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(54) **Electronic system for transferring audio and/or video signals**

Elektronisches System zur Übertragung von Video- und/oder Tonsignalen

Système électronique pour transmettre des signaux audio et/ou vidéo

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Description

[0001] This invention relates to an electronic system for transferring to surveillance stations the audio and/or video signals originating from the rooms of a monitored dwelling, or audio and/or video signals used for assisting persons requiring aid.

[0002] In the domestic field and in offices, electronic antitheft devices are becoming increasingly used, these associating with an alarm siren activated automatically or manually (by the surveillance station) a telecamera arranged to acquire images and to transfer them to control centres, surveillance points or police stations.

[0003] Electronic tele-aid systems are also known, used to assist elderly persons living alone, hospital patients or handicapped persons, which enable a request for aid to be fed over a telephone line by simply pressing a pushbutton of a portable device. Document US 5,144,661 discloses a security system where a monitored environment communicates by telephone with a base station.

[0004] Pressing said pushbutton initiates an automatic call process repeated to a plurality of telephone numbers until one of the called numbers replies. At that point a telephone conversation can be held with the person requiring aid.

[0005] In the case of an antitheft device, in most cases the alarm device is connected to the closest police station, and the telecamera positioned within the environment being monitored takes images which can be recorded by appropriate apparatus located in safe environments situated in the vicinity.

[0006] In this manner the recording can later be recovered and the filmed scenes viewed with the aid of further devices.

[0007] Alternatively the images can be transmitted to a surveillance centre, from which the scene can be directly checked on a screen. However the receiver device always has a limited range and hence the surveillance centre must be situated in the vicinity of the dwelling or office under supervision.

[0008] If considering an electronic tele-aid system, the request for aid is currently automatically transferred over all the telephone lines previously programmed by the user (and hence the call can reach a great distance from the dwelling of the person requiring assistance), however only oral communication is possible with the user, with the drawback of not being able to know his true physical condition by means of an objective visual examination.

[0009] An object of the present invention is therefore to provide an electronic system for transferring audio and/or video signals which obviates the aforesaid drawbacks by enabling the images of the rooms of a monitored dwelling to be transmitted (in the case of break-in) to any other place equipped for viewing the images received, while at the same time enabling the image of the person or persons requiring aid to be transmitted if the

electronic system performs the function of tele-aid.

[0010] A further object of the invention is to provide an electronic system for transferring audio and/or video signals which is of simple and low-cost construction, without requiring the use of complicated or costly techniques, by using standard circuits and known electrical and electronic components.

[0011] These and further objects are attained by an electronic system for transferring audio and/or video signals in accordance with claim 1, to which reference should be made for brevity.

[0012] Advantageously, the electronic system of the present invention comprises at least one electronic control unit for transmitting the audio and/or video signals, to be installed within the monitored environment, at least one peripheral electronic device to be installed in monitored environments close to that in which said control unit is installed, and at least one electronic apparatus for receiving the audio and/or video signals, to be installed at the surveillance stations.

[0013] Image transmission between the electronic control unit and the peripheral electronic devices is by radiofrequency signals, whereas transmission between the electronic control unit and the electronic signal reception unit is by the telephone network.

[0014] This characteristic enables the images filmed by the telecamera situated in the monitored rooms to be transferred to remote distances.

[0015] The only requirements by the system are that connections to the telephone network are available within the monitored dwelling or office and at the surveillance station.

[0016] In addition, the electronic control unit can feed along the used telephone line synthetic vocal messages for communicating the alarm event to those surveillance stations not provided with an image display screen.

[0017] In this manner the alarm event detected by the telecamera can be handled in good time even if the telephone unit to which the electronic signal reception apparatus is connected is occupied or unavailable, because the electronic control unit continues to call a group of other alternative telephone numbers, to which it feeds exclusively a vocal alarm message.

[0018] By operating on the electronic signal reception apparatus, the electronic system also provides a "follow the user" function. If the user possessing the electronic reception apparatus changes his address, even temporarily, he can inform the electronic system, via said signal reception apparatus, of the new telephone number to which the electronic reception apparatus will be connected.

[0019] When the electronic system has been installed, the user intending to change the location of the reception apparatus operates a keyboard to insert the new telephone number, to which he transfers a suitable command for activating the image reception function.

[0020] Automatically, by way of the telephone line, the electronic reception apparatus communicates with the

electronic control unit and program it, informing it of the new telephone number to which subsequent alarms or calls are to be fed. At this point the user can transfer the electronic signal reception apparatus to the new telephone number.

[0021] Finally, the fact of being able to use the telephone line for image transfer makes the wiring of the entire system simple and the installation of the electronic control unit and the peripheral devices economical.

[0022] The electronic reception apparatus for audio and/or video signals can be associated with a normal television set for image display and sound diffusion, by connecting a standard multicore cable (such as a scart cable) to provide the television set with the signals received via the telephone line.

[0023] Alternatively, the electronic audio and/or video signal reception apparatus can be provided with a liquid crystal screen for image display, and comprises a suitable standard electrical interface for connection to cellular portable telephones.

[0024] Further objects and advantages of the present invention which is defined by the claims will be apparent from the ensuing description and the accompanying drawings, which are provided by way of non-limiting example and in which:

Figure 1 shows a first embodiment, by way of non-limiting example, of the system for transferring audio and/or video signals according to the present invention;

Figure 2 is a block diagram of the electronic control unit used for audio and/or video signal transmission in the embodiment of the system of the present invention shown in Figure 1;

Figure 3 is a block diagram of a peripheral electronic device for installation in monitored environments close to that in which the electronic control unit of Figure 2 is installed, in accordance with the embodiment of the present invention shown in Figure 1;

Figure 4 is a block diagram of the electronic audio and/or video signal reception apparatus in accordance with the embodiment of the present invention shown in Figure 1;

Figure 5 shows a second embodiment of the electronic system of the present invention, shown by way of non-limiting example;

Figure 6 shows a third possible embodiment of the electronic system of the present invention, shown by way of non-limiting example;

Figure 7 is a block diagram of the electronic audio and/or video signal reception apparatus in accordance with the embodiment of the present invention shown in Figure 6.

[0025] With reference to said figures, the full lines connecting the blocks together in pairs represent electrical communication lines, or digital buses, along which data, information, commands and instructions travel in

the form of electrical signals.

[0026] The dashed lines indicate connection lines used for supplying electrical energy to the various functional blocks by the power circuits and storage batteries.

[0027] D indicates a digital signal and A represents an analog signal. The direction of the arrows indicates the direction in which the signal flows from one block to the other. If the line connecting the two blocks carries two arrows, one facing the first block and the other facing the second block, this signifies that data, information, commands and instructions are exchanged between the two blocks.

[0028] Specifically, with reference to Figure 1, S indicates overall the monitored user, C indicates an electronic control unit connected to the electricity supply mains and from which the audio and/or video signals are transmitted, T indicates a first telephone line connecting the audio and/or video signals between the electronic control unit C and an electronic reception apparatus R for said transmitted audio and/or video signals, which is connected to the supply mains and is installed at a surveillance station U.

[0029] With reference to Figure 2, the electronic control unit, indicated overall by C, comprises:

- a telecamera TC, or a device for acquiring images and converting them into electrical signals;
- a passive infrared sensor SC, which activates image acquisition simultaneously with the detection of a moving human body in the monitored room;
- a lighting device RC for the monitored region (of visible or infrared light. For example, a group of infrared LEDs or an infrared electromagnetic radiation lamp can be used), which makes image acquisition possible even when there is no external lighting in the environment;
- an electronic interface circuit IC and a modem MC (modulator-demodulator device) for connection to the switched telephone network;
- a radio receiver-transmitter DC for acquiring images memorized by peripheral electronic devices;
- a voice synthesis message generator GC for indicating the cause of activation of the passive infrared sensor SC to those users of the switched telephone network without an electronic apparatus suitable for receiving and displaying images but are provided with a normal telephone: the modem MC and the voice synthesis message generator GC use some of the electronic components in common, namely those dedicated to analog-digital conversion and to numerical signal processing;
- an electronic device VC for oral communication (in the case of tele-aid);
- an alarm siren AC activated either automatically (following a signal from the passive infrared sensor SC) or manually (by surveillance stations);
- a radiofrequency remote controller EC for activating or deactivating the surveillance state of the elec-

tronic system or for locally activating an alarm call for the tele-aid function;

- a low sound-intensity acoustic signaller LC to inform the user of the state of the electronic control unit C;
- a microprocessor PC for overseeing the operation and programming of the electronic control unit C;
- a digitalizer device DDC which connects the telecamera TC to the microprocessor PC: the microprocessor also generates control signals for operating the digitalizer device DDP and the telecamera TC;
- a memory element FC able to store the filmed images: the memory element FC comprises three separate units (bulk memory or "flash" memory, image memory, working memory), which memorize different functions and technical characteristics.

[0030] The electronic control unit C is also equipped with a set BC of rechargeable nickel-cadmium batteries, which provides a self-sufficiency of some tens of hours of operation (when the electronic control unit C is in the rest state) in the absence of power from the electricity mains.CC.

[0031] With reference to Figure 3, P indicates overall one of the peripheral electronic devices included in the electronic system of the present invention and to be installed in monitored environments close to that in which the electronic control unit C is installed.

[0032] Each peripheral electronic device P comprises:

- a telecamera TP (or a device for acquiring images and converting them into electrical signals);
- a passive infrared sensor SP for activating image acquisition simultaneously with the detection of a human body moving within the monitored room;
- a lighting device RP for the monitored region, making image acquisition possible even when there is no external lighting in the environment;
- a radio receiver-transmitter DP for communication with the electronic control unit C and for transferring the acquired images;
- a set BP of rechargeable nickel-cadmium batteries for operating the electronic system in the absence of power from the electricity mains CP (the self-sufficiency of said battery set BP is some tens of hours of operation when the electronic control unit C is in the rest state);
- a microprocessor PP for overseeing the operation and programming of the peripheral electronic device P;
- a digitalizer device DDP which connects the telecamera TP to the microprocessor PP: the microprocessor also generates control signals for operating the digitalizer device DDP and the telecamera TP;
- a memory element FP able to store the filmed images: the memory element FP comprises three sep-

arate units (bulk memory or "flash" memory, image memory, working memory), which memorize different functions and technical characteristics.

[0033] With reference to Figure 4, the electronic audio and/or video signal reception apparatus, indicated overall by R, comprises:

- a screen NR for displaying the images received via the telephone line from the electronic control unit C (it can be a cathode ray tube or a liquid crystal display);
- an electronic interface circuit IR for communication with the switched telephone network;
- a modem MR (modulator-demodulator device) for connection to a telephone of the user of the switched telephone network;
- an electronic device VR for oral communication (in the case of tele-aid functions);
- a memory element FR able to store a certain number of the latest images received, so that these images can be viewed at times subsequent to memorization: the memory element FR comprises three separate units (bulk memory or "flash" memory, image memory, working memory), which memorize different functions and technical characteristics;
- an output socket from the screen NR (not shown on the drawings) which, via the video signal in standard format, makes the image displayed on the screen NR available for display on a screen external to the electronic apparatus R or for image videorecording on a magnetic support;
- a voice synthesis message generator GR (and relative loudspeaker) for emitting information on alarms underway;
- a keyboard WR enabling the user to program and control the electronic apparatus R;
- a set of storage batteries BR for operating the electronic apparatus R in the absence of mains electricity supply CR;
- a microprocessor PR which oversees the operation and programming of the peripheral electronic device R.

[0034] With reference to Figure 5, CT indicates a telephone dialler which communicates via radio with a removable telecamera TM provided with a power supply; the telephone dialler CT and the removable telecamera TM are connected to the supply mains and are installed at the surveillance station S'.

[0035] T' indicates a second telephone line connecting audio and/or video signals between the telephone dialler CT and:

- a standard telephone TLF;
- a portable signal receiver module RVP provided with an image display screen.

[0036] TEL indicates a cellular telephone which the portable signal receiver module RVP uses for the telephone connection.

[0037] Finally, CAR indicates an electrical powering device for powering the rechargeable storage batteries provided within the receiver module RVP.

[0038] With particular reference to Figure 6, the reference numeral 20 indicates overall the premises of a surveillance station, 11 indicates an electronic reception apparatus for the audio and/or video signals, 12 represents a cable connecting the apparatus 11 to the electrical supply socket, 13 indicates the telephone line connecting the reception apparatus 11 to the telephone network 16 via the telephone socket 18 and connecting the telephone 15 to the network 16 via said telephone socket 18, and 14 indicates a standard multicore cable, for example of scart type, connecting the reception apparatus 11 to the television set 17 of the surveillance station 20.

[0039] The reference numeral 19 indicates an infrared remote controller for the television set 17, by which the functions of the electronic system of the present invention can be controlled directly or programmed.

[0040] With particular reference to Figure 7, the electronic reception apparatus 11 comprises:

- a set of storage batteries 21, required for operating the apparatus 11 in the absence of mains electricity supply 30;
- an electronic device 22 for oral communication (in the case of tele-aid);
- an electronic interface circuit 23 for communication with the switched telephone network 16;
- a modem 24 (modulator-demodulator device) for connection to the telephone 15 of the surveillance station 20;
- a memory element 25 able to store the images filmed within the interior of the premises of the monitored user (the memory element 25 comprises three separate units, namely a bulk memory or "flash" memory, an image memory, and a working memory), which memorize different functions and technical characteristics;
- a radio controller or an infrared electronic receiver device 26;
- a voice synthesis message generator GR 27 (and relative loudspeaker) for emitting information on alarms underway;
- a keyboard 28 enabling the user to program and control the electronic apparatus 11;
- a device 31 for generating the composite video signal to be fed along the stand multicore cable 14 connected to the television set 17;
- a microprocessor 32 which oversees the operation and programming of the electronic reception apparatus 11.

[0041] The operation of that embodiment of the audio

and/or video signal transfer system described by way of non-limiting example and illustrated in Figures 1-4, is as follows:

[0042] The electronic control unit C can acquire the image of the environment in which it is installed in two different ways, namely by command by the electronic image reception apparatus R or because of an alarm event if the electronic control unit C is in a surveillance state.

[0043] In the case of command by the electronic apparatus R, the apparatus user by pressing a determined sequence of keys on the keyboard WR of said apparatus can order the acquisition of an image.

[0044] This is achieved by an automatic procedure, comprising telephonically connecting the electronic apparatus R to the control unit C: the electronic reception apparatus R sends a call to the control unit C via the telephone network; the control unit C acquires an image (possibly by illuminating the environment by the infrared or visible light device RC) and returns the image to the apparatus R, which displays it on its screen NR.

[0045] The user of the apparatus R can decide to continue the acquisition of other images or conclude the procedure.

[0046] Alternatively, because of an alarm event or a request for assistance by the user of the control unit C (if said control unit C has been put into a surveillance state by the remote controller EC), the passive infrared sensor SC is activated, the control unit C acquires an image (possibly with activation of its infrared lighting device RC if the subject is not identifiable) and the control unit C sends a call via the telephone network to the apparatus R and, having made the connection, transfers a first image to it.

[0047] The apparatus R informs the surveillance station of the event underway by an announcement by the voice synthesis generator GC, of the type: "Attention, attention, alarm sounding, image available".

[0048] Following this, the control unit C feeds the successive images of the monitored environment until the surveillance station decides to cease their acquisition.

[0049] The siren AC of the control unit C can be automatically activated by the control unit C or can be activated by a command from the surveillance station, via the telephone network, for example after acquiring a number of images.

[0050] In the case of a visible-light lighting device RC (incandescent lamp), the control unit C activates the device RC only after completing the transfer of the first image, which is acquired in the absence of light so as not to be immediately identifiable.

[0051] Following activation of the remote controller EC for tele-aid, the lighting device RC is activated from the very first image, as it is not necessary to protect the identity of the control unit C.

[0052] During a connection between the reception apparatus R and the control unit C, the device can be activated by an oral communication device VC, VR to pro-

vide acoustic monitoring of the environment in which the control unit C is positioned, or to converse with the persons present.

[0053] The electronic reception apparatus R enables the surveillance station to memorize one or more images in the memory element FR for their later analysis by the control unit C.

[0054] Images withdrawn from the memory element FR are displayed on the screen NR and can, for example, be recorded on a magnetic tape by an external apparatus using the video signal output socket (not shown) with which the apparatus R is provided.

[0055] The possible peripheral electronic devices P extend the operation of the control unit C by allowing the surveillance station to view images originating from other environments different from but close to that in which the control unit C is installed.

[0056] Again in this case, operation takes place if an alarm arises (if the control unit C has been set to the surveillance state by an appropriate key positioned on the remote controller EC), or by a command by the electronic apparatus R via the keyboard WR in accordance with an automatic procedure identical to the connection between the apparatus R and the control unit C: in this respect, the apparatus R sends a call along the telephone network to the control unit C; via the radio connection which occurs between the receiver-transmitters DC, DP, the control unit C requests the acquisition of an image from the selected peripheral device P; the peripheral device P feeds the acquired image to the control unit C by radio, using the receiver-transmitter (possibly lighting the environment with its own lighting device RP).

[0057] Finally, the control unit C returns the image to the apparatus R, which displays it on its own screen NR.

[0058] The surveillance station can decide to continue the acquisition of further images or terminate the procedure.

[0059] In the case of an alarm event with the control unit C in its surveillance state, the passive infrared sensor RP of a peripheral device P is activated, the peripheral device P acquires the image and transfers it by radio to the control unit C, using the receiver-transmitter DP; and the control unit C activates the same alarm procedure which would have been generated by the activating of its own sensor SC: via the telephone network, the control unit C sends a call to the apparatus R and when the connection is made transfers to it a first image provided by the peripheral device P.

[0060] The electronic reception apparatus R informs the surveillance station of the event underway by an announcement by the voice synthesis generator GC, of the type: "Attention, attention, alarm sounding, image available".

[0061] Following this, the control unit C feeds the successive images of the environments monitored by the peripheral devices P until the surveillance station decides to cease their acquisition.

[0062] The siren AC of the control unit C can be au-

tomatically activated by the control unit C or can be activated by a command from the surveillance station, via the telephone network, for example after acquiring a number of images.

5 **[0063]** Again in this case, if a visible-light lighting device RC (incandescent lamp) is activated, the peripheral device P activates said lighting device RC only after completing the transfer of the first image, which is acquired in the absence of light so as not to be immediately identifiable.

10 **[0064]** The user selects the peripheral device P from which to acquire images by pressing appropriate keys or key sequences on the keyboard WR of the electronic reception apparatus R.

15 **[0065]** The control unit C can be switched into or out of the surveillance state in two ways: either locally by the remote controller EC or from the reception position by the electronic reception apparatus R.

20 **[0066]** When in proximity to the control unit C, the user by pressing a key on the remote controller EC switches the control unit C into the non-surveillance state.

25 **[0067]** When in the non-surveillance state the control unit C does not initiate any procedure for calling the electronic apparatus R in the case of an alarm indicated by the passive infrared sensor SC.

[0068] The control unit C is switched into the non-surveillance state when the environment in which it is positioned is inhabited or frequented by persons.

30 **[0069]** The surveillance state of the control unit C can also be altered by a function of the electronic apparatus R, activated by pushing a determined sequence of keys.

35 **[0070]** The apparatus R can effect this operation either by directly calling the control unit C or when there is already a connection with the control unit C underway, for example during a telephone alarm call.

[0071] The operation of the electronic control unit C is governed by a microprocessor PC of the eight or sixteen bit type depending on the number of images to be handled.

40 **[0072]** When in its rest state, said microprocessor PC analyzes the output of the passive infrared sensor SC, performs radio communication with the possible peripheral devices P by enabling the receiver-transmitter DC and analyzes the electronic interface circuit IC for communication with the telephone line to identify a possible call signal.

45 **[0073]** In the case of an alarm generated by the passive infrared sensor SC, the microprocessor PC activates the telecamera TC and the lighting device RC (if of infrared type) and acquires the image present, to memorize it in its own digital memory element FC. Simultaneously the microprocessor PC activates the electronic telephone interface circuit IC by calling the telephone number to which the electronic reception apparatus R has been connected. Having made the connection with the modem MR of the apparatus R, the control unit C feeds the data regarding the acquired image to the apparatus R via its own modem.

[0074] The microprocessor PC can process the image data before transmission to eliminate the redundancies of the video signal, by one of the algorithms of the known art (for example using a protocol of CCITT-V32bis type), to best utilize the small band width of the telephone channel.

[0075] In the case of radio reception of an alarm condition by one of the peripheral devices P, the control unit C, by radio using the receiver-transmitter DC, receives from the peripheral device P the data regarding the image and memorizes them in the digital memory element FC.

[0076] The procedure for feeding data to the electronic apparatus R via the telephone line is the same as the case in which the alarm is generated by activation of the infrared sensor SC of the control unit C.

[0077] In all cases of alarm (alarm generated by the sensor SC of the control unit C or generated by one of the passive infrared sensors SP of the peripheral devices P), the control unit C makes an alarm call to stations provided with the electronic reception apparatus R which can display the acquired image, and to stations without the electronic apparatus R (and hence without a display screen NR), who possess as the station terminal a normal telephone.

[0078] To stations without an electronic apparatus R and display screen NR the control unit C feeds a voice synthesis alarm message generated by the generator GC.

[0079] The interface circuit IC towards the telephone line also comprises a call detector (not shown on the figures) which enables the control unit C to reply automatically to an entering call.

[0080] This provides the function of remote surveillance, ie the apparatus R can call the control unit C from any remote place connected to the telephone network, and command the acquisition of an image sequence by the telecamera TC of the control unit C or by the telecameras TP of one or more peripheral devices P.

[0081] The call detector also allows programming of the control unit C.

[0082] Having identified a call, the microprocessor PC engages the telephone line and dialogues with the calling apparatus R via the modem MC; having received from the apparatus R the command relative to the function to be performed, the microprocessor PC executes it (image acquisition, activation of the lighting device RC, memorizing in the memory FC the data regarding the image from the telecamera TC); the microprocessor PC then possibly processes the image data and feeds them to the apparatus R via the modem MC.

[0083] Operation of the entire control unit C is ensured even in the absence of the mains electrical supply CC, because of the incorporated rechargeable storage battery set BC which provides self-sufficiency for some tens of hours of operation in the rest state.

[0084] The microprocessor PP of the peripheral device P analyzes, while in the rest state, the state of the

passive infrared sensor SP and receiver-transmitter DP, which communicates via radio with the control unit C.

[0085] In the case of an alarm sensed by the infrared sensor SP, the microprocessor PP activates the lighting device RP and acquires an image from the telecamera TP, storing its data in the memory element FP; the image data, possibly processed to eliminate video signal redundancies in accordance with an algorithm of the known art, are then transmitted by radio using the receiver-transmitter DP, to the control unit C which feeds them via the telephone line to the apparatus R.

[0086] The microprocessor PP can receive an image acquisition command from the control unit C via the receiver-transmitter DP.

[0087] In a manner identical to that already described relative to the control unit C, the microprocessor PP in this case handles the image acquisition and data transfer to the control unit C.

[0088] Operation of the peripheral device P is ensured even in the absence of the mains electrical supply CP, because of the incorporated rechargeable storage battery set BP which provides operational self-sufficiency for some tens of hours of operation in the rest state.

[0089] The microprocessor PR of the electronic image reception apparatus R governs the overall operation of the device.

[0090] When in the rest state the microprocessor PR analyzes the commands fed via the keyboard WR and the electronic interface circuit IR to the telephone network.

[0091] When a call enters from the telephone network, the microprocessor PR senses it and initiates an automatic response procedure.

[0092] In this case the microprocessor PR engages the telephone line and dialogues with the modem MC of the control unit C; the microprocessor PR then transfers data regarding an image sent by the control unit C and copies them in a portion of the memory element FR; the image is immediately displayed on the screen NR (of the cathode ray or liquid crystal type); the microprocessor PR also triggers reproduction of a synthetic voice message via the message generator and the incorporated loudspeaker GR to warn the surveillance station of the event underway; the surveillance station can terminate the acquisition and communication phase underway by feeding a determined command via the keys of the keyboard WR.

[0093] The functions which can be activated by the keyboard WR (and handled by the microprocessor PR and memory element FR) are many, such as programming the mode of operation of the electronic apparatus R (the telephone number of the control unit C, the time and the date can be set), programming the control unit C (the private parameters of the control unit C, for example the telephone numbers to be called in the case of an alarm, can be changed via the telephone network using an appropriate protected procedure), interrogating the control unit C for image acquisition (the image

acquisition command can be provided via the modem MR, the electronic interface circuit IR and the telephone line), examining the images memorized in the memory element FR (the microprocessor PR scans the memory element FR and commands its display on the screen NR).

[0094] Operation of the entire electronic reception apparatus R is ensured even in the absence of the mains electrical supply CR, because of the incorporated rechargeable storage battery set BR which provides self-sufficiency for some tens of hours of operation in the rest state.

[0095] With regard to the embodiment described (by way of non-limiting example) and illustrated in Figures 6 and 7, the electronic audio and/or video signal transfer system of the present invention operates as follows.

[0096] Again in this case, an electronic control unit installed with the monitored user acquires an image of the environment in which it is installed, on command by the surveillance station or following an alarm generated by the monitored user, or automatically following the detection of a person in the monitored environment.

[0097] In all cases the surveillance station 20 can see the image of the monitored environment on its television set 17 (which is connected to the electronic reception apparatus 11 for signals originating from the control unit) or directly on the electronic apparatus 11 if this is portable and provided with a screen (generally of liquid crystal type).

[0098] After receiving an image, the station can simply use the telephone 15 or, by pressing a key on the keyboard 28 of the electronic reception apparatus 11, can command the acquisition of new images or listen to the sounds produced in the monitored environment or speak orally to the assisted person via the electronic device 22.

[0099] If the electronic apparatus 11 is fixed, the television set 17 of the surveillance station 20 acts as the image screen and the television loudspeaker acts as the audio transmitter.

[0100] The electronic apparatus 11 is also provided with an infrared receiver device 26 able to self-learn some of the commands emitted by the infrared remote controller 19 of the television set 17 of the station 20.

[0101] In this manner the surveillance station can, using the remote controller 19 of its own television set 17, command some of the functions of the electronic reception apparatus 11.

[0102] Two stages of operation-of the electronic reception apparatus 11 for the audio and/or video signals can be distinguished, namely when the electronic apparatus 11 is called by the electronic control unit of the monitored user and when the electronic apparatus 11 calls said control unit.

[0103] When the electronic apparatus 11 is called by the control unit it replies automatically to the telephone call after a certain number of rings of the telephone set 15 of the surveillance station 20 (the number of rings

can be programmed by the user).

[0104] If the television set 17 is switched on and is receiving a program, the electronic apparatus 11 automatically causes the image received from the control unit to be displayed, interrupting reception of the television program.

[0105] This enables the surveillance station to be alerted automatically. If the television set 17 is not switched on at that moment in which the electronic apparatus 11 receives an image from the telephone line 13, the apparatus 11 memorizes this image and a certain number (programmable) of subsequent images, enabling them to be displayed later on command by the surveillance station.

[0106] The command can be triggered by the electronic apparatus 11 or by the infrared remote controller 19 of the television set 17.

[0107] Display is always by the television set 17 of the surveillance station 20.

[0108] When the electronic apparatus 11 calls the control unit, this signifies that the surveillance station, of its initiative, intends to acquire an image of the monitored environment.

[0109] The surveillance station 20 can command this function by its user pressing a pushbutton of the electronic apparatus 11 or by directly operating the infrared remote controller 19 of its own television set 17.

[0110] The microprocessor 32 governs the overall operation of the apparatus 11.

[0111] In the rest state the microprocessor 32 analyzes the keyboard 28 and the electronic interface circuit 23 to the telephone network 16.

[0112] When a call enters from the telephone network 16, the microprocessor 32 senses it and initiates an automatic response procedure.

[0113] In this case the microprocessor 32 engages the telephone line 13 and dialogues with the modulator-demodulator device of the control unit.

[0114] The microprocessor 32 then transfers digital data regarding an image sent by the control unit and copies them in a portion of the memory element 25, the image being displayed on the television set 17 connected to the electronic apparatus 11 (the microprocessor 32 commands the video and audio interface circuit 23 such as to switch the television set 17 to display of images and reproduction of sounds originating from the electronic apparatus 11).

[0115] The microprocessor 32 also triggers reproduction of a vocal message via the device 27 and the relative loudspeaker of the apparatus 11 and possibly by the loudspeaker of the television set 17 to warn the surveillance station 20 of the event underway.

[0116] The surveillance station user can conclude the acquisition and communication under way by feeding a suitable command via the keyboard 28 of the apparatus 11 or keying a suitable command on the infrared remote controller 19 of the television set 17.

[0117] The microprocessor 32, in its rest state, can

sense the pressing of a key or a sequence of keys of the keyboard 28 or decode a command fed by the station to the infrared receiver device 26 of the television set 17.

[0118] In this case the following functions can be activated:

1) Programming the mode of operation of the electronic apparatus 11: by means of appropriate procedures the microprocessor 32 acquires from the user all the information relative to the desired operation of the apparatus 11 (for example, the telephone number of the control unit, the time and date), recording them in the memory element 25, within the private unerasable memory region.

2) Programming the control unit: this is done by an appropriate procedure, comprising telephone connection to the control unit and information exchange, by means of the modulator-demodulator devices with which the control unit and apparatus 11 are provided. By means of an appropriate protected procedure, using the keyboard 28 of the apparatus 11 the private parameters of the surveillance, such as the telephone number to be called in the case of an alarm, can be changed.

3) Interrogating the control unit for image acquisition (by the control unit or by the peripheral electronic devices situated in environments close to that in which the control unit is installed); this is achieved by interrogation of the control unit by the electronic apparatus 11, effected along the telephone line 13.

By suitably commanding the telephone interface circuit 23 and initiating a dialogue via the modem 24, the microprocessor 32 becomes connected to the control unit and sends the image acquisition command.

4) Memory examination: by feeding a suitable command via the keyboard 28, the images memorized in the element 25 of the apparatus 11 can be later examined.

[0119] In this case the microprocessor 32 scans its image memory and commands its display on the liquid crystal screen of the apparatus 11 or on the screen of the television set 17.

[0120] Again in this case operation of the entire electronic system is ensured in the absence of the mains electrical supply 30, because of the incorporated storage battery set 21 which provides adequate self-sufficiency (some tens of hours of operation in the rest state.)

[0121] From the foregoing description the characteristics of the electronic system for audio and/or video signal transfer according to the present invention are clear, as are the resultant advantages.

[0122] In particular, these are:

- flexibility, ease and rapidity of installation and wiring of the system electronic components;

- versatility of application of the system to existing installations without having to modify the electrics;
- ease of integration with other known electrical systems and/or image reception apparatus, and reliability in terms of ease of use (because of the method of recognizing the installed peripheral apparatus and hence the rapid configuration) and the unambiguous identification of an apparatus fault, following diagnostic error messages;
- time saving in system installation compared with the known art;
- time saving in the procedures for checking operation and self-sufficiency of the apparatus connected to the system, compared with the known art;
- ability to reach any remote image reception position (at any distance) and different surveillance stations with sounds and images from the premises of the environment to be monitored, in the case of a break-in attempt or a request for aid by the user of the control unit;
- ability to reach any remote image reception position (at any distance) in the case of a visual aid message;
- saving in appliance cost and installation compared with the known art.

[0123] The aforescribed electronic system for audio and/or video signal transfer can be easily extended to the case in which the electronic reception apparatus consists of a signal receiver module (provided with an image display screen) connected to a standard telephone or a cellular telephone.

[0124] In this case the electronic control unit is provided with a removable telecamera connected by radio to a telephone dialler which is connected via the telephone network to the signal receiver module (provided with an image display screen) and to the standard telephone.

[0125] The signal receiver module is connected to an electrical power supply and can consist of a portable video unit with a liquid crystal screen.

[0126] Finally, it is apparent that numerous further modifications can be made to the electronic system for audio and/or video signal transfer according to the present invention, without leaving the novel principles of the inventive idea, it being also apparent that in the practical implementation of the invention, the materials, shapes and dimensions of the illustrated details can be chosen at will according to requirements, and can be replaced by others technically equivalent.

Claims

1. Electronic system for transferring audio and video signals, which is capable of transferring to surveillance stations (20, U, U') vocal messages and images originating from monitored user environments

(S, S') or vocal messages and images used for assisting persons requiring aid, comprising at least one control unit (C) for transmitting said audio and video signals, which is installed within said monitored environments (S, S'), and at least one electronic reception apparatus (11, R) for receiving said audio and video signals, which is installed within said surveillance stations (20, U, U'), wherein said electronic control unit (C) includes electrical power supplying means (BC, CC), image acquisition and converting means (SC, TC, DDC, RC, TM), means for memorising (FC) and transmitting (MC, IC, CT) said images, means for generating (GC, AC, LC) and transmitting (VC) vocal messages and acoustic warnings, means for triggering (EC) the surveillance state and means for overseeing (PC) the functioning of the control unit (C) by means of data communication, commands and instructions along digital buses, and wherein said electronic reception apparatus (11, R) includes electrical power supplying means (21, 30, BR, CR, CAR), means for receiving (17, 27, GR, RVP) audio signals, means for receiving and emitting (22, 27, VR, GR, TLF, TEL) said vocal messages and said acoustic warnings, means for receiving (17, 31, IR, MR, RVP), memorising (25, FR) and displaying (17, NR) said images, means for overseeing (32, PR) the functioning of the reception apparatus (11, R) by means of data communication, commands and instructions along digital buses, means for programming and controlling (19, 26, 28, WR) the reception apparatus (R) and the control unit (C), said images being transferred along at least one switched telephone line (13, T, T'), **characterised in that** said image acquisition and converting means (SC, TC, DDC, RC, TM) and said transmitting means (MC, IC, CT) of the control unit (C) consist, respectively, of at least one telephone dialler (CT) connected to the electrical mains and at least one movable camera (TM) with a power unit connected to the electrical mains, said telephone dialler (CT) and said movable camera (TM) being installed within said monitored user environments (S, S') and mutually exchanging radiofrequency signals, said telephone dialler (CT) also being connected, via said switched telephone line (13, T, T'), to at least one telephone set (TLF) and to at least one television set (17) of said reception apparatus (11, R), said television set (17) being installed at said surveillance stations (20, U, U') and being provided for displaying on a screen at said surveillance stations (20, U, U') the images transferred from said monitored environments (S, S') when said telephone set (TLF) of said electronic reception apparatus (11, R) is activated by a telephone call, coming from the telephone dialler (CT) of said control unit (C), wherein when said television set (17) is off and does not receive a TV program, said electronic reception apparatus (11, R) memo-

risers said images coming from said monitored environments (S, S') in a memory, allowing them to be displayed later on said television set (17), via a keyboard (28) or by operating an infrared remote controller (19) of the television set (17) or by scanning said image memory.

2. Electronic system as claimed in claim 1, **characterised in that** said television set (17) is provided with an infrared remote controller (19), an infrared receiver (26) and a keyboard (28) for displaying said transferred images on said screen.
3. Electronic system as claimed in claim 1, **characterised in that**, when said television set (17) is on and receives a TV program, said electronic reception apparatus (11, R) automatically triggers the display of said images received from said monitored environments (S, S') and interrupts the reception of said TV program.

Patentansprüche

1. Elektronisches System zur Übertragung von Audio- und Videosignalen, das von überwachten Benutzerumgebungen (S, S') stammende Sprachnachrichten und Bilder oder zur Hilfe für hilfsbedürftige Personen verwendete Sprachnachrichten und Bilder an Überwachungsstationen (20, U, U') übertragen kann, mit mindestens einer Steuereinheit (C) zur Übertragung der Audio- und Videosignale, die in den überwachten Umgebungen (S, S') eingerichtet ist und mindestens einer elektronischen Empfangsvorrichtung (11, R) zum Empfang der Audio- und Videosignale, die in den Überwachungsstationen (20, U, U') eingerichtet ist, wobei die elektronische Steuereinheit (c) eine elektrische Stromversorgungseinrichtung (BC, CC), eine Bildaufnahme- und Umwandlungseinrichtung (SC, TC, DDC, RC, TM), eine Einrichtung zum Speichern (FC) und Übertragen (MC, IC, CT) der Bilder, eine Einrichtung zur Erzeugung (GC, AC, LC) und Übertragung (VC) von Sprachnachrichten und akustischen Warnungen, eine Einrichtung zur Auslösung (EC) des Überwachungszustands und eine Einrichtung zur Kontrolle (PC) der Funktion der Steuereinheit (C) mittels Datenkommunikation, Kommandos und Befehlen über digitale Busse beinhaltet, und wobei die elektronische Empfangsvorrichtung (11, R) eine elektrische Stromversorgungseinrichtung (21, 30, BR, CR, CAR), eine Einrichtung zum Empfang (17, 27, GR, RVP) von Audiosignalen, eine Einrichtung zum Empfang und zum Aussenden (22, 27, VR, GR, TLF, TEL) der Sprachnachrichten und der akustischen Warnungen, eine Einrichtung zum Empfang (17, 31, IR, MR, RVP) zum Speichern (25, FR) und zur Anzeige (17, NR) der Bilder, eine Einrichtung

zur Kontrolle (32, PR) der Funktion der Empfangsvorrichtung (11, R) mittels Datenkommunikation, Kommandos und Befehlen über digitale Busse und eine Einrichtung zur Programmierung und Steuerung (19, 26, 28, WR) der Empfangsvorrichtung (R) und der Steuereinheit (C) beinhaltet, wobei die Bilder über mindestens eine vermittelte Telefonleitung (13, T, T') übertragen werden, **dadurch gekennzeichnet, daß** die Bildaufnahme- und Umwandlungseinrichtung (SC, TC, DDC, RC, TM) und die Übertragungseinrichtung (MC, IC, CT) der Steuereinheit (C) jeweils aus mindestens einem mit dem elektrischen Stromversorgungsnetz verbundenen Telefonwähler (CT) und mindestens einer beweglichen Kamera (TM) mit einem mit dem elektrischen Stromversorgungsnetz verbundenen Netzteil besteht, wobei der Telefonwähler (CT) und die bewegliche Kamera (TM) innerhalb der überwachten Benutzerumgebungen (S, S') eingerichtet sind und wechselseitig Funkfrequenzsignale austauschen, der Telefonwähler (CT) über die vermittelte Telefonleitung (13, T, T') auch mit mindestens einem Telefonapparat (TLF) und mindestens einem Fernsehapparat (17) der Empfangsvorrichtung (11, R) verbunden ist und der Fernsehapparat (17) an den Überwachungsstationen (20, U, U') zur Anzeige der von den überwachten Umgebungen (S, S') übertragenen Bilder auf einem Schirm bei den Überwachungsstationen (20, U, U') vorgesehen ist, wenn der Telefonapparat (TLF) der elektronischen Empfangsvorrichtung (11, R) durch einen von dem Telefonwähler (CT) der Steuereinheit (C) stammenden Telefonanruf aktiviert wird, wobei dann, wenn der Fernsehapparat (17) ausgeschaltet ist und kein Fernsehprogramm empfängt, die elektronische Empfangsvorrichtung (11, R) die von den überwachten Umgebungen (S, S') kommenden Bilder in einem Speicher speichert, so daß sie über eine Tastatur (28) oder durch Bedienung einer Infrarot-Fernsteuerung (19) des Fernsehapparats (17) oder durch Abtasten des Bildspeichers später auf dem Fernsehapparat (17) angezeigt werden können.

2. Elektronisches System nach Anspruch 1, **dadurch gekennzeichnet, daß** der Fernsehapparat (17) mit einer Infrarot-Fernsteuerung (19), einem Infrarot-Empfänger (26) und einer Tastatur (28) zur Anzeige der übertragenen Bilder auf dem Schirm versehen ist.
3. Elektronisches System nach Anspruch 1, **dadurch gekennzeichnet, daß** dann, wenn der Fernsehapparat (17) eingeschaltet ist und ein Fernsehprogramm empfängt, die elektronische Empfangsvorrichtung (11, R) die Anzeige der von den überwachten Umgebungen (S, S') her empfangenen Bilder automatisch auslöst und den Empfang des Fernsehprogramms unterbricht.

Revendications

1. Système électronique pour le transfert de signaux audio et vidéo pouvant transférer vers des postes de surveillance (20, U, U') des messages vocaux et des images provenant d'environnements contrôlés d'utilisateur (S, S') ou des messages vocaux et des images utilisés pour assister des personnes nécessitant une aide, comprenant au moins une unité de commande (C) pour émettre lesdits signaux audio et vidéo, qui est installé dans lesdits environnements contrôlés (S, S') et au moins un appareil électronique de réception (11, R) pour recevoir lesdits signaux audio et vidéo qui est installé dans lesdits postes de surveillance (20, U, U'), dans lequel ladite unité de commande électronique (C) comprend des moyens d'alimentation en énergie électrique (BC, CC), des moyens d'acquisition et de conversion d'image (SC, TC, DDC, RC, TM), des moyens pour la mémorisation (FC) et pour la transmission (MC, IC, CT) desdites images, des moyens pour la génération (GC, AC, LC) et pour la transmission (VC) de messages vocaux et d'avertissements acoustiques, un moyen pour déclencher (EC) l'état de surveillance et un moyen pour superviser (PC) le fonctionnement de l'unité de commande (C) au moyen d'une communication de données, de commandes et d'instructions le long de bus numériques, et dans lequel ledit appareil électronique de réception (11, R) comprend des moyens d'alimentation en énergie électrique (21, 30, BR, CR, CAR), des moyens pour la réception (17, 27, GR, RVP) de signaux audio, des moyens pour recevoir et émettre (22, 27, VR, GR, TLF, TEL) lesdits messages vocaux et lesdits avertissements acoustiques, des moyens pour recevoir (17, 31, IR, MR, RVP), pour mémoriser (25, FR) et pour afficher (17, NR) lesdites images, des moyens pour superviser (32, PR) le fonctionnement de l'appareil de réception (11, R) au moyen d'une communication de données, de commandes et d'instructions sur des bus numériques, des moyens pour programmer et commander (19, 26, 28, WR) l'appareil de réception (R) et l'unité de commande (C), lesdites images étant transférées sur au moins une ligne téléphonique commutée (13, T, T'), **caractérisé en ce que** lesdits moyens d'acquisition et de conversion d'image (SC, TC, DDC, RC, TM) et lesdits moyens de transmission (MC, IC, CT) de l'unité de commande (C) consistent respectivement en au moins un numéroteur téléphonique (CT) connecté au réseau électrique et au moins une caméra mobile (TM) munie d'une unité d'alimentation connectée au réseau électrique, ledit numéroteur téléphonique (CT) et ladite caméra mobile (TM) étant installés à l'intérieur desdits environnements contrôlés d'utilisateurs (S, S') et échangeant mutuellement des signaux de fréquence radio, ledit numéroteur téléphonique (CT) étant connecté, de même, par

l'intermédiaire de ladite ligne téléphonique commu-
tée (13, T, T') à au moins un combiné téléphonique
(TLF) et à au moins un poste de télévision (17) dudit
appareil de réception (11, R), ledit poste de télévi- 5
sion (17) étant installé dans lesdits postes de sur-
veillance (20, U, U') et étant prévu pour afficher sur
un écran desdits postes de surveillance (20, U, U')
les images transférées à partir desdits environne-
ments contrôlés (S, S') lorsque ledit combiné télé- 10
phonique (TLF) dudit appareil électronique de ré-
ception (11, R) est activé par un appel téléphonique
provenant du numéroteur téléphonique (CT) de la-
dite unité de commande (C), dans lequel, lorsque
ledit poste de télévision (17) est éteint et ne reçoit 15
pas de programme TV, ledit appareil électronique
de réception (11, R) mémorise lesdites images pro-
venant desdits environnements contrôlés (S, S')
dans une mémoire, leur permettant d'être affichés
plus tard sur ledit poste de télévision (17) par l'in- 20
termédiaire d'un clavier (28) ou par actionnement
d'une unité de commande à distance à infrarouge
(19) du poste de télévision (17) ou par balayage de
ladite mémoire d'image.

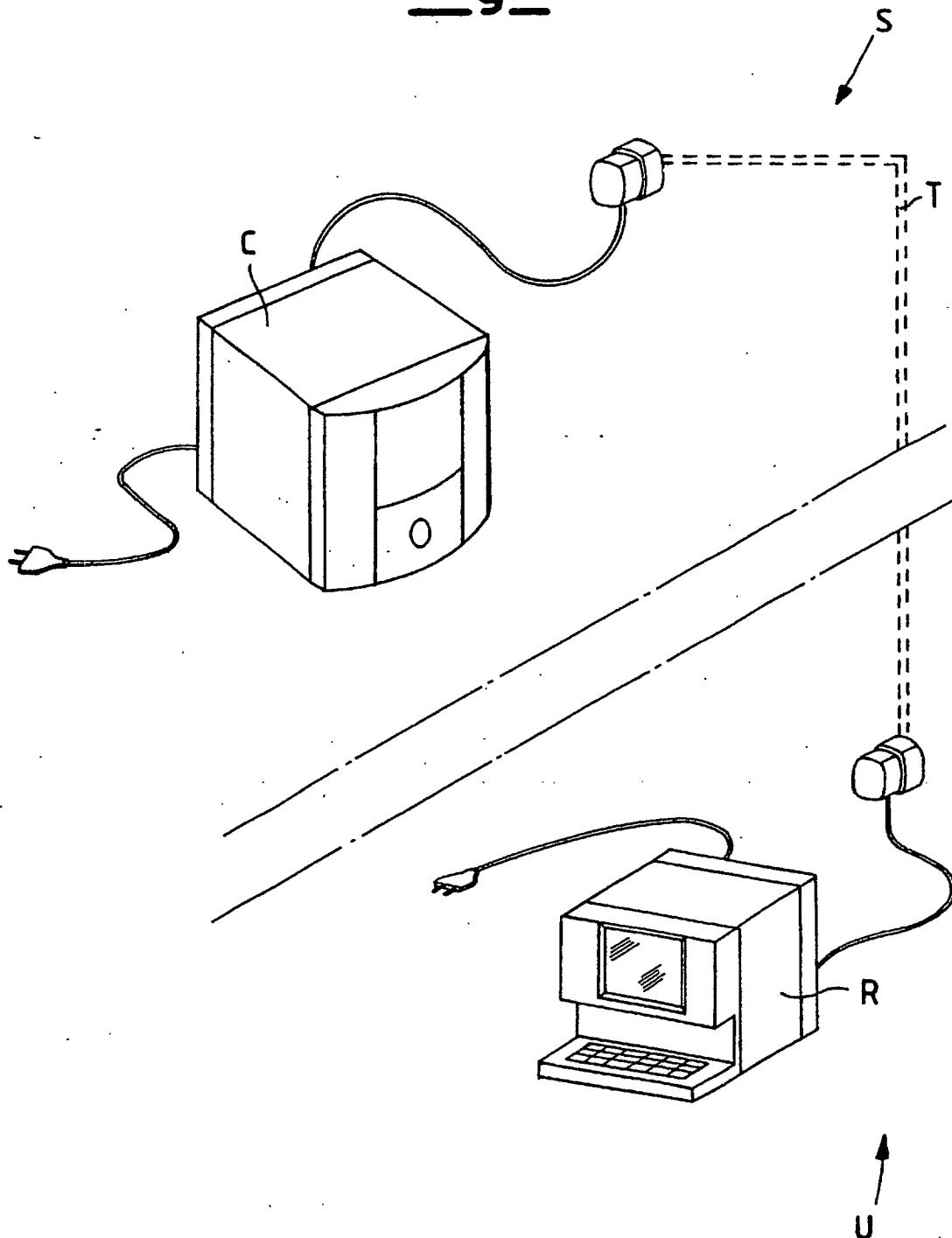
2. Système électronique selon la revendication 1, **ca-** 25
ractérisé en ce que ledit poste de télévision (17)
est muni d'une unité de commande à distance à in-
frarouge (19), d'un récepteur à infrarouge (26) et
d'un clavier (28) pour afficher lesdites images trans- 30
férées sur ledit écran.
3. Système électronique selon la revendication 1, **ca-**
ractérisé en ce que lorsque ledit poste de télévi-
sion (17) est allumé et reçoit un programme TV, ledit 35
appareil électronique de réception (11, R) déclen-
che, de façon automatique, l'affichage desdites
images reçues desdits environnements contrôlés
(S, S') et interrompt la réception dudit programme
TV. 40

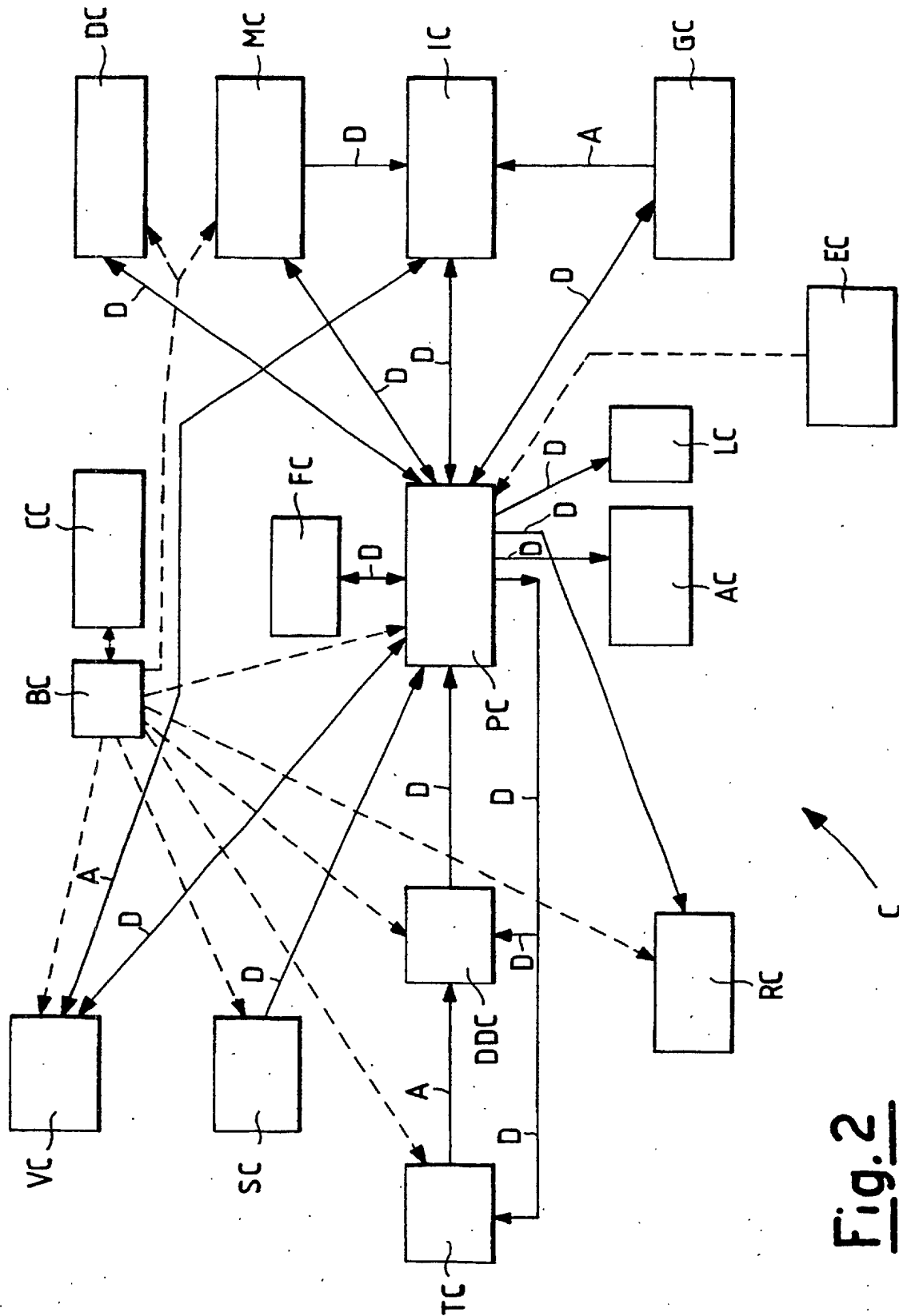
45

50

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Fig.1





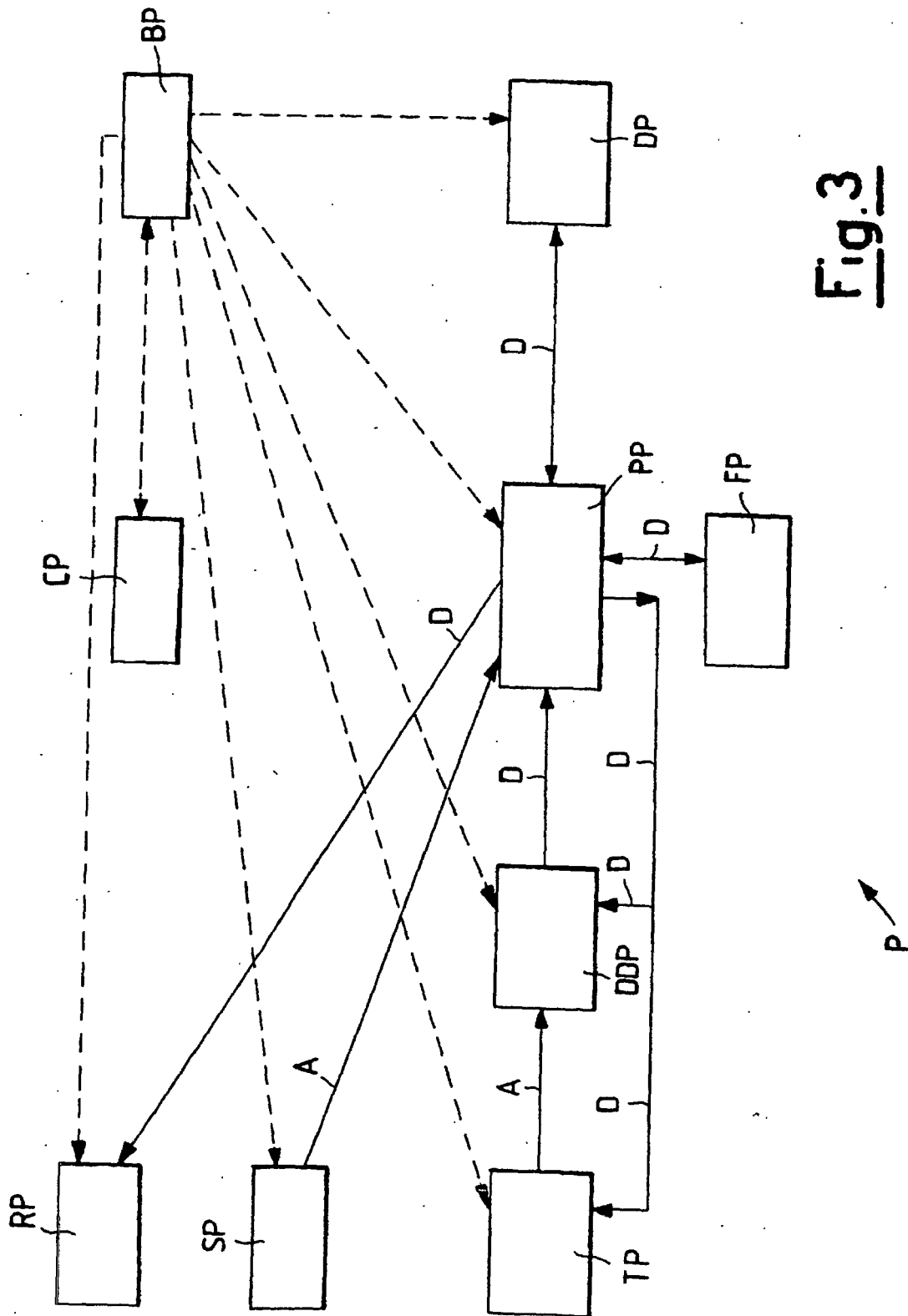


Fig. 3

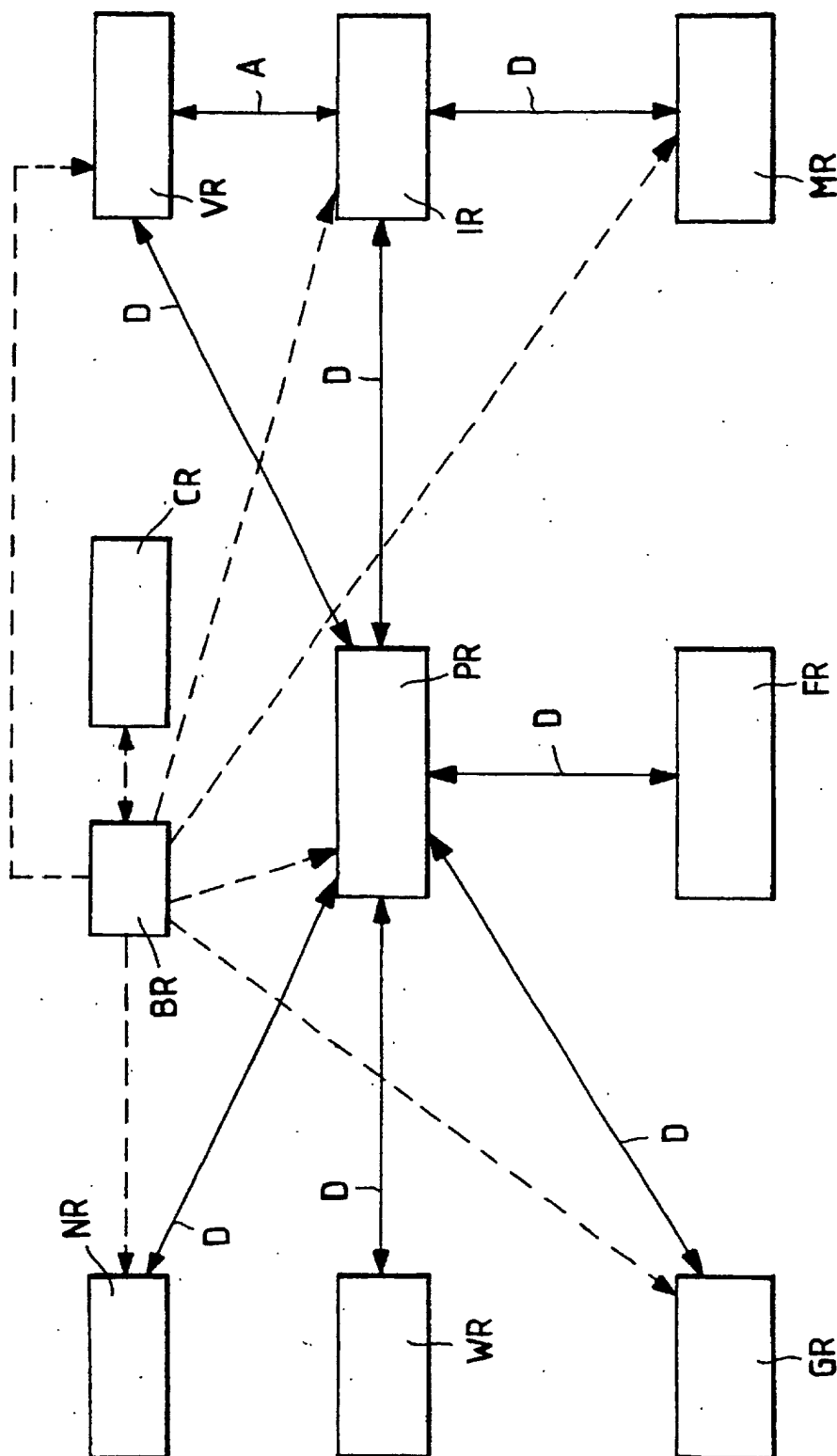


Fig. 4

R

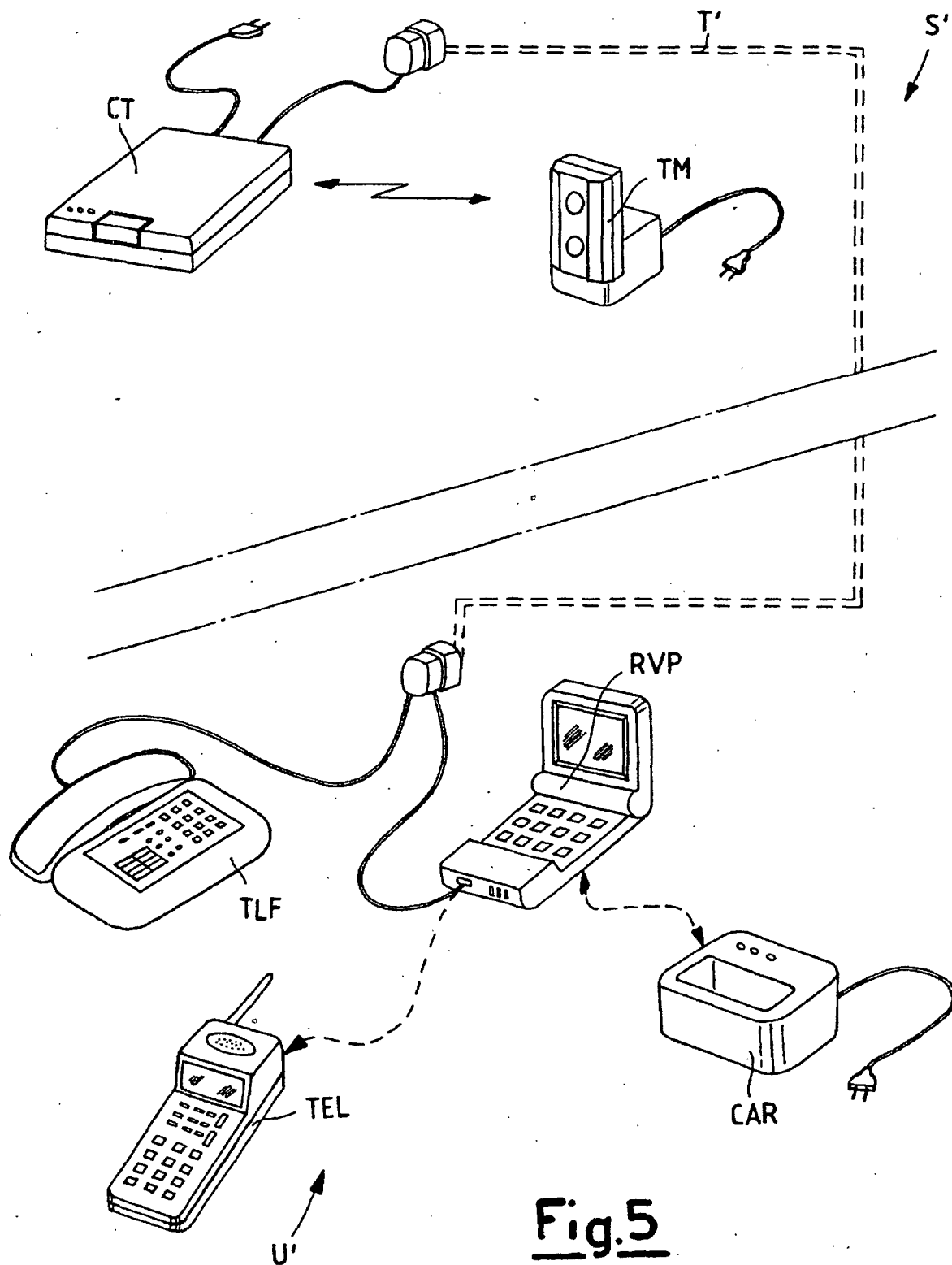


Fig.6

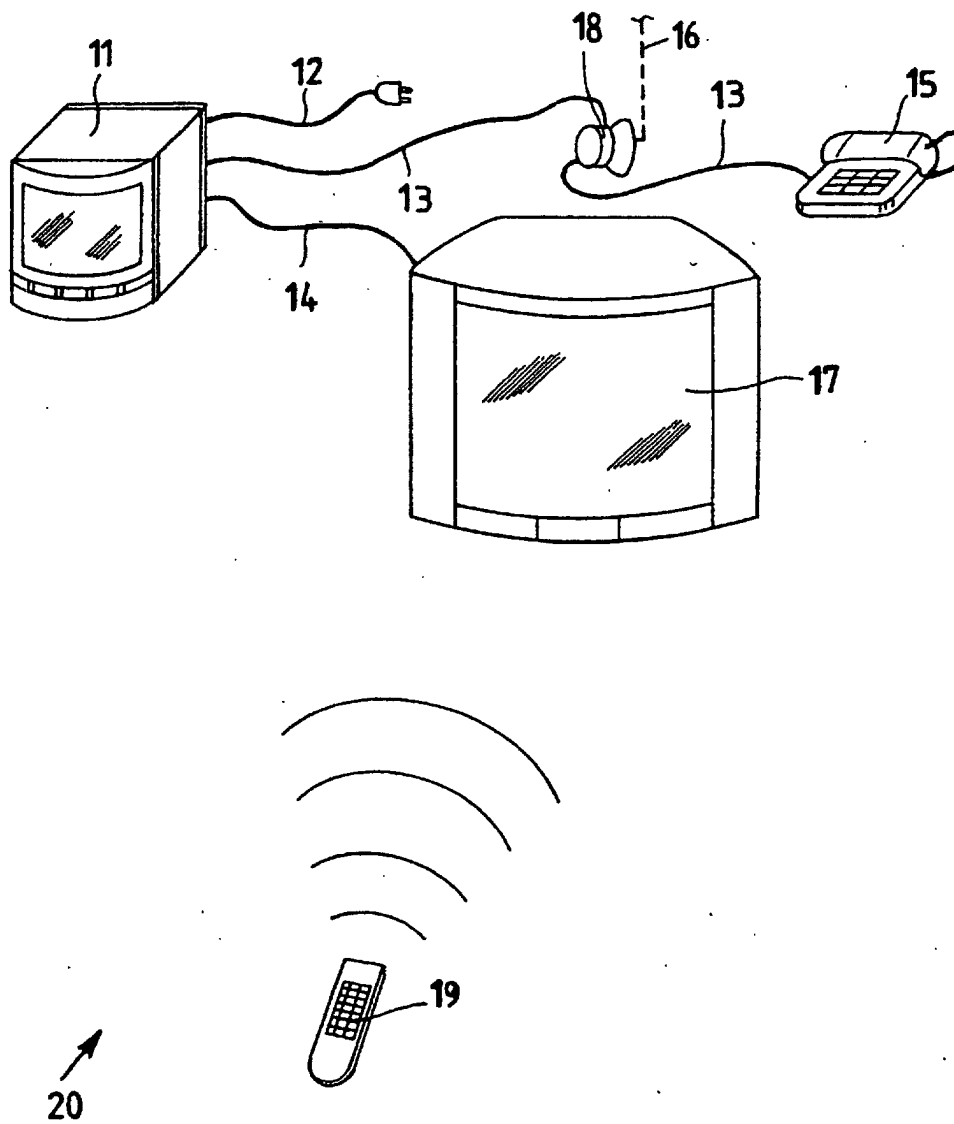


Fig.7

