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(54) **Integrated care and monitoring system**

(57) The invention relates to an integrated care and monitoring system, particularly suited for caring and watching two different groups of elderly people: those living in a nursing home and those living independently . A decentralized module is provided connected to a central unit by using the TCP/IP protocol.

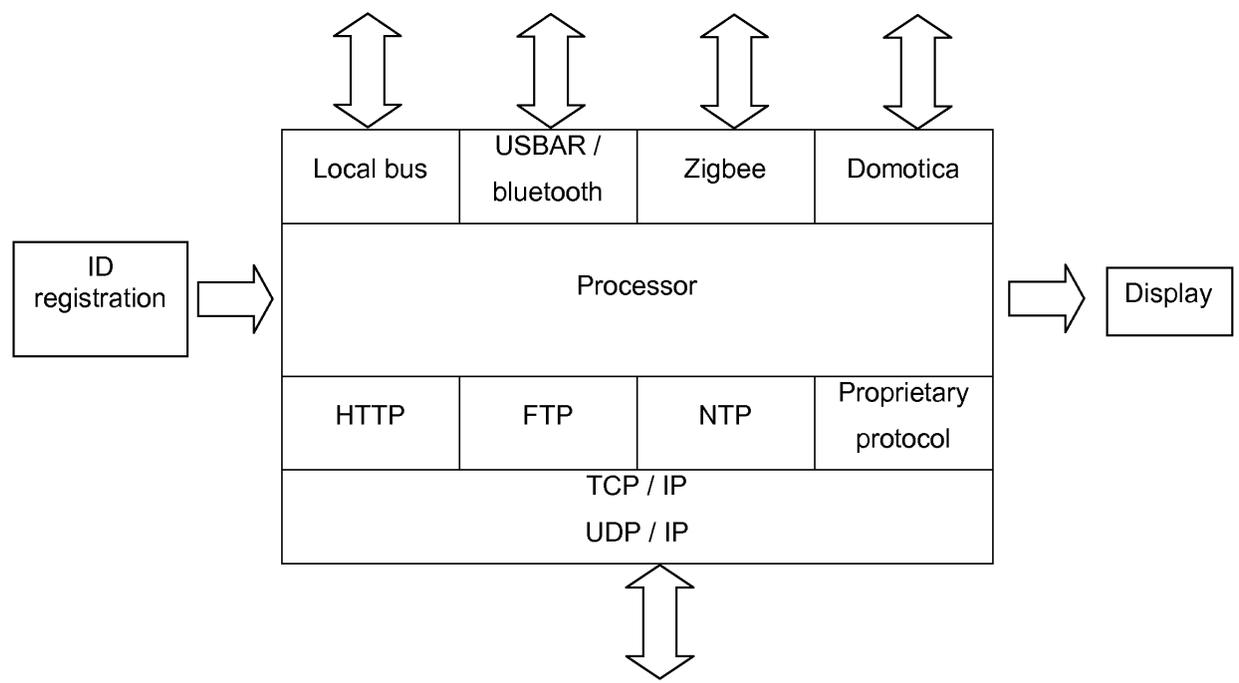


FIG. 2

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Description

Technical field of the invention

[0001] The present invention relates to an integrated care and monitoring system, particularly suited for caring and watching two different groups of elderly people: those living in a nursing home and those living independently

Background of the invention

[0002] The population is rapidly getting older. This quick demographic evolution will, rather soon, lead to a shortage of places in nursing homes. Older people will become more and more dependent on home care and the number of people in the nursing homes, having a need of continuous care, will increase. Today, already some relatively simple means are available on the market allowing older people, living at home, to send a call for help by a medallion, carried by the individual concerned. In this way a signal is sent wirelessly to a central point over an alarm exchange. Elderly people, who need a higher degree of care, typically move to a nursing home. Due to the expected shortage of places in the nursing homes, only people with a need for a high degree of care will be allocated a place in these homes. The number of elderly people, who cannot find a place in a nursing home but also cannot stay at home with the existing means for calling, will increase.

[0003] A first problem then is how to offer the elderly person at home the same degree of safety, comfort and social contacts as is offered to people living in a nursing home. It is clear that this goal will not be realised completely due to the absence of human contact. However, full use is to be made of existing and future technology in order to fill the gap in human contact for elderly people, getting care at home. The spread of the internet in the wireless age and the IP-connectivity make it possible to develop affordable and integrated stand-alone solutions, which can operate independently from a PC. It is a combination of the evolutions in the area of wireless standards and their applications, of the integration possibilities on IC level, of the secure broadband connectivity and of the quality of video communication which constitutes the basis of the present invention.

[0004] A second problem is situated in the area of a central calling point for the assistance services. The rapid demographic evolution creates a need for organizations capable of rendering such assistance. Organizations, having the necessary experience and possibilities of delivering assistance are obviously the nursing homes themselves. They have all possibilities at their disposal for delivering meals, for organizing activities, for assuring permanency, etc. From this originates the need to work with one central care call system, organized within a nursing home with an extension to people at home.

[0005] In the known call-systems, often special signal-

ization connecting cables are provided in the nursing homes for connecting a call and cancel unit with a central calling point. These signalization connecting cables are not adapted for other applications like data transmission.

[0006] WO 2007/000 021 (VIDEO SYSTEMS IP PTY LTD.) discloses a care and monitoring system suited for both, for people living independently and for people living in a nursing home. In this system, peripheral apparatus is connected to a control bus. The peripheral apparatus comprises call buttons and other contacts to be operated, radio-frequency devices, water and gas monitoring devices, alarm devices, etc. The control bus is a C-bus, connected over a LAN and a router to a private IP-network. The private IP-network itself is further connected over routers and a LAN to one or more servers.

[0007] The system, disclosed in WO 2007/000 021 is a hierarchical system, needing at each level, its own network with an adapted protocol.

[0008] This drawback is avoided by the invention by using for all communication between a decentralized unit and a central unit the Internet with IP, whereby only one protocol is used, the TCP/IP protocol.

[0009] Having a single central calling point, receiving all calls for a nurse, constitutes an advantage of the system according to the invention and allows the system to centralize in a single point the assistance service. Preferably, this central point is situated in a nursing home having now the possibility to extend its services externally.

[0010] It is also an object of this invention to provide in a decentralized module, which is realized with as small dimensions as possible and preferably with dimensions adapted to fit in a standard installation box for electrical switches or electrical wall sockets.

[0011] It is also an object of this invention to provide a system, capable of integrating other peripheral apparatus of the house (automated home systems, access control, measurement apparatus...) and offering a platform for other applications as video communication, digital TV, etc..

Summary of the invention

[0012] It is an object of the present invention to provide apparatus and methods for providing a unique integrated care and monitoring system suitable for both categories of people: people in a nursing home and people living at home.

[0013] The above object is accomplished by the devices and methods according to the present invention.

[0014] In a first aspect, the present invention provides a decentralized module for a care and monitoring system, the decentralized module being directly connected to the internet, whereby signals are exchanged between this decentralized module and a central unit using the TCP/IP protocol and whereby the decentralized module comprises:

- a processor;
- a memory;
- means for sending and receiving files by the FTP-protocol;
- means for calling care staff generating call signals;
- a presence and/or canceling means generating canceling signals indicating that a previous call has been answered;

whereby these call or canceling signals are sent to the central unit using the TCP/IP protocol.

[0015] According to a further aspect of the present invention, the decentralized module comprises identification means coupled with the cancelling means, the identification means generating identifying signals.

[0016] According to a further aspect of the present invention, the means for calling care staff includes a button, mounted on the decentralized module.

[0017] According to a further aspect of the present invention, the presence or canceling means and/or the identification means include a button, mounted on the decentralized module.

[0018] According to a further aspect of the present invention, the decentralized module comprises intercom means, the intercom means using the VoIP protocol for connecting the module to a central unit or to other decentralized units.

[0019] According to another aspect of the present invention, the decentralized module comprises the necessary software for setting or resetting the module. According to a further aspect of the present invention, the decentralized module comprises means for sending data to and receiving data from auxiliary apparatus and computers.

[0020] According to a further aspect of the present invention, said auxiliary apparatus comprise at least one of:

- an alarm button;
- a blood pressure measuring instrument;
- a temperature measuring instrument;
- a fire detector;
- a telephone connection.

[0021] According to still a further aspect of the present invention, the decentralized module comprises an interactive display allowing the user to exchange data with a central unit.

[0022] According to a further aspect of the present invention, a care and monitoring system is provided comprising one or more decentralized modules as described above, one or more central servers and an IP-network for connecting the one or more decentralized modules with the one or more central servers.

[0023] According to still another aspect of the present invention a method is provided for communicating between a decentralized unit and a central unit of a care and monitoring system; the method comprises, at the level of the decentralized unit, the step of transmitting

and receiving information and data to and from the central unit using the TCP/IP protocol; this information and data comprises calling signals for calling care staff and also presence or canceling signals.

[0024] According to still another aspect of the present invention the information and data further comprise identification signals.

[0025] According to still another aspect of the present invention the information and data further comprises intercom signals.

[0026] The objects of the present invention may be achieved by each of the aspects, described above, on its own or by combining two or more of these aspects.

15 Brief description of the drawings

[0027]

Fig. 1 illustrates a general overview of an implementation of the system according to the invention.

Fig. 2 illustrates a general diagram of a decentralized module (generic data acquisition or address module)

Fig. 3 illustrates a realization of a decentralized module provided with a display.

25 Description of illustrative embodiments

[0028] The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn to scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to actual reductions to practice of the invention.

[0029] Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequence, either temporally, spatially, in ranking or in any other manner. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0030] It is to be noticed that the term "comprising", used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It is thus to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a device comprising means A and B" should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the only relevant components of the device are A and B.

[0031] Similarly, it is to be noted that the term "coupled", also used in the claims, should not be interpreted as being restricted to direct connections only. The terms "coupled" and "connected", along with their derivatives, may be used. It should be understood that these terms are not intended as synonyms for each other. Thus, the scope of the expression "a device A coupled to a device B" should not be limited to devices or systems wherein an output of device A is directly connected to an input of device B. It means that there exists a path between an output of A and an input of B which may be a path including other devices or means. "Coupled" may mean that two or more elements are either in direct physical or electrical contact or that two or more elements are not in direct contact with each other but yet still co-operate or interact with each other.

[0032] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment, but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

[0033] Similarly it should be appreciated that in the description of exemplary embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the detailed description are hereby expressly incorporated into this detailed description, with each claim standing on its own as a separate embodiment of this invention.

[0034] Furthermore, while some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

[0035] Furthermore, some of the embodiments are described herein as a method or combination of elements of a method that can be implemented by a processor of a computer system or by other means of carrying out the function. Thus, a processor with the necessary instructions for carrying out such a method or element of a meth-

od forms a means for carrying out the method or the element of a method. Furthermore, an element of an apparatus embodiment described herein is an example of a means for carrying out the function performed by the element for the purpose of carrying out the invention.

[0036] In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practised without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

[0037] The invention will now be described by a detailed description of several embodiments of the invention. It is clear that other embodiments of the invention can be configured according to the knowledge of persons skilled in the art without departing from the true spirit or technical teaching of the invention, the invention being limited only by the terms of the appended claims.

[0038] Fig. 1 illustrates a general overview of the system according to the invention. All rooms of the nursing home and the houses are connected with a central server as if all decentralized units were situated in the same building. All communications are based on the TCP/IP standard whereby within the nursing home e.g. a standard UTP-wiring or WiFi can be used while the modules in the houses are connected with the server over Internet. The combination of the developments in the IP-area with the developments of wireless IP makes this possible.

[0039] Each room and each house is provided with a decentralized module, also called generic data acquisition or address module (Fig. 2). Such a decentralized module is installed in the rooms of the nursing home as well as at the home of the elderly person.

[0040] All address modules are connected with a central server (e.g. a Netrix-server of Essec). Each module sends the calls and other data to this server, from where the information is dispatched to the relative application or person. It is also necessary to have a secure data connection with the resident or patient. This can be realized in a number of ways with the technology presently available on the market. The decentralized module is a stand-alone IP- unit, having a direct internet connection and also having the necessary interfaces for communicating with existing or new apparatus.

[0041] It is important, in order to use the decentralized modules in the nursing home, that the existing wiring can be reused as far as possible. When using the decentralized modules at home, the communication with the peripheral apparatus becomes important: or a wireless communication (e.g. over Zigbee) or communication over a local bus.

[0042] The decentralized module transmits the information on calls from the rooms to the central server. These calls originate from the call button on the decentralized module or from other call buttons, e.g. present in the toilet, next to the bed, etc. These other call assistance buttons are connected to the decentralized module

over a local bus or over a wireless connection (e.g. Zig-
bee). Above this basic functionality, the modules transmit
other information, which they receive from peripheral ap-
paratus like a blood pressure measurement device, a
temperature measurement device, etc. to the server or
to another central unit.

[0043] Calls coming from rooms or houses are trans-
mitted to the central server; a procedure is then started
by this server to inform the person who must react to this
call:

- in the case of a central dispatch: by generating a
pop-up signal on the screen of the server, accom-
panied by an acoustical warning signal;
- in the case of a nursing home, also in charge of care
at home: by starting a calling cycle in order to inform
the care staff in the nursing home over e.g. a dect
handset, a beeper, GSM, etc.

[0044] After having received the information of a call,
the nursing staff can start a voice connection with the
people concerned in order to know the reason, the gravity
and the urgency of the call. This voice connection can
be implemented in different ways:

- in the case of a room in a nursing home is it possible
to use a digital telephone or a Voice-over-IP tele-
phone with integrated intercom, connected to the
central switching board of the nursing home;
- in the case of care at home is it possible to use a
Voice-over IP telephone, connected over internet
with the switching board of the nursing home or the
switching board of the central dispatch;
- Or, very generally, the voice connection may be im-
plemented by an intercom connection, in which case
an intercom possibility over IP will be integrated in
the decentralized module. Such an intercom con-
nection allows a two-way communication between
the person present in the room where the decentral-
ized module is installed and the person present at a
central unit. At the decentralized level, this intercom
is preferably integrated in the decentralized module.

[0045] A complete logging of the calls and the reaction
thereon gives a control on the efficient functioning of the
care staff. This logging is performed by a particular mod-
ule (in Essec the Novilog-module). Responsible people,
having the adequate authorization, can, in principle, re-
alize the control on the calls from anywhere.

[0046] Two kinds of decentralized modules are fore-
seen: modules without a display and modules with a dis-
play.

[0047] All decentralized modules may have one or
more of the following features:

- they have their own memory and FTP-server in order
to ensure the highest speed of communication and
also the highest degree of security;

- the communication with the central server uses
TCP/IP;
- Intelligent auxiliary modules (e.g. auxiliary appara-
tuses) are connected to the decentralized modules
over LAN/WAN/Internet.

[0048] Decentralized modules without a display may
further comprise one or more of the following features:

- 10 • Standard call facilities for a nurse call system ac-
cording to the German VDE 834-1 and VDE 834-2
standards, inclusive reassuring LED; a call button is
mounted on the decentralized module;
- An intercom facility;
- 15 • Presence indication/cancel of the call with possibility
of identifying the nursing person by using an I-button;
- Possibility of mounting in a standard installation box
in the wall (e.g. the installation box for a wall socket
or for a lamp switch);
- 20 • A frame for mounting on the wall when mounting in
the wall is not possible;
- Power over the same LAN-wiring or over a particular
power lines (home care);
- Local bus 4-wire interface or wireless interface in
order to connect call buttons and switches within the
room or within the house with individual addressing
so as to give the right priority to the different calls;
- 25 • Existing 4-wire signalization cabling in the room or
home can be reused;
- 30 • Availability of extra interface module in order to in-
tegrate in the room or house existing (old), standard
call buttons with the address module and in so doing,
maximum recuperation of existing switching materi-
al;
- 35 • Simple to connect and to program;
- Possible disturbances are automatically transmitted
to the central server;
- Possibility of tele-diagnosis from the central server
or from a service centre for all address modules and
for all local bus or wireless call buttons.
- 40

[0049] Fig. 3 illustrates a realization of the decentral-
ized module having a display; this display is an interactive
display allowing the interactive exchange of data with the
central server.

[0050] As an example, the modules with display com-
prise, on top of the features of the modules without dis-
play, one or more of the following features:

- 50 - An 8-row display which is clearly readable under all
illumination circumstances;
- 16 grey values available in the display in order to
emphasize more or less some display information;
- A night mode with a more softly illuminated display;
- 55 - Provision of displaying the name and photograph of
the resident in the sleeping mode of the display;
- Possibility of interactive communication with the
most used software relative to the care file, whereby

the tasks to be executed per resident are transmitted to the module and the care staff has the possibility to indicate which tasks are executed. This information is then sent back to the care file.

- Possibility to display other functionalities like reservation for a meal, reservation of a hairdresser or physiotherapist, etc.;
- When the care staff is present, displaying other calls from the department (or group of houses);
- Availability of a specific installation box available for mounting the module within the wall;
- Provision of a Bluetooth/Zigbee interface in order to connect medical apparatus and transmitting their information to the central system;
- Provision of a wireless receiver for wireless medallions or wireless call buttons, when there is no signalization wiring in the room or in the house.

[0051] Both modules have different interfaces as:

- TCP/IP (Ethernet)
- WiFi
- RS232
- Local Bus
- I2C
- I/O
- USB
- SPI
- Bluetooth
- Infrared
- Zigbee
- TV out
- Identification

[0052] Links are created by these interfaces over which peripheral apparatus like blood pressure measurement devices, temperature measurement devices, automatic home systems, etc. transmit their information to a central database. This information is then immediately and reliably available for each competent person.

[0053] Managing software can be provided for finding any of the decentralized modules using broadcasting methods. Each decentralized module can be set over its software. Standard settings of each decentralized module can be adapted or reset over a web interface.

[0054] The complete system can be used for a plurality of applications, like for example, but not limited thereto:

- Security: examples of increasing the security of the resident are social alarm, burglar alarm, video-intercom, surveillance of the bed.
- Presence information: By presence detection, the welfare of the resident can be monitored and there is also the possibility of environment surveillance, when the resident is absent.
- Fire and smoke alarm: By connecting the fire and smoke alarms to the module, the follow-up of the alarm by the staff giving assistance becomes much

easier. It is possible to make better estimations of the situation at a distance and to take decisions.

- Climate control: by controlling the climate within the resident's space, it is possible to set the climate according to the presence or the absence of the resident and to the exact value; in this way economies of energy can be made.
- Control of the environment: this control allows the switching off of TV/Radio when there is an emergency call and it is easier to follow-up on the resident. In the case of fire or smoke alarms, it is possible to extinguish the fire source
- Rolling shutters, Venetian blinds, sun protection: this control allows an optimal controlling of the climate which will also contribute to an improved comfort for the resident.
- Illumination: the illumination can be controlled by the care staff, which allows an improved accompaniment and follow-up of the patient.
- Door openers: it becomes easy for the care staff to get access to the patients; when the door is locked, a command can be given from the central unit to the module to open the door.
- Intercom and care-communication: An improved support of the patient by the care staff is possible by this speak/listen link. The speak/listen link can be extended with a visual link, possibly to be connected to the TV.
- Care and services: Over the module, a plurality of services can be offered, e.g.
 - Meal service
 - Shopping
 - Jobbing
 - Cleaning
 - Dry cleaning
 - Library
 - Holiday service
 - Etc.
- Wandering detection: A surveillance of areas or spaces is possible by integrating such systems. When the cared person leaves the area, an alarm can be given.
- Care registration: by using this module, care registration is possible i.e. it is possible to determine and store which kind of care is given by which care staff to which client on what moment.
- Registration of welfare: when no movement is detected during a predetermined period of time in one or more rooms of the house, a call is sent over the module to the care staff.
- Integration with home automation: because two intelligent systems are coupled with each other, the integration of home automation can further increase the controlling.
- Control of care: measurements of blood pressure, control of temperature and other medical measure-

ments can be integrated.

Claims

1. A decentralized module for a care and monitoring system, the decentralized module being directly connected to the internet, whereby signals are exchanged between this decentralized module and a central unit using the TCP/IP protocol and whereby the decentralized module comprises:

- a processor;
- a memory;
- means for sending and receiving files by the FTP-protocol;
- means for calling care staff, generating call signals;
- a presence or canceling means generating canceling signals indicating that a previous call has been answered,

whereby these call or canceling signals are sent to the central unit using the TCP/IP protocol.

2. The decentralized module according to claim 1 further comprising identification means coupled to the cancel means, the identification means generating identifying signals.

3. The decentralized module according to any of claims 1 or 2, whereby the means for calling care staff includes a button, mounted on the decentralized module.

4. The decentralized module according to any of claims 1 to 3, whereby the presence or canceling means and/or the identification means includes a button, mounted on the decentralized module.

5. The decentralized module according to any of claims 1 or 4, the module further comprising intercom means, the intercom means using the VoIP protocol for connecting the module to a central unit or to other decentralized units.

6. The decentralized module according to any of the claims 1 to 5, comprising the necessary software for setting or resetting the module.

7. The decentralized module according to any of the claims 1 to 6, further comprising means for sending data to and receiving data from auxiliary apparatus and computers.

8. The decentralized module according to any of the claims 1 to 7, wherein said auxiliary apparatus comprise at least one of:

- an alarm button,
- a blood pressure measuring instrument,
- a temperature measuring instrument,
- a fire detector,
- a telephone connection

9. The decentralized module according to any of the claims 1 to 8, further comprising:

- an interactive display allowing the user to exchange data with a central unit.

10. A care and monitoring system comprising:

- one or more decentralized modules according to any of the claims 1 to 9,
- one or more central servers, and
- an IP-network for connecting the one or more decentralized modules with the one or more central servers.

11. A method for communicating between a decentralized unit and a central unit of a care and monitoring system comprising:

- at the level of the decentralized unit, transmitting and receiving information and data using the TCP/IP protocol
- whereby this information and data comprises calling signals for calling care staff and
- whereby this information and data further comprises presence or canceling signals.

12. A method for communicating between a decentralized unit and a central unit of a care and monitoring system according to claim 9, whereby this information and data further comprises identification signals.

13. A method for communicating between a decentralized unit and a central unit of a care and monitoring system according to claim 9, whereby this information and data further comprises intercom signals.

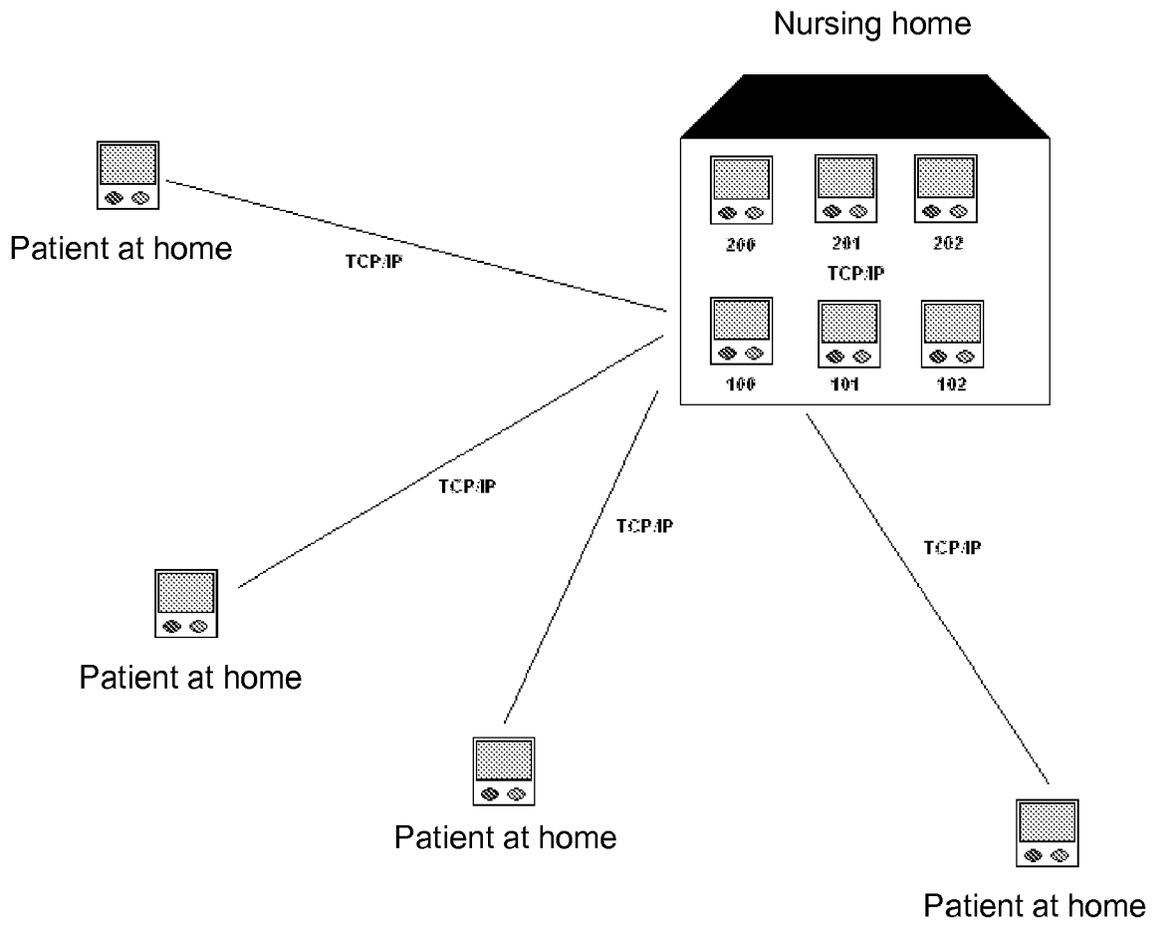


FIG. 1

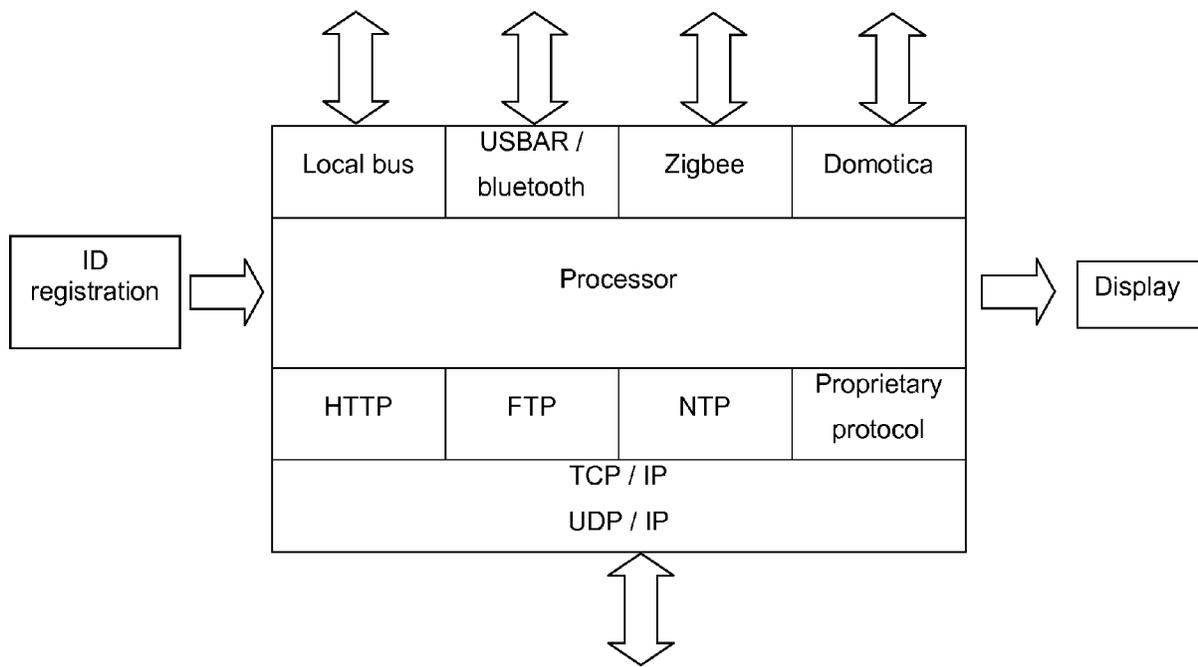


FIG. 2

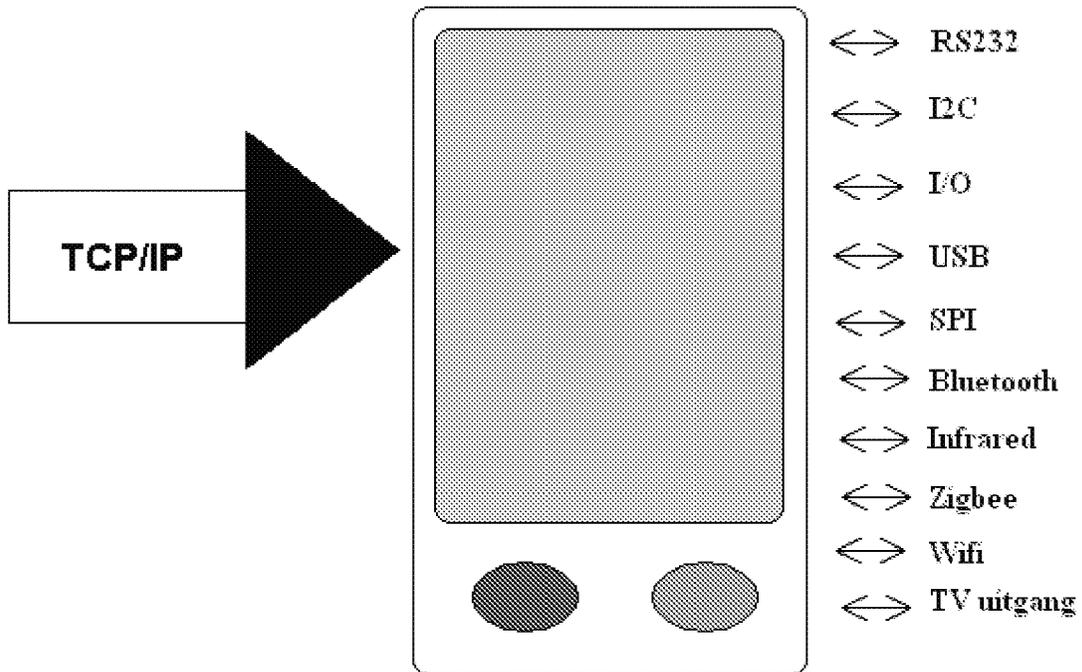


Fig. 3



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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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
The Hague		2 October 2008	Sgura, Salvatore
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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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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