

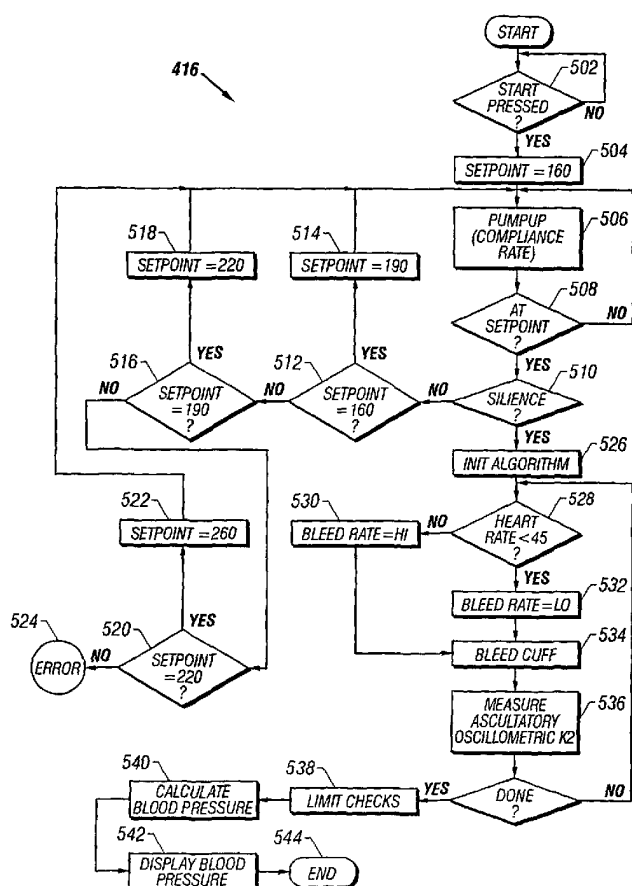
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(54) **Title:** BLOOD PRESSURE MEASUREMENT SYSTEM

(57) **Abstract:** A blood pressure measurement device and associated operating method utilize a measurement algorithm based on a plurality of measurements, supplying a unique ability to increase diagnostic and analytical success in detection. In an illustrative implementation, three measurement techniques are used in combination to improve overall measurement accuracy. A first of the three techniques is an auscultatory technique. A sound measurement acquired from a microphone located in the measurement cuff detects start and end Korotkoff sounds using a combination of filters. The auscultatory technique is a conventional method that is recommended by the American Heart Association and is similar to manual techniques used by a nurse or technician. The auscultatory technique and associated filtering techniques are well known by those having ordinary skill in the art. A second technique is an oscillometric technique that is commonly found in many low-cost blood pressure measurement devices. A pressure cuff is used to measure pressure oscillations, which are detected and monitored using mean pressure, and systolic and diastolic pressure ratios to identify systolic and diastolic blood pressure. A third technique, called a pattern recognition technique, measures a sound envelope and incorporates pattern recognition to identify systolic and diastolic pressures. A signal from the pressure sensor is used in addition to the three techniques to quantify the regions of sound under analysis.



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BLOOD PRESSURE MEASUREMENT SYSTEM

BACKGROUND OF THE INVENTION

5 The field of medicine has long employed health care screening to diagnose and tract patients' health. An annual physical examination is a well-known part of patient medical care.

A number of portable monitoring devices are used in medical monitoring. One well known device is the so-called Holter monitor which is an EKG monitor which typically uses a magnetic tape recorder to record EKG signals from a patient over extended periods of time.

10 Another is a monitor for obtaining blood pressure readings over extended periods of time.

Hospitals, health clinics, and pharmacies, in addition to an active role is supplying medical supplies and pharmaceuticals, have actively promoted various health care screenings and wellness programs. Programs are sometimes offered with the help of other health care providers or coordinated on a national basis with groups such as the American Lung Association, the American Diabetes Association and the American Podiatric Medical Association.

Health care screening devices in hospitals, physician's offices, businesses, and the like, in combination with the growing number of home diagnostic kits that are available have increased the efficiencies in health care delivery. Chain drug store operators have increasingly encouraged individual testing by making available in-store diagnostic testing devices. For example, a pharmacist who fills a high-blood pressure medicine for a customer may encourage the customer to regularly check blood pressure. The customer may use a blood pressure measurement and screening device in the drug store.

The offer of in-store testing commonly is highly popular among customers and greatly boosts the number of people visiting the store. In-store testing is valuable for positioning stores as health and wellness centers as well as retailers of health care products. In-store testing increases sales since a consumer who learns of a health problem through screening in the store has some likelihood of purchasing a home test kit to monitor the problem. For example, a customer who discovers a problem of high blood pressure through an in-store test is a likely candidate to purchase a home test kit.

In-store health care screening expands the pharmacist's role in patient care through education. Test device manufacturers have advanced the design and functionality of products

to simplify usage and improve accuracy. The challenge for further improvements in health care screening is to educate consumers about the need for medical tests, and demonstrate that many tests are effectively performed by publicly available devices or at home.

5 A present concern is that health screening is performed on an insufficient segment of the population to efficiently prevent or treat ailments. Other concerns are that health screening is too costly, limited in scope, and time-consuming both for individual patients and health care providers. Despite these deficiencies, a strong awareness exists of a need and desire for improved health screening procedures and equipment. Health care providers, insurance companies, and employers that ultimately pay for health care have encouraged development
10 and usage of improved, accurate yet economic health screening facilities both for treatment and prevention of health care problems.

Generally individual doctors and small groups of doctors have insufficient capital to maintain a complete health screening facility. Even if more health care providers were suitably equipped, typically only a small part of the population exploits health screening facilities due to
15 time and cost considerations and apathy.

What are needed are health screening devices, facilities, and methods that can be placed in locations that are convenient to health care customers. Suitable locations include retail outlets such as pharmacies or drug stores where customers already make health care purposes, but also include medical offices or hospitals, convalescence and elderly care homes,
20 work places such as offices or factory sites, college dormitories, and the like. What are further needed are health screening devices, facilities, and methods that are convenient, efficient, low in cost, and professionally accurate in screening health care data.

SUMMARY

A blood pressure measurement device and associated operating method utilize a
25 measurement algorithm based on a plurality of measurements, supplying a unique ability to increase diagnostic and analytical success in detection. In an illustrative implementation, three measurement techniques are used in combination to improve overall measurement accuracy. A first of the three techniques is an auscultatory technique. A sound measurement acquired from a microphone located in the measurement cuff detects start and end Korotkoff sounds using a
30 combination of filters. The auscultatory technique is a conventional method that is recommended by the American Heart Association and is similar to manual techniques used by a nurse or technician. The auscultatory technique and associated filtering techniques are well known by those having ordinary skill in the art. A second technique is an oscillometric

technique that is commonly found in many low-cost blood pressure measurement devices. A pressure cuff is used to measure pressure oscillations, which are detected and monitored using mean pressure, and systolic and diastolic pressure ratios to identify systolic and diastolic blood pressure. A third technique, called a pattern recognition technique, measures a sound envelope
5 and incorporates pattern recognition to identify systolic and diastolic pressures. A signal from the pressure sensor is used in addition to the three techniques to quantify the regions of sound under analysis.

The combination of measurement techniques produce multiple measurements that are combined using a voting technique to identify and discard improper results. Remaining
10 measurements are averaged to within a predefined tolerance to improve the final results. Use of additional measurement techniques improve the measurement accuracy.

The auscultatory technique employs Korotkoff sounds to determine systolic and diastolic pressure points to determine measurement cycle timing. The oscillometric technique senses and monitors oscillations in a pressure waveform to locate systolic and diastolic
15 pressures. A pattern analysis technique senses a pressure envelope and monitors the pressure envelope to locate characteristic changes in a sound envelope to determine systolic and diastolic pressures.

In some embodiments, the blood pressure measurement device includes a controller for controlling a pressure cuff to inflate the cuff in preparation for a blood pressure measurement
20 and to slowly deflate, or bleed, the cuff to determine systolic and diastolic pressures and to generate a pressure waveform.

In accordance with one aspect of the present invention, a test apparatus includes an auscultatory analyzer, an oscillometric analyzer, and a pattern recognition analyzer. The auscultatory analyzer is capable of sensing and analyzing an audio signal using Korotkoff
25 sounds to determine a systolic pressure and a diastolic pressure. The oscillometric analyzer is capable of sensing and analyzing oscillations of a pressure signal to determine the systolic pressure and the diastolic pressure. The pattern recognition analyzer is capable of sensing a pressure envelope and monitoring the envelope pattern to locate characteristic changes and thereby identify systolic and diastolic pressures. A comparing block compares the parameters
30 measured using the distinct measurement techniques, determines mutually consistent limits for the distinct measurement techniques, and rejects measurement samples outside the determined limits. Results produced by the distinct measurement techniques are combined to quantify an optimal systolic pressure result and an optimal diastolic pressure result.

In accordance with another aspect of the blood pressure measurement device and operating method, a blood pressure measurement system includes a kiosk, a blood pressure interface coupled to the kiosk and capable of detecting a pressure signal, a microphone coupled to the blood pressure interface and capable of detecting an audio signal, and a blood pressure analyzer coupled to the kiosk, the blood pressure interface, and the microphone. The blood pressure analyzer includes a plurality of separate analyzers that detect blood pressure using a plurality of separate analysis techniques, the plurality of analysis techniques being based on analysis of audio signals, pressure oscillations, and pattern recognition of a pressure envelope.

In accordance with another aspect of the blood pressure measurement device, a method of measuring blood pressure of a test subject includes acquisition of at least three distinct measurement techniques that measure a plurality of physiological parameters. A first technique is an auscultatory technique including sensing an audio signal and analyzing the audio signal using an auscultatory analysis of Korotkoff sounds to determine a systolic pressure and a diastolic pressure. A second technique is an oscillometric technique including sensing pressure oscillations and analyzing the pressure oscillations using an oscillometric analysis to determine mean pressure, systolic and diastolic blood pressure, and to identify systolic and diastolic pressures. A third technique is a pattern analysis technique including sensing a pressure envelope and monitoring the envelope pattern to locate characteristic changes and thereby identify systolic and diastolic pressures. The method further includes comparing the parameters measured using the distinct measurement techniques, determining mutually consistent limits for the distinct measurement techniques, and rejecting measurement samples outside the determined limits. Results produced by the distinct measurement techniques are combined to quantify an optimal systolic pressure result and an optimal diastolic pressure result.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the described embodiments believed to be novel are specifically set forth in the appended claims. However, embodiments of the invention relating to both structure and method of operation, may best be understood by referring to the following description and accompanying drawings.

FIGURE 1 is a schematic block diagram illustrating a suitable network for interconnecting one or more health information kiosks and a health information server.

FIGURE 2 is a pictorial diagram illustrating a suitable health information kiosk for usage in interfacing to a health care information system.

FIGURE 3 is a pictorial diagram illustrating another view of the suitable health information kiosk with improved visualization of a blood pressure cuff.

FIGURE 4 is a schematic block diagram showing functional elements of a blood pressure measurement operation that can be performed by the health care information system.

5 **FIGURE 5** is a schematic flow chart that depicts a suitable control routine for controlling the blood pressure measurement.

FIGURE 6 is a schematic block diagram that illustrates a test interface that is suitable for performing multiple analysis operations.

10 **FIGURE 7** is a schematic block diagram showing a pulse discriminator for extracting a user pulse signal directly from an output terminal of a pressure transducer attached to a pressure cuff.

FIGURE 8 is a schematic block diagram illustrating a measurement cycle controller that generates signals governing a measurement cycle based on sensed sound signals.

15 **FIGURE 9** is a schematic block diagram that shows a sample counter that generates a sample count for marking event times.

FIGURE 10 is a schematic block diagram that shows an example of a suitable auscultatory interface for measuring blood pressure using an auscultatory technique.

FIGURE 11 is a schematic block diagram that shows an example of a suitable oscillometric interface for measuring blood pressure using an oscillometric technique.

20 **FIGURE 12** is a schematic block diagram that shows an example of a suitable pattern recognition interface for measuring blood pressure using a pattern recognition technique.

FIGURE 13 is a pictorial computer screen display illustrating a main menu screen that is initially displayed when health services and information system software is activated.

25 **FIGURES 14A and 14B** depict pictorial computer screen displays including a blood pressure testing start screen and a blood pressure testing end screen.

FIGURES 15A, 15B, and 15C are graphic displays showing pressure waveforms depicting examples of data that are analyzed to perform blood pressure measurements.

FIGURES 16A and 16B are pictorial computer screen displays associated with a health risk appraisal function, including a questionnaire form for setting user parameters and a health care appraisal result screen.

FIGURES 17A and 17B are pictorial computer screen displays associated with a
5 medication encyclopedia display function.

FIGURES 18A and 18B are pictorial computer screen displays that illustrate a health information display function.

FIGURES 19A, 19B, 19C, and 19D are pictorial computer screen displays that illustrate a local community information display function.

10 **FIGURES 20A and 20B** are pictorial computer screen displays that illustrate a “Shopping Mall” business access display function.

FIGURES 21A and 21B are pictorial computer screen displays showing a blood pressure history access screen to allow protected access to a user’s blood pressure history information.

15 **FIGURES 22A, 22B, and 22C** depict several examples of schematic graphs that show collective user health data.

FIGURE 23 is an example of a table showing a compilation of acquired samples of health care data that can be generated by the health services and information system.

20 **FIGURE 24** is an example of a test printout that can be produced by the health services and information system.

FIGURE 25 is a schematic screen display showing an entry screen for user identifying information for use in saving and accessing secured patient information.

FIGURE 26 is a schematic screen display that illustrates a registration form for a web site.

25 **FIGURE 27** is a schematic screen display illustrating a weight measurement result screen.

FIGURES 28A, 28B, 28C, and 28D are four three-dimensional pictorial diagrams showing various frontal views of a health care information kiosk with a retractable seat.

DESCRIPTION OF THE EMBODIMENTS

Referring to **FIGURE 1**, a schematic block diagram illustrates a suitable network **102** for interconnecting one or more health information kiosks **110** and a health information server **104**. Typically, an individual health information kiosk **110** includes a processor **106** or
5 controller with a storage **108** or memory that maintains a local archive of user information that stores a relatively small number of relatively recent test results, measurements, and possibly other information. The processor **106** executes a logic (not shown), typically a computer program, that is stored as software, firmware, control logic or other executable forms as are known by one of ordinary skill in the art. In an illustrative health care information system **100**,
10 the health information kiosk **110** employs additional computing power by adding a digital signal processor (DSP) **112** that operates in conjunction with the processor **106** to perform computation-intensive operations such as various health test operations.

The local archive includes tracking of health reading including blood pressure, heart rate and weight. Individual users also have an individual personal health site on the health
15 information server **104**. The health information server **104** is generally used to store a long-term archive of user results, measurements, and information received from the individual health information kiosks **110**. In one example, the local health information kiosk **110** stores information from many users and all information that is generated on the health information kiosk **110** is automatically loaded, for example on a daily basis, to the central health
20 information server **104**. The results are sent to the health information server **104** for long-term storage and archiving. The information for the individual users are stored on corresponding personal health sites that are assigned to the particular individual users so that accurate and current information are available for all of the individual users.

In the illustrative example, the individual users determine the degree and level of
25 health care information to be acquired and stored on the site. The individual user assigns a privilege level to allow the user's physician or pharmacist to enter information to the site with a desired level of security. The physician or pharmacist having the privilege granted by the individual user gains entry to the user site upon entry of a physician or pharmacist license or registration number granted by a federal, state, or local licensing authority. Entry of the
30 licensing or registration number enforces user security and privacy concerns, preventing fraudulent change to the user database. Using the secured access to the user's site, the physician can be allowed to download health care information to the user site. Information is not changed on the site so the physician's level of security insures accuracy of the downloaded

information. The physician's security specification permits the physician to transmit secured prescription orders and records to the individual health care site.

5 The health care information system **100** benefits the individual users by permitting secured accessibility of health care information and prescription needs anywhere in the world through usage of the internet. The health care information system **100** supplies accurate and current individual health care information that is accessible in a crisis or emergency situation.

10 In one example, the health information server **104** includes a layered security program for protecting user data from privacy violations. In an example of a layered security program, a user's personal health site can have a sixteen digit security card for entry into the health information kiosk **110** and an individual personal identification (PID) number to access the user's personal health site on the health information server **104**. The level of security is equivalent to the security of an ATM machine in which the only person having access is the user since the user establishes the PID number.

15 The health information kiosks **110** are generally accessible to the public. For example, pharmacies or drug stores are suitable facilities for supplying floor space for a health information kiosk **110**. Other suitable facilities include other retail outlets, health care providers such as physician offices, clinics, hospitals, and the like. The facilities housing a health information kiosk **110** typically have an agreement with the kiosk supplier to supply information, services, and products. The health information kiosk **110** executes various functions such as health testing and health evaluation. In some systems, the health information kiosk **110** supports operations including health testing and measurement, health and fitness evaluation, and various health care information sources. Various health tests may be supported. Common health tests include blood pressure testing, heart rate testing, and the like. For example, some systems may support various noninvasive blood analyses using pulse oximetry data acquisition. Measurements may include simple or complex measurements. One common measurement is a weight measurement that is supplied using a seat scale that is installed into the seat of the health information kiosk **110**. Health care information sources may include a medication encyclopedia, a vitamin and supplement encyclopedia, an electronic health care library, health care provider directories, and the like.

30 The health information kiosk **110** interfaces to a server such as a store computer system or to a centralized server that services a wide geographical area. For example, the health information kiosk **110** may interface to a local pharmacy or drug store computer. The health information kiosk **110** may alternatively interface to a main frame health information server

104 that services a large area such as a country or region of the world. The health information kiosk **110** in combination with the health information server **104** typically includes a highly comprehensive pharmacy library covering prescription medications and over-the-counter remedies.

5 The individual health information kiosks **110** commonly include display software that displays a selected idle presentation, an attract screen with still-frame or dynamic graphics, or plays video clips that promote a selected party such as the sponsoring store or medical service providers.

10 Software programs in the individual health information kiosks **110** is updated by downloading, for example via internet access, or media transfer such as removable disk loading.

 The health information server **104** commonly supports Internet sites for user access of health information, storage of personal history information, and to shop for products that are not available local to the health information kiosk **110**.

15 Referring to **FIGURES 2 and 3**, a pictorial diagram shows a suitable health information kiosk **110** for usage in interfacing to a health care information system **100**. The health information kiosk **110** includes a test interface **212** and a display **216**. The display **216** can be configured as a touch-screen user input interface such as a touch-screen keyboard for operation as an input device. Some examples of the health information kiosk **110** can include a
20 measurement interface **222** such as a weighing scale. The test interface **212** and display **216** are connected to a processor or controller (not shown) that executes diagnostic test operations using data acquired using the test interface **212**. In an illustrative example, the test interface **212** is a blood pressure cuff **213** for acquiring blood pressure measurements. A microphone **211** is attached to the blood pressure cuff **213** to measure a sound or audio signal. The touch
25 screen display **216** in the configuration as a user interface or keyboard is used to acquire patient data and other information from the user. The processor includes communication interfaces for communicating with the test interface **212**, the display **216**, and a remote terminal so that the health information kiosk **110** can be connected into a communication network (not shown). In some systems, the health care information system **100** includes a telephone handset **218** that a
30 user may employ to receive information from the health care information system **100** in privacy or for usage in telephone communication. Some versions of the health information kiosk **110** optionally include a printer **220** for printing test results, information materials, advertisements, coupons, and the like.

The illustrative test interface **212** is a blood pressure cuff **213** with one or more pressure transducers (not shown) for acquiring blood pressure waveforms from the user. The pressure transducer has an electrical connection to the processor via the communication interface so that pressure waveform data is supplied to the processor. The processor executes a computerized blood pressure detection algorithm to produce highly accurate measurements of systolic and diastolic blood pressure, and mean blood pressure. The processor also analyzes the blood pressure waveforms to detect heart rate information.

The processor executes software programs including data analysis routines that produce highly accurate blood pressure and heart rate measurements. The health care information system **100** acquires other health care information from the patient and from various health care databases via network communication linkages to generate a full health appraisal. The health care information system **100** includes local storage and the network communication link to external storage resources to allow a user to access pertinent health care information. For example, the health care information system **100** permits the user to access a full medication encyclopedia that lists pharmaceutical medications that are currently available on the market. A health care provider directory is accessible via the network interconnection, either on the kiosk or by an Internet connection, to enable the user to find area physicians, specialists, clinics, hospitals, health maintenance organizations (HMOs), and the like.

One example of a suitable display **216** is a high-resolution Active Matrix color touchscreen display. The display **216** is used to present menus and controls, as well as to present information including test results, measurements, health information such as seasonal health information. A text display shows text in one or more of various selected languages. Many other displays of various sizes, specifications, and utilizing various technologies are also suitable.

One example of a suitable test interface **212** is a blood pressure cuff **213** including a nylon washable exterior cuff with a seamless inner natural latex bladder that is inflated using a pneumatic power system. A suitable cuff size is 30x12.5 cm. The cuff can be constructed of medical grade silicone tubing that is non-reactive, and thus allergy-free, to body tissue. Cuff pressure is regulated by pressure monitors (not shown) that are inherently stable and are calibrated to function accurately with cuff pressure variations of less than +/-1% over a full operating range of systolic maximum pressure 250mm-Hg and minimum pressure 80mm-Hg, and diastolic maximum pressure 130mm-Hg and minimum pressure 38mm-Hg, a differentiation of 8 points between systolic and diastolic pressure, and a heart rate from 38 to 200bpm. The monitors use automatic zero pressure variations to prevent accuracy from being affected by

altitude level or other changes in atmospheric pressure, temperature, and humidity. The exemplary test interface **212** also detects sound signals for usage with Korotkoff sound detection. Both pressure signals and sound signals are converted to digital form and transmitted to the processor to perform blood pressure measurements using both oscillometric and auscultatory analysis. The pressure and sound signals can be processed to determine heart rate measurement using a beat-to-beat averaging method. In some examples, tests are activated using a touch screen in which a virtual green start button initiates a test procedure by inflating the cuff positioned about the patient's arm. Touching the display screen halts the test and returns the pneumatic cuff to the open position. Various other specifications, materials, and technologies or combinations of technologies that are known by those having ordinary skill in the art are also suitable.

An illustrative measurement interface **222** is a weighing scale formed into a moveable seat **224** that is attached to the health information kiosk **110**. The seat scale has accuracy within one pound. In some systems, the seat **224** of the health information kiosk **110** is moveable so that the test interface **212** and display **216** are wheel-chair accessible and easily used by the disabled without assistance.

Referring to **FIGURE 4**, a schematic block diagram shows functional elements of a blood pressure measurement operation that can be performed by the health care information system. In an illustrative embodiment, a blood pressure measurement routine **400** is implemented for usage on the digital signal processor **112** that operates in combination with control operations executed on the processor **106**. One suitable digital signal processor **112** is a 32-bit floating-point processor. Basis operating routines in the blood pressure measurement routine **400** that can be functionally divided into operating system functions **402** and measurement operations **404**. The operating system functions **402** include a basic integrity diagnostic routine **410**, a communications interface **412**, and a monitoring routine **414** for monitoring switch input signals and sensor data. The measurement operations **404** include a control routine **416** that controls cuff inflation and bleed cycles and a pulse rate measurement routine **418** to compute the blood pressure result. The measurement operations **404** return processing control back to the operating functions **402** to execute a limit checking routine **420** and a display routine **422** for displaying individual blood pressure measurements, or values associated with a combination of measurement values.

Referring to **FIGURE 5**, a schematic flow chart depicts suitable measurement operations **404** including the control routine **416** for controlling the blood pressure measurement. The control routine **416** inflates the blood pressure cuff **213** shown in **FIGURE**

2. The user presses a START button **502** on the health information kiosk **110**, sending a signal to the processor **106** to begin inflating the blood pressure cuff **213**. The control routine **416** initializes a pressure setpoint **504** to a common level of 160mm-Hg and starts a Pump-up cycle **506** that inflates the cuff bladder to the initial pressure setpoint. During the Pump-up cycle **506**, the pressure is increased at a controlled rate to avoid blood vessel compliance issues that could reduce measurement accuracy. Four pumping levels are used to attain a reduced or minimal pumping pressure level, thus reducing the noise level during detection of Korotkoff sounds. For example, if the Pump-up cycle **506** increases the pressure to 160mm-Hg as determined by a pressure limit test **508** and an audio test for Korotkoff sounds **510** does not sense a "silent" level, then the setpoint is first increased to 190mm-Hg **514** and the Pump-up cycle **506** gradually increases the pressure to 190mm-Hg. If the absence of Korotkoff sounds is not detected in function block **510** at pressures of 160mm-Hg and 190mm-Hg, the setpoint is set and tested for setpoints of 220mmHg and 260mm-Hg in function blocks **518** and **522**, respectively, as controlled by logic operations in blocks **512**, **516**, and **520**. If Korotkoff sounds are not eliminated even at a pressure of 260mm-Hg, then the test is aborted and an error message is generated in block **524**.

When the pressure is set to the setpoint, as determined by the cessation of Korotkoff sounds in block **510**, then a measurement initialization operation **526** initializes the blood pressure measurement parameters. A bleed rate is selected that is either a high bleed rate in operation **530** or a low bleed rate **532**, depending on the user's heart or pulse rate, as determined by logic operation **528**.

During a cuff bleed cycle **534**, the blood pressure measurement routine **400** gradually reduces pressure in the cuff **213** while executing three separate analysis operations **536** that analyze sampled data. In the illustrative blood pressure measurement routine **400**, the three test techniques including an auscultatory technique, an oscillometric technique, and a pattern recognition technique. In some systems, the three analysis operations are executed sequentially. In other systems, the analysis operations can execute simultaneously or concurrently. For example, some systems may include multiple processors or may use multi-threading, multi-processing or superscalar processing techniques and the like to attain computational efficiencies.

The blood pressure measurement routine **400** supplies results from the three separate analysis techniques to an operating system **502** executing in the processor **106** which executes a limit checking operation **538**, a blood pressure calculation operation **540**, a display operation **542**, and an end operation **544**.

The multiple separate analysis operations **536** are performed by the test interface **112** depicted in a block diagram shown in **FIGURE 6** in which an auscultatory interface **602**, an oscillometric interface **604**, and a pattern recognition interface **606** function in combination to improve the accuracy of a blood pressure measurement. The auscultatory interface **602** functions as a controlling measurement that determines diastolic and systolic pressure points from audio signals. The diastolic and systolic pressure points that are determined using the auscultatory technique **602** are used to define the sequence of the measurement cycle for the oscillometric technique **604** and the pattern recognition technique **606**. The measurement using the oscillometric technique **604** uses oscillations on a measured pressure waveform to locate systolic and diastolic pressures. The pattern recognition technique **606** employs pattern recognition to locate characteristic changes in the sound envelope to determine systolic and diastolic pressures.

Input signals to the test interface **112** include a sound signal from the microphone **211** located in the pressure cuff **213**, and a pressure signal which indicates cuff pressure. A pulse discriminator **700** shown in **FIGURE 7** extracts the user pulse signal directly from an output terminal of a pressure transducer (not shown) attached to the pressure cuff **213**. The pulse discriminator **700** extracts the user's pulse signal directly from the pressure signal produced by the pressure transducer. The pulse discriminator detects a pulse by monitoring variations in the pressure signal including the slope and the rate of change of the slope of the pressure signal.

Referring to **FIGURE 8**, a schematic block diagram illustrates a measurement cycle controller **800** that generates signals governing a measurement cycle based on sensed sound signals. Korotkoff sounds detected from the microphone **211** in the pressure cuff **213** control the measurement cycle. The measurement cycle controller **800** initially waits for first sounds. When the measurement cycle controller **800** detects the first sounds, a cycle begins. The measurement cycle controller **800** detects subsequent sounds and times the duration between sounds. When the duration between Korotkoff sounds is more than a selected duration, the measurement cycle controller **800** registers that a period of silence has occurred, which ends the measurement cycle.

Referring to **FIGURE 9**, a schematic block diagram shows a sample counter **900** that generates a sample count for marking event times. The sample counter **900** is synchronized by an external signal and maintains a sample count that is used by each of the auscultatory interface **602**, the oscillometric interface **604**, and the pattern recognition interface **606** to mark event times. The sample counter **900** marks the systolic and diastolic events for external displays.

Referring to **FIGURE 10**, a schematic block diagram shows an example of an
ascultatory analyzer **1000** such as a suitable ascultatory interface **602** (shown in **FIGURE 6**)
for measuring blood pressure using the ascultatory technique **602**. The ascultatory technique
602 determines systolic and diastolic pressures by using a microphone and signal processing to
5 detect an onset of Korotkoff sounds and a lapse of Korotkoff sounds. The ascultatory
technique **602** is similar to the manual technique that is conventionally used by health care
practitioners. The ascultatory interface **602** detects and stores the systolic and diastolic
pressures. The ascultatory interface **602** has an input terminal that connects to the microphone
211, a filter **604**, and a threshold detector **606**. The filter **604** has filter characteristics that are
10 similar to the characteristics of a stethoscope and operates by sorting sound components that
are characteristic of the Korotkoff sounds. The threshold detector **606** detects the presence or
absence of the Korotkoff sounds. To avoid false detection, the ascultatory interface **602**
employs sequential analysis techniques to detect false conditions.

The techniques for detecting Korotkoff sounds are well known the health care
15 practitioners having ordinary skill in the art. The ascultatory interface **602** implements the well
known manual ascultatory techniques using computer hardware and software techniques that
are well known to those having ordinary skill in the computer arts.

Referring to **FIGURE 11**, a schematic block diagram shows an example of a suitable
oscillometric interface **1100** for measuring blood pressure using an oscillometric technique.
20 The oscillometric interface **604** has an input terminal that is connected to the pressure cuff **213**
and receives the pressure signal. The oscillometric interface **604** monitors the pressure
oscillations in the pressure cuff **213**. The oscillometric interface **604** includes a peak detector
1102, an analog-to-digital converter **1104**, and a computation block **1106**. For a pulse, the
oscillometric interface **604** detects the peak pressure using the peak detector **1102**, determines
25 the amplitude of the pressure at the peak by sampling the pressure signal waveform using the
analog-to-digital converter **1104**. The oscillometric interface **604** saves the sampled peak
amplitude. The computation block **1106** averages the pressure measurements throughout the
pulse cycle. Upon determination of the mean pressure, the computation block **1106** uses an
empirical systolic ratio to find the systolic pressure pulse and associated cuff pressure. The
30 computation block **1106** then uses the diastolic pressure to subsequently find the diastolic pulse
and the cuff pressure associated with the diastolic pulse. Both systolic and diastolic
measurement techniques employ heuristic filtering techniques to ignore known pressure pulse
events that would otherwise produce erroneous results.

Referring to **FIGURE 12**, a schematic block diagram shows an example of a suitable pattern recognition interface **606** for measuring blood pressure using a pattern recognition technique. The pattern recognition interface **606** includes a first input terminal **1202** that is connected to the microphone **211** and a second input terminal **1204** that is connected to the pressure cuff **213**. The first input terminal **1202** is connected to a smoothing filter **1206**, a differentiator **1208**, pattern analyzer **1210**, and glitch logic **1211**. The pattern recognition interface **606** searches for a pattern recognition signature by first smoothing the audio signal from the distal microphone **211** using the smoothing filter **1206**, and using the differentiator **1208** to determine the second derivative of the audio signal, thereby magnifying a residual noise component of the audio signal. To affirm that a valid pattern recognition signature is found, the pattern analyzer **1210** searches for a characteristic asymmetric “W” pattern during the pulse interval. The negative edge of the pulse signal is delayed with the duration of the delay being indicative of validity and invalidity of the systolic pattern. The glitch logic **1211** includes J-K flip-flops **1212** and **1214** and is used to eliminate spurious match signals to verify that two consecutive match signals exist. The first J-K flip-flop **1212** latches the systolic pressure and sample count. The second J-K flip-flop **1214** latches the pressure and sample count for the last match that occurs. The diastolic pressure and sample count are updated for every match and correspondingly latch the pressure and sample count for the last match that occurs.

The pattern recognition interface **606** and technique use pattern recognition to determine sound signal characteristics that are highly correlated to intra-arterial measurements of systolic and diastolic blood pressure.

The multiple facets of the illustrative blood pressure measurement, including the auscultatory interface **602**, the oscillometric interface **604**, and the pattern recognition interface **606**, assure accuracy. Results of the three separate measurements are checked against a set of predetermined limit values and compared. The resulting numbers are used to calculate a mean systolic pressure and a mean diastolic pressure.

The test interface **112** uses digital signal processor technology to implement a multiple-method measurement technique. The test interface **112** uses the digital signal processor to simultaneously execute separate measurements in real time, but at a low cost, to permit a choice of the optimum measurement result. Furthermore, usage of the digital signal processor employs processing of digital signals rather than analog signal processing. Analog signal processing results in errors and spurious variation in measurement results due to variations in

environmental conditions. In contrast, digital signal processing is generally immune to environmental variations.

5 A health kiosk provides blood pressure testing, a health and fitness evaluation, and a medication encyclopedia. The health kiosk typically interfaces to a computer or server, such as a pharmacy computer or a remote server which compares pharmaceuticals selected by a user to information in the medication encyclopedia to determine compatibility for prescription medications and over-the-counter medications. In some systems, the kiosk also supplies one item or more of an extended health information, a weight scale constructed into the seat of the kiosk, a directory of health care service and product providers, an a directory of community health, support, and service groups.

10 The health services and information system delivers services in areas ranging from patient education, medical research, dispensing of counseling and health information, and disease state management to database centralization of pharmacist-owners' credentials. The health services and information system includes a network web site that supplies consumers with information about such topics as nutrition and fitness, women's and men's health, diabetes, asthma, HIV and other health conditions. Consumers also use the web site to locate a nearby pharmacy.

Health care screenings are integral to delivery of services since screenings clearly set forth a customer's goals and needs.

20 The health services and information system supports third-party prescription plans and uses a managed care network to contract for third-party business on behalf of its network of stores. The managed care network allows a retailer to compete on an equal basis with chains for third-party contracts. Otherwise, most independent retailers would be locked out of the third party contracts.

25 Along with increased buying power, franchisees have access to support services including a nationally coordinated marketing program with health care screenings. Although, only basic blood pressure testing is described, the health services and information system can additionally support more sophisticated evaluations including vision tests, and evaluations of cholesterol levels and body fat. For example, other tests that can be performed include colorectal cancer tests, blood glucose screenings, glaucoma tests, screening for foot fungus infections, and others.

Referring to **FIGURE 13**, a pictorial computer screen display illustrates a main menu screen 1302 that is initially presented when health services and information system software

120 is activated. The health services and information system software **120** is a program employing a graphical user interface to receive information from a user and to display selected display screens to the user. The graphical user interface of the health services and information system software **120** is generally a touch screen display in which various touch buttons are actuated when the user touches a defined region on the display screen. In one example, the main menu screen **1302** has several touch buttons including a blood pressure test button **1310**, a health risk appraisal button **1312**, a medication encyclopedia button **1314**, a health information selection button **1316**, a community directory button **1318**, a special coupons access button **1320**. The main menu screen **1302** further includes a vitamins and minerals selection button **1322**, a blood pressure history button **1324**, a weighing function request button **1326**, and a personal health site button **1328**. The main menu screen **1302** permits the user to touch a selection to begin multifaceted access to the health services and information system database. The main menu screen **1302** facilitates user access to information concerning the specific user's health, the local community, the business or businesses sponsoring the health information kiosk **110** executing the health services and information system software **120**.

When the user actuates the blood pressure test button **1310**, the health services and information system software **120** displays a blood pressure testing start screen **1400**, shown in **FIGURE 14A**, that instructs the user in performing a self-test of blood pressure. The blood pressure testing start screen **1400** includes a graphic **1402** that instructs the user to place an arm in the blood pressure cuff test interface **212** in an appropriate position. The blood pressure testing start screen **1400** also has soft buttons including an illustration button **1404** for displaying additional educational and instructional material regarding the blood pressure test procedure, a start button **1406** that initiates operation of the test interface **212** to begin acquiring data, and a main menu button **1408** that allows the user to return to the main menu screen **1302**.

The user places the left arm in the cuff as is shown on the display **216**, touches a virtual start button on the display screen and the health services and information system **100** controls the test interface **212** to perform a blood pressure measurement in conjunction with computation operations executed by the processor **106** and, in some systems, the DSP **112**. When the test is completed, the user touches a virtual touch print button to receive a printout of blood pressure results.

Pressing the start button **1406** actuates the test interface **212** to begin the blood pressure testing, typically by inflating the blood pressure cuff **213**, then gradually deflating the cuff while acquiring pressure and sound readings from the cuff. The sound and pressure

measurements acquired by the test interface **212** are sent to processors including a digital signal processor (not shown) and a central processor (not shown) which process the measurements to determine blood pressure using one or more techniques. A first technique is a conventional sound (auscultatory) method. A second technique is a conventional pressure (oscillometric) method. A third technique calculates blood pressure using a combination of sound and pressure measurements. In some systems, blood pressure samples are determined using all three of the auscultatory, oscillometric, and combination techniques. A complete blood pressure waveform is acquired for a plurality of heart cycles and stored in memory for analysis, allowing a determination of both systolic and diastolic blood pressure after cuff pressure is deflated. In an illustrative system, the digital signal processor is capable of executing thirty-five million operations per second, to permit analysis of approximately 6500 samples in a single blood pressure test. In some systems, the heart rate is determined using a beat-to-beat averaging technique.

Referring to **FIGURES 15A, 15B, and 15C**, graphic displays of pressure waveforms are depicted which show examples of data that is analyzed to perform blood pressure measurements. **FIGURE 15A** shows a Bell Curve of an actual blood pressure wave. **FIGURE 15B** shows a magnified section of the blood pressure waveform. **FIGURE 15C** displays a pressure waveform showing systolic and diastolic pressures.

When the blood pressure test is complete, the health services and information system software **120** displays a blood pressure testing end screen **1420**, shown in **FIGURE 14B**, that displays results of the blood pressure test. The blood pressure testing end screen **1420** includes a graphic **1422** showing results of the blood pressure test including systolic pressure, diastolic pressure, and heart rate. The blood pressure results display rates the measured systolic and diastolic pressures in relation to desirable and unhealthy rates. The blood pressure testing end screen **1420** has soft buttons including a store results button **1424** for storing the patient's results in the patient's individual database, a health care appraisal button **1426** which, like the health risk appraisal button **1312** of the main menu screen **1302**, generates a health care appraisal screen. The blood pressure testing end screen **1420** also has a main menu button **1408** that allows the user to return to the main menu screen **1302**. The blood pressure testing end screen **1420** has a print button that the user can actuate to generate a printout of the results for user record-keeping. In some systems an icon (not shown) may be supplied that allows a user to store history information to a personal secured database.

When the user actuates the health care appraisal button **1426** on the blood pressure testing end screen **1420** or the health risk appraisal button **1312** on the main menu screen **1302**,

the health services and information system software **120** generates and displays a health risk appraisal screen. The pictorial computer screen displays associated with a health risk appraisal function, include a health care appraisal questionnaire form **1600** for setting user parameters and a health care appraisal result screen **1620**, respectively shown in **FIGURES 16A and 16B**.

5 The health services and information system software **120** first displays the health care appraisal questionnaire form **1600** filled with any previously available information. Fields in which data has not been entered request updating. The user may update filled fields by actuating a display bar showing a value in the field. In the illustrative system, the health care appraisal questionnaire form **1600** displays the user's age **1602**, height **1604**, weight **1606**, gender **1608**,
10 frame size **1610**, exercise habits **1612**, and smoking habits **1614**. Additional fields may be added to the health care appraisal questionnaire form **1600** or a subsequent screen for setting additional conditions. The health care appraisal questionnaire form **1600** also includes a continue button **1616** for proceeding to additional questionnaire forms or for proceeding to the health care appraisal result screen **1620**.

15 The health care appraisal result screen **1620** shown in **FIGURE 16B**, displays results of the health risk appraisal including systolic pressure, diastolic pressure, heart rate, and appraisal ratings. The appraisal function is typically executed by the processor and combines blood pressure results, heart rate results, and answers to health-related questions to determine a health risk category for the user. The appraisal ratings include an appraisal score, a health
20 rating, and the health risk rating.

User information including test results, measurement results, analysis, and personal information, if authorized by the user, can be entered into a customer database for usage by sponsors of the health information kiosk **110**. The sponsors to attract user patronage of the kiosk and the sponsor of the kiosk may support a user rewards sign-up program.

25 The health care appraisal result screen **1620** has a main menu button **1630** that allows the user to return to the main menu screen **1302**, and has a print button which the user can actuate to generate a print-out of the results for user record-keeping.

The health risk appraisal operation is based on data made available by the U.S. government in combination with the user blood pressure results. The user answers questions
30 that are presented on the display **216**. The health services and information system **100** determines a health risk appraisal and presents the appraisal results on the display screen. The user can actuate a virtual print button **1632** on the display screen to print the results on the printer **220**.

Referring to **FIGURES 17A and 17B**, several pictorial computer screen displays exemplify a medication encyclopedia display function. When the user is accessing the main menu screen **1302** and actuates the medication encyclopedia button **1314**, the health services and information system software **120** displays a medication encyclopedia index screen **1710**,
5 shown in **FIGURE 17A**. In one example, the health services and information system **100** includes an encyclopedia of over 7500 over-the-counter and prescription medications. The encyclopedia specifies directions for using the medications, side effects, proper and improper usage, and other pertinent information. The medication encyclopedia index screen **1710** includes a plurality of touch buttons in the form and arrangement of a virtual keyboard to allow
10 the user to enter the first letters of a particular medication. In one example, when the user enters the first three letters of a medication, the health services and information system **100** displays the selected medication.

The medication information is supplied, for example, from the United States Pharmacopoeia leaflet patient version that is maintained as the information is regularly updated
15 in government documents.

FIGURE 17B depicts a medication entry screen **1712**, illustratively showing the description of an azatadine oral medication. The medication entry screen **1712** includes several touch buttons for accessing additional information relating to the medication. A first button (WHAT) **1714** is highlighted to signify that the display describes the medication. A second
20 button (TELL) **1716** describes usage for the medication. A third button (TAKE) **1718** relates common dosages or dosages for the particular user, as determined by information from health care providers of the user or from user information in the database of the health services and information system **100**. A fourth touch button (WARNING) **1720** describes warnings regarding usage of the medication. A fifth touch button (SIDE EFFECTS) **1722** informs the
25 user of any known side effects of the medication. A sixth touch button (View Another Drug) **1724** is used to return to the medication database to select additional medications that are commonly used for the same purposes as the accessed medication. A seventh touch button (DRUG INTERACTION) **1726** is accessed to determine whether the medication taken in combination with any of the user's current medications will cause adverse reactions. An EXIT
30 touch button **1728** allows the user to return to the main menu screen **1302**.

When the user actuates the seventh touch button (DRUG INTERACTION) **1726**, a number keyboard is displayed to permit the user to enter a PIN number that protects the users private information database. The user first selects an over-the-counter product that is considered for usage and actuates the seventh touch button (DRUG INTERACTION) **1726**

from the medication encyclopedia. The user enters a personal identification number (PIN). The health services and information system software **120**, typically executing on the processor, checks the pharmacy database and generates a response of either: (1) Interaction, Please see the Pharmacist, or (2) No Interaction - Use Allowed. After the search is completed, information is
5 made accessible to the local pharmacist. The pharmacist collects a file of customers and interactions that are checked in subsequent references. A warning screen may be displayed.

Referring to **FIGURES 18A and 18B**, pictorial computer screen displays exemplify a health information display function. When the user is accessing the main menu screen **1302** and actuates the health information selection button **1316**, the health services and information
10 system software **120** displays a health information menu screen **1810**, shown in **FIGURE 18A**. The health information menu screen **1810** allows the user to link to various information sites relating to health care. Typically accessed entries are viewed and printed by the user, if desired. Many sites include color graphics and full motion video. The accessible selections can include standard entries or can be customized for a particular location of the health
15 information kiosk **110**. The illustrative health information menu screen **1810** includes touch buttons to access disease information **1814**, information relating to the human body **1816**, exercise and fitness information **1812**, food facts **1818**, and medical facts **1820**. **FIGURE 18B** depicts a disease screen **1830** that can be displayed when user actuates the touch button for the disease information **1812**. The disease screen **1830** includes touch buttons that the user can
20 actuate to receive information relating to a particular disease or affliction.

The health information is displayed in several formats including text, graphics, full motion video, and on-line information optioned via Internet. For sensitive information, the user can lift the telephone handset (not shown) to listen to the topics in privacy.

Referring to **FIGURES 19A, 19B, 19C, and 19D**, pictorial computer screen displays
25 illustrate a local community information display function. The community display generates a directory of local health care providers or medical facilities such as physicians, hospitals, emergency centers, crisis centers, and the like for display to a user. In addition to local health care providers and medical facilities, the health services and information system **100** also may generate entries that are regional, national, or international in scope, generally for providers of
30 services that are more wide-ranging in scope. The community display also stores and displays information relating to schools, colleges, churches, and other public or service facilities.

When the user is accessing the main menu screen **1302** and actuates the community directory button **1318**, the health services and information system software **120** displays a

community services menu screen **1910**, shown in **FIGURE 19A**. The community services menu screen **1910** allows the user to link to various information sites relating to health care. Typically accessed entries are viewed and printed by the user, if desired. Many sites include color graphics and full motion video. The accessible selections can include standard entries or
5 can be customized for a particular location of the health information kiosk **110**. The illustrative community services menu screen **1910** includes touch buttons to access a physician directory **1912**, a school directory **1914**, a hospital directory **1916**, a civic group's directory **1918**, and a support groups directory **1920**.

When the user actuates the support groups directory touch button **1920**, the health
10 services and information system software **120** displays a support groups menu **1930** that presents touch buttons for accessing directories of particular types of support groups. **FIGURE 19B** depicts an example of a support groups menu screen **1930** that is displayed when user actuates a touch button for alcohol and drug abuse programs from the support groups menu screen **1930**. The support groups menu screen **1930** includes touch buttons that the user
15 can actuate to receive information relating to various treatment programs for treating a particular disease or affliction. In the illustrative system, one of the touch buttons on the support groups menu screen **1930** is an alcohol and drug abuse touch button **1932**.

When the user actuates the alcohol and drug abuse touch button **1932**, the health services and information system software **120** presents an alcohol and drug abuse service
20 provider directory screen **1934**, an example of which is shown in **FIGURE 19C**. Entries in the alcohol and drug abuse service provider directory screen **1934** show the name, address, and telephone number of a listed alcohol and drug abuse service provider. The alcohol and drug abuse service provider directory screen **1934** has a cursor for pointing to a particular entry, an "up" button and a "down" button for scrolling through the list, and a "select" button for
25 selecting a particular entry that is designated by the cursor.

When the user selects an entry, the health services and information system software **120** displays a screen showing additional information relating to the selected group. **FIGURE 19D** shows a group screen for an alcoholics anonymous support group.

Using the community information display function, the user can obtain local and wide
30 ranging information in a list format. Alternatively, if the health services and information system **100** includes the telephone handset (not shown), the user can use telephone communication via the telephone handset to connect directly to the community service organization of interest.

The community directory supplies a listing of local services and information that give the user finger-touch access to communicate with local physicians, hospitals, or support groups directly from the kiosk. Although the community information screen is described as including local information, this description is made primarily to indicate that information is customized for particular local communities. The community information commonly also includes groups, individuals, or organizations that are national or international in scope.

The community listing directory typically includes a full listing for each entry. The health services and information system **100** also supports more extension coverage of a particular entry. For example, a health care provider, group, or other entity may arrange for one or more information pages or an expanded video presentation on the display **216**.

In some systems, a local bulletin board is supported and displayed on the health information kiosk **110** to supply information to employees of the organization supporting the kiosk. The bulletin board may be accessed via a selection on the community groups function or may be accessed in other ways.

Referring to **FIGURES 20A** and **20B**, pictorial computer screen displays illustrate a special coupons access display function. When the user is accessing the main menu screen **1302** and actuates the "Shopping Mall" business access button **1320**, the health services and information system software **120** displays a "Shopping Mall" business access menu screen **2000**, shown in **FIGURE 20A**. The "Shopping Mall" business access menu screen **2000** allows the user to access various advertisements, special offers, and coupons. Typically, accessed advertisements, offers, and coupons are viewed and printed by the user, if desired. The accessible selections can include standard entries or can be customized for a particular location and to support selected advertisers or clients associated with the health information kiosk **110**. The illustrative "Shopping Mall" business access menu screen **2000** includes touch buttons to access pharmacy items **2002**, groceries **2004**, household items **2006**, and mail order specials **2008**. **FIGURE 20B** depicts a grocery coupon screen **2010** that can be displayed when user actuates the touch button for the groceries **2004**. The grocery coupon screen **2010** includes touch buttons that the user can actuate to receive printed grocery coupons, advertisements, and special offers. The coupons and informational materials are printed on the printer **220** when requested by the user.

Coupons can be printed from the health information kiosk **110**, permitting point-of-purchase advertising and usage of seasonal specials. A mail-order program effectively expands the floor-space of a store using e-commerce by offering hundreds or thousands of additional

products or services that a customer can order directly from the health information kiosk **110**. The user can order the products or services directly from the health information kiosk **110** and arrange for purchased items to be made available for delivery at the kiosk location or delivered to the user. The "Shopping Mall" business access display function permits advertising using
5 full motion commercials and coupons at a fraction of the cost of other media sources. The health services and information system **100** also supports online ordering for supported clients.

The health services and information system software **120** generates similar screens for accessing informational and ordering materials for purchases of vitamin and mineral supplements via a vitamins and minerals selection button **1322**. Information on vitamins,
10 herbs, and minerals is available at a touch of the display screen. The information includes various remedies, studies, and documented interactions of concurrent remedies.

When the user actuates the blood pressure history button **1324**, the health services and information system software **120** displays a blood pressure history access screen **2100**, shown in **FIGURE 21A**, that allows protected access to the users blood pressure history information.
15 The blood pressure history is stored as a sequence of time and date entries in a memory accessed and written by the processor within the health information kiosk **110**. Entries are identified with a particular user and protected against access of others by usage of a PIN number or ID card. Upon identification of a user, the user can retrieve records from previous tests.

20 The blood pressure history access screen **2100** includes a numerical touch button pad that permits the user to enter an access number such as a social security number, a password, a PIN number, or the like. A system that utilizes personal identification numbers (PIN), the PIN number may be assigned according to a workplace (corporate) account, a store account at which the user is a customer, or a customer account assigned directly to the user.

25 In the illustrative health services and information system software **120**, the user enters a Personal Identification Number (PIN) and/or inserts an access card and enters a PIN number to access the blood pressure history data. Also in the illustrative system, local memory of the health information kiosk **110** stores the most recent ten results. The user may select any desired result or group of results, including statistics that are derived from the results.

30 Blood pressure test results for the patient are displayed in **FIGURE 21B**.

The health services and information system **100** collects and stores data for a plurality of users and generates overall average and trend information from the collective data, while

maintaining the privacy of individual users. Various parties may use the collective data to supply inventory information, marketing studies, business planning, and the like. For example, parties using the collective data may include the store or facility in which the health information kiosk **110** is located, suppliers of medications and supplements, health care

5 providers, insurers, and the like. Referring to **FIGUREs 22A, 22B, and 22C**, several schematic graphs are depicted which show collective user health data. **FIGURE 22A** shows a graph of health risk appraisal scores and data, according to gender, **FIGURE 22B** shows a graph of health risk appraisal value according to smoking habits. **FIGURE 22C** shows a graph of systolic and diastolic blood pressure. The illustrative graphs exemplify only a few of a

10 myriad of possible statistical displays that may be displayed, as is known by those having ordinary skill in the art.

The health services and information system **100** stores and categorizes data from a user according to identification number. Stored data can be accessed for usage by commonly available spreadsheet software programs for review or presentation. Data may be stored

15 according to identification number, data and time, or other arrangement.

Referring to **FIGURE 23**, an example of a table show a compilation of acquired samples of health care data that can be generated by the health services and information system **100**. The table is a compilation of the sequential transactions executed by the health services and information system **100** over a real time interval.

Referring to **FIGURE 24**, an example of a test printout **2400** shows data that can be produced by the health services and information system **100** for access by a user. The kiosk produces a personal waveform printout with a blood pressure result printout **2402** when the user actuates the print button on the blood pressure testing end screen **1420** to show the blood pressure result. A health risk appraisal result printout **2404** is generated by the health services

25 and information system **100** when the user actuates the print button from the health care appraisal result screen **1620**. A blood pressure history result printout **2406** is produced when the user actuates the print button from the blood pressure history access screen **2100**.

The user can actuate the Personal Health Site button **428** on the main menu screen **1302** shown in **FIGURE 13** to store and access a secure personal health history. The user

30 enters identifying information on a touch-screen display **2500**, shown in **FIGURE 25**, that is displayed following actuation of the Personal Health Site button **1328**. PIN numbers or other security measures secure patient information and prevent unauthorized access to confidential information.

In some systems, the user can be automatically connected to a proprietary web site after registration with the site. **FIGURE 26** is a schematic screen display that illustrates a registration form for a web site.

5 The user can actuate the weighing function request button **1326** on the main menu screen **1302**, shown in **FIGURE 13**, to activate the weight scale formed into the seat of the kiosk. The user reads the result from a weight measurement result screen **2700** shown in **FIGURE 27**.

10 A health care test kiosk includes a carrel body, a controller, a physiological test interface, a seat, and a weight scale. The carrel body supports a console housing and includes a support side panel forming a lateral side and extending beyond the console housing. The controller is housed within the console housing and includes a display and user interface. The physiological test interface is coupled to and supported by the carrel body on the support side panel. The physiological test interface is communicatively coupled to the controller for supplying physiological information to the controller for analysis and display. The seat is
15 coupled to the support side panel of the carrel body. The weight scale is coupled to and supported by the seat. The weight scale is communicatively coupled to the controller for supplying weight information to the controller for analysis and display in combination with the physiological data.

A seat assembly for use in a health care test kiosk includes a seat and a weight scale.
20 The health care kiosk includes a carrel body supporting a console housing and having a vacant knee-space beneath the console housing. The carrel body includes a support side panel forming a lateral side and extending beyond the console housing and the knee-space. The health care test kiosk further includes a physiological test interface coupled to and supported by the carrel body on the support side panel. The seat assembly includes the seat and the weight scale. The
25 weight scale is coupled to and supported by the seat, the weight scale being communicatively coupled to the controller for supplying weight information to the controller for analysis and display in combination with the physiological data.

A health care test kiosk includes a carrel body that supports a console housing and has a vacant knee-space beneath the console housing. The carrel body includes a support side
30 panel forming a lateral side and extending beyond the console housing and the knee-space. A physiological test interface is connected to and supported by the carrel body on the support side panel. A retractable seat is movably connected to the support side panel of the carrel body for

selective positioning in a location ranging from withdrawn into the knee-space beneath the console housing to extended completely from the knee-space.

A retractable seat assembly includes a retractable seat and a connector fixedly coupled to the retractable seat and capable of moveable coupling to the support side panel of the carrel
 5 body for selective positioning in a location ranging from withdrawn into the knee-space beneath the console housing to extended completely from the knee-space.

A method of fabricating the health care test kiosk includes forming a carrel body supporting a console housing and having a vacant knee-space beneath the console housing, and attaching a support side panel as a side of the carrel body. The support side panel forms a
 10 lateral side and extends beyond the console housing and the knee-space. The method further includes attaching a physiological test interface to the carrel body on the support side panel, and movably coupling a retractable seat to the support side panel of the carrel body for selective positioning in a location ranging from withdrawn into the knee-space beneath the console housing to extended completely from the knee-space.

Referring to **FIGURES 28A, 28B, 28C, and 28D**, four three-dimensional pictorial diagrams show various frontal views of a health care information kiosk **110**. **FIGURE 28A** illustrates a frontal view of the full health care information kiosk **110** with a retractable seat assembly **2812** in a enclosed position within the kiosk. **FIGURE 28B** illustrates a frontal view
 15 of the full health care information kiosk **110** with a retractable seat assembly **2812** in a withdrawn from the enclosed position with respect to the kiosk. **FIGURE 28C** shows a locking mechanism of the retractable seat assembly with the seat enclosed into the kiosk. **FIGURE 28D** shows the locking mechanism of the retractable seat assembly **2812** with the seat assembly in an extended position. The health care test kiosk **110** includes a carrel body **2810** and a moveable and retractable seat assembly **2812**.

The carrel body **2810** has an entry side panel **2814** and a support side panel **2818** that are opposing and connect at right angles to a back panel **2816**, forming three sides of a console housing **2808**. The console housing **2808** contains a health care test controller (not shown) with input interface **2817** and display **2819** that respectively control a test acquisition and display a test result. The console housing **2808** also includes a planar top panel **2820**
 25 connected at right angles to top edges of the entry side panel **2814**, the back panel **2816**, and the support side panel **2818**. The console housing **2808** also includes a planar bottom panel **2822** that forms a plane parallel to the plane of the top panel **2820** and is affixedly attached at a position medial to the top and bottom edges of the entry side panel **2814**, the back panel **2816**,

and the support side panel **2818**. The bottom panel **2822** is interposed at the medial position at a suitable height from the floor to allow sufficient vacant knee-space for a person seated on the seat assembly **2812**. The structure of the console housing **2808** is completed by a display panel **2824** that opposes the back panel **2816**, connects to edges of the top panel **2820** and the entry
5 side panel **2814**, connects to an edge and surface of the support side panel **2818**, and connects to a surface of the bottom panel **2822**. A portion of the bottom panel **2822** extends forward beyond the display panel **2824** to form a resting surface for the convenience of a user.

The support side panel **2818** extends forward beyond the forward edges of the display panel **2824** and the entry side panel **2814**. The support side panel **2818** supports a
10 physiological test structure **2826** that, in the present example, is a blood pressure test interface **2828**. The physiological test structure **2826** is moveable or positionable to permit testing of different sized users. For example, the illustrative physiological test structure **2826** is connected to the support side panel **2818** at a pivot point so that a test acquisition element, such as a blood pressure cuff, can be moved to various positions along a radius to allow testing of
15 users ranging from large adults to small children. The moveable or positionable characteristics of the physiological test structure **2826** are also useful for allowing test access to users in different positions. For example, a user in a wheel chair may position the seat assembly **2812** in the knee-space beneath the console housing **2808**, move the wheel chair into a position near the physiological test structure **2826**, and pivot the physiological test structure **2826** into a
20 suitable position for acquiring a measurement.

The support side panel **2818** has a mounting surface **2830** upon which is mounted a seat track **2832**. In the illustrative health care test kiosk **110**, the seat track **2832** is an elongated bar with a C-shaped cross-sectional form **2834**. The seat track **2832** extends longitudinally from front to back of the support side panel **2818** in a horizontal configuration so that the seat
25 assembly **2812** that is movably attached to the health care test kiosk **110** can move horizontally beneath the console housing **2808** and retracted forward from the console housing **2808**. The physiological test structure **2826** is positioned so that the seat assembly **2812** is clear from obstruction whether the seat assembly **2812** is enclosed beneath the console housing **2808** or extended from the console housing **2808**. A seat lock **2836** is also affixed to the mounting
30 surface **2830** of the support side panel **2818**, typically positioned near a forward portion of the seat track **2832**. The seat lock **2836** permits the seat assembly **2812** to be held firmly in place when a user is using the health care test kiosk **110**.

The illustrative seat assembly **2812** has a top horizontal planar support **2850** that is supported on a support side **2837** by a moveable connection to the seat track **2832** and

supported on an entry side **2839** by a fixedly attached seat support **2840**. The illustrative top horizontal planar support **2850** is shown as a planar, level panel that is generally in the form of a rectangle except with corners rounded on the entry side of the health information kiosk **110**. The top horizontal planar support **2850** serves as a brace for holding a weighing scale **2852** that
5 measures the weight of a user. In some systems, the weighing scale **2852** has a cable (not shown) that extends to the edge of the seat assembly **2812** through an aperture (not shown) in the support side panel **2818** to the console housing **2808**, then into the console housing **2808** to the health care test controller. The cable may carry data signals, control signals, and power. In some systems, the cable may carry data and control signals alone and be powered by a battery.
10 Some systems may communicate data and control signals using wireless techniques. Any combination of wired and wireless communication may be used.

A top seat panel **2838** is supported by the weighing scale **2852** and serves as a sitting surface for the user. The illustrative top seat panel **2838** has the form of a planar, horizontal panel or flat bench-top panel. The top seat panel **2838** in other examples may take various
15 other forms. For example, instead of a planar surface, the top seat panel **2838** may have a contoured top surface for comfort of the user.

In the exemplified seat support **2840** includes a side seat support **2842** and a front seat support **2844** that are firmly attached at an angle, such as a right angle, that supports the top seat panel **2838** in two dimensions. Top surfaces of the seat support **2840** lie in a single plane
20 and are fastened to the top seat panel **2838**. The seat assembly **2812** is removably and retractably attached to the carrel body **2810** by a moveable connector (not shown) that is firmly affixed to the top seat panel **2838** and movably connects to the seat track **2832**. The seat assembly **2812** is generally a suitable size to fit completely within the cavity beneath the console housing **2808** when the seat assembly **2812** is positioned in a withdrawn position.

In an illustrative example, the moveable connector is a horizontal bar (not shown) with a T-shaped cross-section so that the T-connector is movably held within the C-shaped cross-section of the seat track **2832**. In other suitable examples, the moveable connector may be a plurality of T-brackets (not shown) that are affixed at regular (or otherwise) intervals along the side of the top seat panel **2838**. In other examples, the seat track **2832** may include a
25 horizontally-disposed rod (not shown) that is disposed within one or more cylindrical hinges that are attached to the top seat panel **2838** and have a hollow cylindrical central lumen encasing the rod. A lock handle **2846** is attached to the seat assembly **2812** and is operated to engage the seat lock **2836**. Other moveable attachment structures that are known to one having
30

ordinary skill in the art may be used to movably connect the seat assembly **2812** to the carrel body **2810**.

An alternative structure may include more than one seat lock **2836** disposed at various positions on the support side panel **2818** to selectively hold the seat assembly **2812** at a plurality of positions. For example, one seat lock **2836** may be disposed near the forward edge of the support side panel **2818** to permit a large adult to sit a comfortable distance from the console housing **2808**. A second seat lock may be positioned a few inches back from the first seat lock to permit a smaller adult to more easily reach the console housing **2808**. A third seat lock may be positioned a few more inches back from the second seat lock to fit a child within the health care test kiosk **110**. A seat lock may or may not be positioned at an innermost location closest to the back panel **2816** so that the seat assembly **2812** may be fully enclosed into the health care test kiosk **110** to permit a user in a wheel chair to use the physiological test structure **2826**. An inner seat lock may be omitted in consideration of allowing a weaker user to withdraw the seat assembly **2812** without reaching beneath the carrel body **2810** knee-space and having to disengage the lock. Alternatively, an inner seat lock may be employed to prevent the seat assembly **2812** from inadvertently rolling from beneath the carrel body.

While the invention has been described with reference to various embodiments, it will be understood that these embodiments are illustrative and that the scope of the invention is not limited to them. Many variations, modifications, additions and improvements of the embodiments described are possible. For example, those skilled in the art will readily implement the steps necessary to provide the structures and methods disclosed herein, and will understand that the process parameters, materials, and dimensions are given by way of example only and can be varied to achieve the desired structure as well as modifications which are within the scope of the invention. Variations and modifications of the embodiments disclosed herein may be made based on the description set forth herein, without departing from the scope and spirit of the invention as set forth in the following claims.

In the claims, unless otherwise indicated the article “a” is to refer to “one or more than one”.

WHAT IS CLAIMED IS:

1 1. A test apparatus comprising:
2 an auscultatory analyzer (1000) that is capable of sensing and analyzing an audio
3 signal using Korotkoff sounds to determine a systolic pressure and a diastolic
4 pressure;
5 an oscillometric analyzer (1100) that is capable of sensing and analyzing oscillations
6 of a pressure signal to determine the systolic pressure and the diastolic
7 pressure;
8 a pattern recognition analyzer (1200) that is capable of sensing a pressure envelope
9 and analyzes the pressure envelope using a pattern recognition analysis by
10 monitoring the envelope pattern to locate characteristic changes, and
11 identifying systolic and diastolic pressures from the characteristic changes;
12 and
13 a comparison block (416) coupled to the auscultatory analyzer, the oscillometric
14 analyzer, and the pattern recognition analyzer that determines an optimal
15 systolic pressure result and an optimal diastolic pressure result based on
16 results from the auscultatory analysis, the oscillometric analysis and the
17 pattern recognition analysis.

1 2. A test apparatus according to Claim 1 further comprising:
2 a pulse discriminator (700) that is capable of sensing and analyzing an audio signal
3 including determining an audio signal slope and slope rate of change, the
4 pulse discriminator generating a pulse signal that is used by one or more of
5 the auscultatory analyzer, the oscillometric analyzer, and the pattern
6 recognition analyzer to define a measurement cycle that is used for analysis.

1 3. A test apparatus according to Claim 1 or Claim 2 further comprising:
2 a measurement cycle controller (800) that is capable of sensing and analyzing an
3 audio signal using Korotkoff sounds to determine a measurement cycle start
4 at a first Korotkoff sound and a measurement cycle end at a cessation of
5 Korotkoff sounds.

1 4. A test apparatus according to any of Claims 1-3 wherein:
2 the auscultatory analyzer includes a filter that sorts sound components of Korotkoff

3 sounds.

1 5. A test apparatus according to any of Claims 1-4 wherein:
2 the oscillometric analyzer senses a pressure pulse height, determines a mean pressure
3 and an empirical systolic ratio to find a systolic pressure pulse and associated
4 systolic pulse cuff pressure, and determines a mean pressure and an empirical
5 diastolic ratio to find a diastolic pressure pulse and associated diastolic pulse
6 cuff pressure.

1 6. A test apparatus according to any of Claims 1-5 wherein the pattern recognition
2 analyzer further includes:
3 an input terminal (1202) that is capable of being coupled to a microphone (211) for
4 detecting an audio signal;
5 a filter (1206) coupled to the input terminal that smoothes the audio signal;
6 a differentiator (1208) that magnifies a residual noise component of the audio signal;
7 and
8 a pattern analyzer (1210) that detects an asymmetric "W" pattern during a pulse
9 interval.

1 7. A test apparatus according to any of Claims 1-6 wherein the pattern recognition
2 analyzer further includes:
3 an input terminal that is capable of being coupled to a microphone for detecting an
4 audio signal;
5 a first latch (1212) that latches a systolic pressure and sample count; and
6 a second latch (1214) that latches a diastolic pressure and sample count.

1 8. A test apparatus according to any of Claims 1-7 further comprising:
2 a blood pressure cuff (213);
3 a pressure pump (506) coupled to the blood pressure cuff; and
4 a controller (106) coupled to the pressure pump for controlling pressure in the blood
5 pressure cuff.

1 9. A method of measuring blood pressure of a test subject comprising:
2 sensing an audio signal;
3 analyzing the audio signal using an auscultatory analysis of Korotkoff sounds to
4 determine a systolic pressure and a diastolic pressure;

5 sensing pressure oscillations;
6 analyzing the pressure oscillations using an oscillometric analysis; further including:
7 determining mean pressure, systolic and diastolic blood pressure from the
8 pressure oscillations; and
9 identifying systolic and diastolic pressures from the mean pressure, and
10 systolic and diastolic blood pressure;
11 sensing a pressure envelope;
12 analyzing the pressure envelope using a pattern recognition analysis including:
13 monitoring the envelope pattern to locate characteristic changes;
14 identifying systolic and diastolic pressures from the characteristic changes;
15 and
16 determining an optimal systolic pressure result and an optimal diastolic pressure
17 result based on results from the auscultatory analysis, the oscillometric
18 analysis, and the pattern recognition analysis.

1 10. A method according to Claim 9 further comprising:
2 comparing the parameters measured using the distinct measurement techniques,
3 determining mutually consistent limits for the distinct measurement
4 techniques, and rejecting measurement samples outside the determined limits.
5 Results produced by the distinct measurement techniques are combined to
6 quantify an optimal systolic pressure result and an optimal diastolic pressure
7 result.

1 11. A method according to any of Claims 9-10 further comprising:
2 analyzing the audio signal including:
3 determining an audio signal slope and slope rate of change;
4 detecting a pulse based on the audio signal slope and slope rate of change;
5 and
6 generating a pulse signal that is by used one or more of the auscultatory
7 analysis, the oscillometric analysis, and the pattern recognition
8 analysis to define a measurement cycle.

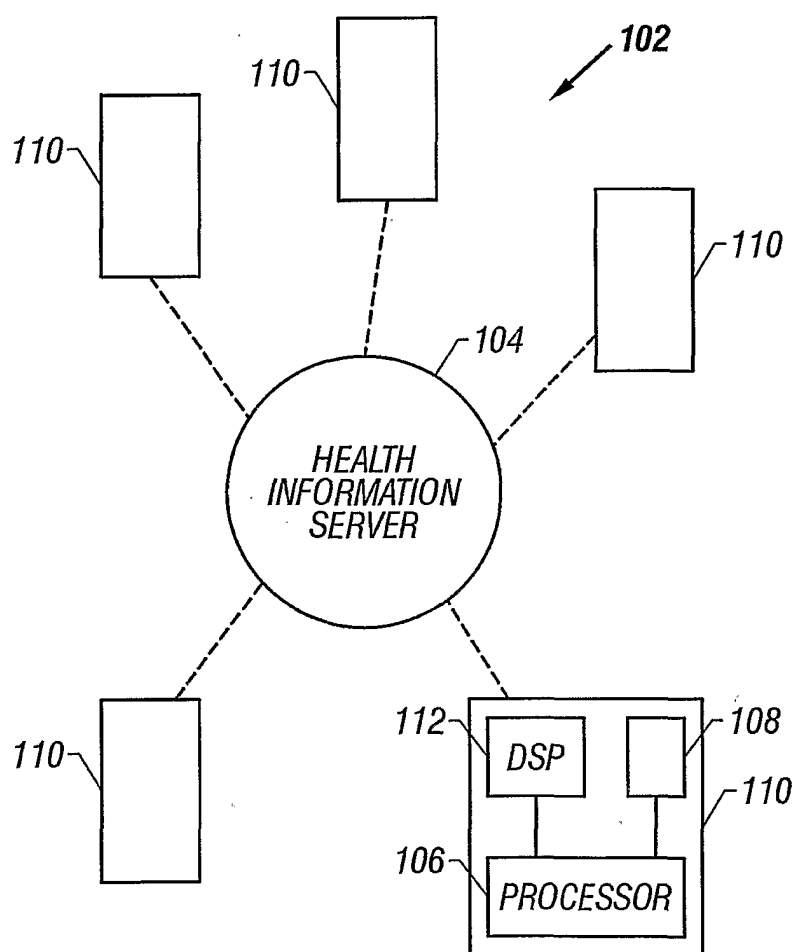
1 12. A method according to any of Claims 9-11 further comprising:
2 analyzing the audio signal using Korotkoff sounds to determine a measurement cycle
3 start at a first Korotkoff sound and a measurement cycle end at a cessation of
4 Korotkoff sounds.

1 13. A method according to any of Claims 9-12 further comprising:
2 filtering the audio signal;
3 sorting sound components of Korotkoff sounds in the audio signal.

1 14. A method according to any of Claims 9-13 further comprising:
2 sensing a pressure pulse height;
3 determining a mean pressure and an empirical systolic ratio to find a systolic pressure
4 pulse and associated systolic pulse cuff pressure, and
5 determining a mean pressure and an empirical diastolic ratio to find a diastolic
6 pressure pulse and associated diastolic pulse cuff pressure.

1 15. A method according to any of Claims 9-14 further comprising:
2 detecting an audio signal;
3 filtering the detected audio signal;
4 differentiating the audio signal to magnify a residual noise component of the audio
5 signal; and
6 detecting asymmetric "W" pattern during a pulse interval.

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**FIG. 1**

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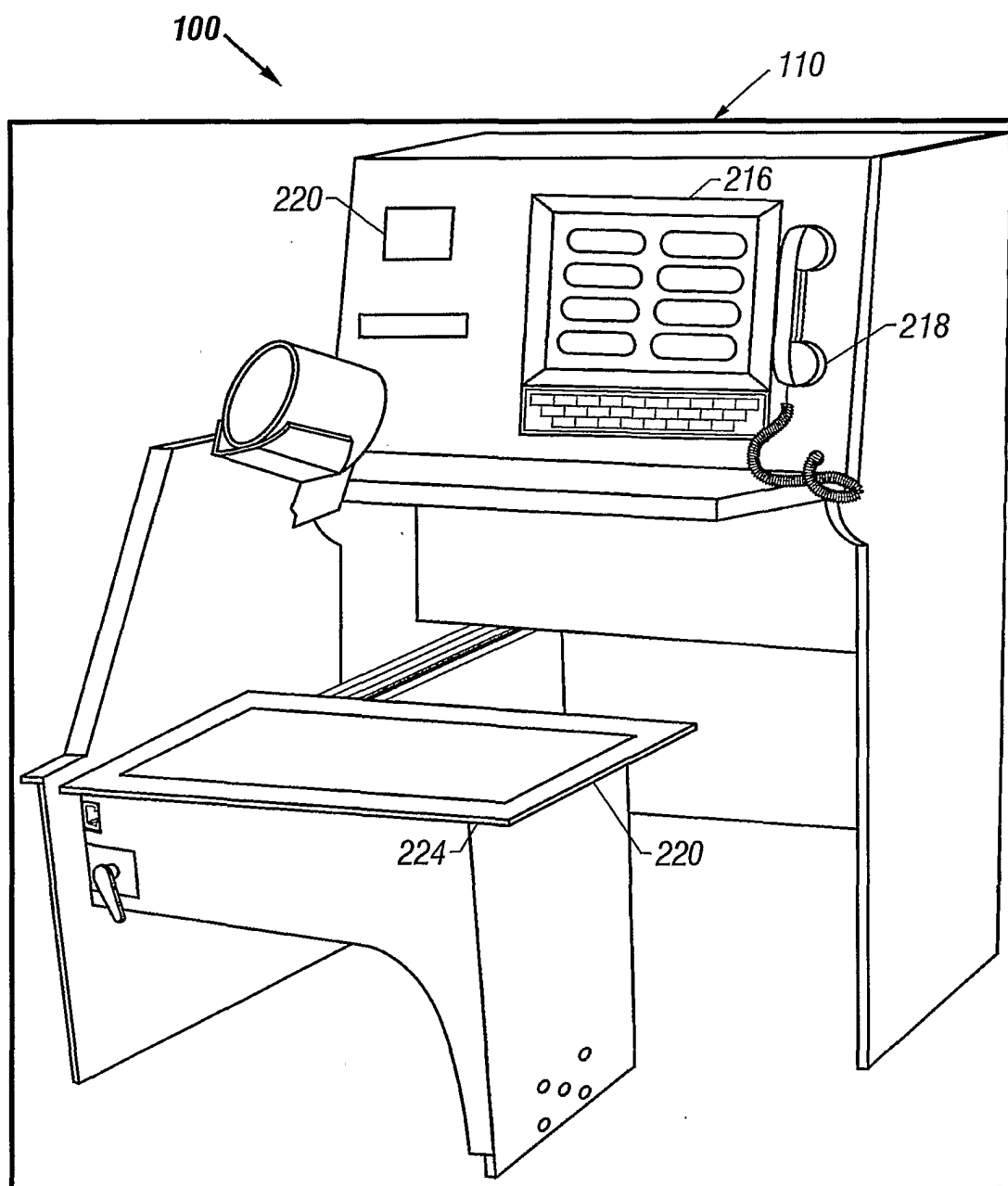


FIG. 2

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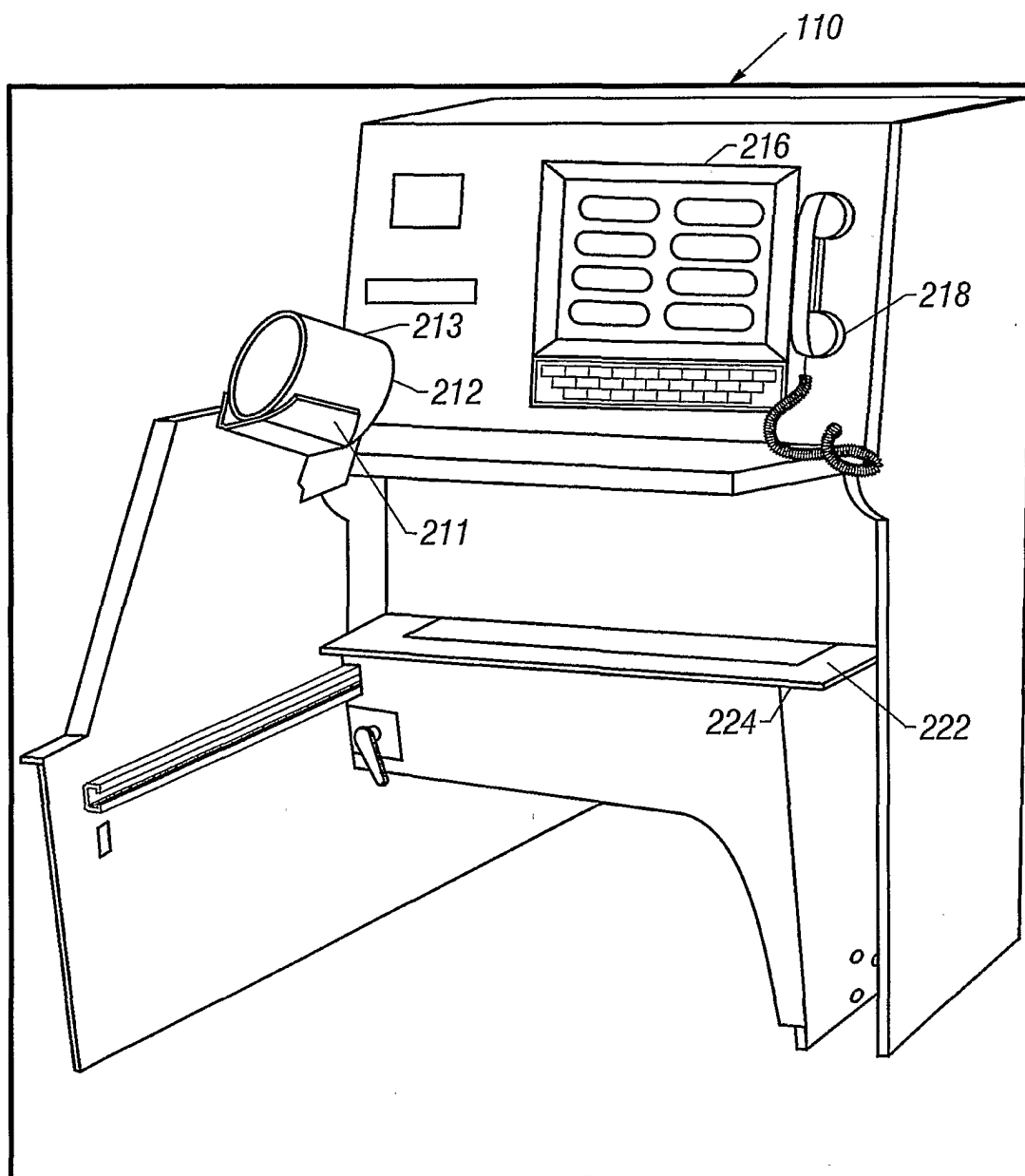


FIG. 3

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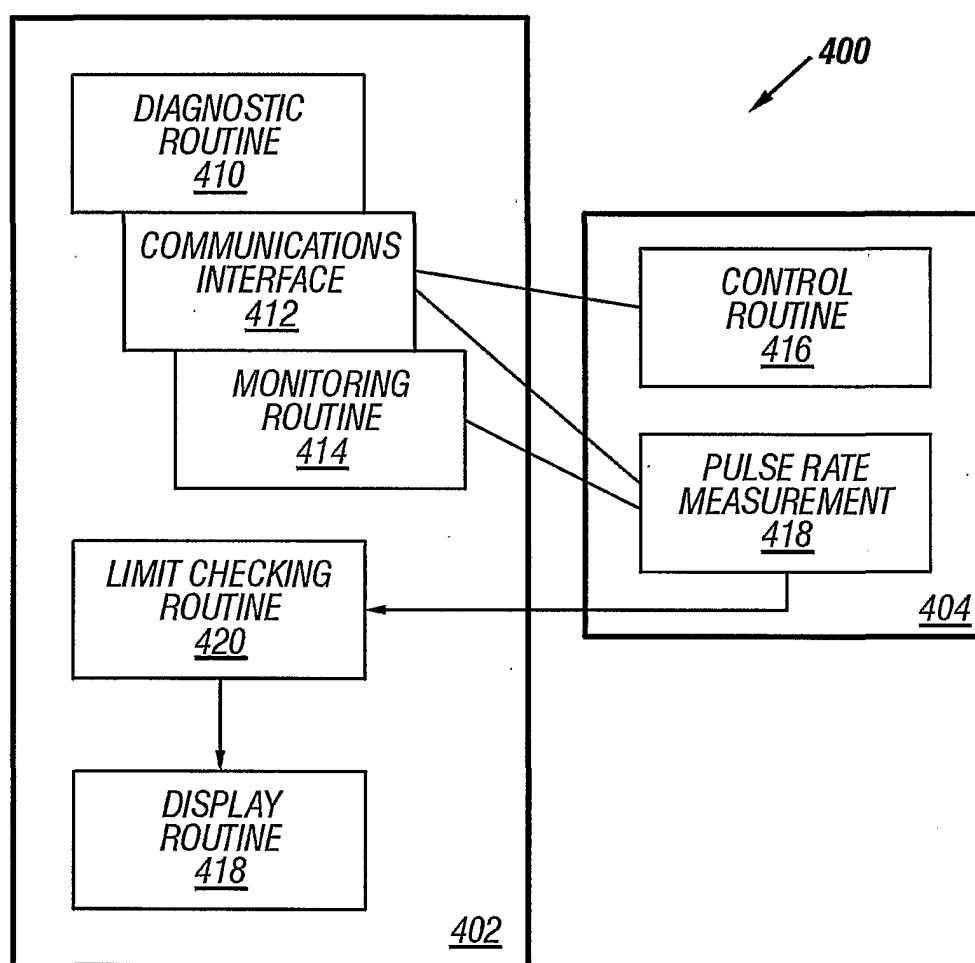


FIG. 4

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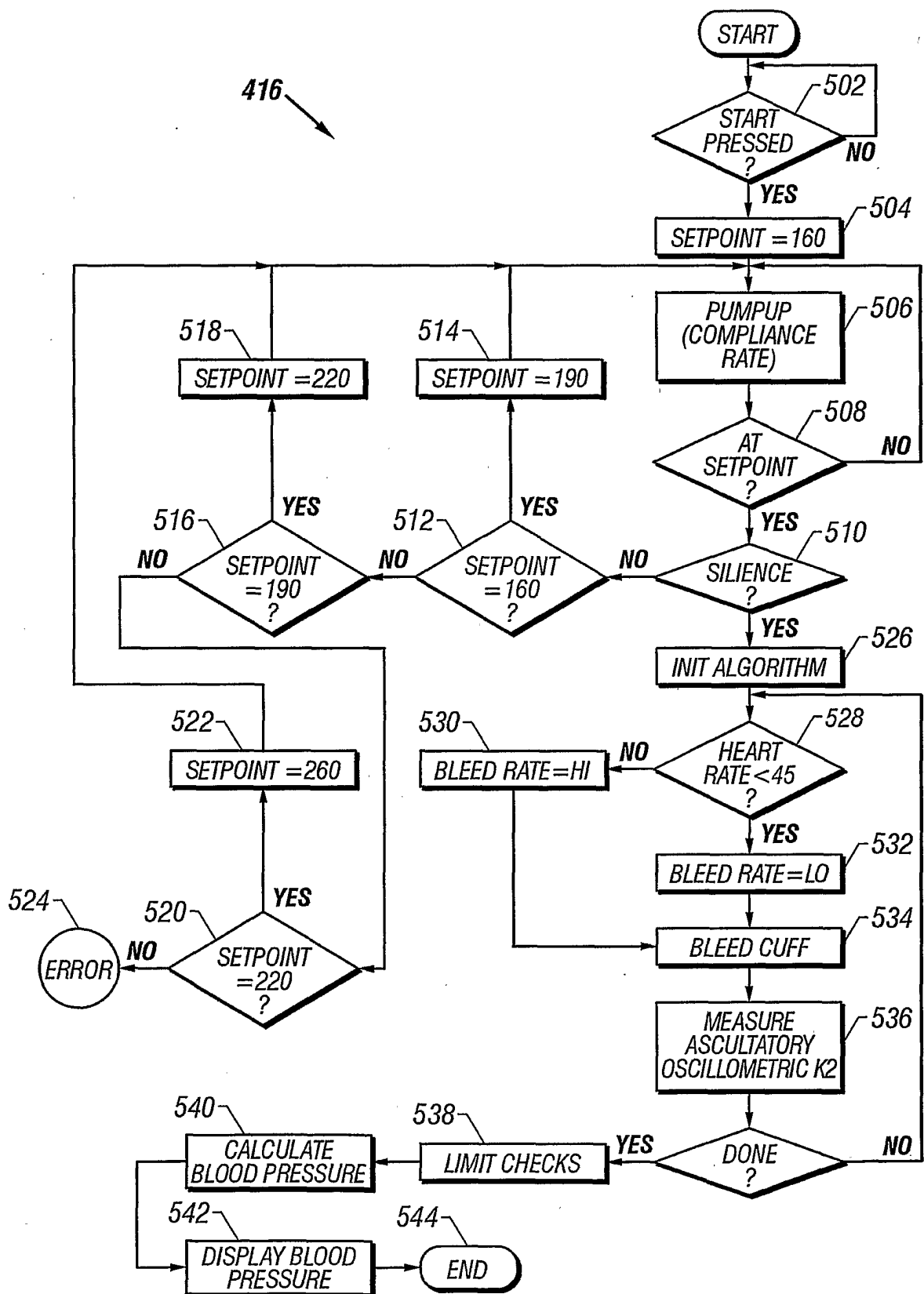


FIG. 5

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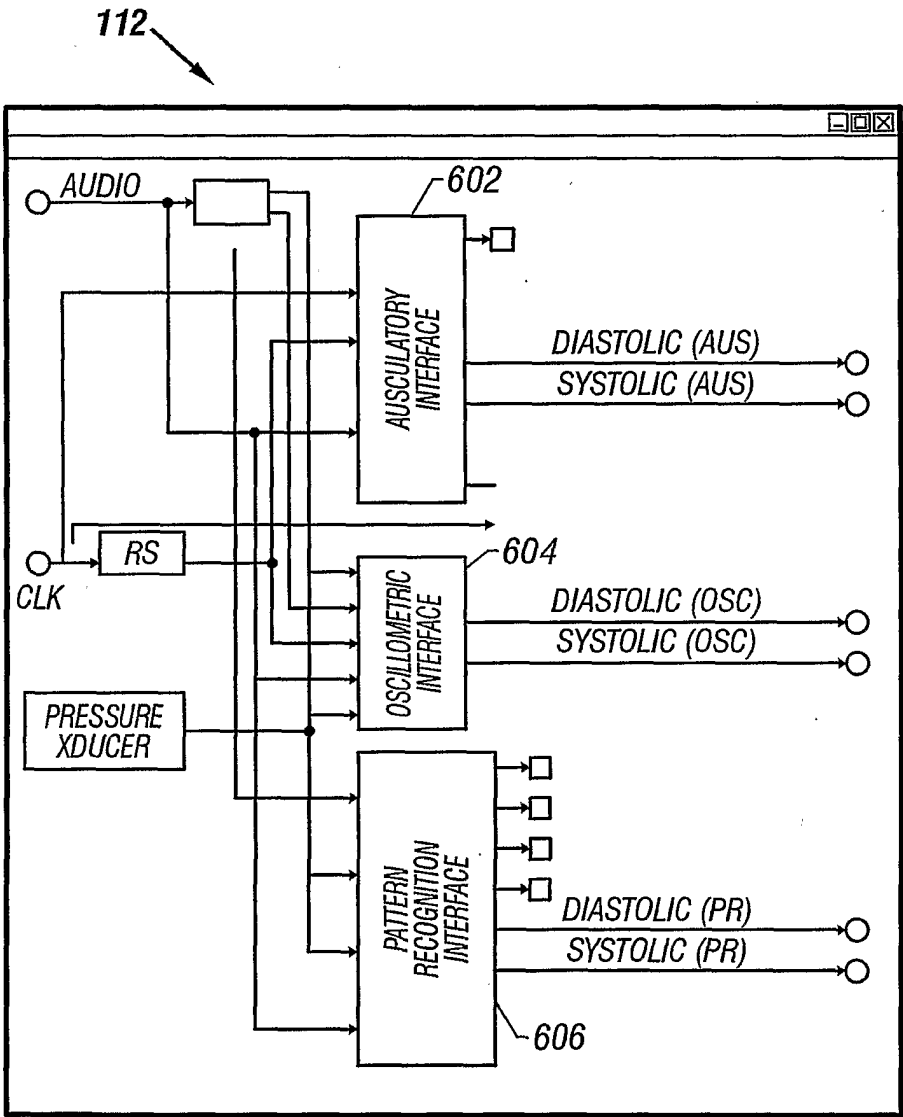


FIG. 6

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700

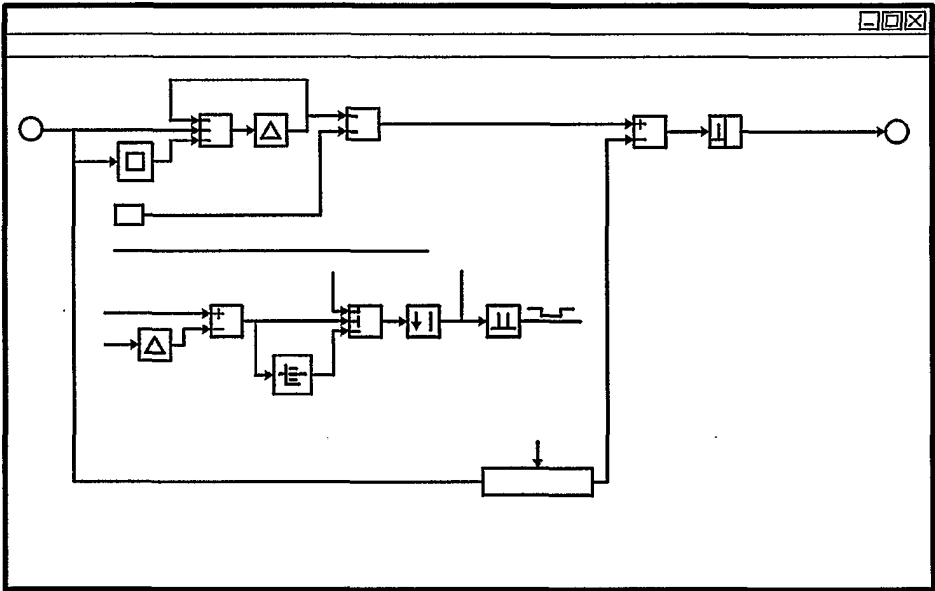


FIG. 7

800

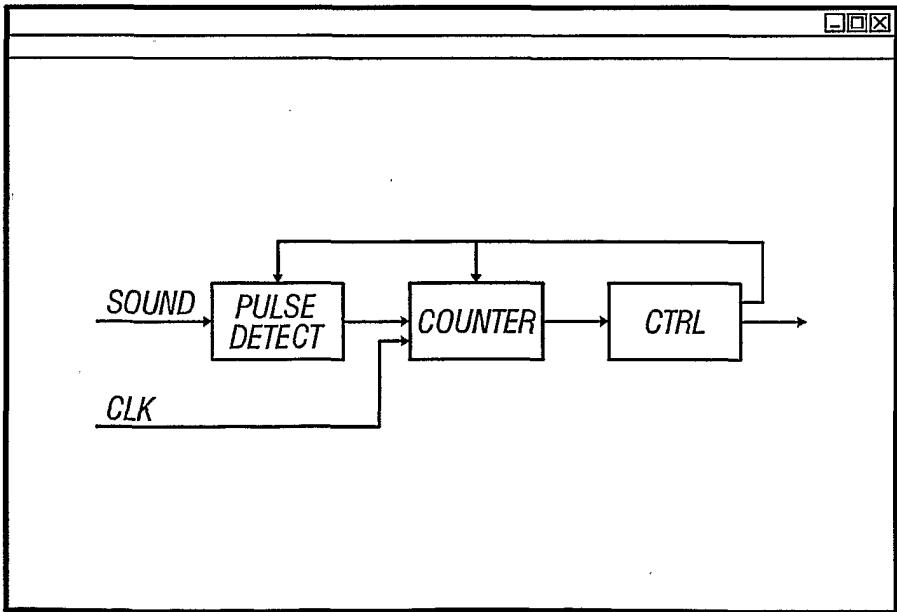


FIG. 8

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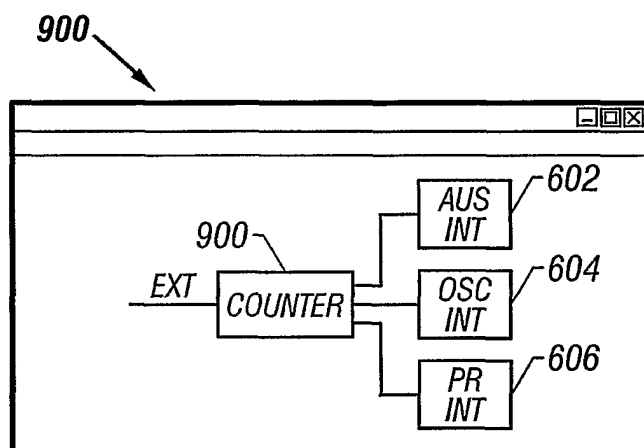


FIG. 9

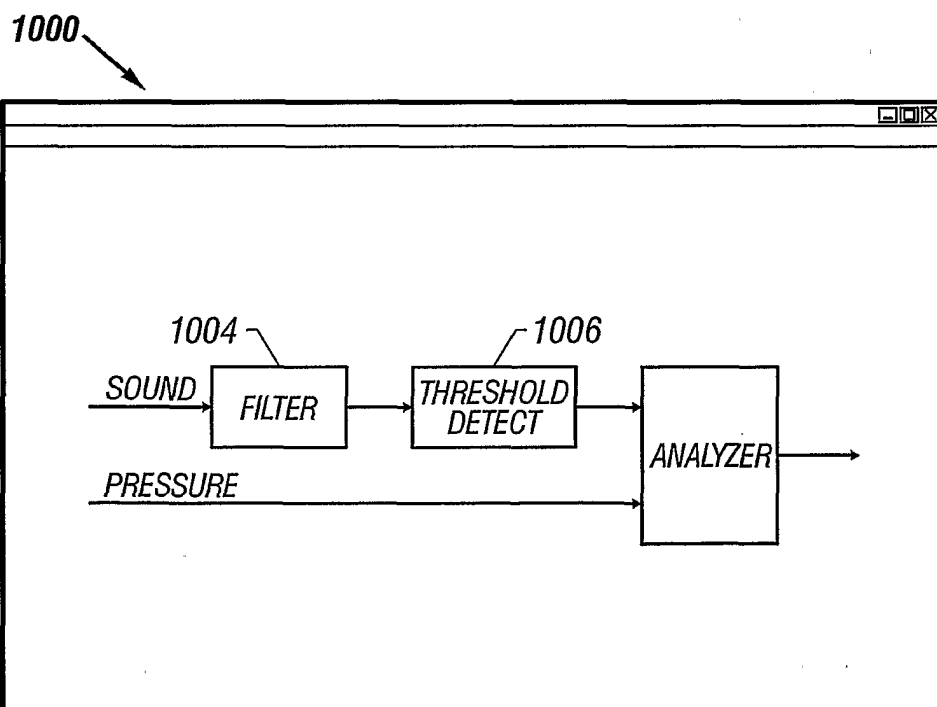


FIG. 10

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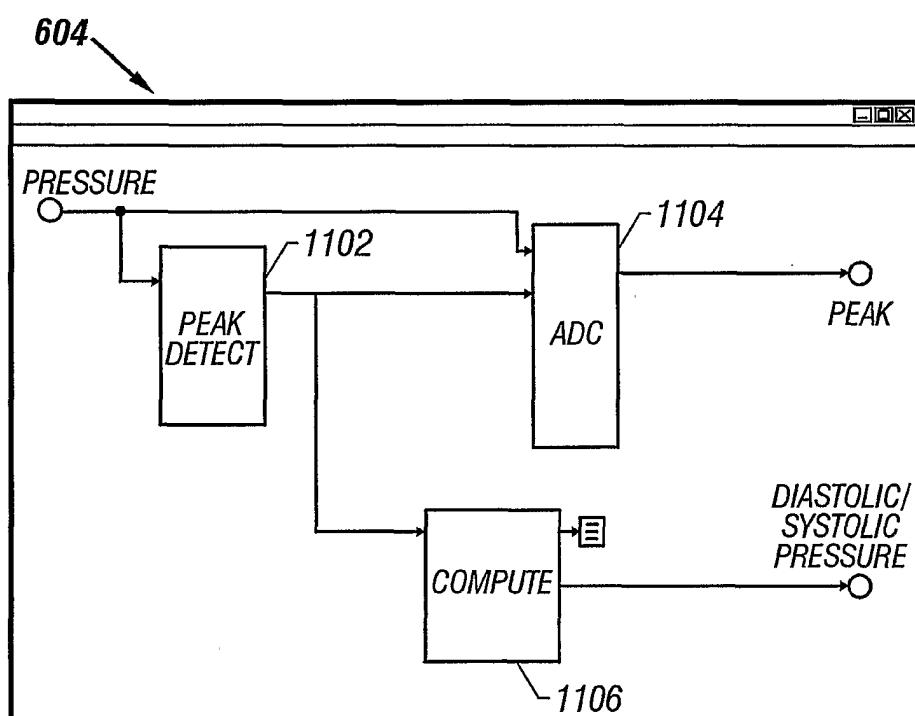


FIG. 11

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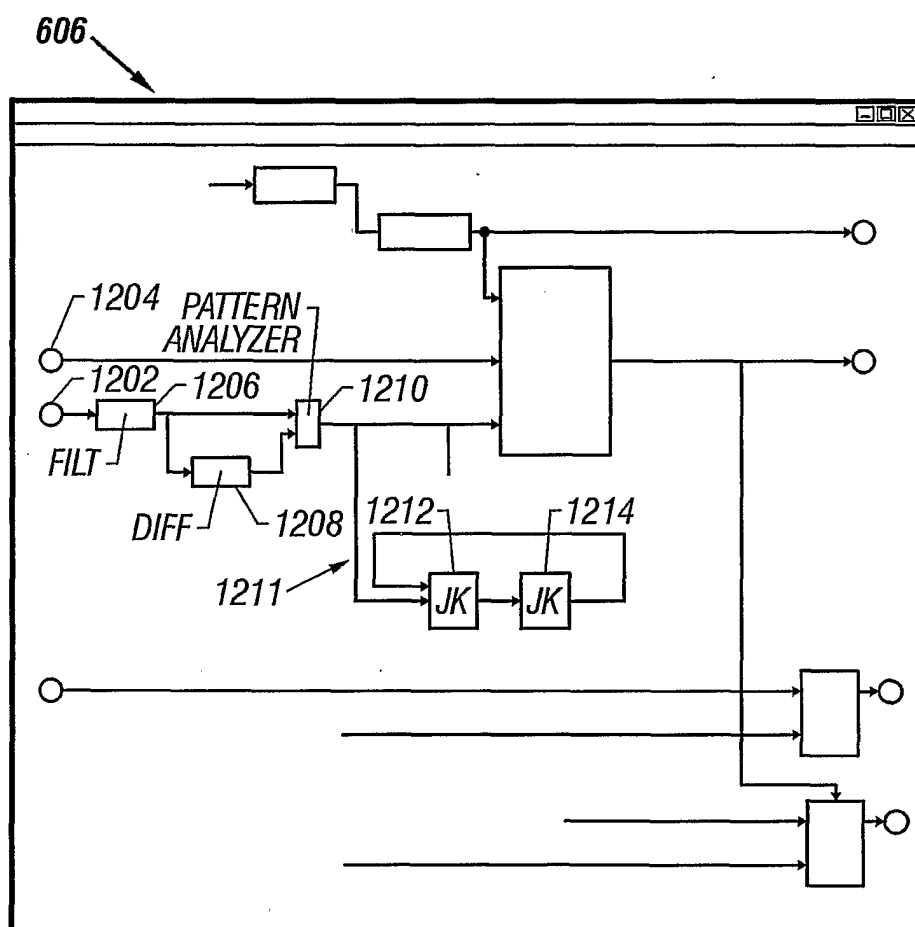


FIG. 12

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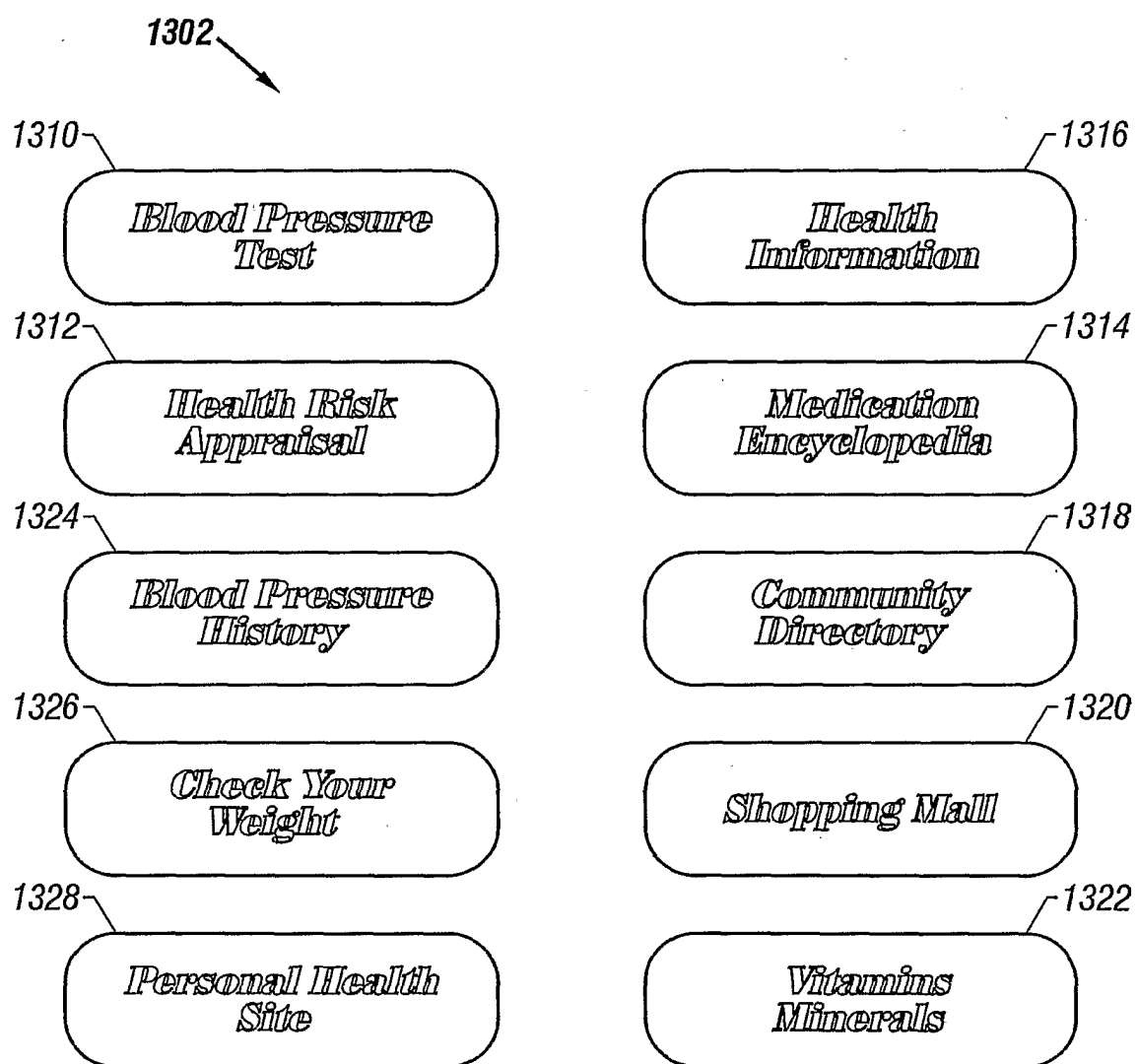


FIG. 13

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FIG. 14A

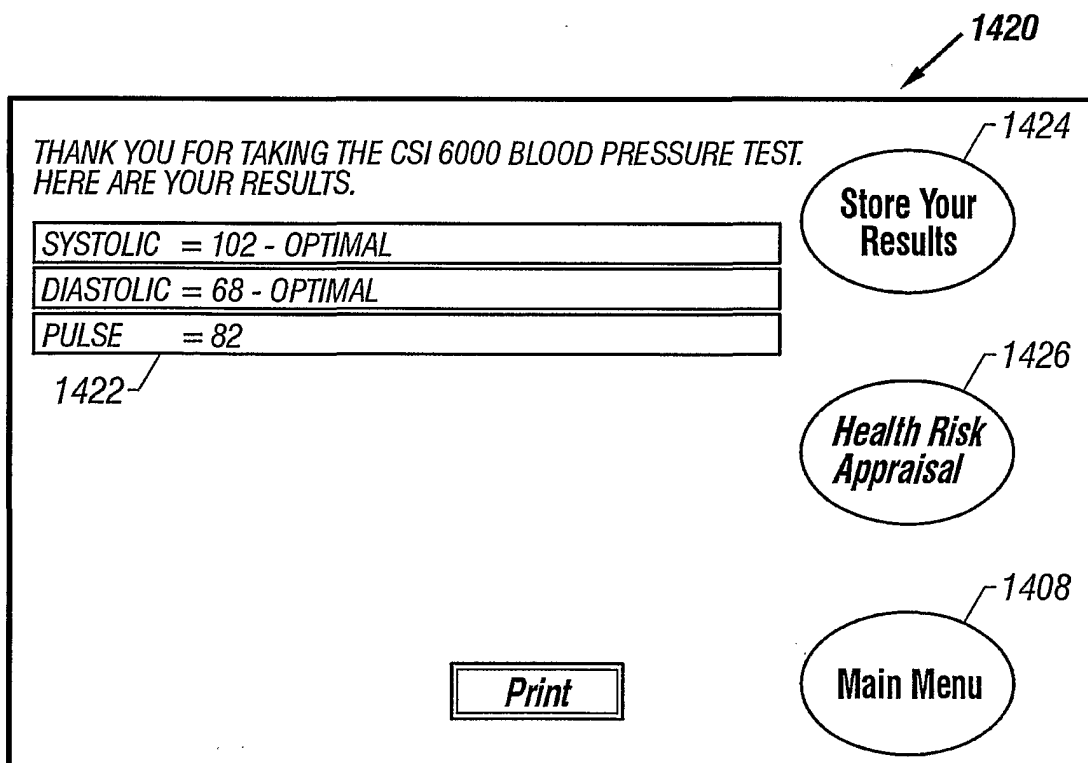


FIG. 14B

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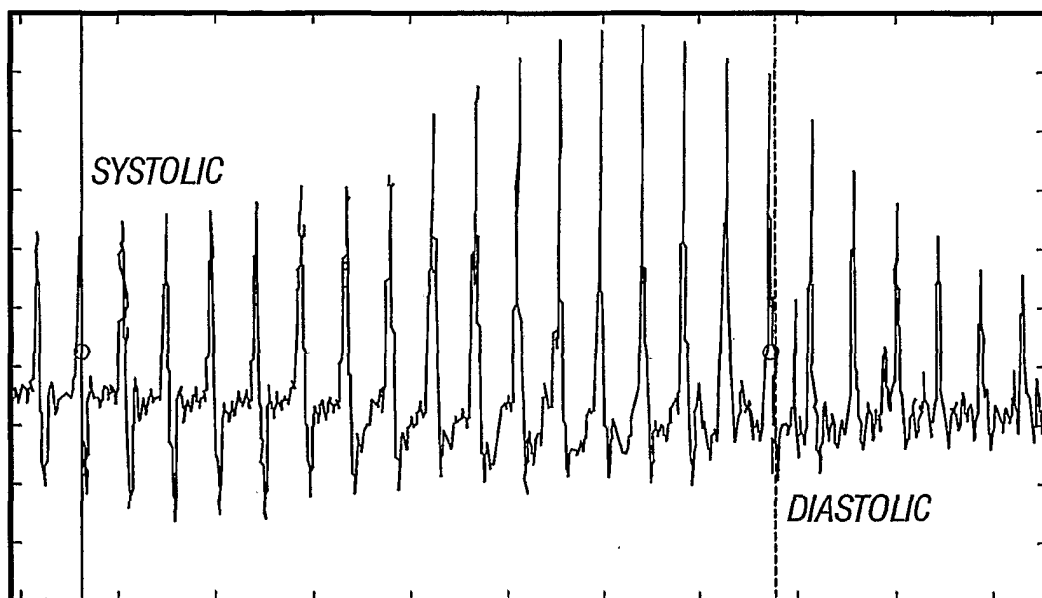


FIG. 15A

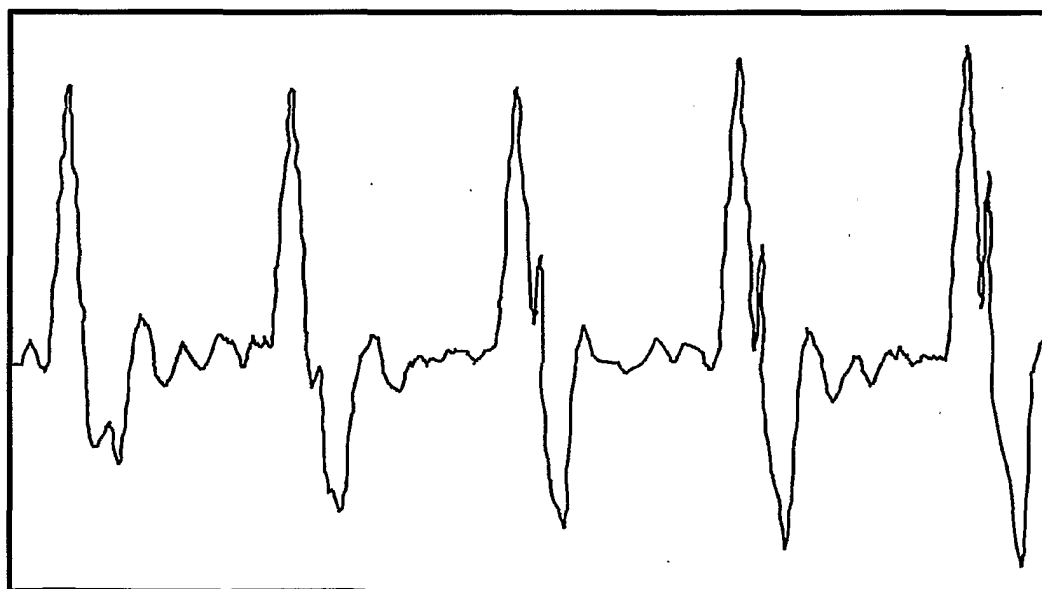


FIG. 15B

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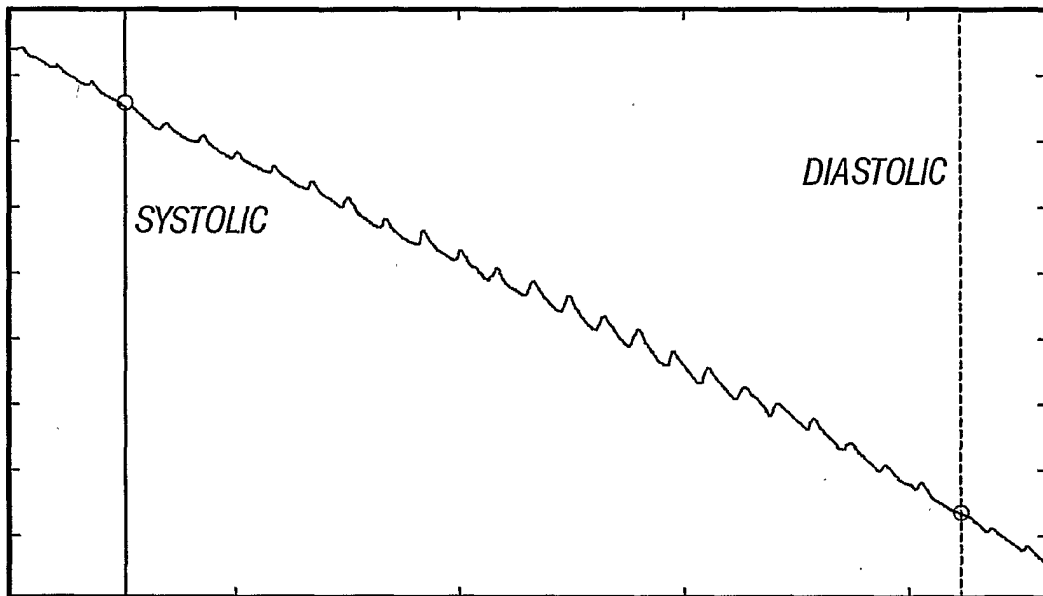


FIG. 15C

1600

BELOW ARE YOUR ANSWERS. IF YOU WISH TO CHANGE AN ANSWER, PLEASE TOUCH THE INCORRECT FIELD. IF THE ANSWERS ARE CORRECT, TOUCH CONTINUE TO PROCESS.

YOU ARE 31 YEARS OLD	1602
YOU ARE 5FT, 5IN. TALL	1604
YOU WEIGH 154 POUNDS	1606
YOUR SEX IS MALE	1608
YOUR FRAME SIZE IS SMALL	1610
YOU EXERCISE 11-20 MINUTES A DAY	1612
YOU ARE A NON-SMOKER	1614

1616

(CONTINUE)

FIG. 16A

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1620

HERE ARE YOUR BLOOD PRESSURE RESULTS
AND YOUR HEALTH RISK APPRAISAL RESULTS

SYSTOLIC = 85 - OPTIMAL
DIASTOLIC = 72- OPTIMAL
PULSE = 74
YOUR APPRAISAL SCORE IS: 102 YOUR HEALTH RATING IS: GOOD YOUR HEALTH RISK IS: SATISFACTORY

1630

1632

MAIN MENU

Print

FIG. 16B

1710

TACROLIMUS (INJECTION) -- INTRODUCTORY VERSION*
TACROLIMUS (ORAL) -- INTRODUCTORY VERSION*
TERAZOSIN (ORAL)
TERFENADINE AND PSEUDOEPHEDRINE (ORAL)
TERIPARATIDE (DIAGNOSTIC -- INJECTION)
TESTOSTERONE (TRANSDERMAL)
TETRACYCLINE PERIODONTAL FIBERS (DENTAL)
TETRACYCLINES (ORAL)
THEOPHYLLINE BRONCHODILATORS (ORAL)
THIAZIDE DIURETICS (ORAL)

VIEW
ANOTHER
DRUG

EXIT

FIG. 17A

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1712
1714
1716
1718
1720
1722
1724
1726
1728

WHAT

TELL

TAKE

WARNING

SIDE EFFECTS

VIEW ANOTHER DRUG

DRUG INTERACTION

EXIT

WARNING:

- IF YOU MUST TAKE THIS MEDICINE REGULARLY AND YOU MISS A DOSE, TAKE IT AS SOON AS POSSIBLE. HOWEVER, IF IT IS ALMOST TIME FOR YOUR NEXT DOSE, SKIP THE MISSED DOSE. DO NOT DOUBLE DOSES.
- DO NOT DRINK ALCOHOL OR TAKE OTHER MEDICINES THAT MAKE YOU SLEEPY.
- DO NOT DRIVE OR DO DANGEROUS JOBS IF THIS MEDICINE MAKES YOU SLEEPY.
- IF YOU THINK YOU MAY HAVE TAKEN AN OVERDOSE OF THIS MEDICINE, CHECK WITH YOUR DOCTOR.
- DO NOT GIVE ANY OF YOUR MEDICINE TO OTHERS. IT MAY HURT THEM.
- DO NOT LEAVE THIS MEDICINE WHERE CHILDREN CAN GET IT.

PRINT

DOWN

FIG. 17B

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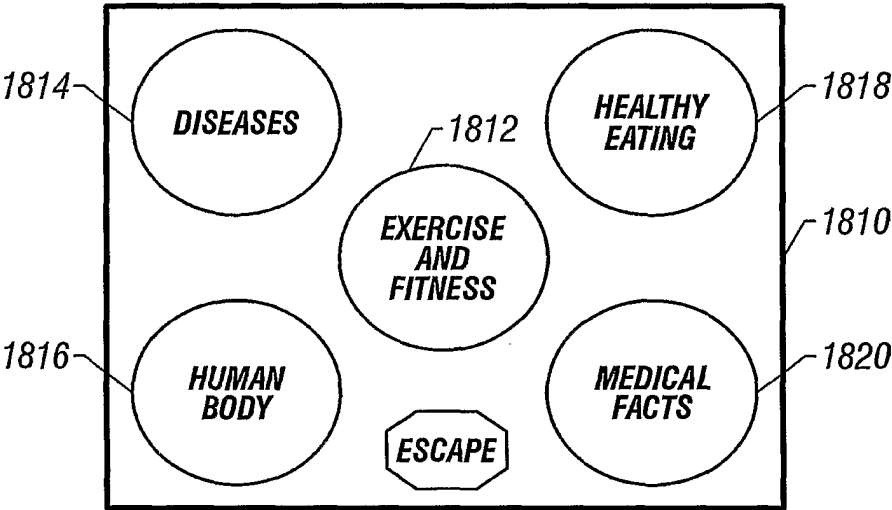


FIG. 18A

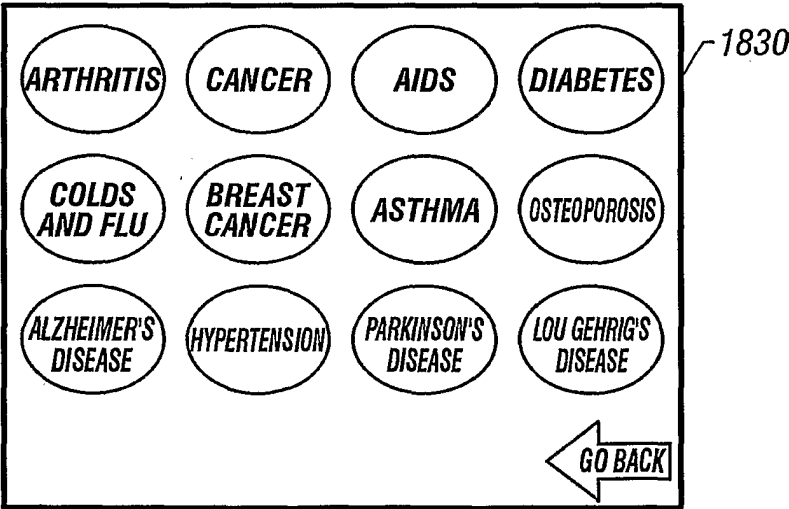


FIG. 18B

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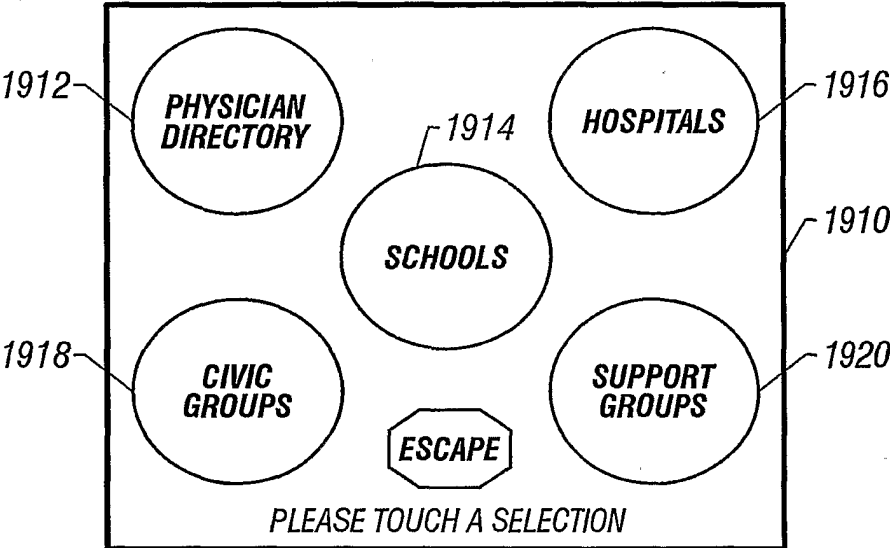


FIG. 19A

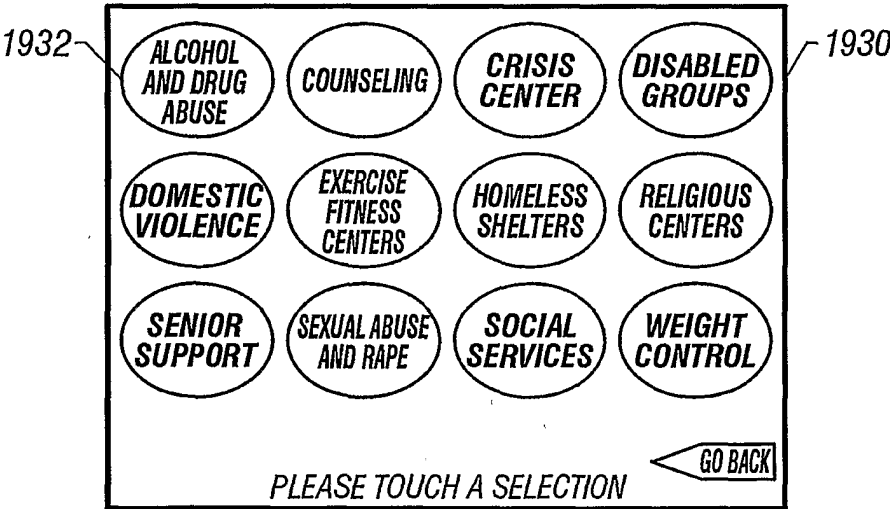


FIG. 19B

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UP		
A NEW CHOICE COUNSELING DUI PROGRAM	210 S. SIERRA	(702) 322-4500
AAA FRESH START	1016 N. ROCK BLVD.	(702) 358-1011
ACES DUI SCHOOL	975 RYLAND	(702) 329-5737
ALCOHOLICS ANONYMOUS	418 S. ROCK BLVD.	(702) 355-1151
ALPINE COUNSELING ASSOCIATES	505 S. ARLINGTON	(702) 786-7343
ASSOCIATED COUNSELING	676 FAIRVIEW Dr.	(702) 887-0577
BASIC RECOVERY ASSOCIATES INC.	1085 S. VIRGINIA	(702) 329-4771
BETTY FORD CENTER	39000 BOB HOPE DR.	800-854-9211
CAGE COUNSELING	P.O. BOX 50147	(702) 322-1697
CAPITAL CITY ALANO CLUB	1803 N. CARSON	(702) 884-0303
CARSON DETOXIFICATION CENTER	120 N. HARBIN AVE.	(702) 885-2727
CENTERS FOR BEHAVIORAL HEALTH	160 HUBBARD WAY	(702) 829-4472
CHOICES UNLIMITED	200 COURT ST.	(702) 324-5022
COMMUNITY COUNSELING CENTER	625 FAIRVIEW DR.	(702) 882-3945
EVERGREEN EVALUATION EDUCATION CENTER	955 S. VIRGINIA	(702) 324-0600
DOWN		GO BACK

PLEASE TOUCH A SELECTION

FIG. 19C

ALCOHOLIC ANONYMOUS
CENTRAL OFFICE/24 HOUR HOTLINE
355-1151
LOCATED AT 418 S. ROCK BLVD.
SPARKS
OFFICE HOURS ARE FROM 9:00 A.M. TO 5:00 P.M.
MONDAY-FRIDAY
THE MAIN OFFICE PROVIDES INFORMATION FOR ALL LOCAL
RENO/SPARKS AND EASTERN NEVADA AA MEETINGS.
THERE IS NO FEE OR APPOINTMENTS NECESSARY. THERE
ARE A TOTAL OF 210 MEETINGS IN EACH AREA. LOCATIONS
OF THESE MEETINGS ARE PROVIDED BY THE CENTRAL
OFFICE.

TOUCH HERE TO CALL ALCOHOLICS ANONYMOUS DIRECTLY.

AA SAMPLE

GO BACK

FIG. 19D

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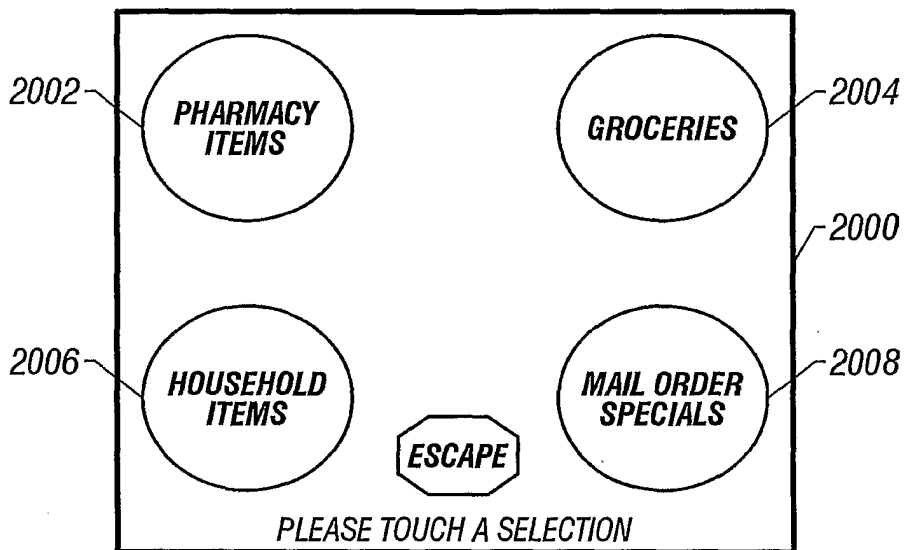


FIG. 20A

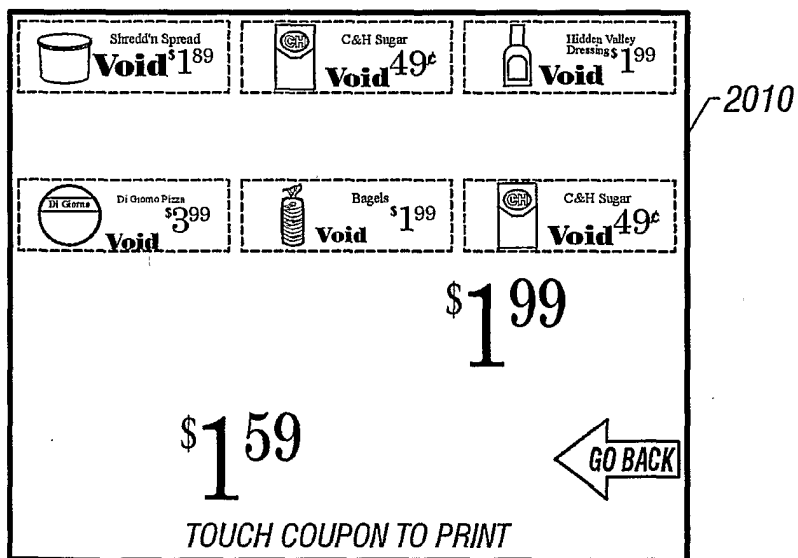


FIG. 20B

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TO RETRIEVE YOUR BLOOD PRESSURE HISTORY,
PLEASE ENTER YOUR SOCIAL SECURITY NUMBER.
TOUCH ENTER WHEN DONE

555-55-5555

1	2	3	Enter Escape
4	5	6	
7	8	9	
0	Clear		

FIG. 21A

BLOOD PRESSURE HISTORY FOR: 549-27-2771

SYSTOLIC	DIASTOLIC	PULSE	TIME	DATE	
109	81	96	11:18	04-08-00	
118	79	73	09:59	03-21-00	
120	79	62	12:04	01-29-00	
132	81	83	11:16	01-20-00	
133	73	81	10:52	01-20-00	
120	77	75	15:06	01-14-00	
138	99	74	10:22	01-07-00	PRINT
154	96	81	09:46	01-07-00	
140	84	94	09:25	01-07-00	
124	83	68	15:01	12-09-99	

Escape

FIG. 21B

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FIG. 22A

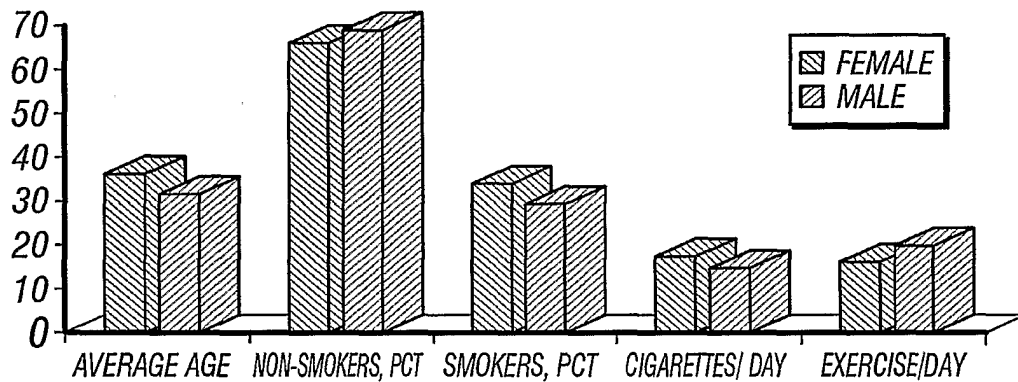


FIG. 22B

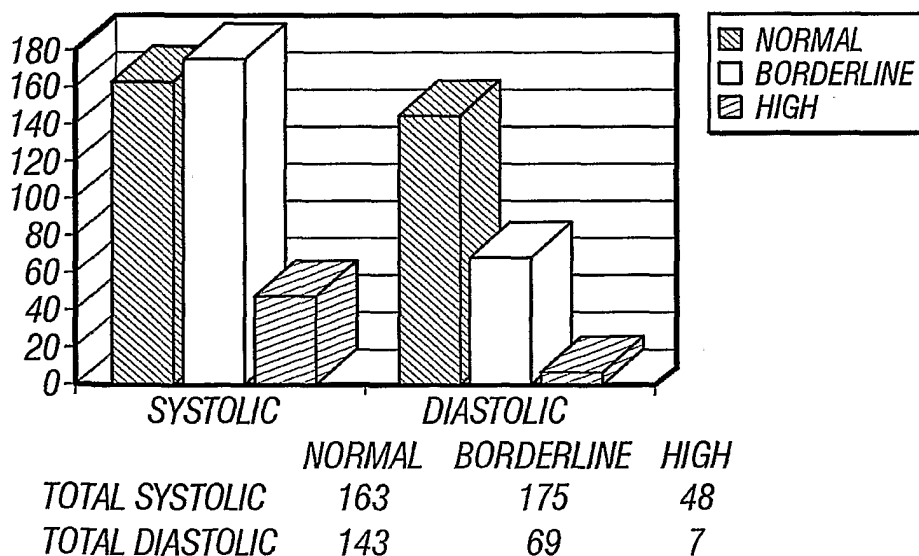


FIG. 22C

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Rec	Yr	Mo	Dy	Hr	Mn	Sy	Di	Pu	BPx	Sx	Ag	Ht	Wt	Ex	Sk	Fs	BPT	HRA	BB3	BB4	ET
1	96	11	11	20	29	107	69	57	1	0	0	0	0	0	0	0	1	0	0	0	1:20
2	96	11	22	22	43	97	66	75	1	0	0	0	0	0	0	0	1	0	0	0	1:10
3	96	11	5	20	22	112	66	76	1	0	0	0	0	0	0	0	1	0	0	0	0:59
4	96	11	5	20	21	106	66	82	1	1	22	68	135	2	1	1	0	0	0	0	1:47
5	96	11	5	20	29	119	67	79	1	0	0	0	0	0	0	0	1	0	0	0	0:52
6	96	11	5	20	25	118	66	83	1	0	0	0	0	0	0	0	1	0	0	0	0:54
7	96	11	5	20	23	118	64	92	1	0	0	0	0	0	0	0	1	0	0	0	0:53
8	96	11	20	1	16	108	68	72	1	0	0	0	0	0	0	0	1	0	0	0	1:26
9	96	11	24	17	59	117	69	86	1	0	0	0	0	0	0	0	0	0	0	0	1:15
10	96	11	26	18	39	111	77	83	1	0	0	0	0	0	0	0	1	0	0	0	1:32
11	96	12	3	16	45	104	69	64	1	0	0	0	0	0	0	0	0	0	0	0	1:15
12	96	11	24	13	43	114	72	66	1	1	48	72	180	3	1	2	1	0	0	0	3:03
13	96	11	18	18	7	113	69	80	1	0	0	0	0	0	0	0	0	0	0	0	1:17
14	96	12	4	0	26	111	69	81	1	0	0	0	0	0	0	0	1	0	0	0	1:19
15	96	12	2	1	50	103	66	89	1	0	0	0	0	0	0	0	1	0	0	0	1:36
16	96	11	25	2	49	111	71	71	1	0	0	0	0	0	0	0	1	0	0	0	1:34
17	96	11	20	16	59	111	67	74	1	0	0	0	0	0	0	0	1	0	0	0	1:32
18	96	12	1	2	10	118	77	57	1	0	0	0	0	0	0	0	1	0	0	0	0:59
19	96	11	17	2	4	116	72	83	1	0	0	0	0	0	0	0	1	0	0	0	1:01
20	96	11	16	20	47	111	73	74	1	1	30	72	216	3	1	3	1	0	0	0	2:03
21	96	11	20	13	21	109	69	81	1	1	30	72	215	3	1	3	1	0	0	0	1:59
22	96	12	4	8	25	93	72	68	1	0	0	0	0	0	0	0	0	0	0	0	1:18
23	96	12	2	2	9	116	72	77	1	0	0	0	0	0	0	0	1	0	0	0	1:01
24	96	11	21	14	26	84	67	0	1	0	0	0	0	0	0	0	0	0	0	0	0:59
25	96	11	13	15	51	119	69	63	1	1	30	72	215	3	1	3	1	0	0	0	2:23
26	96	11	28	8	1	104	67	79	1	1	30	72	216	4	1	3	1	0	0	0	2:10
27	96	11	18	1	12	115	72	69	1	1	30	72	215	3	1	3	1	0	0	0	2:00
28	96	11	30	17	44	108	69	78	1	0	0	0	0	0	0	0	1	0	0	0	0:57
29	96	11	18	22	55	104	69	87	1	0	0	0	0	0	0	0	1	0	1	1	1:28
30	96	11	25	9	9	119	65	81	1	0	0	0	0	0	0	0	0	0	0	0	1:20
31	96	11	22	11	22	119	66	66	1	1	23	0	167	3	1	2	1	1	0	0	2:21
32	96	11	23	1	13	86	69	0	1	0	0	0	0	0	0	0	1	0	0	0	1:01
33	96	11	22	18	9	101	66	78	1	0	0	0	0	0	0	0	1	0	0	0	1:19

FIG. 23

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BP RESULTS 2402

YOUR BLOOD PRESSURE TEST HAS BEEN COMPLETED. HERE ARE THE RESULTS.

SYSTOLIC = 112 - OPTIMAL
 DIASTOLIC = 71 - OPTIMAL
 PULSE = 65

05-10-1997 14:16:54

THANK YOU FOR VISITING CSI6000

HRA RESULTS 2404

HERE ARE YOUR HEALTH RISK APPRAISAL RESULTS.

YOUR SCORE IS: 95

RATED AS: EXCELLENT

YOUR HEALTH RISK IS: VERY LOW

05-10-1997 14:17:36

THANK YOU FOR VISITING CSI6000

BLOOD PRESSURE HISTORY 2406

555-55-5555

SYS	DIA	PULSE	TIME	DATE
112	71	65	14:16	05-10-97
110	86	90	13:04	05-10-97
115	66	64	12:34	05-10-97
118	79	66	15:49	04-02-97
130	69	66	14:37	04-01-97
152	110	93	08:43	04-01-97
144	96	80	14:54	03-28-97
163	78	80	10:27	03-28-97

05-10-1997 14:18:05

THANK YOU FOR VISITING CSI6000

FIG. 24

2500

Please Enter your Name

(first name)

(last name)

(address)

(city)

(state)

(zip code)

(phone number)

Backspace

1

2

3

4

5

6

7

8

9

0

Q

W

E

R

T

Y

U

I

O

P

A

S

D

F

G

H

J

K

L

Z

X

C

V

B

N

M

Enter

Escape

Space Bar

FIG. 25

Exit

Back

Forward

www.computerized-screening.com

Secure Personal Health Site

CSI Health Net.Com

Registration Form

Email

First Name

Address 1

Address 2

City

Last Name

State

Zip

FIG. 26

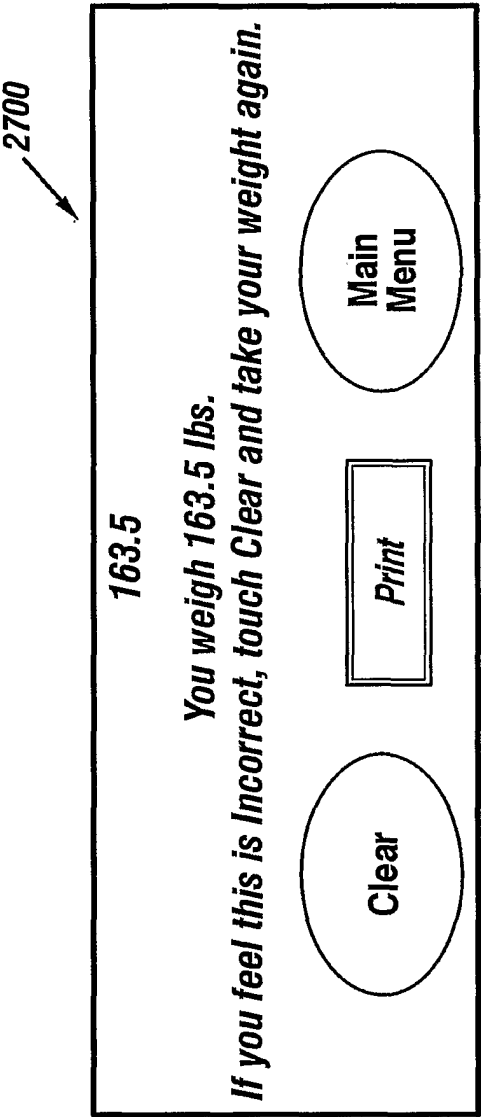
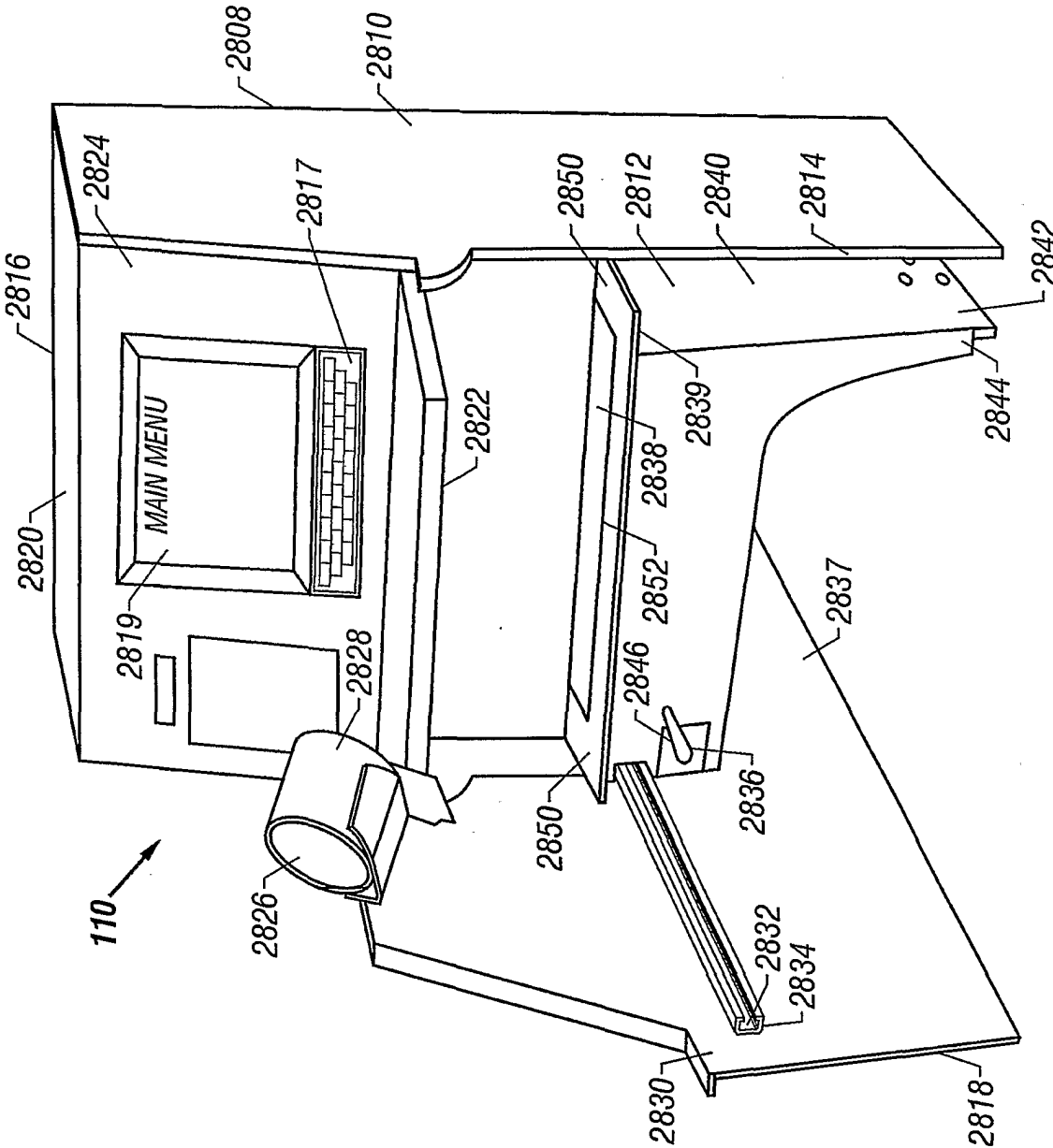


FIG. 27

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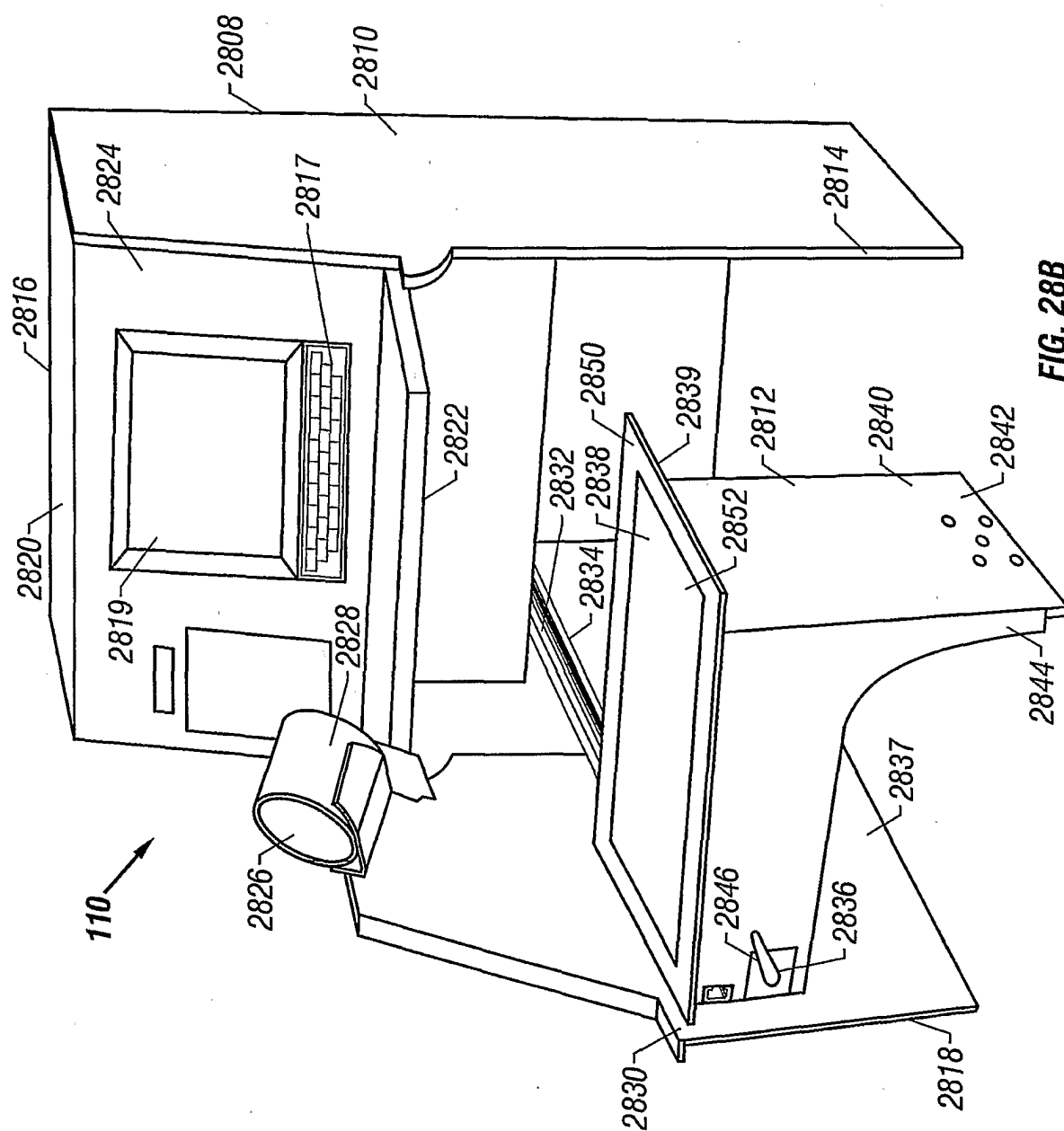


FIG. 28B

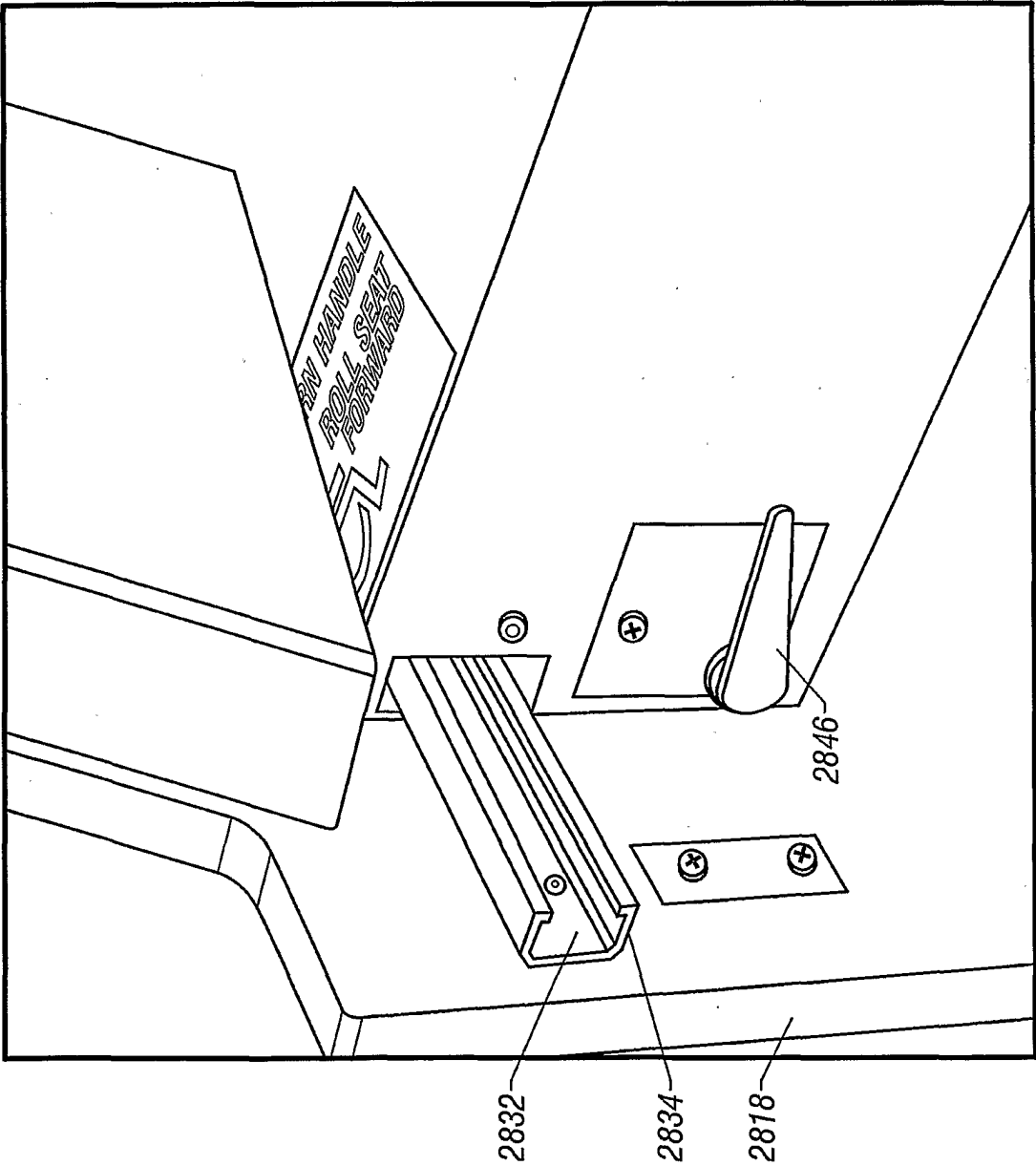


FIG. 28C

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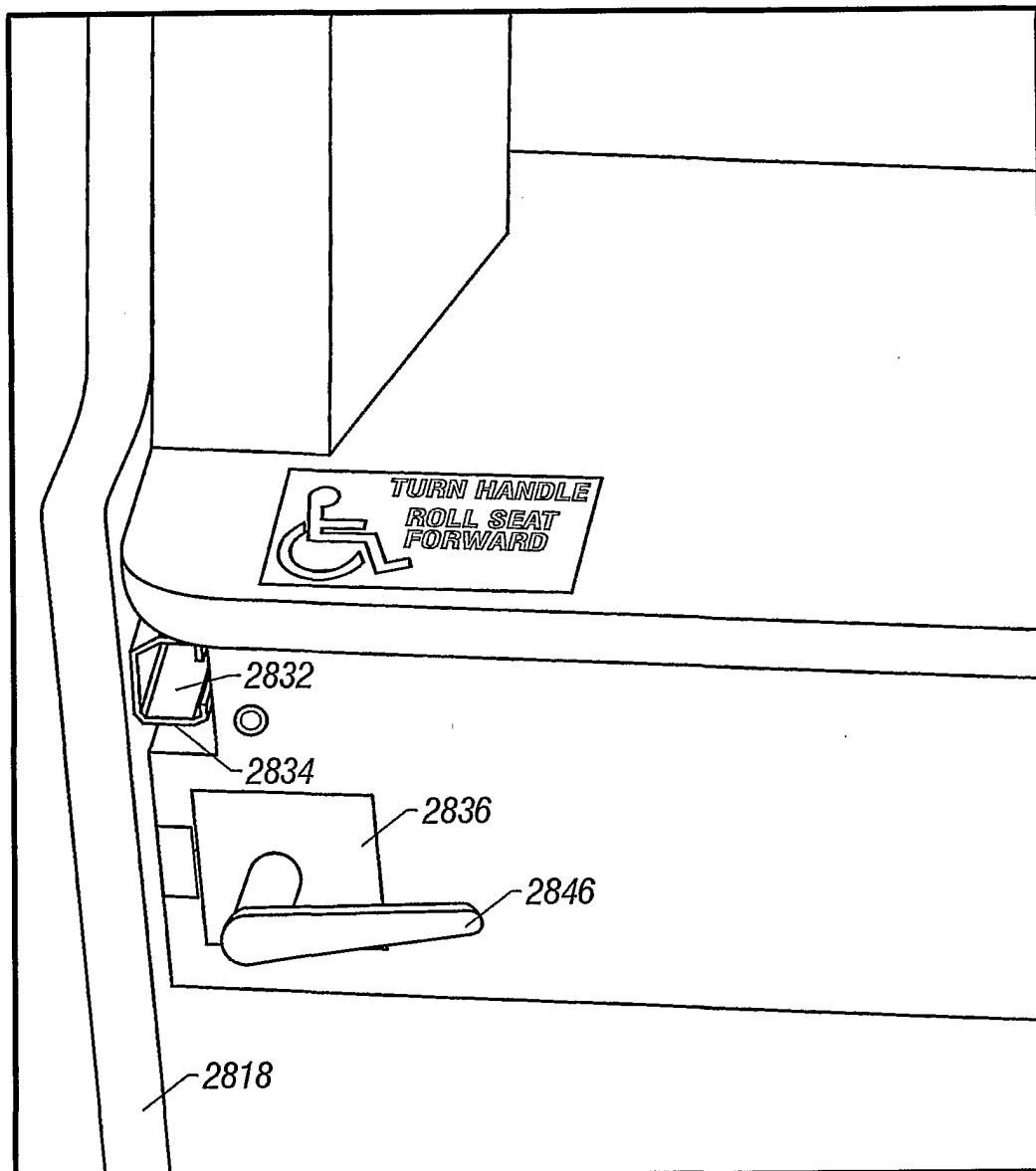


FIG. 28D

专利名称(译)	血压测量系统		
公开(公告)号	EP1272103A2	公开(公告)日	2003-01-08
申请号	EP2001924996	申请日	2001-04-11
[标]申请(专利权)人(译)	COMPIZED筛选		
申请(专利权)人(译)	计算机筛选 , INC.		
当前申请(专利权)人(译)	计算机筛选 , INC.		
[标]发明人	BLUTH CHARLES BLUTH JAMES		
发明人	BLUTH, CHARLES BLUTH, JAMES		
IPC分类号	A61B5/00 A61B5/022		
CPC分类号	A61B5/6888 A61B5/0002 A61B5/02208 A61B5/02225 A61B5/411 A61B5/7239		
优先权	09/549451 2000-04-14 US 09/548805 2000-04-14 US 09/549840 2000-04-14 US 09/549972 2000-04-14 US		
外部链接	Espacenet		

摘要(译)

血压测量装置和相关的操作方法利用基于多个测量的测量算法，提供增加检测中的诊断和分析成功的独特能力。在说明性实现中，组合使用三种测量技术以提高整体测量精度。这三种技术中的第一种是一种基本技术。从位于测量袖带中的麦克风获取的声音测量使用滤波器的组合来检测开始和结束Korotkoff声音。第二种技术是在许多低成本血压测量装置中常见的示波技术。压力袖带用于测量压力振荡，其使用平均压力和收缩压和舒张压比来检测和监测，以识别收缩压和舒张压。第三种技术，称为模式识别，用于识别收缩压和舒张压。除了三种技术之外，还使用来自压力传感器的信号来量化分析中的声音区域。