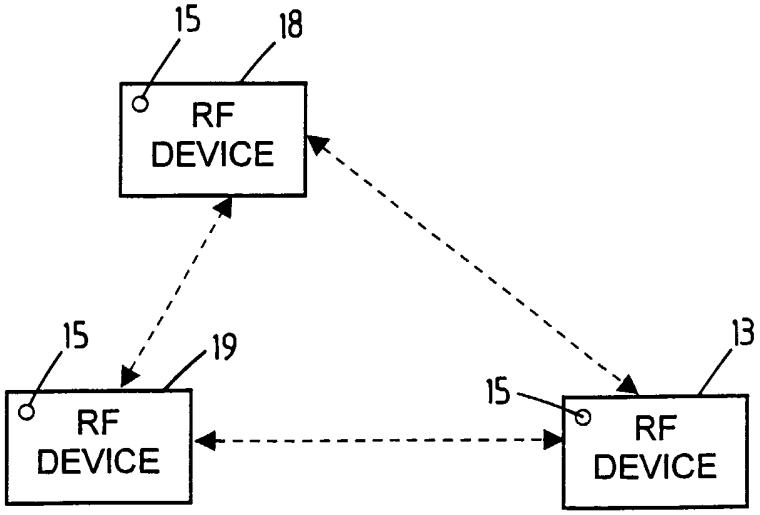
15
18
RF
DEVICE
15
19
RF
DEVICE
13
15
RF
DEVICE

FIG 4

INTERNATIONAL SEARCH REPORT

PCT/NL 01/00544

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G08B13/14

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)
IPC 7 G08B

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 practical, 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.
A	US 5 821 854 A (DORINSKI DALE W ET AL) 13 October 1998 (1998-10-13) abstract	1-10
A	US 6 011 471 A (HUANG DENNIS) 4 January 2000 (2000-01-04) abstract	1-10
A	WO 00 38124 A (GATEWAY INC) 29 June 2000 (2000-06-29) abstract	1-10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
21 February 2002	27/02/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Sgura, S

INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/NL 01/00544

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
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