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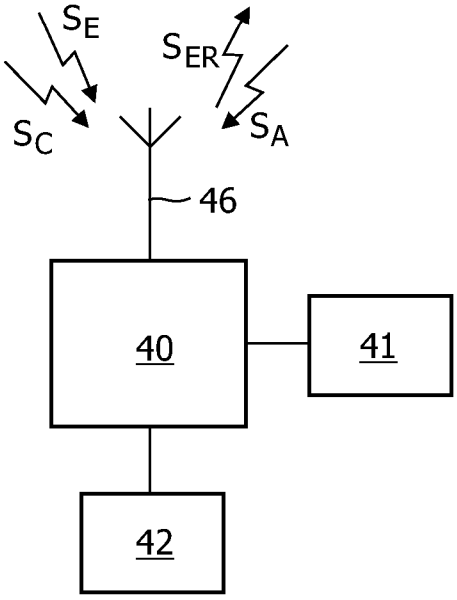

(57) Abstract: A network communication system (2), comprises a network device (11) capable of operating in an enlistment mode and comprising: communication means (16) for transmitting a signal; a virginity memory (60) containing a virginity code (NDVC); - a comparison memory (61) containing a first predetermined value; wherein the network device is arranged, in response to an operation initiation event, to compare the virginity code (NDVC) with the value in the comparison memory, and: if the virginity code is equal to the first predetermined value of the comparison memory, to enter the enlistment mode, to emit an enlistment signal, to perform the enlistment procedure for enlisting to the network, to write a second predetermined value into the virginity memory, and to enter a ready-for-use mode; otherwise if the virginity code is unequal to the first predetermined value of the comparison memory, to immediately enter the ready- for-use mode.

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Network communication system

FIELD OF THE INVENTION

The present invention relates in general to a communication system having a network structure, preferably but not necessarily capable of two-way communication. In a particular example, the invention may relate to a system for controlling a plurality of light sources, and the invention will be specifically explained with reference to this example, but it is noted that the invention is not limited to this example. Particularly, the network may comprise multiple household appliances of different nature, for instance lighting devices, heating devices, televisions, etc; more generally, any electrically powered appliance, either powered from mains or from a battery.

BACKGROUND OF THE INVENTION

In a particular example, the invention relates to an illumination system comprising a plurality of lamps. Each lamp is provided with a network device capable of switching the corresponding lamp ON or OFF, and possibly capable of dimming the lamp. In the case of an armature with multi-colour lamps, the lamps can be ordered to make a certain desirable mix colour. A user-operated remote control is a network component capable of issuing command signals to the network devices over a communication path that may be wired but preferably is wireless; a preferred way of communication is via RF signals. Thus, the user can remotely operate his illumination system without needing to operate individual switches located with the individual lamps. Further, the system does not require a new infrastructure: an existing lightbulb may simply be replaced by a new lightbulb having the associated network device.

In the following discussion, for sake of convenience, reference will be made to a "lamp" in cases where actually the network device of such lamp is intended, as should be clear to a person skilled in the art.

In order to be able to operate a plurality of lamps individually, it is necessary that the lamps can be distinguished from each other. Therefore, each lamp has a unique ID code or address code, and the command signal issued by the remote control contains an

instruction part as well as a part indicating the addressee, i.e. the lamp for which the instruction is intended; the instruction part tells this lamp what it is expected to do.

The command signal may also contain a request for acknowledgement; in that case, apart from receiving and obeying the instruction, the network device also sends an acknowledgement message to the remote control, so that the remote control knows that its command signal has been received by the addressee network device. If such acknowledgement message is not received quickly enough, the remote control will automatically resend the command signal, without the user needing to actuate the corresponding command button again.

The system further comprises a memory containing network definition information. This memory will be indicated as network definition memory. The network definition information comprises, inter alia, a list of ID codes of network devices and a list of ID codes of corresponding remote control devices. It is noted that there may be more network devices in the neighbourhood taking part in the communication and therefore per definition being part of the communication network, but if a network device is not included in the network definition information (i.e. it is not on the list), it can not be addressed and therefore not operated by the remote control. Further, it is noted that there may be more remote control devices in the neighbourhood, but if a remote control is not included in the network definition information (i.e. it is not on the list), its command signals will not be accepted or obeyed.

Further, the network definition information may comprise a table defining which network device (ID code) is associated with which command button. It is possible that the remote control has command buttons associated with individual lamps. However, it is preferred that one command button is capable of operating a group of lamps simultaneously. In that case, the network definition information may comprise, for each command button, a list of network devices (ID codes) associated with that particular command button, or, alternatively, a list defining which network devices are member of which group as well as a table defining which group is associated with which command button.

The network is not static. It is possible that lamps are added or removed, or that the group assignment of a lamp is changed. Thus, there is functionality allowing the user to amend the network definition memory. The combination of network definition memory and the amendment functionality will be indicated as "coordinating means". In a suitable embodiment, the coordinating means are implemented as a separate device, which will be indicated by the phrase "coordinator". However, the coordination function may also be integrated with other network devices, for instance a remote control. An advantage of a

separate coordinator device lies in the fact that the remote control is preferably implemented as a light-weight battery operated device while the coordinator is preferably provided with constant power from mains so that its settings are not lost when the batteries run empty.

A particularly suitable communication protocol for implementing the present invention is Zigbee. Since Zigbee is known per se, as it is an open source standard, a detailed description of Zigbee is omitted here.

SUMMARY OF THE INVENTION

As mentioned above, each component of the network, i.e. network device, remote control, coordinator, has a unique address or ID code, so that it is possible to send a command that is received by multiple receivers but only actually processed by one, i.e. the intended addressee. However, this implies that, for a successful communication, the network components must "know" each other. The remote controls must know the ID codes of the network devices they can address. The network devices must know the ID code(s) of the remote control(s) they are to obey. The network devices and the remote controls must know the ID code of the coordinator they are to obey; etc. Immediately after manufacture, each such component only has its own ID code installed, and it has no knowledge of other components. In fact, the components may be manufactured at different locations, and the set of components constituting the network may be brought together later.

It is quite common that a network is sold to a consumer as a set of components, also indicated as a kit. For instance, in the above example, a starters kit may comprise one coordinator, one remote control and four lamps with network devices. It is appealing to a manufacturer or retailer to simply provide the six individual components, put them in a box and sell this to the consumer. However, when the user comes home, he must not only physically mount the components but he must also functionally mount the network. This is done by placing each component in an enlistment mode, in which each component enlists itself to the network. In the process of enlisting a component, its ID code is registered in the network configuration memory of the coordinator, and it "learns" the ID codes of the other components. This is rather a tedious task, especially when considering that the consumer is probably not familiar with the products.

Consumers are mostly interested in increased user comfort with "plug-and-play" type of functionality. To date, this is realized in that the tedious task of making the components acquainted with each other is performed by, for instance, the manufacturer or retailer, or at least somewhere in the channel from manufacturer to

consumer. This, however, is rather costly. Further, after such enlistment stage the components must be kept together, which increases the burden on the logistic process.

An object of the present invention is to overcome this problem.

According to the present invention, a network component is capable of determining that it is switched on for the very first time and, in response to such finding, to automatically enter its enlistment mode. In this mode, the network component will send enlistment messages, containing its ID code. Other network components receiving such enlistment message from a component will automatically acknowledge the enlistment and recognize the component as part of their network. Further, they may return acknowledgment messages containing their own ID code, which the new component will automatically store in its own memory as being ID codes of the same network.

The new network component will stay in this enlistment mode for a predetermined time, which may for instance be one hour. This predetermined time will be chosen such that, in a practical implementation where a user brings home a set of network components, there is sufficient time for the user to unpack all components and switch them on, i.e. put batteries into them.

Further advantageous elaborations are mentioned in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects, features and advantages of the present invention will be further explained by the following description of one or more preferred embodiments with reference to the drawings, in which same reference numerals indicate same or similar parts, and in which:

Figure 1 schematically shows a light bulb with a network device;

Figure 2 schematically shows an illumination system;

Figures 3A-B schematically illustrate a control signal and an enlistment signal;

Figure 4 is a table schematically illustrating network definition information;

Figure 5 is a table schematically illustrating network definition information;

Figure 6 is a block diagram schematically illustrating a network device according to the present invention;

Figure 7 is a flow diagram schematically illustrating the operation of the network device according to the present invention;

Figure 8 is a block diagram schematically illustrating a remote control according to the present invention;

Figure 9 is a flow diagram schematically illustrating the operation of the remote control according to the present invention;

Figure 10 is a block diagram schematically illustrating a coordinator according to the present invention;

Figure 11 is a flow diagram schematically illustrating the operation of the coordinator according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

By way of example of an appliance in accordance with the present invention, figure 1 schematically shows a light bulb 10. The outer appearance of the light bulb is quite common, but internally the light bulb 10 comprises a network device 11 having terminals 12, 13 connected to the lamp contacts for receiving power, and having output terminals 14, 15 connected to the actual light-generating element of the light bulb, e.g. a spiral L. Alternatively, instead of an incandescent light bulb, other types of light sources are possible, for instance a LED or a gas discharge lamp, in which case the output terminals 14, 15 may be connected to a corresponding lamp driver. The network device 11 further has a communication facility, indicated by an antenna 16, via which the network device 11 is capable of receiving a command signal S_C and issuing an acknowledgement signal S_A.

Figure 2 schematically shows an illumination system 1, comprising a plurality of light sources 10, each comprising an associated network devices 11. The illumination system 1 is provided with a network communication system 2, comprising the network devices 11 of the light sources 10. In figure 2, for sake of simplicity, only four of such light sources 10 with network devices 11 are shown, supplemented by an index for mutual distinction; however, it should be clear that the number of network devices may be less or more than four.

Communication system 2 further comprises a user-operated remote control 20, also having a communication facility, indicated by an antenna 26, via which the remote control 20 is capable of issuing a command signal S_C and receiving an acknowledgement signal S_A. The remote control 20 has user input means, typically control keys or buttons, indicated at 21.

In order to be individually addressable, each network device 11 has a unique ID code, indicated as ID(i). Figure 3A schematically illustrates that the command signal S_C comprises a data part 31 containing the ID code ID(i) of the network device 11(i) addressed,

and a command part 32 containing the actual command, for instance "switch ON" or "switch OFF". Other methods for indicating which network device or group of network devices are addressed are also applicable. Thus, for being able to control a certain lamp 10(i), the remote control 20 must know the ID code ID(i) of the corresponding network device 11(i).

On the other hand, a network device 11(i) receiving a command signal S_C containing its ID code ID(i) must check whether this command signal S_C originates from a "stranger" or from a remote control 20 that is part of the network. Thus, for being able to obey the command signal S_C, the network device 11(i) must know the ID code of the remote control 20.

The communication system 2 further comprises a coordinator 40, typically implemented as a suitably programmed microcomputer or the like. The coordinator 40 also has a communication facility, indicated by an antenna 46, via which the coordinator 40 is capable of receiving the command signals S_C and the acknowledgement signals S_A.

The coordinator 40 is provided with a network definition memory 41, comprising, among others, a list of ID codes of network components belonging to the network, and a relationship between remote control buttons and ID codes. Further, the network devices may be arranged in groups, and the network definition memory 41 also contains the group allocation information. Suitably, the information in the network definition memory 41 is arranged as a table. Figure 4 gives an example of such table. The figure shows that the network comprises four network devices with ID codes ID(1) to ID(4), that network devices ID(1) and ID(2) belong to group 1 and are associated with button 4, and that network devices ID(3) and ID(4) belong to group 2 and are associated with button 5. It is also possible that there is no separate group information, because the association with a certain button already implies a group allocation. It is also possible that there is a table associating network devices with groups, and that there is a separate table associating groups with buttons.

By operating the suitable button 21, the user can thus remotely operate the lamps 10, either individually or in groups.

Assume that the user wishes to add a new lamp 10(5) to the system, this new lamp having a network device 11(5) with ID code ID(5). Assuming that this ID code is not known in the network, such new lamp will not be controlled by the remote control 20. To solve this, the network devices of the invention are designed to be automatically in the enlistment mode for a predetermined amount of time, and the remote control 20 comprises a

button which, when actuated by the user, causes the remote control to enter an enlistment mode for a predetermined amount of time.

In the enlistment mode, a network device 11 sends an enlistment signal S_E, which contains the ID code 33 of the network device as well as a code 34 indicating a request for enlistment (see figure 3B). When such enlistment signal S_E is received by the coordinator 40, the coordinator 40 enters the ID code ID(5) of the fifth network device 11(5) into the network definition memory 41 (see figure 5), the coordinator 40 notifies this ID code to all other members of the network, and the coordinator 40 notifies the ID codes of all other members of the network to the fifth network device 11(5).

Likewise, it is possible to install a new remote control: this network component also has a button or the like, with which the user can bring the remote control into an enlistment mode, in which it emits an enlistment signal, and the response of the coordinator is similar as described above.

Likewise, it is possible to install a new coordinator: this network component also has a button or the like, with which the user can bring the coordinator into an enlistment mode, in which it emits an enlistment request signal S_{ER}. Like the enlistment signal S_E, the enlistment request signal S_{ER} contains the ID code 33 of the coordinator 40 as well as a code 34, now indicating that this signal originates from a new coordinator. Until that moment, the other network components did not know the ID code of this new coordinator, but in view of the enlistment request signal S_{ER} they will acknowledge this new coordinator. Further, they will all send their enlistment signal S_E, which is received by the coordinator 40, who then will install the network on the basis of all ID codes it receives from all network components.

It is noted that the precise procedure of the enlistment is not relevant for a good understanding of the present invention, and it is further noted that systems showing the above functionality are known per se. However, in such known systems, the above procedure always requires a user action for making the system enter the enlistment mode, be it for introduction of a new coordinator, a new remote control, or a new lamp. In a more intuitive and therefore user-friendly embodiment according to the present invention, the system automatically enters the enlistment mode, without a specific user action being required, when a network device (or actually when any network component) is used for the very first time. Thus, new network components are automatically added to the network.

The gist of the present invention will now be specifically explained for the addition of a new network device, but a similar explanation would apply to the addition of another type of network component.

Figure 6 is a block diagram schematically showing a network device 11 implemented in accordance with the present invention. The figure shows that such device is provided with a virginity memory 60 containing a network device virginity code NDVC. This memory is a non-volatile memory, so its contents are maintained even if a power source (not shown) is switched off. It is noted that non-volatile memory is known per se, so an explanation of non-volatile memory is not needed here.

On manufacture, a first predetermined value is stored into the virginity memory 60, for instance "0", indicating that this network device 11 is brand new.

Figure 7 is a flow diagram schematically illustrating the operation of the network device 11 implemented in accordance with the present invention on power-up [step 71].

In step 72, the network device 11 checks its own status by reading the virginity code NDVC in the virginity memory 60 and comparing it with the first predetermined value. To this end, the first predetermined value is also stored in a comparison memory 61, which is a non-erasable memory. Typically, this will be implemented by this first predetermined value being incorporated in the software of the network device 11, but for sake of clarity figure 6 shows a separate memory location.

If it appears that virginity code NDVC in the virginity memory 60 is equal to the first predetermined value "0", indicating that this network device 11 is brand new, this network device 11 enters its enlistment mode [step 73] in which it will emit the enlistment signal S_E [step 74]. As a result, the enlistment procedure [step 75] is executed, which can be the same as the prior art procedure.

After having completed the enlistment routine [step 75], the network device 11 writes [step 76] a second predetermined value into the virginity memory 60, for instance "1", indicating that this network device 11 is not brand new any more. The exact value of this second predetermined value is not relevant, as long as it differs from the value in the comparison memory 61. The network device 11 is now ready for use [step 77].

On any later power-up [step 71], the network device 11 again checks its own status by reading the virginity code VC in the virginity memory 60 [step 72]. It now will find that the virginity code VC has the second predetermined value "1", indicating that this network device 11 is not brand new, as a result of which the network device 11 will skip

steps 73-76 and is immediately ready for use [step 77]. Thus, it is effectively avoided that the network device 11 initiates an enlistment procedure on each and every power-up event.

Figure 8 is a block diagram schematically showing a remote control 20 implemented in accordance with the present invention. The figure shows that such device is provided with a non-volatile virginity memory 80 containing a remote control virginity code RCVC, and is further provided with a comparison memory 81.

On manufacture, a first predetermined value is stored into the virginity memory 80, for instance "0", indicating that this remote control 20 is brand new.

Figure 9 is a flow diagram schematically illustrating the operation of the remote control 20 implemented in accordance with the present invention on power-up [step 91].

In step 92, the remote control 20 checks its own status by reading the virginity code RCVC in the virginity memory 80 and comparing it with the first predetermined value in the comparison memory 81.

If it appears that virginity code RCVC in the virginity memory 80 is equal to the first predetermined value "0", indicating that this remote control 20 is brand new, this remote control 20 enters its enlistment mode [step 93] in which it will emit the enlistment signal S_E [step 94]. As a result, the enlistment procedure [step 95] is executed, which can be the same as the prior art procedure.

After having completed the enlistment routine [step 95], the remote control 20 writes [step 96] a second predetermined value into the virginity memory 80, for instance "1", indicating that this remote control 20 is not brand new any more. The remote control 20 is now ready for use [step 97].

On any later power-up [step 91], the remote control 20 again checks its own status by reading the virginity code RCVC in the virginity memory 80 [step 92]. It now will find that the virginity code RCVC has the second predetermined value "1", indicating that this remote control 20 is not brand new, as a result of which the remote control 20 will skip steps 93-96 and is immediately ready for use [step 97]. Thus, it is effectively avoided that the remote control 20 initiates an enlistment procedure on each and every power-up event.

Figure 10 is a block diagram schematically showing a coordinator 40 implemented in accordance with the present invention. The figure shows that such device is provided with a non-volatile virginity memory 100 containing a remote control virginity code CVC, and is further provided with a comparison memory 101.

On manufacture, a first predetermined value is stored into the virginity memory 100, for instance "0", indicating that this coordinator 40 is brand new.

Figure 11 is a flow diagram schematically illustrating the operation of the coordinator 40 implemented in accordance with the present invention on power-up [step 111].

In step 112, the coordinator 40 checks its own status by reading the virginity code CVC in the virginity memory 100 and comparing it with the first predetermined value in the comparison memory 101.

If it appears that virginity code CVC in the virginity memory 100 is equal to the first predetermined value "0", indicating that this coordinator 40 is brand new, this coordinator 40 enters its enlistment mode [step 113] in which it will emit the enlistment request signal S_{ER} [step 114]. As a result, the network installation procedure [step 115] is executed, which can be the same as the prior art procedure.

After having completed the network installation routine [step 115], the coordinator 40 writes [step 116] a second predetermined value into the virginity memory 100, for instance "1", indicating that this coordinator 40 is not brand new any more. The coordinator 40 is now ready for use [step 117].

On any later power-up [step 111], the coordinator 40 again checks its own status by reading the virginity code CVC in the virginity memory 100 [step 112]. It now will find that the virginity code CVC has the second predetermined value "1", indicating that this coordinator 40 is not brand new, as a result of which the coordinator 40 will skip steps 113-116 and is immediately ready for use [step 117]. Thus, it is effectively avoided that the coordinator 40 initiates an enlistment procedure on each and every power-up event.

Summarizing, the present invention provides a network communication system 2, comprising:

- at least one network device (11) capable of operating in an enlistment mode and comprising:
- communication means (16) for transmitting a signal;
- a virginity memory (60) containing a network device virginity code (NDVC);
- a comparison memory (61) containing a first predetermined value;

wherein the network device (11) is arranged, in response to an operation initiation event (step 71), to read the network device virginity code (NDVC) from the virginity memory (60), to compare (step 72) the network device virginity code (NDVC) with the value in the comparison memory (61), and:

- if the network device virginity code (NDVC) is equal to the first predetermined value of the comparison memory (61), to enter the enlistment mode (step 73), to emit an enlistment signal (S_E) (step 74), to perform the enlistment procedure (step 75) for enlisting to the network (2), to write (step 76) a second predetermined value into the virginity memory (60), and to enter a ready-for-use mode (step 77); otherwise
- if the network device virginity code (NDVC) is unequal to the first predetermined value of the comparison memory (61), to immediately enter the ready-for-use mode (step 77).

While the invention has been illustrated and described in detail in the drawings and foregoing description, it should be clear to a person skilled in the art that such illustration and description are to be considered illustrative or exemplary and not restrictive. The invention is not limited to the disclosed embodiments; rather, several variations and modifications are possible within the protective scope of the invention as defined in the appending claims.

For instance, the communication system may be implemented in a system comprising devices different than lamps. Even a lighting system may comprise lighting devices different from lamps, such as armatures, transformers, etc, provided with network devices.

Further, while the network preferably is suitable for two-way communication, this is not essential for the present invention. In fact, there are embodiments where the network only is capable of one-way communication and where the present invention can nevertheless be implemented. By way of example, assume that a remote control and a lamp are both brand new, and that, on first power-up, the remote control automatically enters an enlistment mode for sending its ID while the lamp automatically enters an enlistment mode for listening. After the enlistment procedure, the lamp has received an ID code of a remote control and will in the future listen to commands from this remote control, whereas the remote control has no knowledge of associated lamps. While this may not be ideal, it results in any case automatically in a system that works immediately after starting the components without specific user actions being needed.

Further, in the above the invention is explained for an embodiment where a device automatically enters a network enlistment mode in response to a power-up event. However, such is not essential, although quite suitable. What is required for practising the present invention is an event which is always associated with a device being taken into operation, and which may be indicated by the phrase "operation initiation event". Suitable

events also depend on the embodiment of the device concerned. One such possible event is placing a battery in the battery compartment. This can be detected electrically (rising of the power line), but can also be detected mechanically (a battery presence detector; a detector detecting the closing of the battery compartment). At least for some types of device, for instance a remote controller, a movement detector may be suitable, the movement indicating that the device is being picked up for use by a user. Also for a remote controller, the actuation of a button can be considered an event unavoidably associated with taking the device into operation. It is also possible that a device has a protective cover that is removed before operation; in such case, removal of the cover can be detected as operation initiation event. It is also possible that a device in rest is folded so that it is unfolded before operation; in such case, the unfolding can be detected as operation initiation event.

Further, in the above-described embodiment, the comparison memory 61 contains the first predetermined value, and the enlistment mode is automatically entered if the virginity code is equal to the value in this memory. Alternatively, it is also possible that the comparison memory 61 contains the second predetermined value, and that the enlistment mode is automatically entered if the virginity code is unequal to the value in this memory.

Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single processor or other unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. A computer program may be stored/distributed on a suitable medium, such as an optical storage medium or a solid-state medium supplied together with or as part of other hardware, but may also be distributed in other forms, such as via the Internet or other wired or wireless telecommunication systems. Any reference signs in the claims should not be construed as limiting the scope.

In the above, the present invention has been explained with reference to block diagrams, which illustrate functional blocks of the device according to the present invention. It is to be understood that one or more of these functional blocks may be implemented in hardware, where the function of such functional block is performed by individual hardware components, but it is also possible that one or more of these functional blocks are implemented in software, so that the function of such functional block is performed by one or

more program lines of a computer program or a programmable device such as a microprocessor, microcontroller, digital signal processor, etc.

CLAIMS:

1. Network device (11) for use in a network communication system (2), the device being capable of operating in an enlistment mode and comprising:
- communication means (16) for transmitting a signal;
- a virginity memory (60) containing a network device virginity code (NDVC);
a comparison memory (61) containing a first predetermined value;
wherein the network device (11) is arranged, in response to an operation initiation event (step 71), to read the network device virginity code (NDVC) from the virginity memory (60), to compare (step 72) the network device virginity code (NDVC) with the value in the comparison memory (61), and:
- if the network device virginity code (NDVC) is equal to the first predetermined value of the comparison memory (61), to enter the enlistment mode (step 73), to emit an enlistment signal (S_E) (step 74), to perform the enlistment procedure (step 75) for enlisting to the network (2), to write (step 76) a second predetermined value into the virginity memory (60), and to enter a ready-for-use mode (step 77); otherwise
- if the network device virginity code (NDVC) is unequal to the first predetermined value of the comparison memory (61), to immediately enter the ready-for-use mode (step 77).

2. Remote control (20) for use in a network communication system (2), the remote control being capable of operating in an enlistment mode and comprising:
- communication means (26) for transmitting a signal;
- a virginity memory (80) containing a network device virginity code (RCVC);
- a comparison memory (81) containing a first predetermined value;
wherein the remote control (20) is arranged, in response to an operation initiation event (step 91), to read the remote control virginity code (RCVC) from the virginity memory (80), to compare (step 92) the remote control virginity code (RCVC) with the value in the comparison memory (81), and:
- if the remote control virginity code (RCVC) is equal to the first predetermined value of the comparison memory (81), to enter the enlistment mode (step 93), to emit an

enlistment signal (S_E) (step 94), to perform the enlistment procedure (step 95) for enlisting to the network (2), to write (step 96) a second predetermined value into the virginity memory (80), and to enter a ready-for-use mode (step 97); otherwise

- if the remote control virginity code (RCVC) is unequal to the first predetermined value of the comparison memory (81), to immediately enter the ready-for-use mode (step 97).

3. Coordinator (40) for use in a network communication system (2), the coordinator being capable of operating in an enlistment mode and comprising:

- communication means (46) for transmitting a signal;
- a virginity memory (100) containing a coordinator virginity code (CVC);

a comparison memory (101) containing a first predetermined value;

wherein the coordinator (40) is arranged, in response to an operation initiation event (step 111), to read the coordinator virginity code (CVC) from the virginity memory (100), to compare (step 112) the coordinator virginity code (CVC) with the value in the comparison memory (101), and:

- if the coordinator virginity code (CVC) is equal to the first predetermined value of the comparison memory (101), to enter the enlistment mode (step 113), to emit an enlistment request signal (S_{ER}) (step 114), to perform the enlistment procedure (step 115) for configuring the network (2), to write (step 116) a second predetermined value into the virginity memory (100), and to enter a ready-for-use mode (step 117); otherwise
- if the coordinator virginity code (CVC) is unequal to the first predetermined value of the comparison memory (101), to immediately enter the ready-for-use mode (step 117).

4. Network device (11) for use in a network communication system (2), the device being capable of operating in an enlistment mode and comprising:

- communication means (16) for transmitting a signal;
- a virginity memory (60) containing a network device virginity code (NDVC);
- a comparison memory (61) containing a second predetermined value;

wherein the network device (11) is arranged, in response to an operation initiation event (step 71), to read the network device virginity code (NDVC) from the virginity memory (60), to compare (step 72) the network device virginity code (NDVC) with the value in the comparison memory (61), and:

- if the network device virginity code (NDVC) is unequal to the second predetermined value of the comparison memory (61), to enter the enlistment mode (step 73), to emit an enlistment signal (S_E) (step 74), to perform the enlistment procedure (step 75) for enlisting to the network (2), to write (step 76) the second predetermined value into the virginity memory (60), and to enter a ready-for-use mode (step 77); otherwise
- if the network device virginity code (NDVC) is equal to the second predetermined value of the comparison memory (61), to immediately enter the ready-for-use mode (step 77).

5. Remote control (20) for use in a network communication system (2), the remote control being capable of operating in an enlistment mode and comprising:
- communication means (26) for transmitting a signal;
- a virginity memory (80) containing a network device virginity code (RCVC);
- a comparison memory (81) containing a second predetermined value;

wherein the remote control (20) is arranged, in response to an operation initiation event (step 91), to read the remote control virginity code (RCVC) from the virginity memory (80), to compare (step 92) the remote control virginity code (RCVC) with the value in the comparison memory (81), and:
- if the remote control virginity code (RCVC) is unequal to the second predetermined value of the comparison memory (81), to enter the enlistment mode (step 93), to emit an enlistment signal (S_E) (step 94), to perform the enlistment procedure (step 95) for enlisting to the network (2), to write (step 96) the second predetermined value into the virginity memory (80), and to enter a ready-for-use mode (step 97); otherwise
- if the remote control virginity code (RCVC) is equal to the second predetermined value of the comparison memory (81), to immediately enter the ready-for-use mode (step 97).

6. Coordinator (40) for use in a network communication system (2), the coordinator being capable of operating in an enlistment mode and comprising:
- communication means (46) for transmitting a signal;
- a virginity memory (100) containing a coordinator virginity code (CVC);

a comparison memory (101) containing a second predetermined value;

wherein the coordinator (40) is arranged, in response to an operation initiation event (step 111), to read the coordinator virginity code (CVC) from the virginity memory

(100), to compare (step 112) the coordinator virginity code (CVC) with the value in the comparison memory (101), and:

- if the coordinator virginity code (CVC) is unequal to the second predetermined value of the comparison memory (101), to enter the enlistment mode (step 113), to emit an enlistment request signal (S_{ER}) (step 114), to perform the enlistment procedure (step 115) for configuring the network (2), to write (step 116) the second predetermined value into the virginity memory (100), and to enter a ready-for-use mode (step 117); otherwise
- if the coordinator virginity code (CVC) is equal to the second predetermined value of the comparison memory (101), to immediately enter the ready-for-use mode (step 117).

7. Network communication system (2), comprising:

- at least one network device (11) according to claim 1 or 4; or
- at least one remote command device (20) according to claim 2 or 5, capable of issuing at least one command signal (S_C) containing an address code (31) identifying at least one network device (11(i)) and containing an instruction code (32); or
- at least one coordinating means (40) according to claim 3 or 6, provided with a network definition memory (41) containing information relating to the structure and members of the network, and further provided with a device status memory (42) containing information relating to the status of the individual network devices (11) of the network.

8. Illumination system (1) comprising:

- at least one lighting device (10(i)) provided with a network device (11(i)) according to claim 1 or 4; or
- at least one remote command device (20) according to claim 2 or 5, capable of issuing at least one command signal (S_C) containing an address code (31) identifying at least one network device (11(i)) and containing an instruction code (32); or
- at least one coordinating means (40) according to claim 3 or 6, provided with a network definition memory (41) containing information relating to the structure and members of the network, and further provided with a device status memory (42) containing information relating to the status of the individual network devices (11) of the network.

9. Illumination system according to claim 8, wherein the lighting device is a lamp.

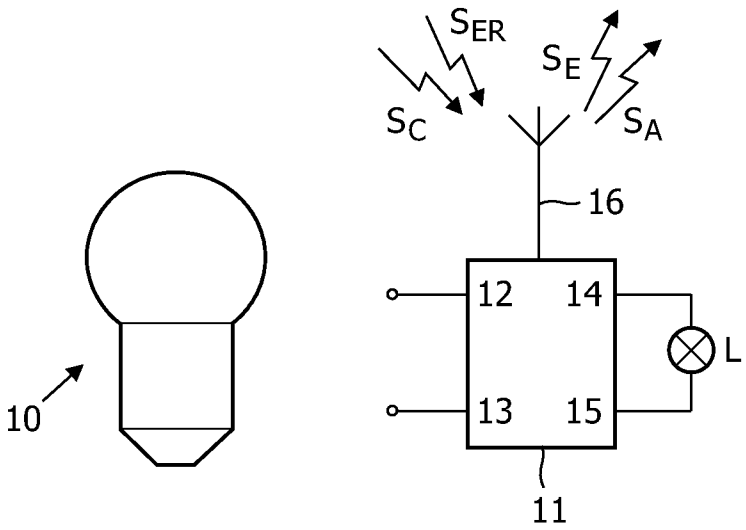

FIG. 1

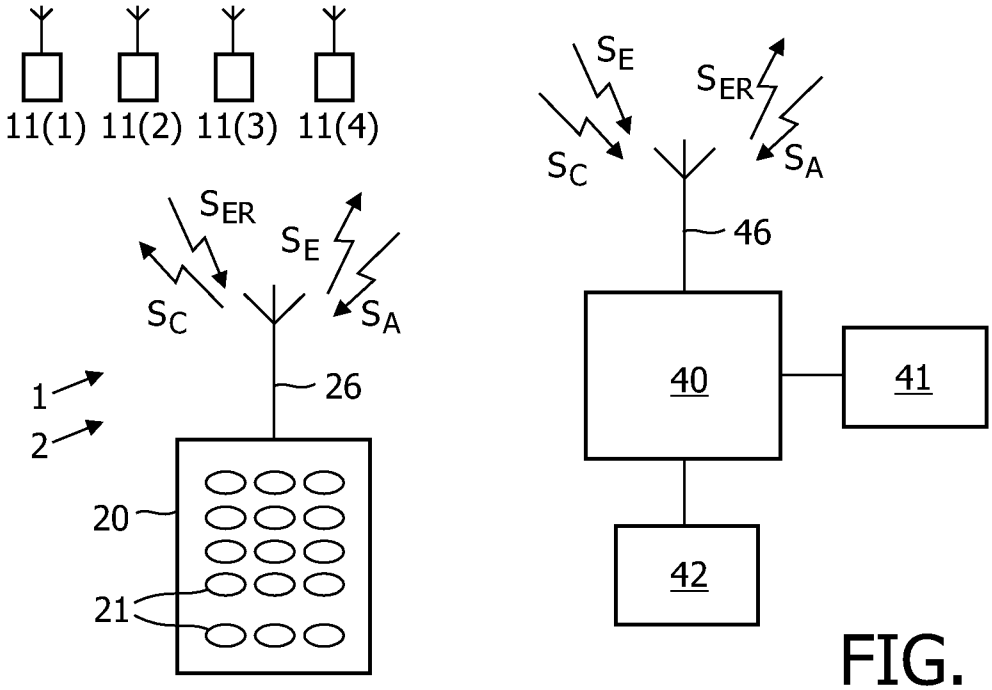

FIG. 2

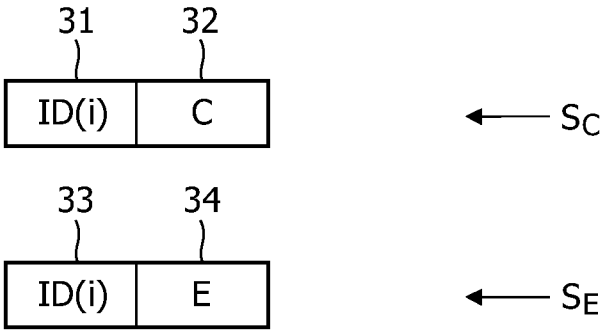

FIG. 3A

FIG. 3B

ID	GROUP	BUTTON
ID(1)	1	4
ID(2)	1	4
ID(3)	2	5
ID(4)	2	5

FIG. 4

ID	GROUP	BUTTON
ID(1)	1	4
ID(2)	1	4
ID(3)	2	5
ID(4)	2	5
ID(5)	2	5

FIG. 5

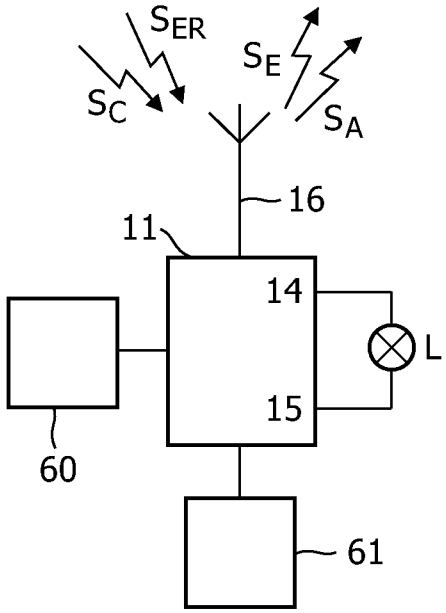
SER
SE
SC
SA
16
11
14
L
15
60
61

FIG. 6

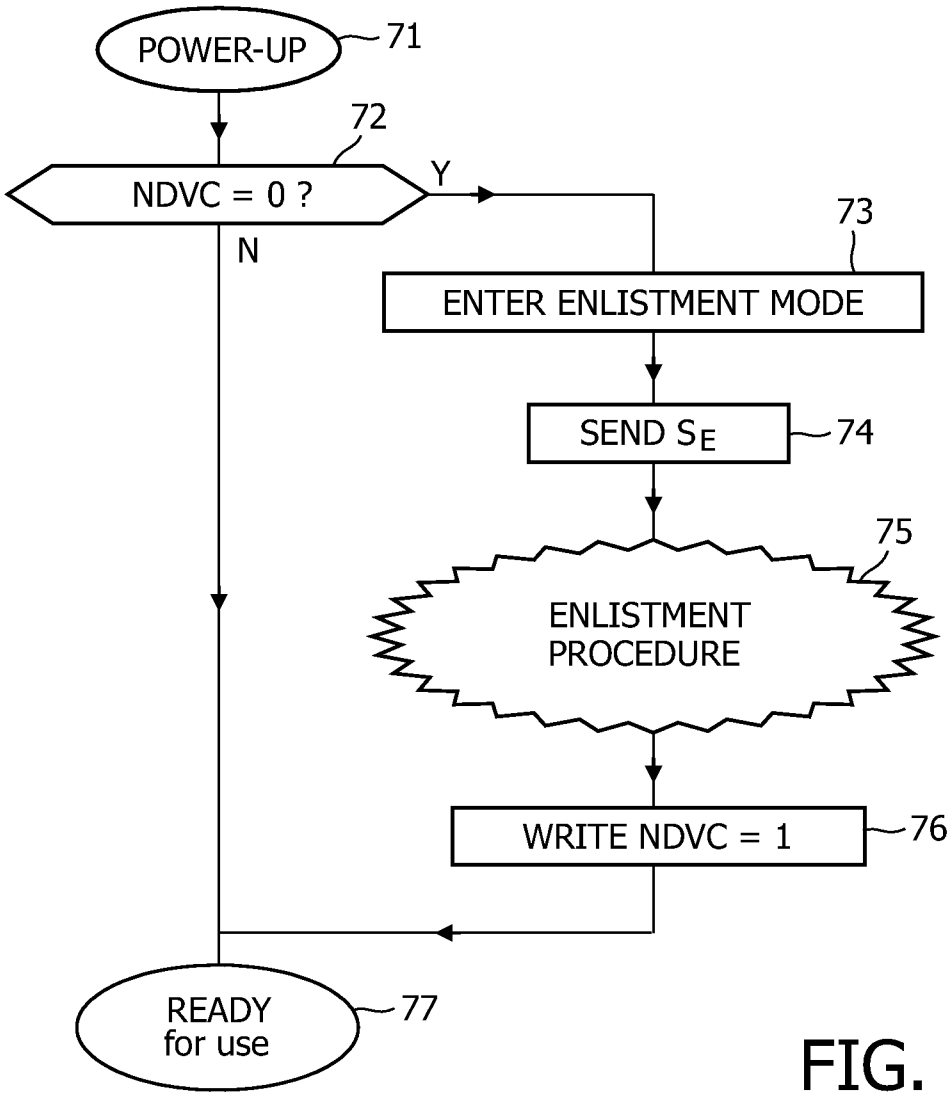
POWER-UP
71
72
NDVC = 0 ?
Y
N
73
ENTER ENLISTMENT MODE
SEND SE
74
75
ENLISTMENT PROCEDURE
WRITE NDVC = 1
76
READY for use
77

FIG. 7

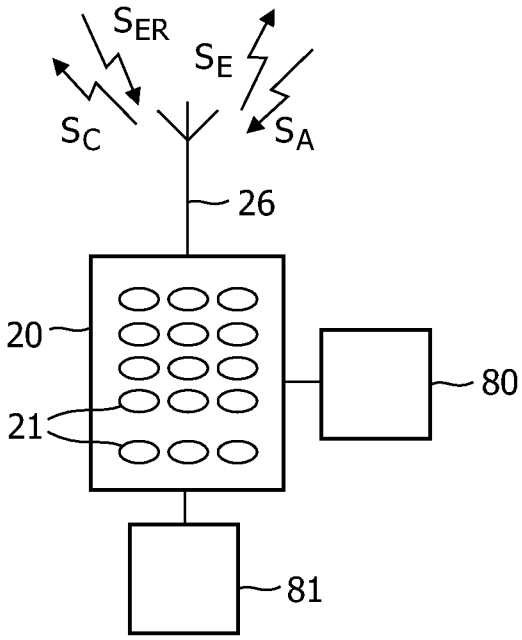
SER
SE
SC
SA
26
20
21
80
81

FIG. 8

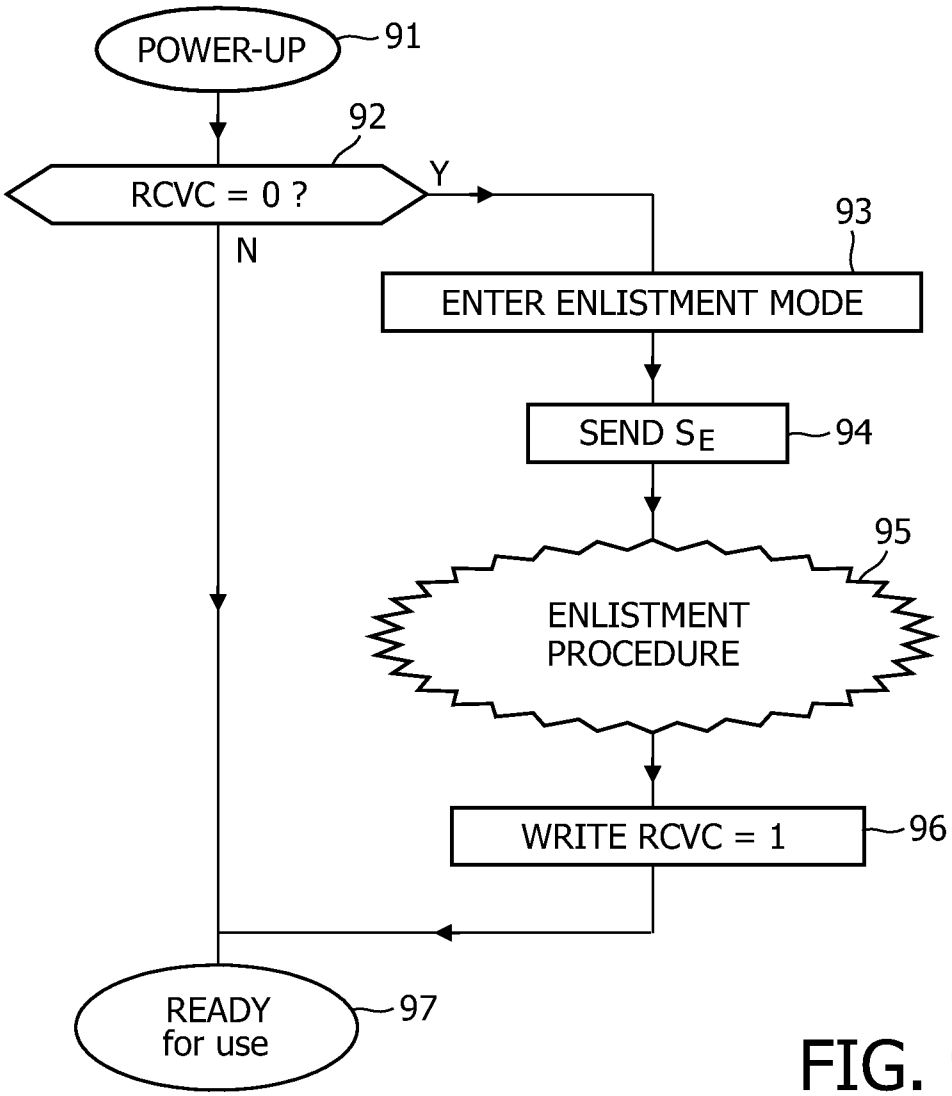
POWER-UP
91
92
RCVC = 0 ?
Y
N
93
ENTER ENLISTMENT MODE
SEND SE
94
95
ENLISTMENT PROCEDURE
WRITE RCVC = 1
96
READY for use
97

FIG. 9

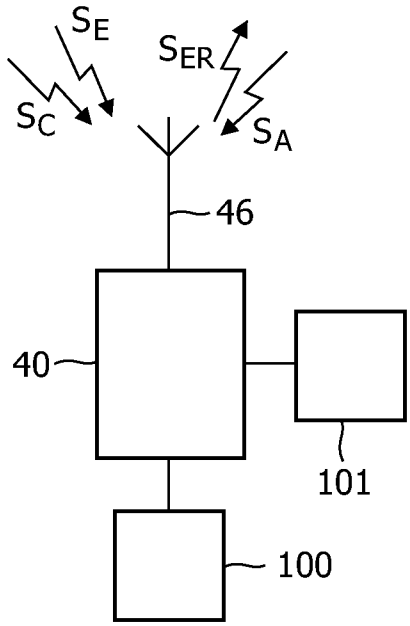
S_E
S_{ER}
S_C
S_A
46
40
101
100

FIG. 10

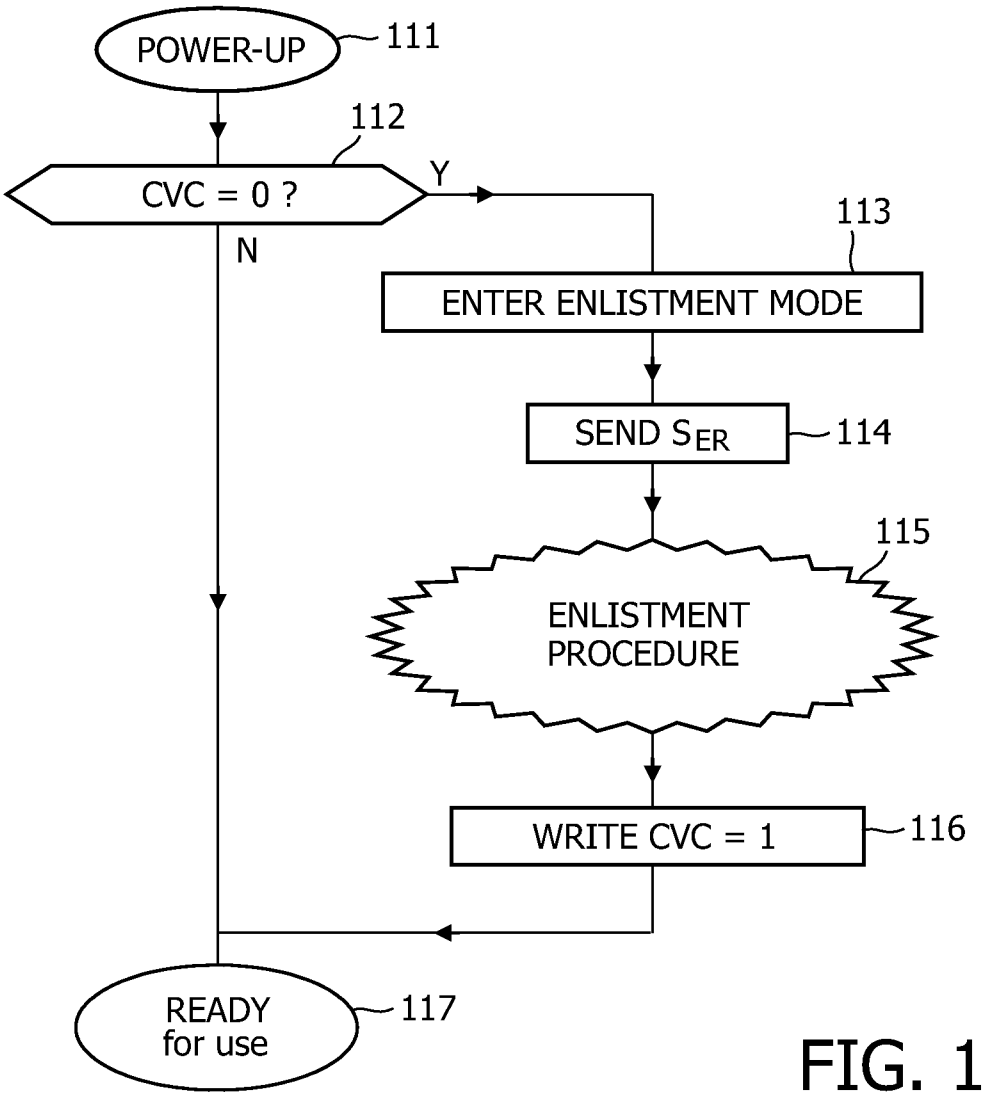
POWER-UP
111
112
CVC = 0 ?
Y
N
113
ENTER ENLISTMENT MODE
SEND S_{ER}
114
115
ENLISTMENT PROCEDURE
WRITE CVC = 1
116
READY for use
117

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2007/055282

A. CLASSIFICATION OF SUBJECT MATTER
INV. H05B37/02

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)
H05B

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.
X	WO 2004/056157 A (KONINKL PHILIPS ELECTRONICS NV [NL]; WANG LING [US]; GIANNOPOULOS DEME) 1 July 2004 (2004-07-01) the whole document	1-9
X	US 2006/049935 A1 (GIANNOPOULOS DEMETRI [US] ET AL) 9 March 2006 (2006-03-09) abstract paragraphs [0001] - [0014], [0021] - [0044] figures 1-4	1-9
X	WO 2004/057927 A (KONINKL PHILIPS ELECTRONICS NV [NL]; GIANNOPOULOS DEMETRI [US]; WANG L) 8 July 2004 (2004-07-08) the whole document	1-9

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

☒ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"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	Date of mailing of the international search report
2 June 2008	11/06/2008

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	Hagan, Colm

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2007/055282

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		AU 2003303120 A1	14-07-2004
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		DE 60312561 T2	30-04-2008
		EP 1579738 A1	28-09-2005
		JP 2006511054 T	30-03-2006