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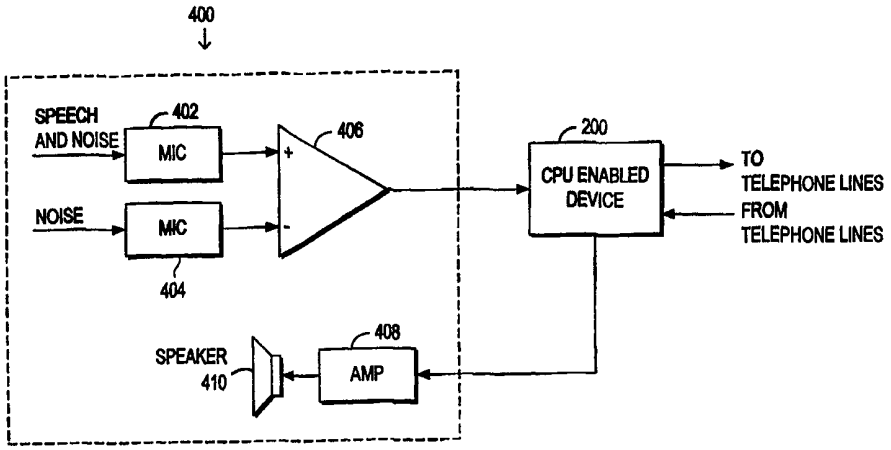

(57) Abstract

A remote control (400), is provided for remotely transmitting key–press signal(s) and speech signal(s) to a CPU enabled device, (200), which recognizes and interprets the speech signal(s) as commands for controlling, in accordance with the interpreted commands and the key–press signal(s), electronic(s) equipment and computer applications coupled thereto. A remote control is provided which includes a keypad having key(s) disposed on the remote control that generates key–press signal(s) in response to keypad presses. A microphone (402), coupled to the remote control receives speech and converts the speech signal(s). A transmitter is provided for transmitting the key–press signal(s) of the keypad and the speech signal(s) of the microphone to the CPU enabled device. In a preferred mode, the CPU enabled device provides speech recognition for recognizing and interpreting the speech signal(s) as speech commands and a controller for controlling, in accordance with the key–press signal(s) and the speech commands, the functions and applications, including internet applications, of electronic(s) equipment coupled thereto including a television, a telephone, a VCR, a stereo and a computer.

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REMOTE CONTROL SYSTEM FOR CONTROLLING KEY-PRESS AND SPEECH ACTUATED ON-LINE APPLICATIONS

RELATED APPLICATIONS

Reference is made to U.S. Patent Nos. 5,251,263, 5,381,473, 5,673,325, 5,715,321 and 5,732,143 which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to a remote control system and, more particularly, to a remote control system for controlling key-press and speech actuated computer applications.

BACKGROUND OF THE INVENTION

Recent advancements in digital technology are increasingly becoming a part of modern life from work to play. With each passing day, cellular telephony facsimile technology and teleconferencing, for example, provide important roles in business. On the homefront, video games, CD-ROM stereo, DVD television additionally have become rooted in our personal lives.

For all these technologies, modern life is plagued with a multitude of consumer electronic(s) which are impossible, if not, infuriating to operate. Our homes are plagued with remotes that can never be located or operated successfully. Cellular telephones require cryptic codes, which are designed to thwart theft, but make placing a phone call a nightmare. Today, one practically needs a doctoral degree to operate the software needed for internet applications.

Recently, these technologies have been integrated within the personal computer. This is sometimes referred to as multi-media. For example, teleconferencing is now possible through a video camera coupled to a personal computer. Telephone calls may be placed/received through the modem connection of the personal computer.

As these technologies become more integrated with the personal computer, it is anticipated that the personal computer will have direct control of consumer electronic(s). A system is needed whereby the consumer quickly and easily

controls the computer applications which will drive the aforementioned consumer electronic(s). Another difficulty in integrating the consumer electronics into the computer is that the user is confined to the local area of the computer.

Heretofore, no such system exists whereby the consumer quickly and easily controls the computer applications which drive computer-integrated consumer electronic(s) equipment.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the present invention is to provide a system whereby the consumer quickly and easily controls the computer applications of computer-integrated consumer electronic(s) equipment.

Another object of the present invention is to provide a system whereby the computer applications are controlled from a single convenient location.

More specifically, it is an object of the present invention to provide a remote control system that controls the computer applications.

In accordance with the foregoing objectives, a remote control system, method and apparatus are provided for controlling in accordance with remotely transmitted key-press and speech signal(s) recognized and interpreted by a processor.

Other objects, features and advantages according to the present invention will become apparent from the following detailed description of the illustrated embodiments when read in conjunction with the accompanying drawings in which corresponding components are identified by the same reference numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A shows the remote control apparatus of a first embodiment of the present invention;

Figs. 1B and 1C show the second embodiment of the remote control apparatus of the present invention;

Fig. 1D shows the mouse of the present invention;

Fig. 1E shows the keyboard of the present invention;

Fig. 1F shows the joystick of the present invention;

Fig. 1G shows the video camera of the present invention;

Figs. 2A-2E show the remote control system of the present invention;

Fig. 2F shows the CPU enabled device of the present invention;

Fig. 3 is a block diagram of the remote control apparatus;

Fig. 4A is a schematic diagram of an active noise cancellation circuit;

Fig. 4B and 4C illustrates near-field/far-field microphones;

Fig. 4D shows a passive noise cancellation microphone;

Fig. 5 is a block diagram of the I/R receiver of the remote control system of the present invention;

Figs. 6A and 6B show transmission schemes of the remote control system of the present invention; and

Fig. 7 shows the third embodiment of the remote control apparatus of the present invention.

DETAILED DESCRIPTION

Fig. 1A shows one embodiment of the remote control apparatus of the present invention, wherein remote control 100 comprises keypad 102, digital-pulse transmitter 104, microphone 106 and speech transmitters 108. In addition, remote control 100 includes push-to-talk (PTT) switch 110 and near-field/far-field switch 112.

The embodiment shown in Fig. 1A resembles a standard television remote control. However, the remote control of the present invention includes other embodiments such as the dual remote control and telephone receiver shown in Figs. 1B and 1C, the remote mouse 118 shown in Fig. 1D, the remote keyboard 120 shown in Fig. 1E, the remote joystick 122 shown in Fig. 1F, and the video camera 124 shown in Fig. 1G. The various embodiments of the remote control of the present invention, as will be discussed in further detail, remotely controls the computer applications for the consumer electronic(s) via key-press and/or speech signals.

In the embodiment shown in Fig. 1A, keypad 102, in response to keypad presses, generates key press signal(s) which are preferably digital pulse signal(s) transmitted as digital pulses via digital-pulse transmitter 104. Preferably, the transmitted key press signal(s) control key-press-controlled functions and applications such as, for example, T.V./VCR control, telephone dialing and internet navigation. Speech spoken into microphone 106 is preferably converted into speech signal(s) in

the form of analog signal(s) frequency modulated (FM) on a signal carrier and transmitted, via speech transmitters 108. In the preferred embodiment, the transmitted speech signal(s) control speech-driven applications that include all of the foregoing key-press driven functions and applications.

PTT switch 110 is provided to, when depressed, allow speech to be input into microphone 106 and prevent speech from being input when not depressed. Near-field/Far-field switch 112 is provided which activates near-field/far-field noise cancellation for microphone 106.

Keypad 102 includes power button 102a, numerical keypad 102b, A-Z keypad 102c, pointing device 102d and scrolling device 102e. Specifically, power button 102a activates the power of the remote control system. Numerical keypad 102b generates numerical key-press signal(s) for controlling functions of electronic equipment including, for example, selecting TV channels, setting the VCR date and dialing telephone numbers. In addition, the numerical key-press signal(s) may control applications, such as internet applications. A-Z keypad 102c generates A-Z key-press signal(s) which control additional functions and applications including, for example, applications which are driven by text commands such as computer applications and internet web-pages. Pointing device 102d generates signal(s) which control, for example, a cursor on a television or computer monitor with directional arrows for controlling the movement of the cursor and a central button for selecting items. Scrolling device 102e generates signal(s) which control, for example, scrolling of data on the television or computer monitor such as a digital TV program menu or an internet web-page.

The remote control 100 transmits the key-press and speech signal(s) in the I/R spectrum between 2.3 and 2.8 MHz. Of course, the signal(s) may be transmitted in another frequency spectrum including, for example, RF (radio frequencies) in the 900 MHz spectrum, microwave or satellite bands.

In the dual remote control and telephone shown in Figs. 1B and 1C the telephone receiver is on the "flip-side" of the remote control such that the user simply "flips" the remote control from a key-pad bearing face to the opposite side. In this embodiment, the speaker 114 reproduces audible sounds from, for example, internet

telephone signals reproduced from an internet telephone communication application running in the CPU-enabled device. The microphone 116 receives speech from the user which is remotely transmitted to the CPU-enabled device, interpreted thereby, and sent, via the internet telephone, to the remote listener. It will be appreciated that the telephone signals may be placed directly through the telephone line, via the PCTI (or modem connections), provided with the CPU-enabled device. The DTMF (dual-tone modulated frequency) signals required for standard telephony are generated by the PCTI or the modem provided with the CPU-enabled device. In addition, the dual remote control and telephone shown in Figs. 1B and 1C can incorporate a cellular telephone which places/receives telephone connections directly using known cellular telephone technology.

The remote control mouse 118 shown in Fig. 1D is a mouse for use with computer applications, including internet T.V. The remote control mouse remotely transmits command signals generated by keys 118a or 118b and/or speech signals received by microphone 106 to the remote CPU-enabled device. The remote control mouse may incorporate speaker 114 for reproducing audible sounds transmitted remotely from the CPU-enabled device. With this arrangement, it will be appreciated that the present invention combines into a single unit, the functions of the mouse, the remote control and speech-actuated applications. Thus, for example, the user is able to manipulate the cursor of a computer application, generate speech signals for dictating e-mail to a voice recognition processor for transcription as a word processor document and converse with remote users via speaker 114. In one embodiment, the remote control mouse includes the housing of a standard mouse having a substantially flat bottom for engaging a surface such as a mouse pad and a track ball for tracking movement of the mouse.

The remote control keyboard 120 shown in Fig. 1E provides, at once, the functions of the keyboard, the remote control and the telephone. With this arrangement, for example, the user enters text using the keyboard 120, inputs speech commands via microphone 106 and listens to audio generated by speaker 114. Thus, the user may, for example, type using the keyboard, surf the internet via voice

recognized speech signals input through microphone 106 and converse with friends on the telephone using speaker 114.

The remote control joystick 122 shown in Fig. 1F, at once, provides the functions of the joystick with the remote control and the telephone. With this arrangement, the user interacts with on-line games, for example, while conversing with other users playing the on-line game in another location.

The remote control video camera shown in capital Fig. 1G provides, at once, the functions of the video camera, the remote control and the telephone. In an alternative embodiment, the video camera 124 may be coupled to the CPU-enabled device and employed solely for teleconferencing. In the preferred embodiment, the video signals generated by the video camera representing video-captured data are interpreted by the CPU-enabled device and transmitted, via the internet, to the other party of the teleconferencing call. The user interacts with the remote party through the television, computer monitor or other display device.

Figs. 2A-2E illustrate the remote control system of the present invention. Particularly, the exemplary embodiment of Fig. 2A illustrates remote control 100 interfacing with CPU enabled device 200 which (as shown in Figs. 2B-2E) may be, for example, a set top box 202 with receiver 204 and television 206, a television integrated with the set top box 208, or a specially-adapted computer 210. Preferably, the CPU enabled device interprets the digital key-press and analog speech signal(s) transmitted from remote control 100 and controls the functions and applications of consumer electronic(s) interfaced/integrated therewith including a television, a VCR, a telephone and an internet-capable computer.

The set top box 202 shown in Fig. 2B, so called because it is set on top of the television set, is actually a computer which controls the functions and applications of consumer electronic(s) coupled thereto. It is preferred that the set top box allows users to interact, via remote control 100 and receiver 204, with a remote entity such as an on-line server (i.e., internet web-server or telephone/cable base station) via the television 206. Preferably, set top box 202 is designed to allow two-way digital communication between the base station and the user such that the user is able to, for example, interact with on-line applications such as e-mail, voice e-mail,

internet phone, internet teleconferencing, on-line game applications and internet TV. With the present invention, it will be appreciated that the user can access movies on demand, pay bills, bank, shop, place orders, make reservations, participate in interactive on-line games and forums, compose e-mail and voice e-mail, dictate e-mail, place calls using internet phone, access informational data bases such as internet web-pages and network computers, and perform numerous other functions through their television such as internet teleconferencing.

In one particular embodiment, the present invention is used for E-commerce.

The television integrated with a set top box 208 shown in Fig. 2C is similar to the arrangement shown in Fig. 2B, except that the set top box is integrated into the television. Receiver 204 in this arrangement may be integrated as part of the television receiver. Thus, television integrated with set top box controls the functions and applications of consumer electronic(s) coupled thereto as well as provide internet access.

The specially adapted computer 210 shown in Fig. 2D may be a personal computer or an internet PC which, similar to the foregoing arrangements, controls the functions and applications of consumer electronic(s) coupled thereto and provides access to the internet or other on-line services.

As shown in Fig. 2E, the CPU enabled device 200 may comprise a teleconferencing system including a video camera 114 coupled to a teleconferencing device 212 which interprets the video signals from video camera 114. A speaker 214 may be included such that the user may speak with the party at the other end of the teleconferencing call shown on the television 206. It will be appreciated that one or more of the elements shown in Fig. 2E may be combined into a single unit such as a two-way television phone.

The CPU enabled device 200 of the present invention is shown in Fig. 2F. Remotely transmitted command signals, such as key-press or speech signals, are received at terminal 218 and converted to digital signals by A/D converter 222 and stored in a buffer. Conversely, signals, such as speech signals, stored in the buffer 226 are converted to digital signals by D/A converter 224 and output through terminal

216. A CPU 228 functions to control the components of the CPU enabled device, interpret commands stored in the buffer 226 as well as provide the typical CPU functions such as arithmetic logic. The CPU 228 may be provided with a cash memory 230 for performing the various operations of the CPU. A voice recognition chip 232 is provided which interprets the speech signals stored in the buffer 226 and/or generates speech signals to be stored by the buffer 226. The TV converter 234 generates TV frames in accordance with the data stored in buffer 226 and at the control of CPU 228. A modem 236 is provided to accommodate modem data transmissions via terminal 220. In addition, a PCTI 238 is provided to accommodate telephony data.

In operation, the CPU enabled device executes a computer application, such as those discussed in the foregoing description, and enters a command mode which receives and interprets commands from the remote control of the present invention. Remotely transmitted commands, such as key-press or speech commands, are received as signals, stored in buffer 226 and interpreted by CPU 228. Speech commands, for example, are interpreted by the CPU 228 with assistance from the voice recognitionship 232 and control, for example, the PCTI 238 to dial telephone numbers in accordance with the commands which may be, for example, names of the people with whom the user wishes to make a telephone call. The speech signals may be passed through the CPU enabled device, via PCTI 238 or modem 236, when the user is speaking to the remote party when, for example, a teleconferencing computer application or telephone application is "running" in the background. Key-press commands may, for example, be interpreted by the CPU as controlling the mouse cursor; wherein the CPU 228 alters the bit-map in the cache memory 230 where the TV image is stored such that the TV converter 234 generates a TV frame with the altered mouse cursor. Similarly, commands transmitted from the remote joystick controls the position of the game object as interpreted by the CPU 228. Key-press commands interpreted as text for a word processing application, for example, are inserted by the CPU in accordance with the computer application at the position of the cursor; in this case, the TV converter converts the entire contents of the buffer 226 into legible text displayed by the TV or computer monitor. It will be appreciated that

the CPU enabled device may also be employed as a pay-per-view device which accepts the remote commands of the user for selecting a pay-per-view movie and, in accordance with a protocol program downloaded from the cable station via modem 236, the user purchases the pay-per-view program. As another example, a web-browsing application may be executed by the CPU 228 and the user controls the web-browser according to the interpreted commands remotely transmitted by the user.

It will be appreciated that the output terminal 216 may be any type of terminal including a telephone connection, a cable connection, a VCR connection, a stereo connection or any other consumer equipment connection. With this arrangement, the CPU 228 receives and interprets commands from the remote control and controls any of the consumer electronics in the home. For example, the CPU can detect the type of consumer equipment and store information and display the same to the user. Thus, for example, the CPU may detect connection to the stereo, retrieve information concerning the CD names and song tracks thereon and display the same on the television or display to the user. The CPU may be programmed to provide the user with a menu screen for selecting among the different title tracks loaded on the stereo. Similarly, video programs stored on video media may be ascertained by the CPU enabled device and displayed on the display in the form of a menu to the user for selection. The user enters remote commands using the remote control of the present invention which are interpreted by the CPU and causes the CPU to generate command signals to command the consumer electronic equipment connected thereto.

It will be appreciated that the present invention may be employed as a cable converter box with copy-protection capability. The CPU enabled device receives cable signals from a cable connection, determines whether an access code supplied by the user corresponds to the access code provided by the cable company and provides the correct cable channel to the TV converter 234 for display on the television or monitor. It will be appreciated that the CPU can be downloaded with a scrambling-descrambling program which scrambles cable television signals and, when provided with the correct access code by the remote control, descrambles the cable television signal.

Preferably, the CPU enabled device includes a telephone receiver and telephone line coupled thereto allowing the user to operate the CPU enabled device 200 precisely like a telephone. Thus, for example, the user places and receives calls through the CPU enabled device 200. In addition to the typical telephony functions, the CPU enabled device 200 offers telephone applications (which a conventional telephone cannot provide) such as automatically responding to an incoming (or outgoing) telephone call.

It will be appreciated from the foregoing description that the present invention quickly and conveniently controls the consumer electronics. It will be appreciated that consumer electronics refers to any one or more consumer technologies including, but not limited to, telephony, internet-TV, on-line services, teleconferencing, e-mail, voice e-mail, voice recognition, audio/video, television or subscription television services.

Fig. 3 is a block diagram of remote control 100 according to the preferred embodiment of the present invention. Key-press signal(s) are generated in response to key-presses of the keypad by keypad control 300, digital protocol 302, amplifier 304 and digital-pulse transmitter 306. Speech is converted into speech signal(s) by microphone 308, analog signal processor 310, frequency modulator (FM) 312, amplifier 314 and speech-signal transmitter 316.

The present invention is operable in any environment; which is important since remote control 100 is operated anywhere. To that end, speech (voice) recognition is provided as a means for controlling the functions and applications when the environment does not allow the user to enter key-presses. In an environment such as the dark, for example, the user relies on speech in the present invention to control the functions and applications of, for example, the television because it is too difficult to identify the correct key. In a noisy environment such as, for example, watching a digital-video-disk (DVD) movie in surround-sound or an airplane cabin, the background noise will interfere with the speech recognition. Thus, the voice recognition of the present invention is coupled with the noise cancellation to provide a powerful method of controlling functions and applications in an environment which is not conducive to key-press control.

More particularly, as shown in Figs. 4A and 4C, the present invention includes either an active noise cancellation or passive noise cancellation. Fig. 4A shows a closed-loop active noise cancellation circuit including first and second microphones 402 and 404, respectively, and a subtracting device 406, which in a preferred embodiment is an operational amplifier ("op-amp"). It is preferred that remote control 100 include an amplifier 408, which is preferably an op-amp, and a speaker 410 for broadcasting signal(s) received from the telephone line such that remote control 100 doubles as a portable telephone. In the alternative, the received signal(s) from the telephone line may be broadcast through the CPU enabled device 200, such as the speaker of the television.

Acoustic signal(s) composed of speech or the like and background noise are supplied to the first microphone 402 and converted therein into a corresponding electrical signal which is thereafter supplied to the plus terminal of the op-amp 406. The background noise is supplied to the second microphone 404 and converted therein into a corresponding electrical signal that is thereafter supplied to the minus terminal of the op-amp 406. The op-amp 406 is adapted to subtract the noise signal from the second microphone 404 from the speech and noise signal from the first microphone 402 and to supply therefrom an electrical signal representing substantially the speech to the CPU enabled device 200. In telephony applications, for example, the speech signal is transmitted from the CPU enabled devices via PCTI, to a desired telephone line. The output signal from the op-amp 16 is also combined in the CPU enabled device 200 with a received signal from the telephone line and supplied to the amplifier 408 for broadcasting by speaker 410.

The op-amps 406 and 408 are preferably relatively low-power integrated circuits (IC's), such as complementary metal oxide semiconductors (CMOS), and may be constructed from either one or more CMOS IC chips. Although not shown in Fig. 4A, amplifier 406 may be manually set by use of a switch so as to adjust the amplification of the received signal to a desired level.

In the preferred embodiment, near-field/far-field switch 112 selects near-field noise cancellation which is governed by the directivity patterns of omnidirectional microphones in the near and far fields and the correct placement of

the microphone's pressure sensitive surfaces as explained in the aforementioned U.S. Patents, particularly 5,381,473, 5,673,325 and 5,732,143, which are incorporated herein by reference. The physical design of the microphone as seen in Figs. 4B and 4C is the determining factor in the S/N increase. Examination of these drawings shows that the microphone pressure sensitive surfaces are preferably placed at 180 mechanical degrees from each other, and provide the optimum separation of the signal going to the voice microphone and noise microphone in the near field. This separation is a primary component in the determination of the signal in the S/N ratio.

A problem in the far field is to add vectorially, at a desired point, the sound pressures arriving at that point from all simple sources. If the summed outputs of the two microphones are zero, then the associated scale factors are equal. This is corrected by adjusting the amplitude of the microphone. Phase adjustment is unnecessary because reproducibility is inherent in the manufacture of the microphones which provide outputs of tracking phase with frequency.

In the far-field, the spacing between the microphones is small compared with the wavelengths at a large distance; the two microphones essentially coalesce and the output at any angle 0 will be zero for matched scale factors (magnitude/phase) at any frequency. In the near field, the spacing is not much smaller than the distance from the microphones and, as a result, the phase relationship between the two microphones to an incoming sound wave establishes the theoretical limit for the crossing of the near and far fields of the noise canceling microphone. As the frequency changes at a fixed spacing, the phase difference between the near field and the far field signal(s) changes, i.e.: at $\phi = 90$, there may be no cancellation at all. This phase change, in the absence of baffles can be a governing factor in the bandwidth of the cancellation.

The present invention uses an acoustic to reduce the effect of the spacing on the far field pattern. In addition, the microphones of the invention are optimally defined by the location of their respective pressure surfaces, preferably 180 degrees in the present invention. When the microphone pressure surfaces are at 0 degrees with respect to each other, total cancellation could be theoretically obtained but no voice would be transmitted. In summary, the inventive system can rely on the

directivity patterns of the microphones in the near and far fields, orientation of their pressure sensitive surfaces, and the electrical process of subtraction.

Near-field noise cancellation of the present invention is designed to be sensitive to distance from the sound source. Tests have proven that arbitrary sound fields which emanate from more than a few inches away from the microphone are substantially canceled by up to 30dB (3200%).

Passive (acoustic) noise cancellation incorporates, as shown in Fig. 4D, a specially-adapted noise canceling microphone 412 comprising a diaphragm having a front port 414 oppositely-situated from a rear port 416 by a distance "D". Due to this port separation (D), the magnitude of sound pressure is greater in the front (Pfront) than in the rear (Prear) of the diaphragm and slightly delayed in time. This results in a net pressure difference (Pnet = Pfront-Prear) between the sound pressures at the front and rear ports which causes the diaphragm to move. In this manner, the passive noise cancellation microphone measures and responds to the net pressure difference (Pnet) in an arriving sound wave between two different points in space, thereby passively canceling noise.

In the preferred embodiment, receiver 204, as shown in Fig. 5, which receives speech signal(s) transmitted from remote control 100, includes receiver detector decoder 500, filter/amplifier stage 502 and demodulator 504. More specifically, receiver detector decoder 500 receives the transmitted speech signal(s), filter/amplifier stage 502 filters and amplifies the received speech signal and demodulator demodulates the speech signal modulated upon transmission on an FM carrier.

The digital-pulse signal(s) are preferably transmitted to the television directly according to conventional transmitting methods. However, the receiver 204 may be adapted to receive the digital pulses as well as the speech signal(s).

In operation, the user quickly and easily controls, in any environment, the functions and applications of any piece of electronic(s) equipment and all future generations thereof. Specifically, remote control 100, in response to user key-presses and speech, transmits corresponding key-press digital pulses and FM analog speech

signal(s) to CPU enabled device 200 which interprets the received signal(s) and controls the desired electronic equipment coupled thereto accordingly.

The remote control system of the present invention, for example, may be used as a universal remote control for controlling all home audio/video equipment. The user, for example, depresses the power button to activate the CPU enabled device 200 and selects functions of the audio/video equipment coupled thereto in accordance with depressed key(s) of keypad 102. The user may, for example, select channels of the television by depressing the numerical key(s) 102b, enter data concerning a particular television program scheduled to be recorded by the VCR by depressing A-Z keys 102c, and select/scroll through data of a displayed digital-TV menu using pointing and scrolling keys 102d, 102e. It will be appreciated that, with such a universal remote control, the user will never again need to fumble with a plurality of remote controls and their intricate operating instructions.

The remote control 100 of the present invention also controls computer applications, particularly on-line applications such as internet applications. Thus, for example, the user manipulates the position of the cursor displayed on a monitor coupled to the CPU enable device 200 using pointing-device 102d and actuates displayed programmable objects, such as hypertext and internet links, by clicking-on the desired object using, as shown in Fig. 1, the central button on the pointing device. The user may also scroll through internet web-pages and databases using scrolling device 102e. More than this, the user can actually interact with the internet such as compose e-mail, voice e-mail, dictate e-mail, internet telephone, enter web site addresses or fill out databases posted on the internet using A-Z keys 102c just like a keyboard. With the microphone, the user can speak with other users, such as during game-play of an on-line game, while interacting with the application.

Since the CPU enabled device 200 is equipped with a PCTI capability, the remote control 100 of the present invention is operable as a portable telephone. The user, for example, depresses telephone-talk button 110 which causes remote control 100 to transmit a request to CPU enabled device to establish a telephone line connection. To receive an incoming call, the user simply depresses the telephone-talk button and the incoming call is coupled from the telephone line to the remote control

100. To place an outgoing call, once the CPU enabled device establishes the dial tone, the user enters the telephone number by depressing the numerical keys 102b on keypad 102, the remote control 100 transmits the telephone number to the CPU enabled device 200, and the CPU enabled device 200 couples the corresponding DTMF (Dual Tone Modulated Frequency) signal(s) to the telephone line to place the call.

It will be appreciated that the remote control of the present invention is operable as a telephone from anywhere there is a computer since computers today are equipped with modem line capability. More than this, if the CPU enabled device 200 is a portable laptop computer with a cellular telephone connection, the user may make a cellular telephone call virtually anywhere.

With the voice recognition capability of the CPU enabled device 200, all of the foregoing controls and functions may be controlled by the user simply by speaking into the remote control 100 which greatly enhances the effectiveness and ease with which the remote control is operated. Thus, for example, the user conveniently changes channels on the television, calls Grandma on the telephone, or surfs the internet simply by speaking into the remote control 100. The speech signal(s) generated in response are transmitted to the CPU enabled device 200 and interpreted thereby for controlling the desired functions and applications. With the voice recognition of the present invention, the user can, with the assistance of a transcribing application can dictate, via the remote control, word-processor documents to compose e-mail and other documents.

It will be appreciated that, the remote control 100 is operable in any environment. With the voice recognition capability provided by the CPU enabled device 200, the remote control system of the present invention is operable in environments which are not conducive to key-press control. Watching movies on the television in the dark, calling the police during a burglary or when hands are not free such as when making a telephone call while driving, are instances where the voice recognition of the present invention provides a powerful means to control functions and applications. The ability to operate in any environment is greatly assisted with the noise cancellation capability of the remote control 100 that, for example, cancels

the noise of the surround-sound stereo of the DVD movie, the noisy burglar, or the sound of the automobile. It shall be noted that, noise cancellation is particularly well-suited for canceling aircraft cabin noise.

It will be appreciated that the remote control of the present invention is operable with all future generations of electronic(s) equipment because the CPU enabled device interprets the commands. With such an arrangement, a virtually unlimited number of equipment may be added to the remote control system of the present invention.

While it is preferred that the remote control 100 transmits the speech signals as an FM signal, it is possible that the remote control digitizes the speech signals and transmits them as a digital signal. The procedure by which digitized speech signals are speech recognized is explained more fully in US Patent 5,251,263.

As shown in Figs. 6A and 6B, the remote control 100 of the second embodiment of the present invention is a dual-faced unit having a first face (Fig. 6A) which comprises essentially all of the elements shown in Fig. 1 and a second face, on the opposite side, which comprises a telephone headset including a speaker 600 and microphone 602.

While it is preferred that the telephony functions be provided by the CPU enabled device 200, it is within the realm of this invention to incorporate a cellular telephone into the remote control 100. In the former case, the user speaks into the first face to control functions and applications of consumer electronic(s) coupled to the CPU enabled device and "flips" the remote control 100 over to employ the remote control as a cellular telephone. With this arrangement, the user is able to quickly switch between controlling the consumer electronic(s) and talking on the phone.

Figs. 7A and 7B illustrate transmission schemes of the remote control system of the present invention. Although the key-press and speech signal(s) generated by the remote control 100 may be transmitted as various types of signal(s), it is preferred that the signal(s) be transmitted in the I/R band because I/R frequency signal(s) consume less power. However, since I/R signal(s) have a tendency not to

penetrate walls, it is preferred that the transmission schemes shown in Figs. 7A and 7B be employed.

The transmission scheme of Fig. 7A, for example, is comprised of repeaters 702 which, when placed in ideal locations, repeats the transmitted I/R key-press and speech signal(s) to the CPU enabled device 200 stationed in a remote location. Thus, for example, the user may control the functions and applications in a remote portion of the household such as the basement, with repeaters 702 transmitting the I/R key-press and speech signal(s) to the CPU enabled device 200 located in, for example, the study.

In addition, the transmission scheme of Fig. 7B, for example, comprises repeater 704 which intercepts the I/R key-press and speech signal(s) transmitted from the remote control 100 and couples the intercepted signal(s) through wiring in the household. Preferably, repeater 704 couples the intercepted signal(s) to the AC wiring in the house via AC outlet 706A. It is preferred that the repeater 704 convert the I/R signal(s) to a signal on a carrier frequency substantially greater than 100KHz such that the converted signal(s) are unaffected by AC line noise. Repeater 708 receives the signal(s) from the AC wiring via AC outlet 706B and transmits the AC signal(s) as I/R signal(s) to the CPU enabled device 200.

While it is preferred that the present invention incorporates a keypad with at least one key, it is possible in some modifications that the remote control does not (or has a limited) keypad. Fig. 8, for example, shows the third embodiment of the remote control apparatus of the present invention that comprises a headset 800 with speakers 800a and boom microphone 800b and I/R medallion 802. The remote control apparatus of the third embodiment of the present invention essentially operates in the same manner as described above except that the microphone is part of the headset 800 and the speech signal(s) are transmitted via I/R emitters 802a located on the I/R medallion which is attachable, via an attaching member (not shown), to the shirt of the wearer. The technology employed for noise cancellation as disclosed in the aforementioned referenced US Patents may be incorporated in the headset of the third embodiment.

It will be appreciated that there may be circumstances where it is convenient to provide only speech control in the present invention. In the third embodiment, for example, it is inconvenient for the user to depress keys on the I/R medallion attached to the shirt because the user cannot readily see the key(s). Thus, while it is preferred that the present invention include a keypad for generating key-press signal(s), it is possible that some embodiments comprise no keypad or limited keypad capability.

It will be appreciated from the foregoing that the remote control system, method and apparatus of the present invention greatly enhances the users ability to quickly and easily control from anywhere, and in any environment, functions and applications of all generations of electronic(s) equipment.

Furthermore, although preferred embodiments of the present invention and modifications thereof have been described in detail herein, it is to be understood that this invention is not limited to those precise embodiments and modifications, and that other modifications and variations may be affected by one skilled in the art without departing from the spirit and scope of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A remote control system for receiving remotely transmitted commands including speech commands for controlling consumer electronics, said system comprising:

a display for displaying video images;

a connection for communicating with said consumer electronics; and

a processor coupled to said connection and said display for recognizing and interpreting said remotely transmitted commands and for controlling said consumer electronics in accordance with the recognized and interpreted commands.

2. The remote control system according to claim 1, wherein said remotely transmitted commands include key-press commands, wherein said processor recognizes and interprets said key-press commands and controls said consumer electronics in accordance with said key-press commands.

3. The remote control system according to claim 1, wherein said display is a television, wherein said processor is a CPU-enabled device which controls, in accordance with said speech commands, said consumer electronics including subscription television, telephone communications and on-line computer applications.

4. The remote control system according to claim 3, wherein said CPU-enabled device causes said display to display a menu for displaying command options and controlling the menu to reflect said speech commands.

5. The remote control system according to claim 4, wherein said CPU-enabled device causes said menu to display said command options for selecting functions of the consumer electronics.

6. The remote control system according to claim 5, wherein said CPU-enabled device causes said television to display a subscription television program menu, wherein one or more subscription television programs are selected in accordance with said speech commands remotely transmitted.

7. The remote control system according to claim 3, wherein said CPU-enabled device includes a personal computer telephone interface which is

controlled to establish telephone communications as controlled by the CPU-enabled device in accordance with said speech commands.

8. The remote control system according to claim 3, wherein said CPU-enabled device includes a modem controlled by said CPU-enabled device in accordance with said speech commands to establish a connection between said CPU-enabled device and an on-line host.

9. The remote control system according to claim 1, wherein said consumer electronics is a teleconferencing application, wherein said processor controls said teleconferencing in accordance with said speech commands.

10. The remote control system according to claim 1, wherein said consumer electronics is an on-line browser, wherein said processor controls said on-line browser in accordance with said speech commands.

11. The remote control system according to claim 1, wherein said consumer electronics is subscription television, wherein said processor controls access to subscription television programs.

12. The remote control system according to claim 1, wherein said computer application is an e-mail application and said processor controls said e-mail application in accordance with said key-press and speech commands.

13. The remote control system according to claim 12, wherein said e-mail application is a voice e-mail application, wherein said processor composes said voice e-mail application in accordance with said speech commands.

14. The remote control system according to claim 12, wherein said processor performs voice recognition, wherein said processor controls said e-mail application by interpreting and recognizing said speech commands as textual data and inserting into said e-mail application said textual data.

15. The remote control system according to claim 1, wherein said consumer electronics is an on-line game, wherein said processor controls an object displayed in said on-line game and transmits speech to other players of said on-line game in accordance with said speech commands.

16. A remote control method for controlling consumer electronics in accordance with remotely transmitted commands including speech commands, said method comprising the steps of:

displaying video images;

communicating with said consumer electronics;

recognizing and interpreting said remotely transmitted commands; and

controlling said consumer electronics in accordance with the recognized and interpreted commands.

17. The method according to claim 16, wherein said remotely transmitted commands include key-press commands, further comprising the steps of:

recognizing and interpreting said key-press commands; and

controlling said consumer electronics in accordance with said key-press commands.

18. The method according to claim 17, wherein said display is a television, wherein said step of controlling said consumer electronics controls subscription television, telephone communications and on-line computer applications.

19. The method according to claim 18, further comprising the steps of:

causing said display to display a menu for displaying command options; and

controlling the menu to reflect said speech commands.

20. The method according to claim 19, wherein said step of controlling the menu to display said command options for selecting functions of the consumer electronics.

21. The method according to claim 20, wherein said step of controlling the menu displays a subscription television program menu, wherein one or more subscription television programs are selected in accordance with said speech commands remotely transmitted.

22. The method according to claim 18, wherein said step of controlling controls a personal computer telephone interface to establish telephone communications in accordance with said speech commands.

23. The method according to claim 18, wherein said step of controlling controls a modem in accordance with said speech commands to establish a connection between said CPU-enabled device and an on-line host.

24. The method according to claim 18, wherein said step of controlling controls a teleconferencing application in accordance with said speech commands.

25. The method according to claim 16, wherein said step of controlling controls an on-line browser in accordance with said speech commands.

26. The method according to claim 16, wherein said step of controlling controls access to subscription television programs.

27. The method according to claim 16, wherein said step of controlling controls an e-mail application in accordance with said key-press and speech commands.

28. The method according to claim 27, wherein said step of controlling controls a voice e-mail application, wherein said processor composes said voice e-mail application in accordance with said speech commands.

29. The method according to claim 27, further comprising the step of interpreting and recognizing said speech commands as textual data and inserting into said e-mail application said textual data.

30. The method according to claim 16, wherein said step of controlling controls an object of an on-line game displayed and transmits speech to other players of said on-line game in accordance with said speech commands.

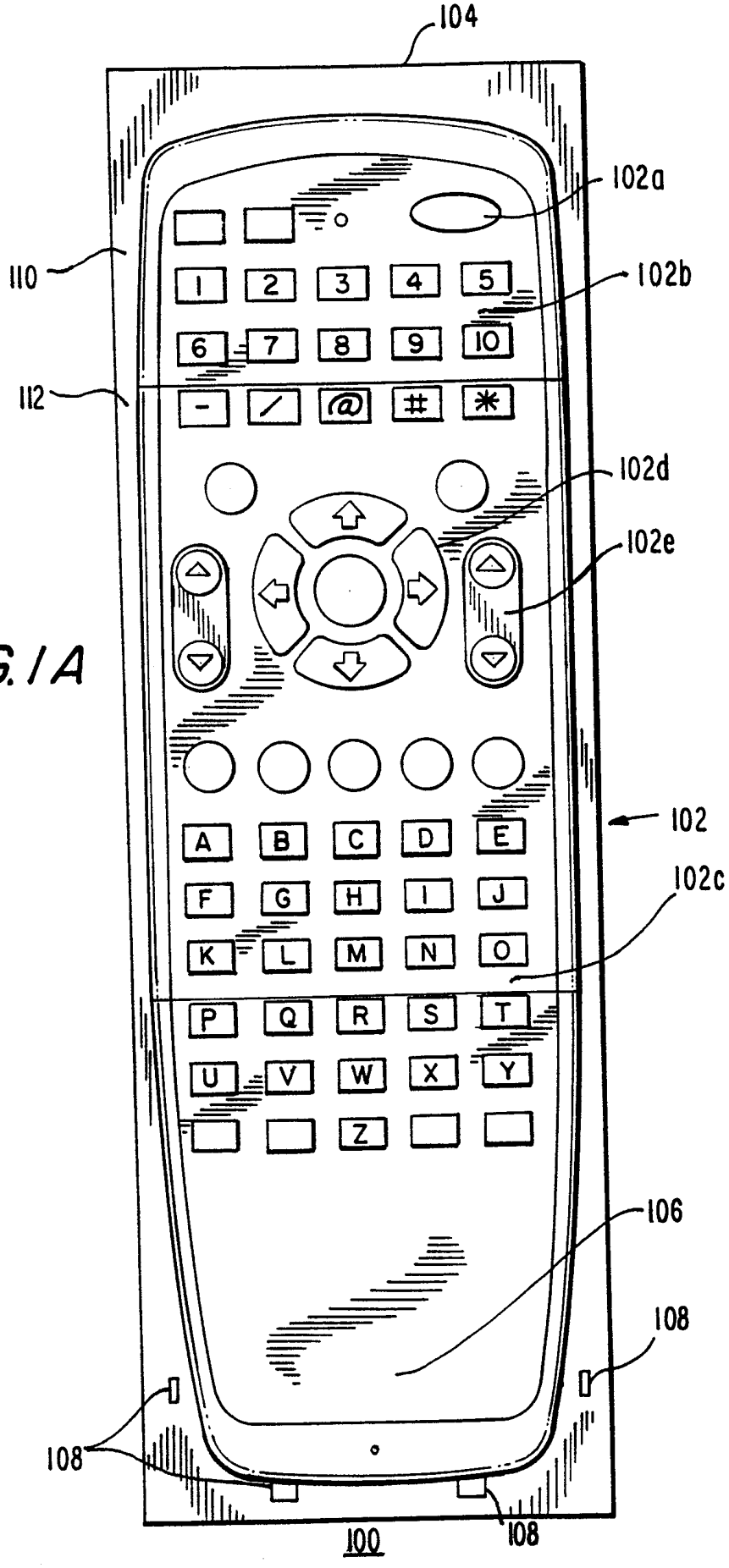


FIG. 1A

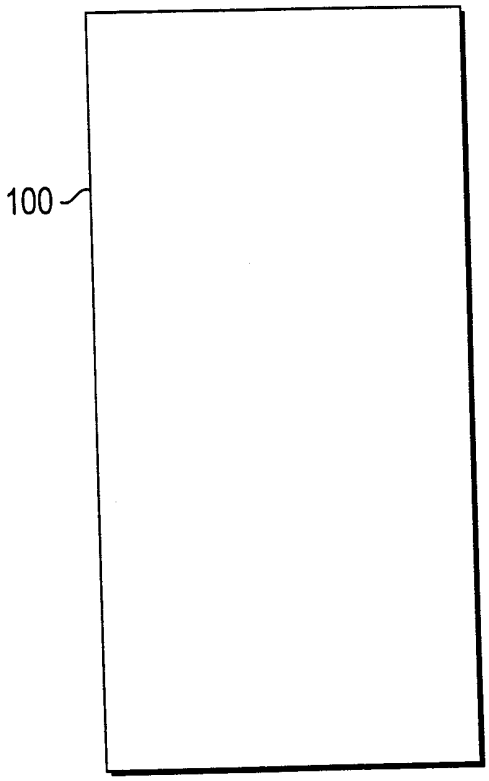


FIG. 1B

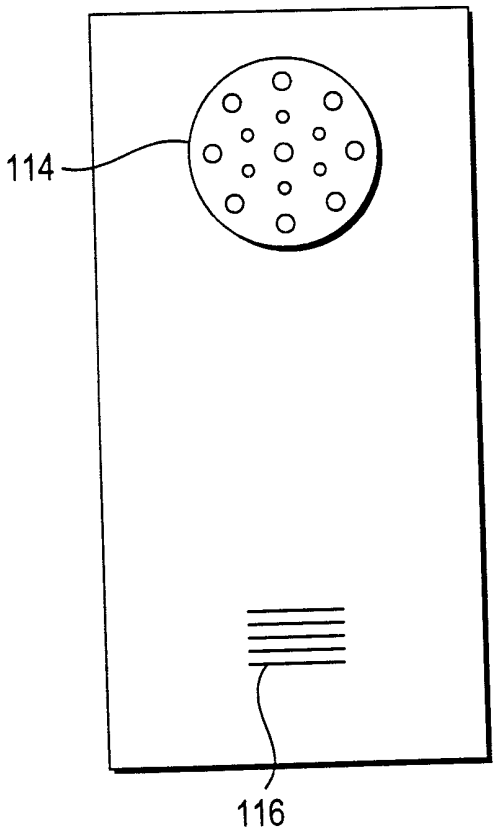


FIG. 1C

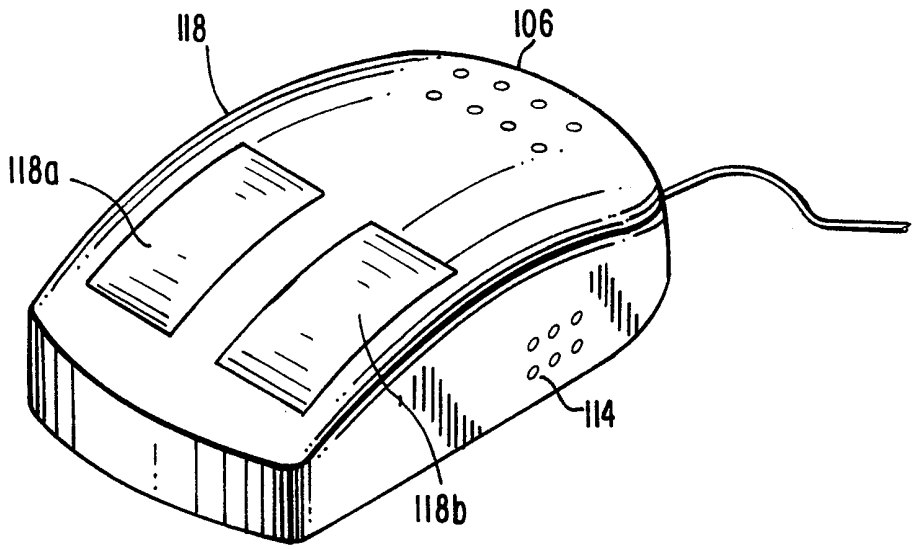


FIG. 1D

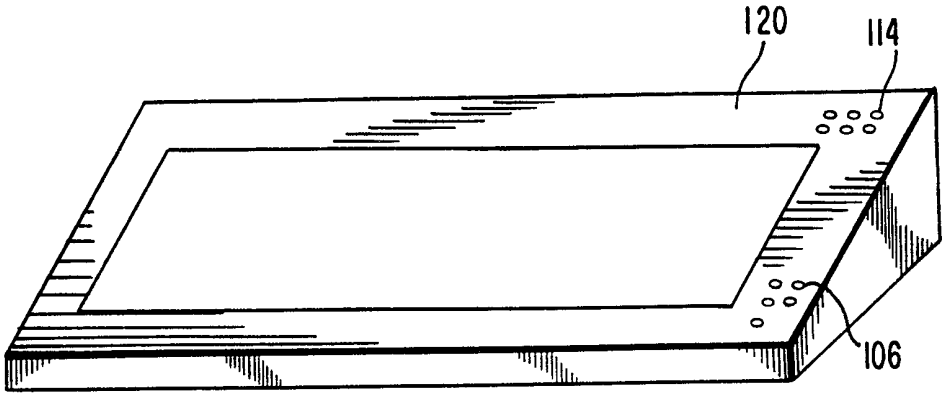


FIG. 1E

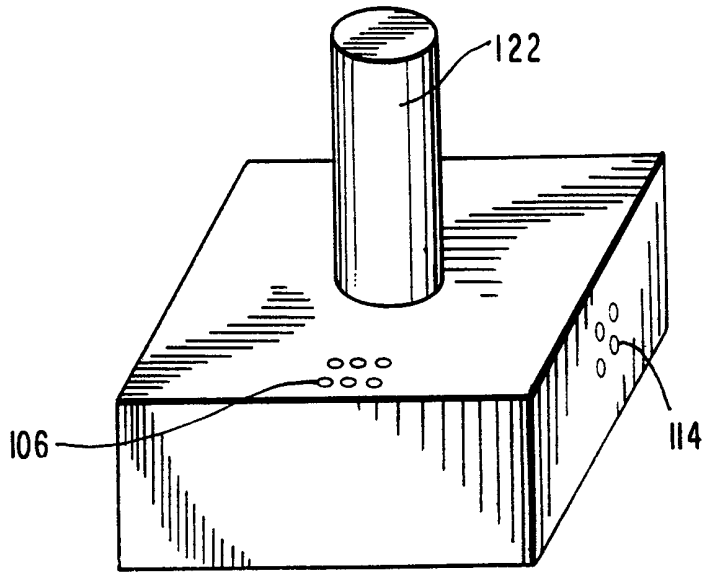


FIG. 1F

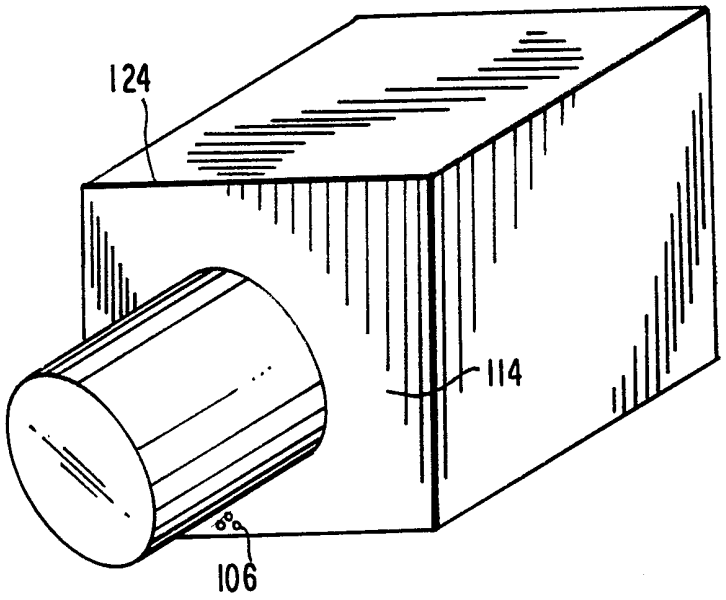


FIG.1G

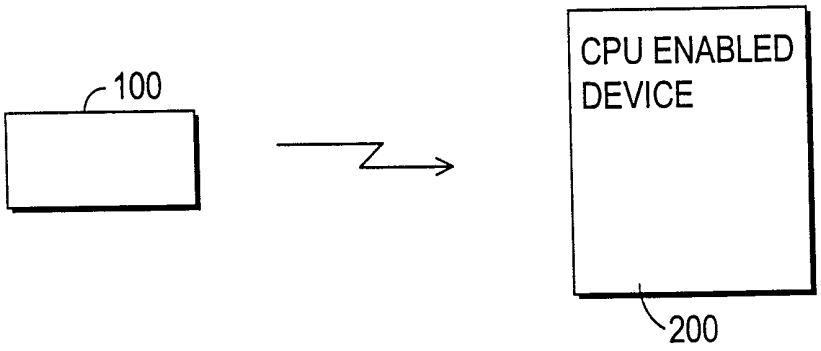


FIG. 2A

FIG.2B

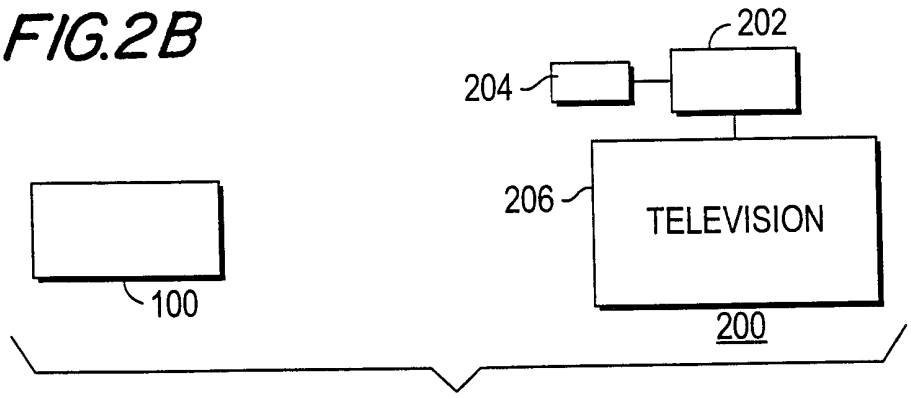


FIG.2C

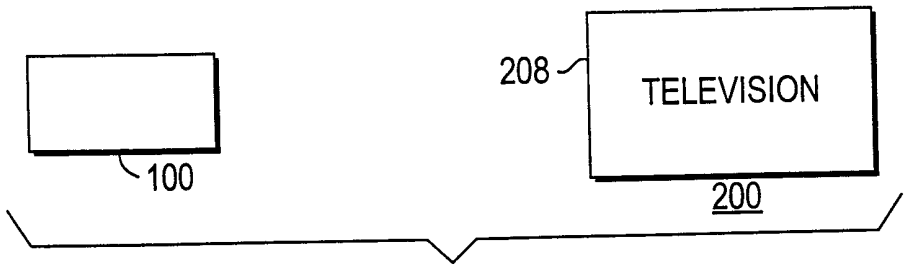
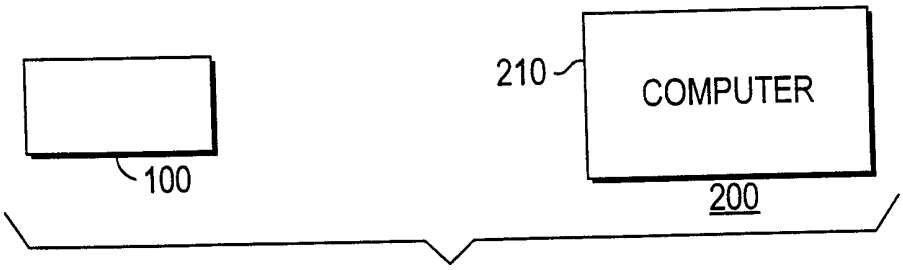


FIG.2D



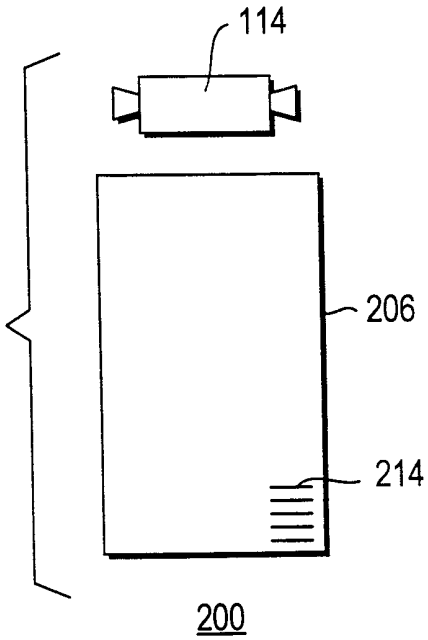

114
206
214
200

FIG. 2E

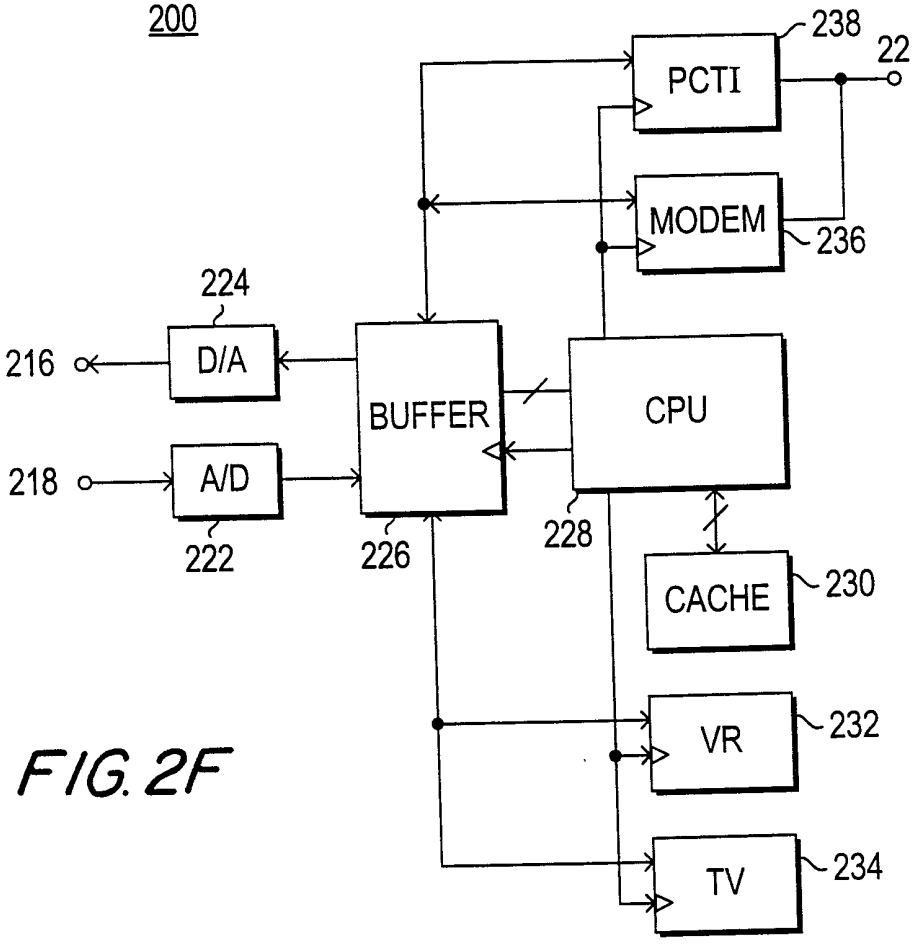

238
22
PCTI
MODEM
236
224
216
D/A
218
A/D
222
BUFFER
226
CPU
228
CACHE
230
VR
232
TV
234

FIG. 2F

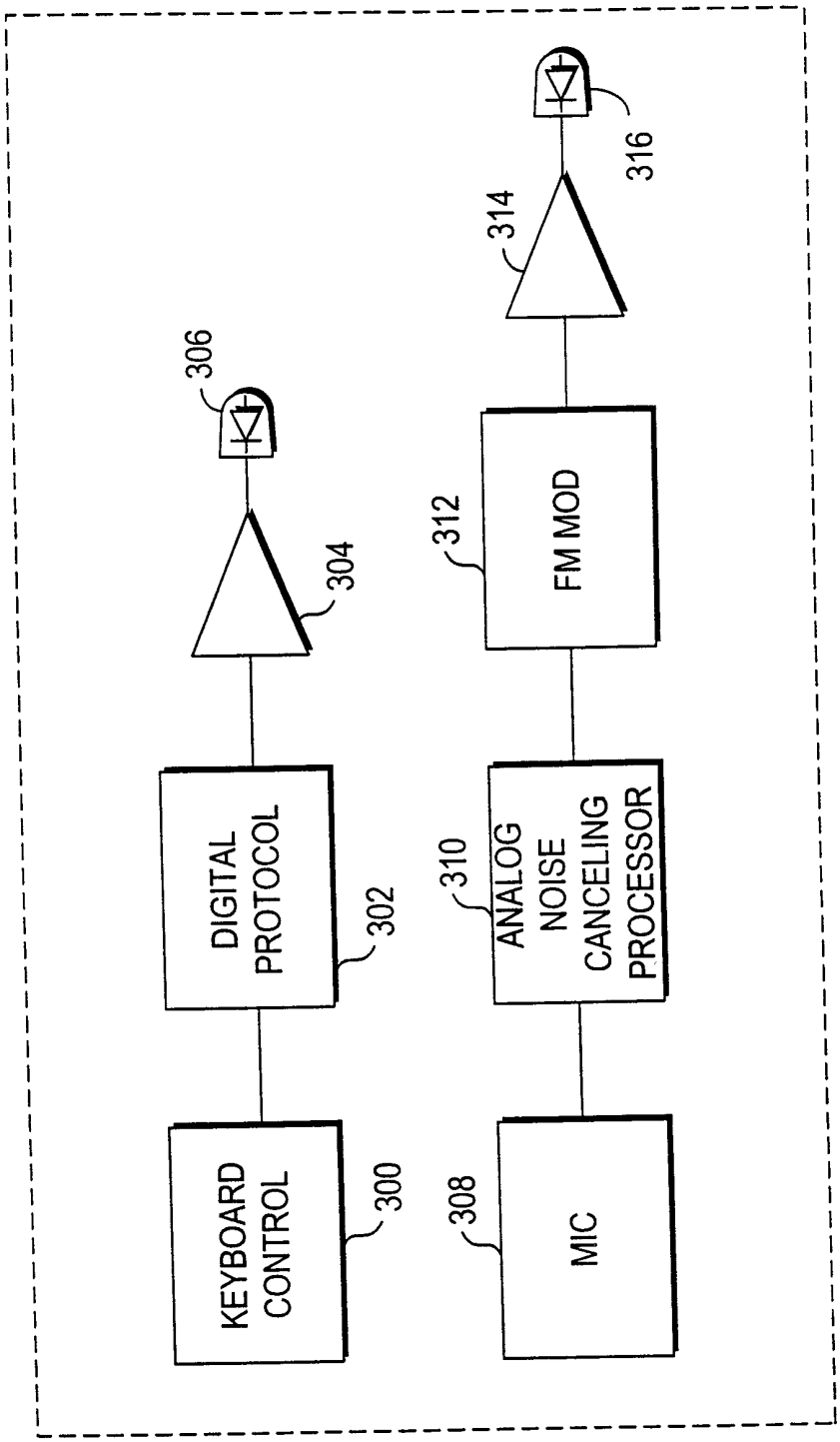

KEYBOARD CONTROL
300
DIGITAL PROTOCOL
302
306
304
MIC
308
ANALOG NOISE CANCELING PROCESSOR
310
FM MOD
312
314
316
102

FIG. 3

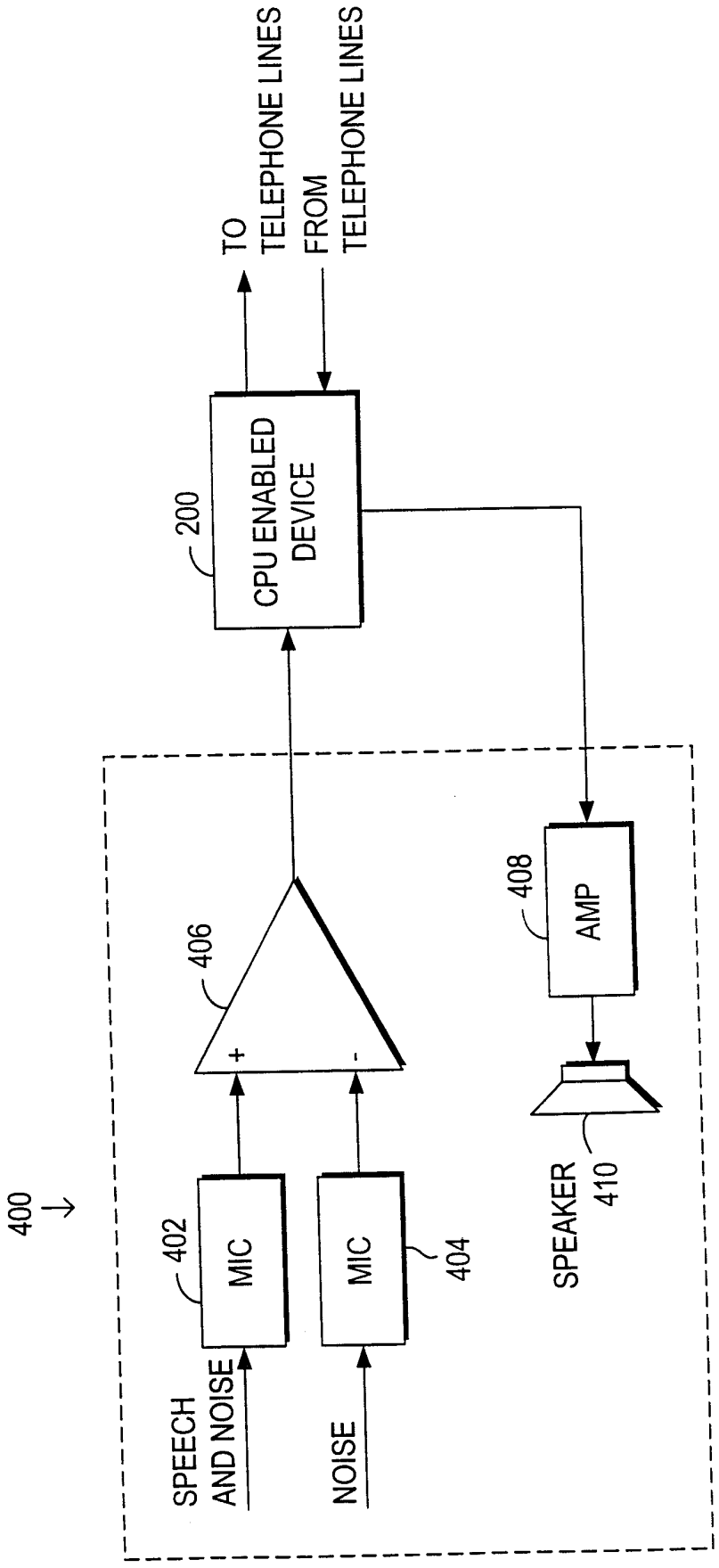

TO TELEPHONE LINES
FROM TELEPHONE LINES
200
CPU ENABLED DEVICE
400
406
+
-
408
AMP
402
MIC
404
MIC
SPEECH AND NOISE
NOISE
SPEAKER
410

FIG.4A

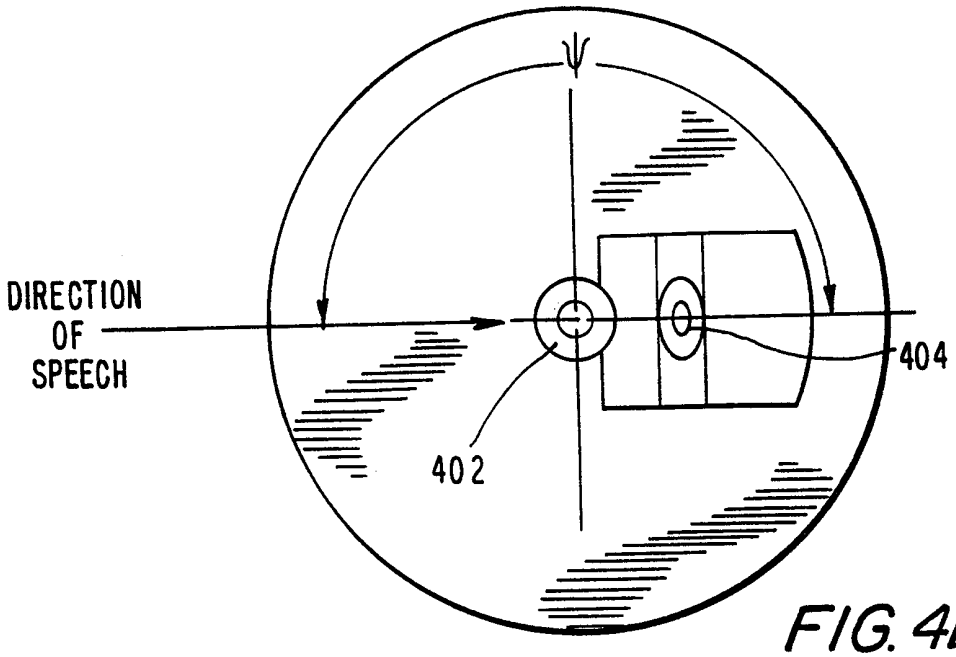

DIRECTION
OF
SPEECH
404
402

FIG. 4B

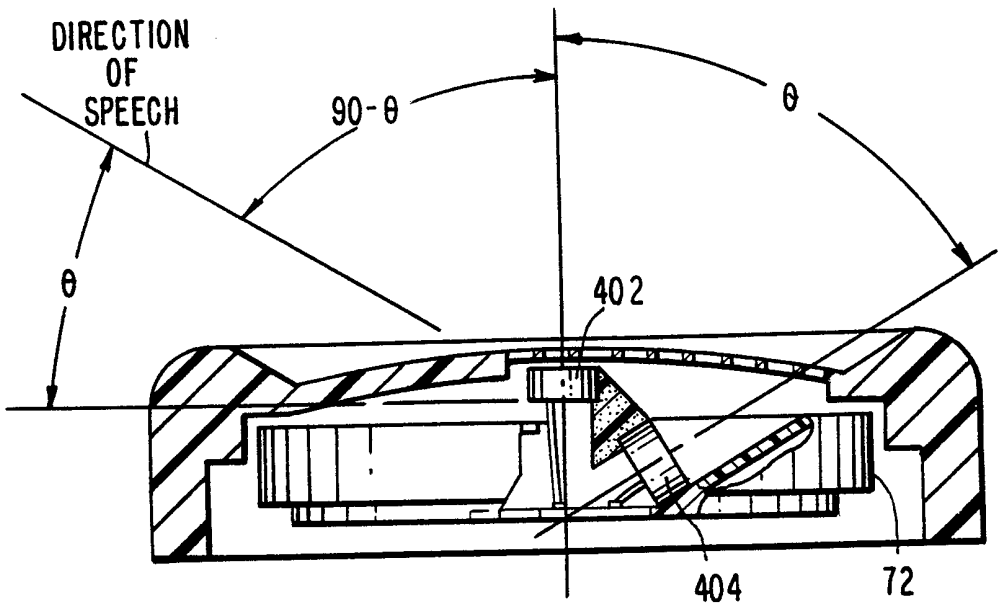

DIRECTION
OF
SPEECH
90-θ
θ
θ
402
404
72

FIG. 4C

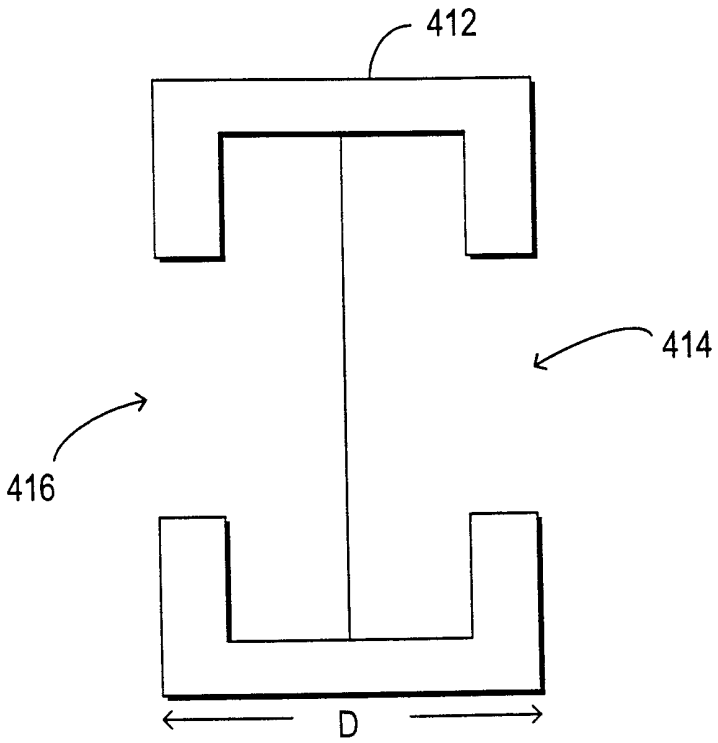


FIG. 4D

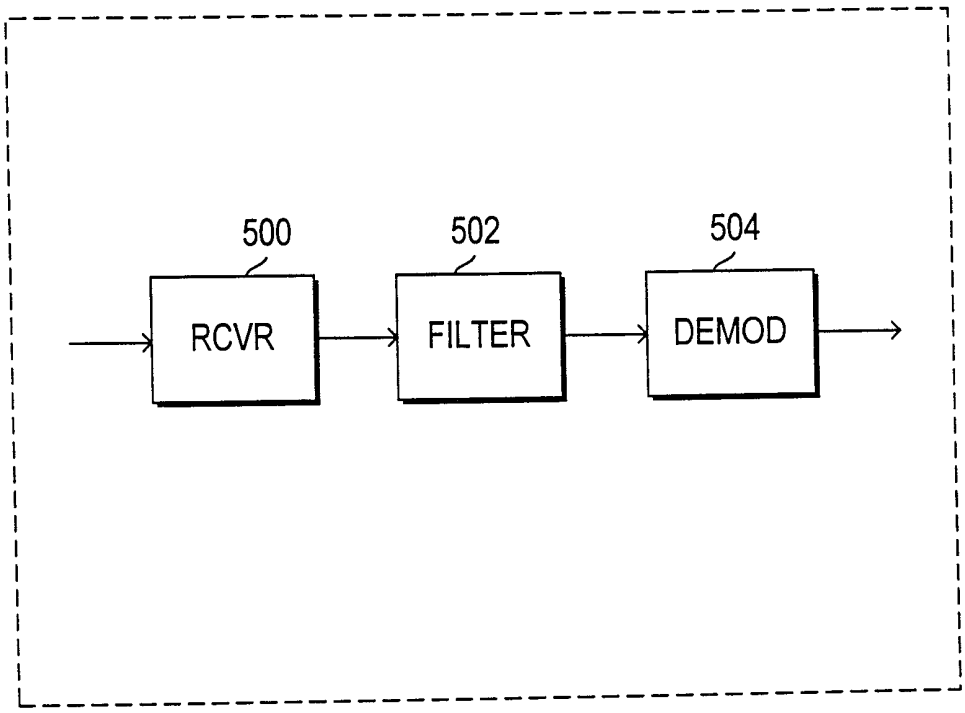
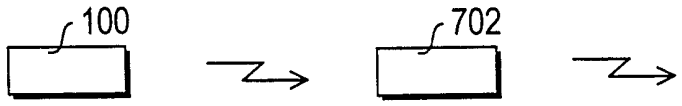


FIG.5

FIG.6A



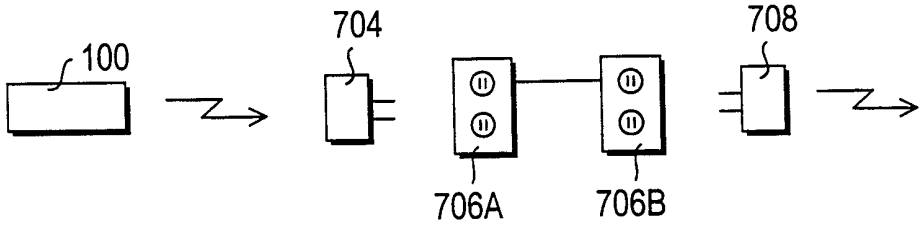


FIG.6B

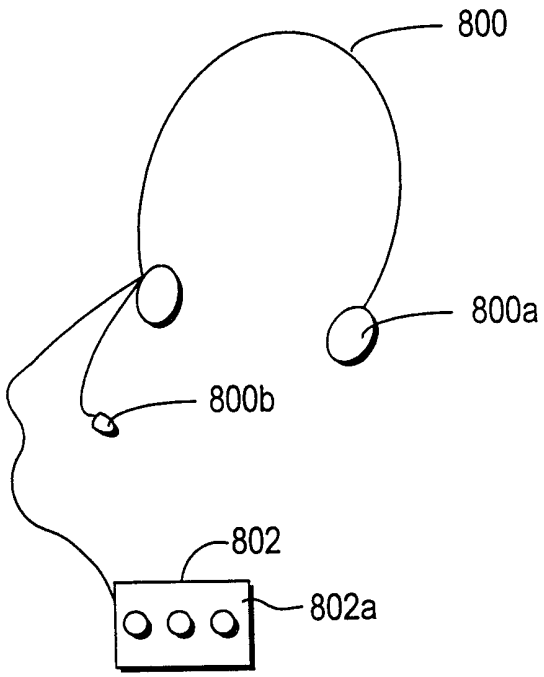


FIG.7

ANY REFERENCE TO FIGS 7A AND 7B
SHALL BE CONSIDERED
NON-EXISTENT (PCT ARTICLE 14(2))

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/06764

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G 10 L 3/00
US CL : 704/275, 704/270

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)

U.S. : 704/275, 704/270

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

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

APS, DERWENT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 5,774,859 A [HOUSER et al] 30 June 1998	1-30.
X	US 5,086,385 A [LAUNEY et al] 04 Feb 1992	1-30.

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search

19 MAY 1999

Date of mailing of the international search report

15 JUN 1999

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Form PCT/ISA/210 (second sheet)(July 1992)★