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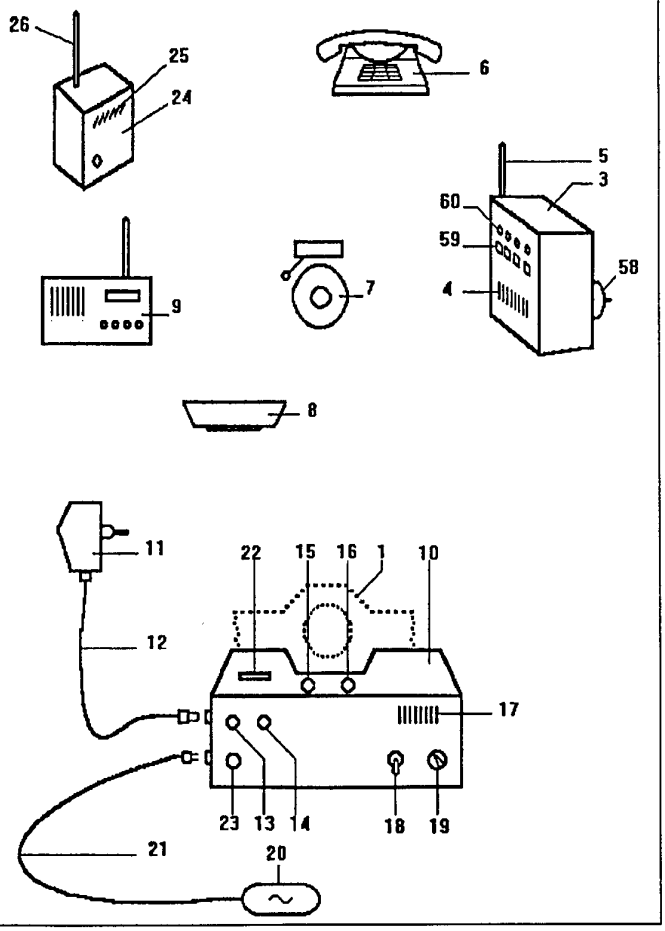
(54) Title: A PORTABLE MODULAR ALARM SYSTEM

(57) Abstract

A portable modular system for persons with impaired hearing and impaired vision, which picks up signals from the surroundings and, when necessary, delivers alarm signals to auxiliary facilities, such as an alarm centre, for instance. The system includes a wristworn receiver (1) for receiving digital radio signals, and a sound recognizing unit (3) adapted to receive acoustic signals, for instance signals from a telephone (6), a doorbell (7), a fire alarm (8) and a public radio receiver (9) having alarm signal receiving means (RDS - Radio Data System). In response to these acoustic signals, the unit (3) delivers digital radio signals to the wristworn receiver (1), which includes mechanical time indicating means (31), optically readable means presented on a dial (2) in the form of symbols (52, 53, 54, 55, 56, 57) corresponding to respective acoustic signals. The wristworn receiver (1) incorporates a vibrator (43, 45) which produces vibrotactile signals having characteristics that correspond to the acoustic signals. The system also includes a microphone-based child minding unit (24, 25, 26) which when the noise level of a child's cry exceeds a predetermined sound level and is of long duration functions to send a digital radio signal to the wristworn receiver (1).



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A PORTABLE MODULAR ALARM SYSTEM

FIELD OF INVENTION

The present invention relates to a portable modular alarm system for persons who have impaired hearing and/or impaired vision and persons who are deaf and deaf-blind, wherein the system is designed to recognize acoustic signals in the surroundings and to deliver alarm signals to auxiliary devices, such as to an alarm centre, wherein the system includes a battery-powered wristworn receiver for receiving digital radio signals and a sound recognizing unit which is able to receive and identify acoustic signals, such as telephone signals, doorbell signals, fire-alarm signals or signals from a broadcasting receiver equipped with a radio data system (RDS), and to deliver digital radio signals to the wristworn receiver in response to these acoustic signals, wherein the wristworn receiver includes mechanical time indicating means, optically readable means with symbols corresponding to respective acoustic signals, and means which function to deliver to the wearer vibrotactile signals having characteristics which correspond to respective acoustic signals.

DESCRIPTION OF THE BACKGROUND ART

Persons whose hearing and/or vision is/are impaired will obvious have difficulties in perceiving signals in their surroundings. Such signals may be signals from smoke detectors, general alarm messages broadcasted over a public radio system with RDS (Radio Data System), telephone signals, doorbell signals or signals deriving from electronic child minding apparatus. The ability to perceive such signals is a necessary condition for a normal life with a normal sense of safety and security. Although systems for transmitting signals from the surroundings are already in existence, these

systems are permanent installations. The main drawback with permanent, or static, systems is that they can only be of assistance in those places in which they are installed. Furthermore, a permannet installation is very expensive.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a system which does not need to be permanently installed but which can be carried easily between different localities and also on journeys. The invention is mainly characterized by a system which includes a portable sound recognizing unit which is constructed to produce digital radio signals in response to acoustic signals, for instance signals deriving from doorbells, telephones, fire alarms, and like devices, wherein the receiver is a wristworn receiver in the form of a wristwatch having mechanical hands and a liquid crystal display divided into a given number of segments and designed to generate in respective segments symbols corresponding to such acoustic signals as telephone signals, doorbell signals, fire alarm signals and signals from corresponding devices, in response to received digital radio signals. The system is also adapted to European standards for emergency telephones, PET (Personal Emergency Telephone), and general alarms broadcasted on general radio networks.

The wristworn receiver has the form of a wristwatch which includes a watch face or dial and mechanical time indicating devices in the form of watch hands, and embodies a digital radio signal receiver and to deliver a characteristic vibrotactile signal to the wearer in response to said signals and to show an associated symbol on the watch dial. Each symbol clearly discloses the type of respective event to which the wearer must be made aware. The nature of the vibrotactile signal can be quickly learned and recognized by the wearer. The wristworn receiver also includes a transmitter which is adapted to activate a PET telephone (Personal Emergency

Telephone). The transmitter is activated by holding a button on the wristworn receiver depressed for a given length of time. The transmitter delivers a digital radio signal which identifies the distressed person and the type of assistance required, this information being forwarded to an alarm centre by the PET telephone.

The wristworn receiver, which is preferably worn only during the daytime, includes a battery charging unit which is powered from the mains with the aid of a mains adapter, and includes a built-in rechargeable battery have an effective operating time of about twenty-four hours, for instance. The receiver is preferably plugged into the battery charging unit overnight and connected galvanically thereto. The receiver is able to receive signals as normal while the battery is being recharged. The vibrotactile signals that characterize respective different events are transmitted by the charging unit to a connected external vibrator placed beneath the pillow of the person concerned when sleeping. The battery charging unit also has a built-in microphone with adjustable threshold sensitivity. The microphone picks up acoustic signals which the wristworn receiver attached to the charging unit is unable to perceive and activates the connected external vibrator. The handicapped person will then be made aware of events in his/her surroundings even while sleeping, which greatly enhances the overall safety and security afforded by the system. For instance, the system enables the sleeping person to be awakened by a fire alarm, a telephone or some other warning signal. The battery charging unit includes two switches, one for switching-off the external vibrator and one for setting the face or dial of the wrist-worn receiver to the correct time at that moment. The battery charging unit also includes a first light-emitting diode which indicates when the wristworn receiver is correctly connected, and a second light-emitting diode which indicates the flow of electric current to the internal battery of the unit. A third light-emitting diode indicates connection of

the mains adapter, and a fourth light-emitting diode (red) indicates when the battery is low. This indication will result in activation of the external vibrator.

The digital radio signals received by the wristworn receiver are transmitted from a central sound recognizing unit, hereinafter referred to as the TSD unit (Transett Sound Detector). The TSD unit includes essentially a microphone with amplifier, a signal processing means for real time processing of the acoustic signals registered by the microphone, and a radio transmitter for transmitting digital radio signals. The radio transmitter is modulated with digital signals that represent the acoustic signal recognized by the TSD unit, for instance a doorbell, telephone, fire alarm, etc. The unit can be set to a learning mode with the aid of a keypad, and the characteristics of a specific sound can be stored in the unit through the medium of the keypad. In its operative mode, the unit recognizes the sounds that have been entered and send corresponding digital radio signals to the wristworn receiver. The TSD unit is placed in the room or location occupied by the handicapped person, so that he/she is able to perceive the acoustic signals generated by the unit.

Each wristworn receiver has an individual address (A-address) to which the TSD unit can be adjusted. All wristworn receivers also include a common address code (B-address) for receiving general alarm messages broadcast on general radio networks. The A-address code is entered with the aid of a hexadecimal switch in th TSD-unit and the B-address code for the RDS-alarm is permanently incorporated in the same unit. When an alarm signal is sent from the wristworn receiver to the PET telephone, there is used a telephone adapted address code (C-address).

Child minding equipment included in the system comprises a microphone-amplifier combination capable of activating a

radio transmitter. When the microphone picks up sound which lies above a certain level and which continues for a given length of time, the transmitter is activated to transmit a digital radio signal to the wristworn receiver. The signal has an A-address specific to the wristworn receiver concerned. The A-address can be entered with the aid of a hexadecimal switch in the child minding equipment. The child minding equipment may be either battery operated or mains operated through a built-in mains adapter.

BRIEF DESCRIPTION OF THE DRAWINGS

So that the invention will be more readily understood and further features thereof made apparent, the invention will now be described in more detail with reference to the accompanying schematic drawings, in which

Figure 1 is an overview of the inventive system;

Figure 2 is a block schematic illustrating one embodiment of the wristworn receiver;

Figure 3 illustrates symbols that can be generated in the segmented LCD layer;

Figure 4 illustrates one embodiment of the TSD unit in a physical form;

Figure 5 is a principle function diagram; and

Figure 6 is a block schematic illustrating child minding equipment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The inventive system illustrated in Figure 1 includes a wristworn receiver 1 which resembles a wristwatch having a

round dial or face of conventional size. The system also includes a mains connected TSD unit 3 which incorporates a microphone 4 which picks up acoustic signals radiated to the surroundings. The TSD unit has a built-in radio transmitter and an external transmitter antenna 5. The acoustic signal sources, such as telephone 6 and doorbell 7, are often placed in the proximity of one another, whereas the fire alarm 8 or smoke detector, may be located further away. The system also includes an RDS-receiver 9 which is able to receive general alarm messages broadcast on radio networks for instance, and to deliver acoustic signals. The RDS-receiver may conveniently be battery-operated and is therefore not limited with regard to its location. The TSD-unit is plugged into a wall socket located closer to the telephone 6 and the doorbell 7 than the fire alarm 8, which normally gives out a very loud sound. The illustrated system also includes a battery charging unit 10 into which the wristworn receiver 1 can be plugged, which is preferably done at night. Electric current is supplied to the unit 10 through a mains adapter 11 plugged into a wall socket and connected to the unit 10 by a lead 12 having a standard 12 volt fuse (direct current). The unit 10 has built therein a chargeable battery which when fully chatged will last for about twenty-four hours and which charges when the mains adapter is connected. The unit also includes a light emitting diode 13 which lights up when the battery is being charged, and a light emitting diode 14 which indicates when the battery is low. When the battery runs down to an unhealthy level, an external vibrator 20 connected to the unit 10 will be activated. The unit also includes a further light emitting diode 15 which indicates correct connection of the wristworn receiver 1 in the battery recharging unit 10, and a further light emitting diode 16 which indicates that charging current flows to the battery of the wristworn receiver 1. The unit 10 has a built-in microphone which can be switched on and off by means of a switch 18. The response threshold of the microphone 17 can be adjusted by means of a knob 19. Sound levels above the set

threshold level will cause the external vibrator 20 to vibrate, said vibrator being connected to the unit by lead 21. The external vibrator can be switched off, by pressing a button 22 provided on the unit 10 to this end. The unit also includes a press button 23 for setting the time on the dial or face 2 of the wristworn receiver 1.

The inventive system illustrated in Figure 1 also includes a microphone-based child minding device 24. The device is battery driven and includes a built-in microphone 25 which picks up the child's or baby's cries and screams of a given loudness and duration. When preset criteria are fulfilled, the microphone signal is able to activate a built-in radio transmitter which transmits a digital radio signal to the wristworn receiver 1 on an antenna 26, therewith drawing the wearer's attention to the fact that the baby is crying or screaming.

The telephone 6 of the Figure 1 embodiment may be a PET telephone of existing type. The wearer is able to control the wristworn receiver 1 to transmit a digital radio signal, by holding the button 27 pressed for a predetermined length of time. The digital radio signal activates the PET telephone, such as to dial a predetermined emergency number. This procedure is carried out by the wearer in the event of an emergency when immediate assistance is required.

Figure 2 is a block schematic illustrating one embodiment of the wristworn receiver 1. The receiver includes a quartz crystal controlled clock circuit 28 having control crystals 29 (e.g. with a fundamental resonance of 32 MHz) which controls showing of the time and determines the clock frequency of a microprocessor 30, said microprocessor controlling all receiver activities. The LCD-based dial 2 has a layer which includes a plurality of segments for showing a requisite number of symbols and mechanical time indicators 31, i.e. hands. The mechanical hands 31 are driven by a

stepping motor 32 which includes a drive circuit 33. Alternatively, the dial 2 may be comprised of two LCD layers, an upper layer which shows the actual time, either by means of hand segments or digitally, and a lower layer showing the symbol that corresponds to a warning signal transmitted from the TDS unit. This latter arrangement obviates the need of the stepping motor 32 and drive circuit 33. Also included is a radio receiver 34 with address and data decoder 35. The wristworn receiver 1 also includes a radio transmitter 36 with an alarm signal output, said transmitter being modulated with digital data from the address memory 37 and a PROM memory 42. Data is transmitted in an appropriate form in the encoding circuit 39, prior to modulating the transmitter 36. Transmission of an alarm signal is initiated by holding the button 27 depressed for a given predetermined length of time. The button 27 is connected to an interface 40 and actuates the microprocessor 30 through said interface, said microprocessor causing an alarm signal adapted to the PET telephone 6 to be transmitted. The antenna 41 is common to both the radio receiver 34 and the radio transmitter 36 and may be embodied in the wrist strap or bracelet. When digital signals are received in the radio receiver 34, the address carried by the signal is decoded in the decoder 35 and compared with the specific A-address or the common RDS alarm address, i.e. the B-address, stored in the address memory 37. If the address is accepted, received data will address the RAM memory 38 and the PROM memory 42, such as to activate the vibrator 43 via the interface 40, and also the LCD dial 2 via the drive circuit 44. The nature of the vibrotactile signals generated by the vibrator 43 and corresponding symbols shown on the dial 2 are determined by the data received. The wristworn receiver includes a bottom plate 45 which is actuated directly by the vibrator 43 and functions to transmit vibrotactile stimuli to the wearer. The tactile and visual stimuli are presented for a predetermined length of time (about twenty seconds). When the wristworn receiver 1 is plugged into the battery-charging unit 10, the receiver

will be connected galvanically to said unit in the illustrated case via terminals 46, 47, 48 and 49. The terminal 46 is connected to the microprocessor 30 through the interface 40, wherein the dial 2 can be set to the correct time by pressing the button 23 on the unit 10 and therewith actuate the terminal 46. The terminal 47 delivers characteristic signals to the external vibrator 20 connected to the battery-charging unit 10. The terminals 48 and 49 are operative in connecting the battery 50 to the battery-charging current. As illustrated in Figure 2, the system also includes a monitoring circuit 51 which in the present case is an analog/digital converter and which periodically checks battery voltage in coaction with the microprocessor 30. When the battery is low, there is shown on the dial 2 a battery symbol which indicates that a predetermined limit value has been reached. All functional blocks in the frame 30 are controlled by the microprocessor 30 and may conveniently be incorporated in one and the same integrated circuit.

Figure 3 illustrates a few of the symbols that can be created by the segment division in the LCD layer of the dial 2. When all segments are activated, the dial background colour is yellow or some other easily seen colour. When no segment is activated, the dial will appear totally black. As before mentioned, the symbols shown in Figure 3 are among those that may be appropriate to the inventive system. Beginning from the left, the symbols in sequence denote a doorbell 52, a telephone 53, low battery voltage 54, fire alarm 55, a general alarm broadcasted on a radio network 56, and a baby alarm 57. The low voltage symbol can be combined with any of the other symbols. In the case of a fire alarm symbol, the battery symbol will appear black on a yellow background. It will be understood that other combinations are possible within the scope of the invention.

Figure 4 illustrates a physical embodiment of the TSD unit 3. The unit is enclosed in a relatively small rectangular box

provided with a mains plug 58 on the rear side thereof and a short antenna 5 on one side. Provided on the front side of the box is a microphone opening 4, and in the illustrated case four push buttons 59 with associated displays in the form of four light emitting diodes 60. The user can set the unit to a learning mode with the aid of the push buttons 59. Thus, four different sounds can be entered in the illustrated embodiment. Correctly stored sound is indicated by a green light on the LED 60 when its associated button is pushed. The learning mode can be repeated subsequent to unplugging the unit. Subsequent to successfully conditioning the unit with respect to said sounds, the unit is plugged into the mains socket and can then recognize and distinguish beteen four different sounds. Recognized sound is indicated with a green light on the light emitting diode adjacent the button used to program or condition said unit. At the same time, a digital radio signal of given duration is sent to the wristworn receiver 1, via the antenna 5. The digital radio signal carries the address of the wristworn receiver 1 and data indicative of the type of acoustic signal concerned.

The sound recognizing TSD unit 3 is based on continuous frequency analysis with the aid of known FFT technology (Fast Fourier Transform). The functional block schematic shown in Figure 5 illustrates an example of the procedure followed. The function blocks are all based on well-known techniques. The microphone 4 picks up sound and the microphone signal is amplified, limited in level and in frequency to a frequency of about 8000 Hz in block 61. Block 61 is followed by block 62 which represents an analog-digital converter having, in the present case, a dynamic range of 60 dB and a sampling frequency adapted to the signal bandwidth of 8000 Hz. The digitalized signal is fed serially into a real time signal processor containing function blocks 63 and 64. The FFT analyses are carried out in block 63, within a framework of 256 amplitude levels, after they have been processed with a Hamming-type cosine function to suppress sidebands. The FFT

analysis generates 128 positive frequency components (real and imaginary) with a resolution of 64 Hz. This frequency spectrum is compressed, in order to reduce the need of memory and processing capacity. The compression is accomplished by virtue of maintaining said resolution up to 8000 Hz, but is then reduced towards higher frequencies. the compressed spectrum will provide 32 frequency components, which are then put into a logarithmic scale in order to emphasize the weak components. The result is processed to remove components having the lowest amplitude and to provide a positive result. Because the FFT analyses are made on a disturbed and noisy signal, a plurality of FFT spectra are integrated. For instance, if 16 frames each with 256 amplitude values are chosen, there will be obtained an integration time of 256 ms, which may be appropriate with regard to the duration of the acoustic signals.

The 32 frequency components are fed into a neural network (NN) 64 of the Back propagation type. The neural network 64 has the ability to build-up characteristic detectors during the so-called learning mode and store these characteristics for sound recognition, said sound often being mixed with noise. The neural network 64 has three layers when including the input layer. The input layer can handle a vector having 32 components, corresponding to the compressed frequency spectra, while the output can handle a vector having four components which represent the binary code of the signal to be recognized. All inputs are connected to all neurons in the "hidden" layer (eight in number). Each connection includes a weight which determines the degree of coupling between the layers. Two neurons in the "hidden" layer belong to each signal and each neuron in the output layer has two weights. In the learning mode (when the unit is removed from the mains socket), the learning procedure is initiated by pressing a specific button 59, and when the compressed and integrated signal spectra has passed its amplitude maximum. This maximum is the sum of the maximum amplitudes of all frequency

components. The frequency components are normalized during the learning mode, wherein the connection weights are determined and stored in the neural network.

In the operational mode (when the TSD unit is plugged into the mains), an FFT analysis is carried out continuously on incoming signals, as represented by function block 63. The signals may be a mixture of noise and signals of relevant interest. The noise recognition process is preferably effected with the same number of compressed and integrated FFT spectra as that used in the learning process, for instance sixteen spectra. The recognition spectra are thus taken from a window with 16 frames of amplitude values (256) which move in time. Recognition tests are run after each new frame, i.e. each sixteenth millisecond. The analyses are made in the same way as in the learning process by normalizing the spectral components, wherein the weights in the connections of the neural network are tabled and compared with the weights stored in the learning process. Significant agreement is obtained with successful recognition, and the light-emitting diode for this specific signal is activated and therewith also the memory circuit 65. The memory circuit 65 contains the specific address for the wristworn receiver (the A-address) and also the common RDS alarm address (the B-address) together with data that represents the specific sound. This data is modulated on the radio transmitter 66 and is transmitted to the wristworn receiver 1 via the antenna 5. The receiver 1 then produces a vibrotactile signal corresponding to said sound, wherewith an associated visual symbol is shown on the dial 2. Unsuccessful learning, or programming, can be erased after unplugging the TSD unit 3. It is only possible to program in a new type of sound when the TSD unit 3 is unplugged and powered by the internal battery in the power supply unit 67. This unit controls this procedure. The weight values obtained in the learning process in a non-volatile memory in the analysis part 63/64.

As an alternative to the radio transmitter in the TSD unit 3, there may be used instead a sound generator which is capable of producing, in this case, four different sound characters, each corresponding to a specific acoustic alarm signal picked up by the microphone 4 and recognized by the TSD unit. Each characteristic sound from the sound generator must have a frequency spectrum that can be readily perceived by the person whose hearing is impaired. Persons who are completely deaf cannot use this embodiment, although it provides an excellent aid to persons whose hearing is moderately impaired.

The child minding equipment 24 shown in Figure 1 will now be described with reference to Figure 6. The microphone 25 picks up the child's cries and the microphone signal is amplified in an amplifier 68 whose frequency characteristic is adapted to the frequency spectra of a baby's or child's cries (mean value). When the strength and duration of the signal exceed a predetermined threshold in a threshold circuit 69, a control circuit 71 is activated. The threshold can be preset by a control knob 70. The control circuit 71 in turn activates the decoder 72 and the radio transmitter 74. The decoder 72 obtains address and data from the memory circuit 73. The digital signal modulates the radio transmitter 74 and the radio signal is sent to the wristworn receiver 1 via the antenna 26. The correct address (A-address) in the memory circuit 73 can be set with the aid of an hexadecimal switch. The radio signal received by the wristworn receiver results in a vibrotactile signal characteristic to the child minding alarm, with associated symbols visualized on the dial 2. The baby alarm 24 is powered by a built-in battery 75, which can be switched on and off by the switch 76. Power-on is indicated by the light-emitting diode 77.

The described alarm and warning system has the advantage of not requiring permanent installations, of being easy to handle and adapted for coaction with general alarm systems

that exist in Sweden and other countries. The system provides a much safer and more dignified environment to elderly people suffering a hearing and/or sight impairment.

CLAIMS

1. A system for persons with impaired hearing and/or vision and functioning to recognize acoustic signals in the surroundings and to transmit alarm signals to auxiliary services such as an alarm centre for instance, wherein the system includes a battery-powered wristworn receiver (1) for receiving digital radio signals, and a sound recognizing unit (3) constructed to receive acoustic signals, such as telephone signals, doorbell signals, fire-alarm signals or signals from a radio receiver with radio data system equipment, and to deliver digital radio signals to the wristworn receiver (1) in response to these acoustic signals, wherein the receiver (1) includes mechanical time indicating means (31), optically readable means having symbols (52, 53, 54, 55, 56, 57) which correspond to respective acoustic signals, and means which function to deliver to the wearer vibrotactile signals having characteristics corresponding to said acoustic signals, **characterized** in that the sound recognizing unit (3) is portable and is constructed to deliver digital radio signals in response to said acoustic signals; in that the wristworn receiver (1) has the form of a wristwatch with mechanical hands (31) and a dial (2), wherein the dial includes a liquid crystal display (LCD) divided into a plurality of segments sufficient to generate telephone, doorbell, fire alarm, symbols, etc., said symbols (52, 53, 54, 55, 56, 57) being generated in response to the aforesaid received digital radio signals.

2. A system according to Claim 1, **characterized** in that the wristworn receiver (1) includes a radio receiver (34) for receiving digital radio signals, a signal decoder (35), an address memory (37) in which there is stored a first address (B) which is common to all wristworn receivers for receiving alarm messages broadcast on radio networks, and a second address (A) specific to respective wristworn receivers for receiving other types of messages, wherein the address

delivered by the decoder (35) is compared with addresses (A and B) stored in said memory, wherein when an accepted address is received, the received data is stored in a first memory unit (38, RAM) included in a microprocessor (30) provided in the wristworn receiver, wherein with the aid of this data said microprocessor collects necessary information from a second memory unit (42, PROM) and activates said visual and vibrotactile devices in accordance with said data.

3. A system according to Claim 2, **characterized** in that the wristworn receiver (1) includes a radio transmitter (36) which is activated by a push button (27) on the wristworn receiver, wherein the transmitter becomes active when a given length of time has lapsed after pressing said button and is modulated with digital data which includes an address (C) from the address memory (37) adapted for telephones capable of transferring emergency signals to an alarm centre, and also transmitter identification data from the second memory unit (42, PROM), said data being coded in a coding circuit (39) prior to being delivered to the radio transmitter (36).

4. A system according to Claim 1, **characterized** in that the system includes means (10) for charging a battery in the wristworn receiver (1), wherein the receiver (1) is preferably connected galvanically to said battery-charging means during the night, said means including a chargeable backup battery and means for setting the dial (2) of the wristworn receiver (1) to the correct time.

5. A system according to Claim 4, **characterized** in that the battery-charging means (10) includes an external vibrator (20) which is intended to be placed beneath the pillow of the person concerned and to deliver a vibrotactile signal of the same nature as the vibrotactile device (43) of the wristworn receiver (1) when the wristworn receiver is connected to the battery-charging means (10), wherein the unit (10) has built thereinto a microphone (17) which functions to pick up sounds

that exceed a predetermined level and warn the sleeping person of the acoustic alarm through the medium of the vibratory device.

6. A system according to Claim 1, **characterized** in that the sound recognizing unit (3) includes a microphone (4) and a microphone amplifier (61) having a given limited frequency range and automatic level control, an analog-digital converter (62) connected to the amplifier (61) and followed by a real time signal processor (63) which generates with the aid of fast Fourier transform technique a compressed spectrum of the acoustic signals picked up by the microphone (4), which spectrum is integrated over a given time period and fed into a neural network (64) of back propagation kind in a manner such that in the learning mode characteristic values of each particular sound picked up by the microphone are stored and used in the recognition mode of the system, wherein the unit (3) includes four push buttons (59) with associated light-emitting diodes (60) adapted to place the unit (3) in its learning mode and to provide indication of correct learning or recognition of four different sounds, wherein a learning mode can only be achieved when the plug (58) of the unit (3) is disconnected from the mains, in which case the unit (3) is operated by a chargeable battery incorporated in the current supply part (67), wherein the recognition mode is activated when the plug (58) of the unit (3) is connected to mains, wherein successful recognition of sound picked up by the microphone (4) a memory circuit (65) is activated so as to activate a radio transmitter (66) incorporated in the unit (3) and transmit a digital radio signal to the wristworn receiver (1) via an antenna (5), said signal containing the specific A-address settable in the unit (3) and applicable to the wristworn receiver (1) concerned, or the general RDS alarm address, the B-address, and data which discloses the nature of the sound that has been recognized, and wherein said transmission continues for a preset limited time such that the wristworn receiver (1) will present corresponding

symbols visually on the dial (2) and the corresponding vibrotactile signal.

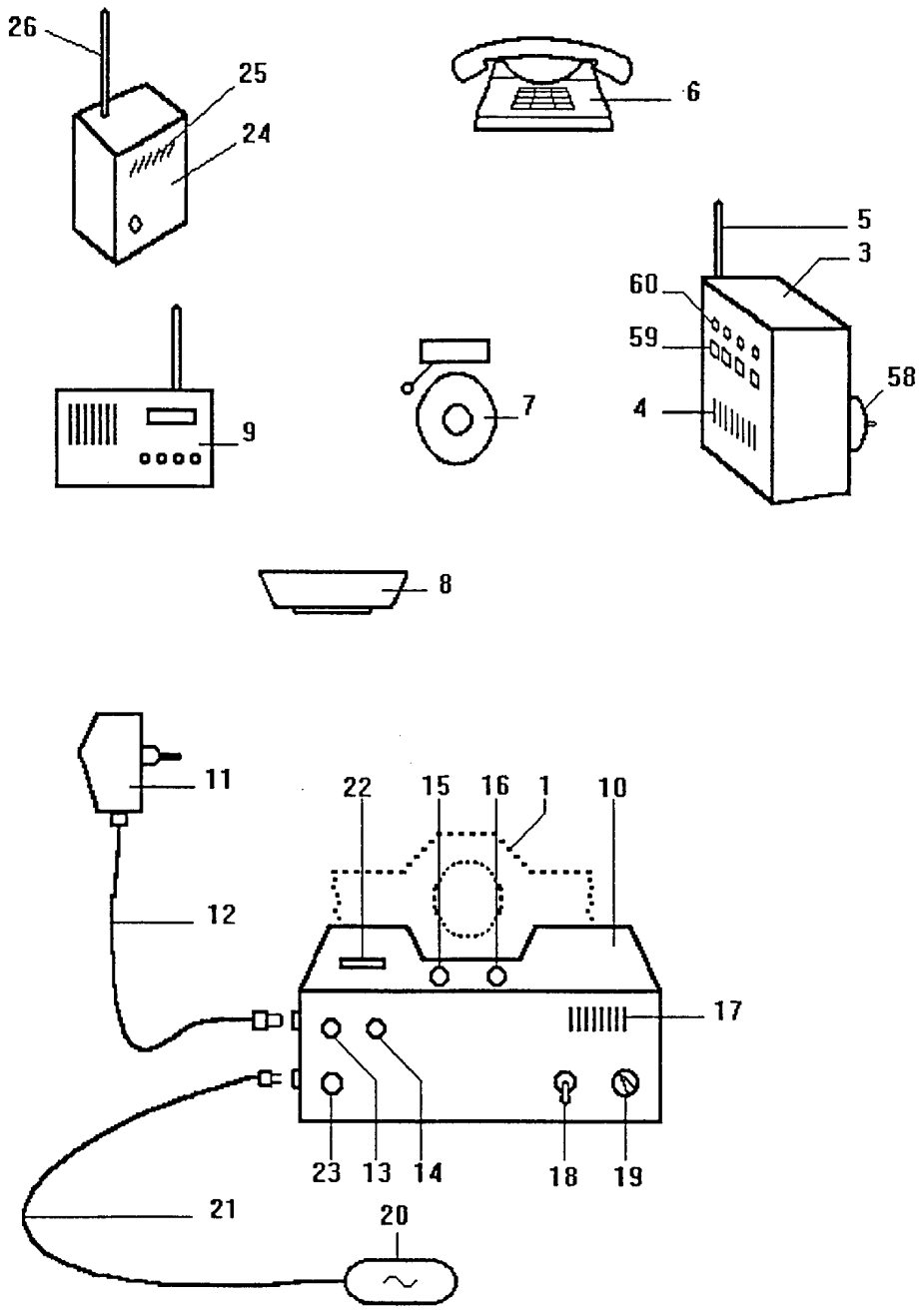

FIGURE 1

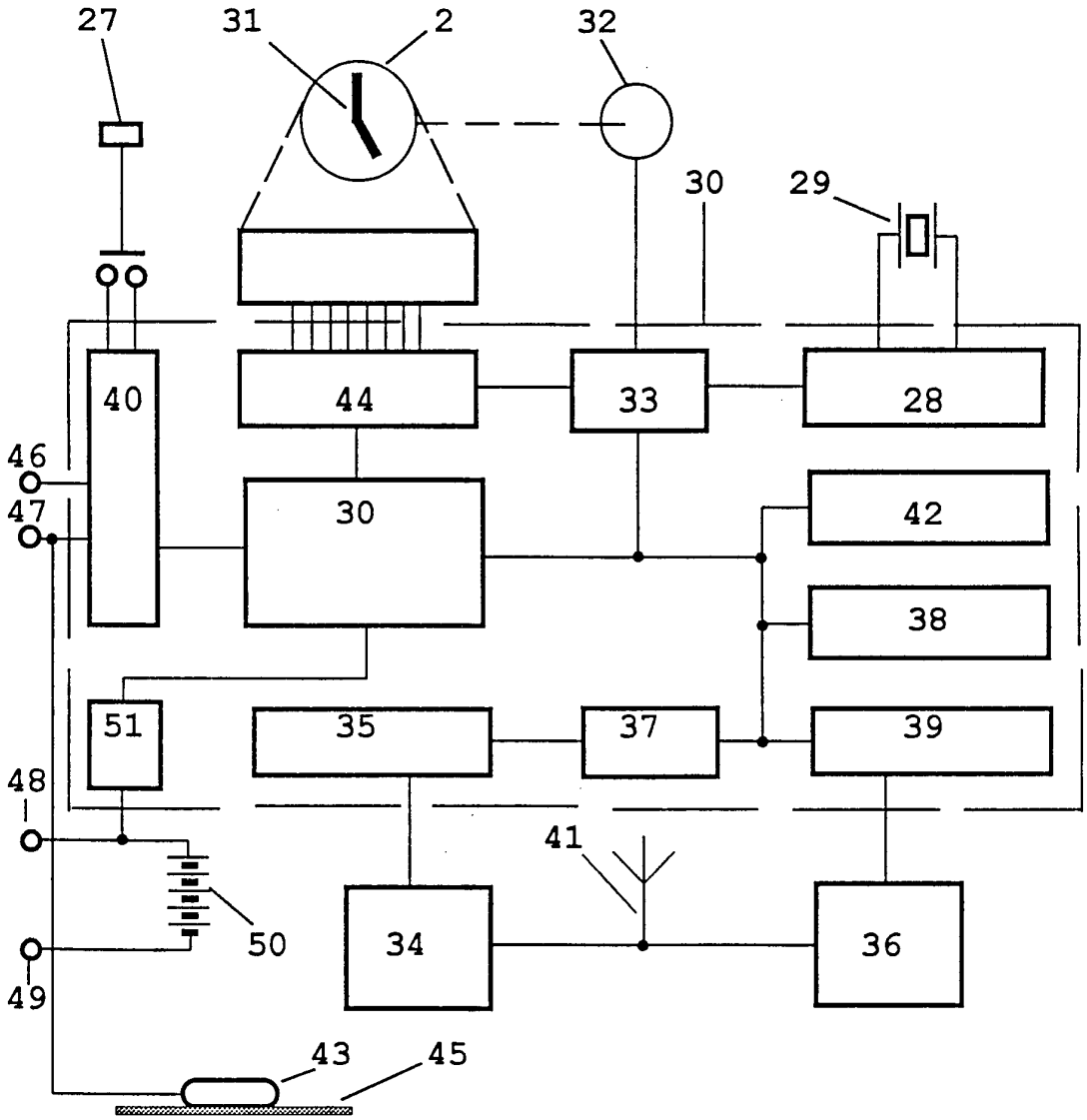
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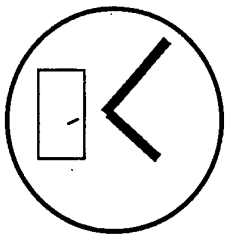
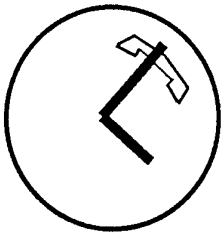
FIGURE 2



52



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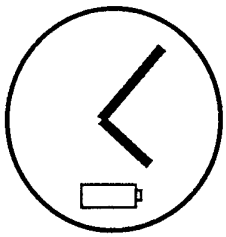

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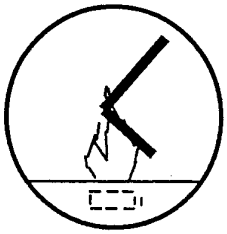

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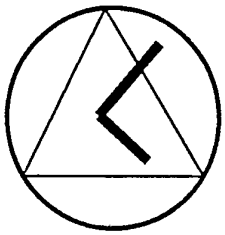

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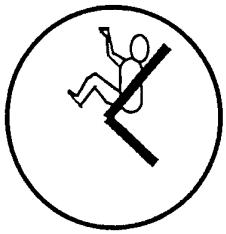

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FIGURE 3

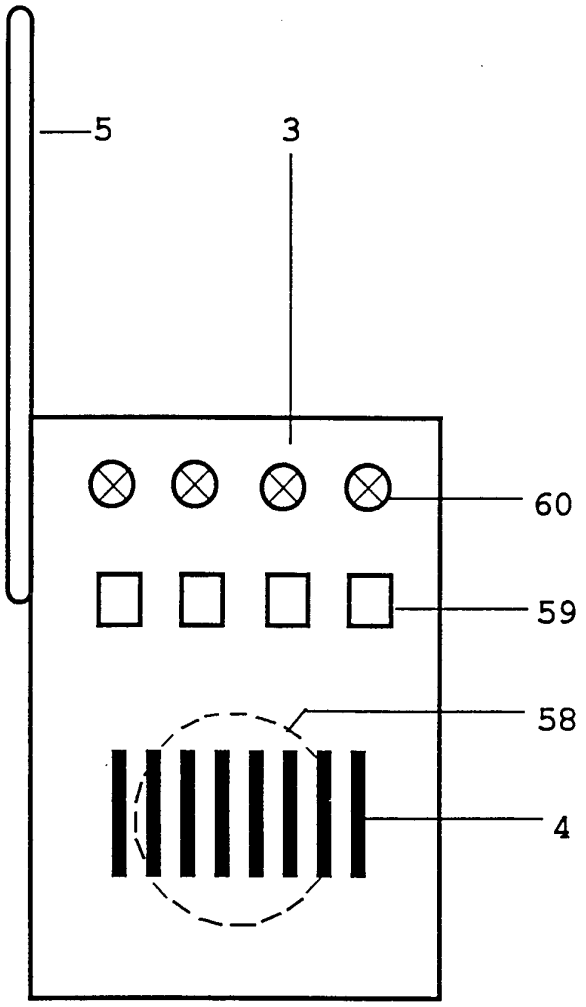

FIGURE 4

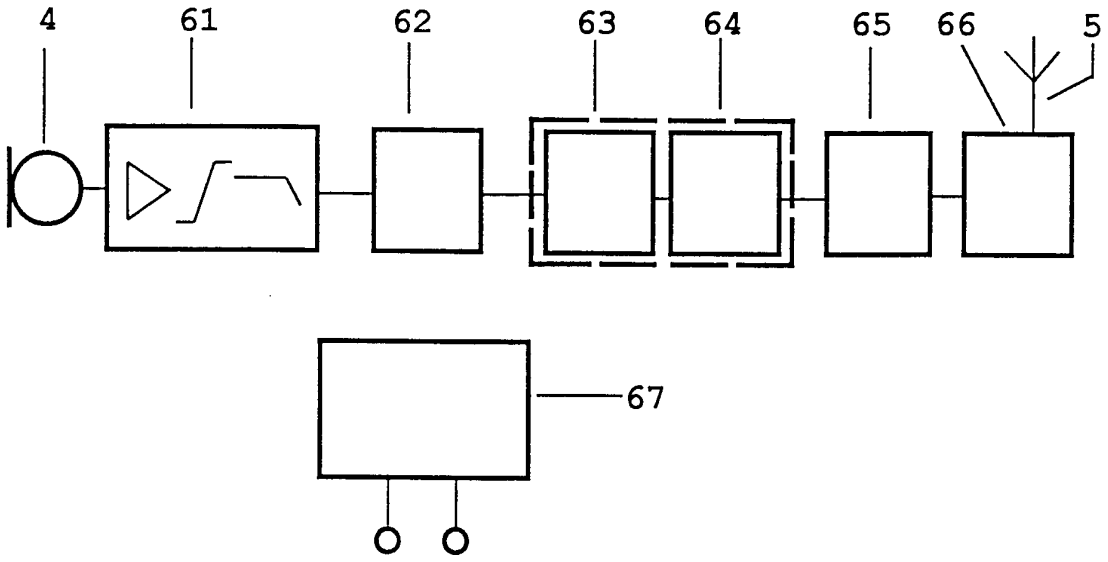

FIGURE 5

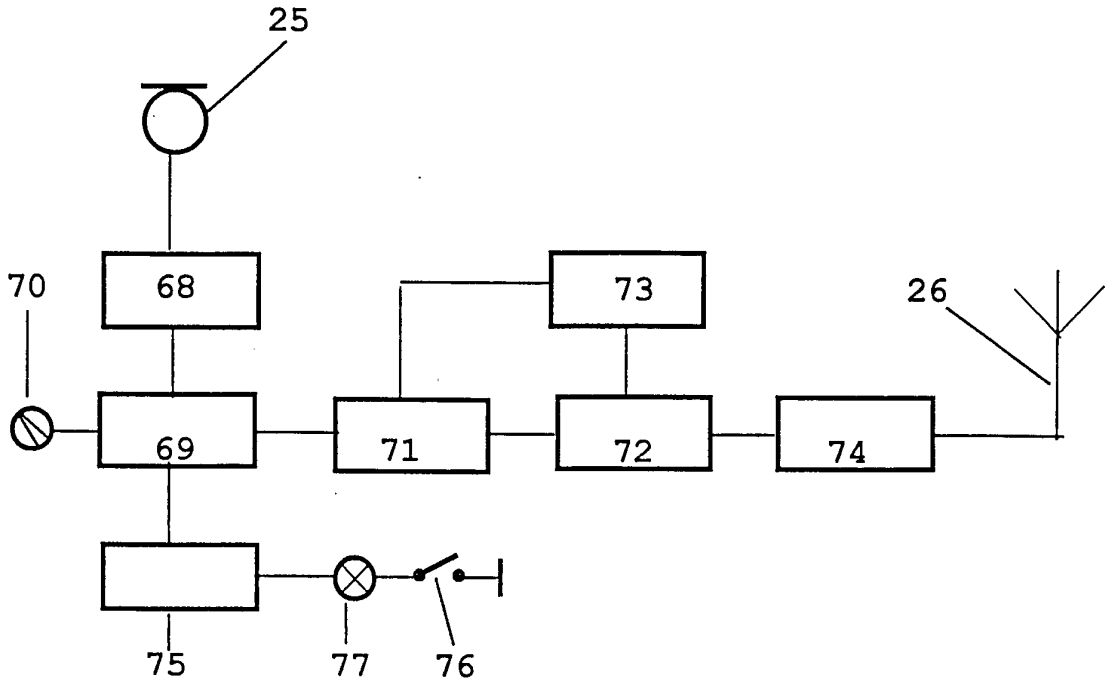

FIGURE 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/00551

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61F 4/00, G09B 21/00 // A 61 F 9/08, A 61 F 11/04
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)

IPC6: A61F, G08C, G09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, CLAIMS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 8401387-9 A (SWEDISH BUSINESS R.N. & CO. AB), 14 Sept 1985 (14.09.85), page 2, line 13 - page 3, line 32, figures 3,4 --	1-2
A	SE 445607 B (ESKIL RAEDER ET AL.), 7 July 1986 (07.07.86), page 4, line 3 - page 5, line 27, figures 1-3 --	1-2
A	EP 0326129 A1 (NAMCO, LTD.), 2 August 1989 (02.08.89), column 1, line 29 - line 52 --	1

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
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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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 February 1996	26 -02- 1996
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Leif Brander Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/00551

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2138616 A (ANATRONICS OF TEXAS INC.), 24 October 1984 (24.10.84), column 2, line 1 - line 22, figures 1,2	1-2

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INTERNATIONAL SEARCH REPORT

Information on patent family members

05/02/96

International application No.
PCT/SE 95/00551

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE-A- 8401387-9	14/09/85	NONE	
SE-B- 445607	07/07/86	SE-A- 8201138	25/08/83
EP-A1- 0326129	02/08/89	SE-T3- 0326129	
		DE-U- 6890364	14/01/93
		JP-A- 1181721	19/07/89
		US-A- 5032836	16/07/91
		JP-A- 1307095	12/12/89
		US-A- 5111427	05/05/92
GB-A- 2138616	24/10/84	NONE	