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(54) **PROVIDING MEDICAL SERVICES AT A KIOSK**

**Related U.S. Application Data**

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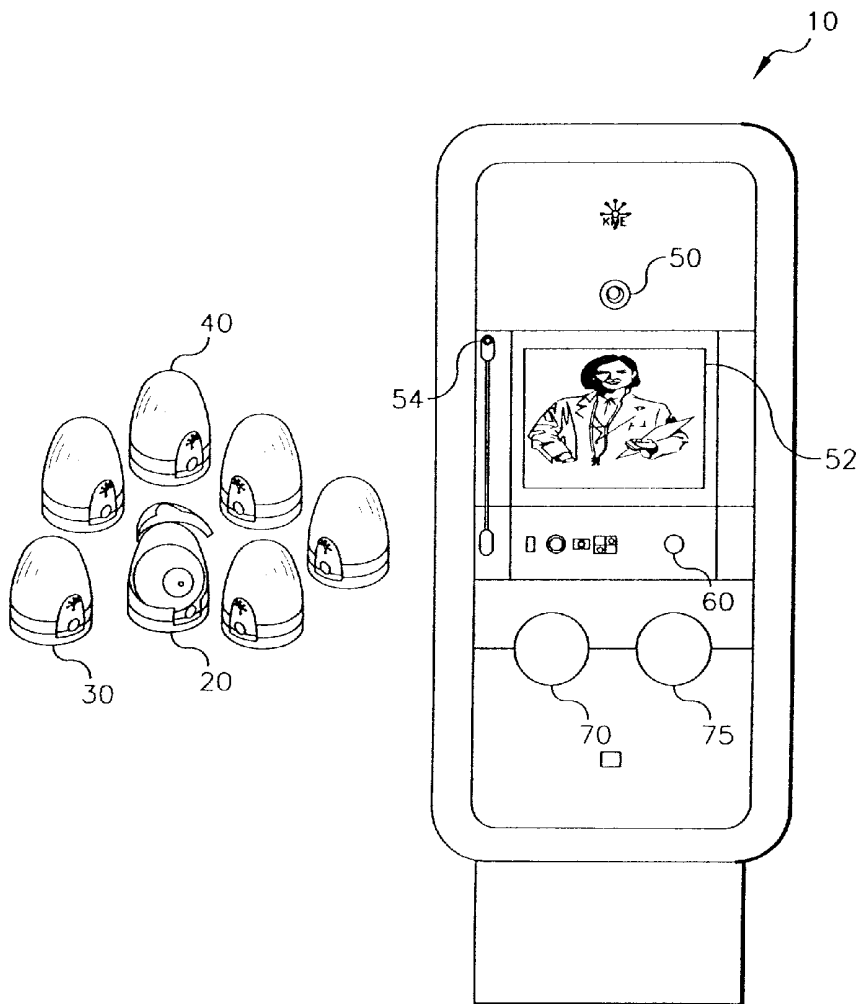
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(57) **ABSTRACT**

A medical kiosk (10) provides medical services. The medical test to be performed are determined (110). A test kit is dispensed from the medical kiosk (120). The necessary tests are performed. The test kit is decontaminated (172) and the results of the tests are recorded.

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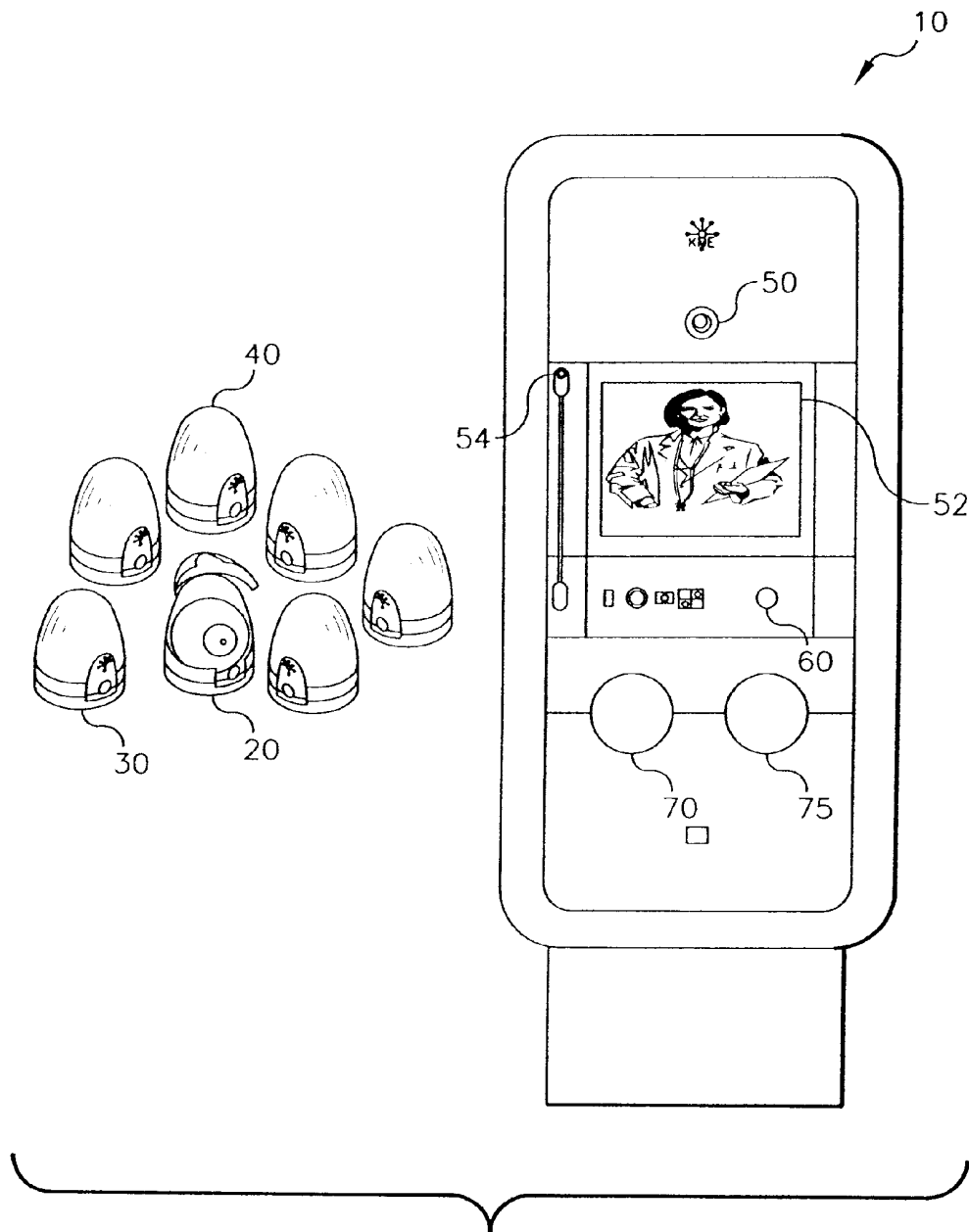


FIG. 1

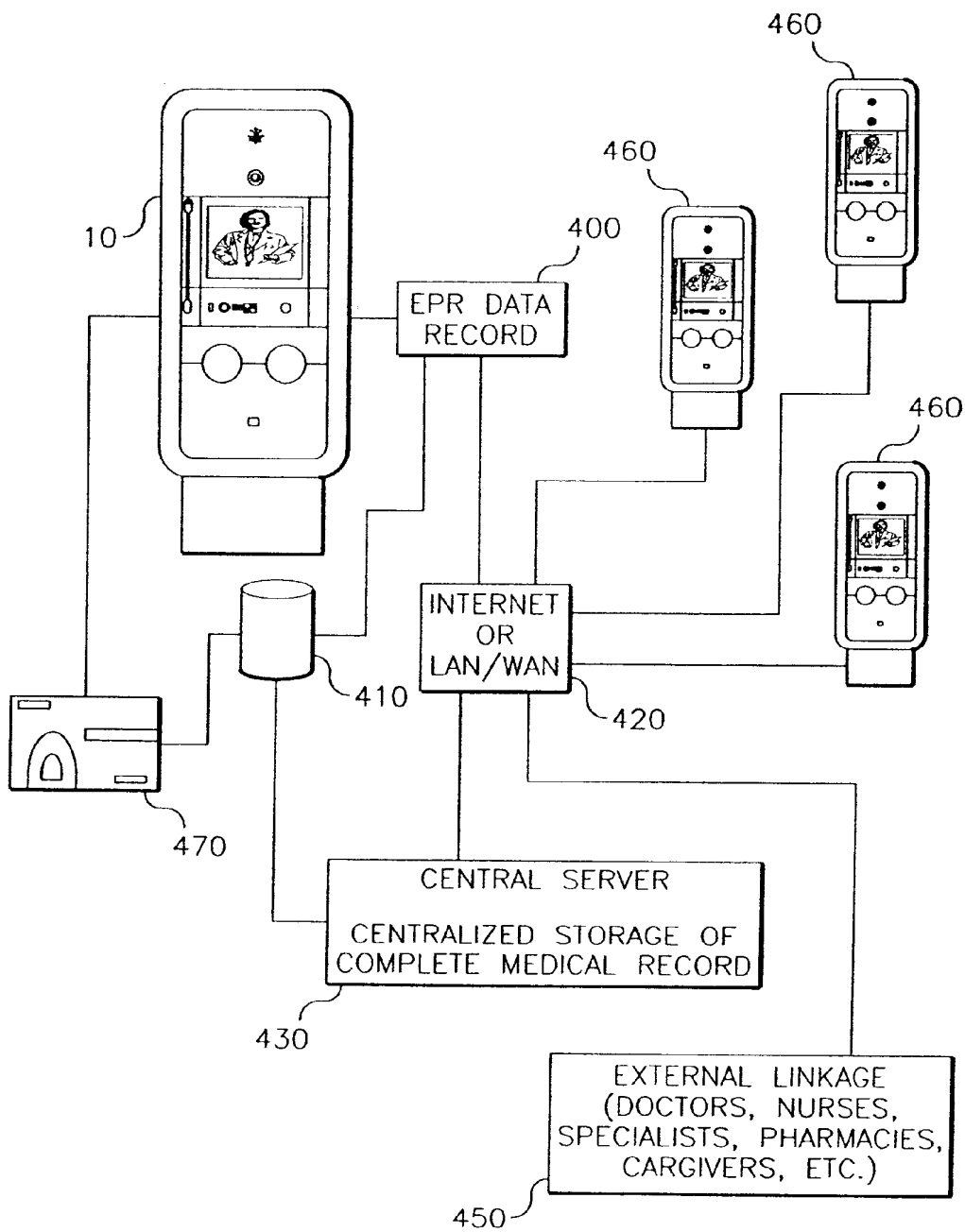


FIG. 2

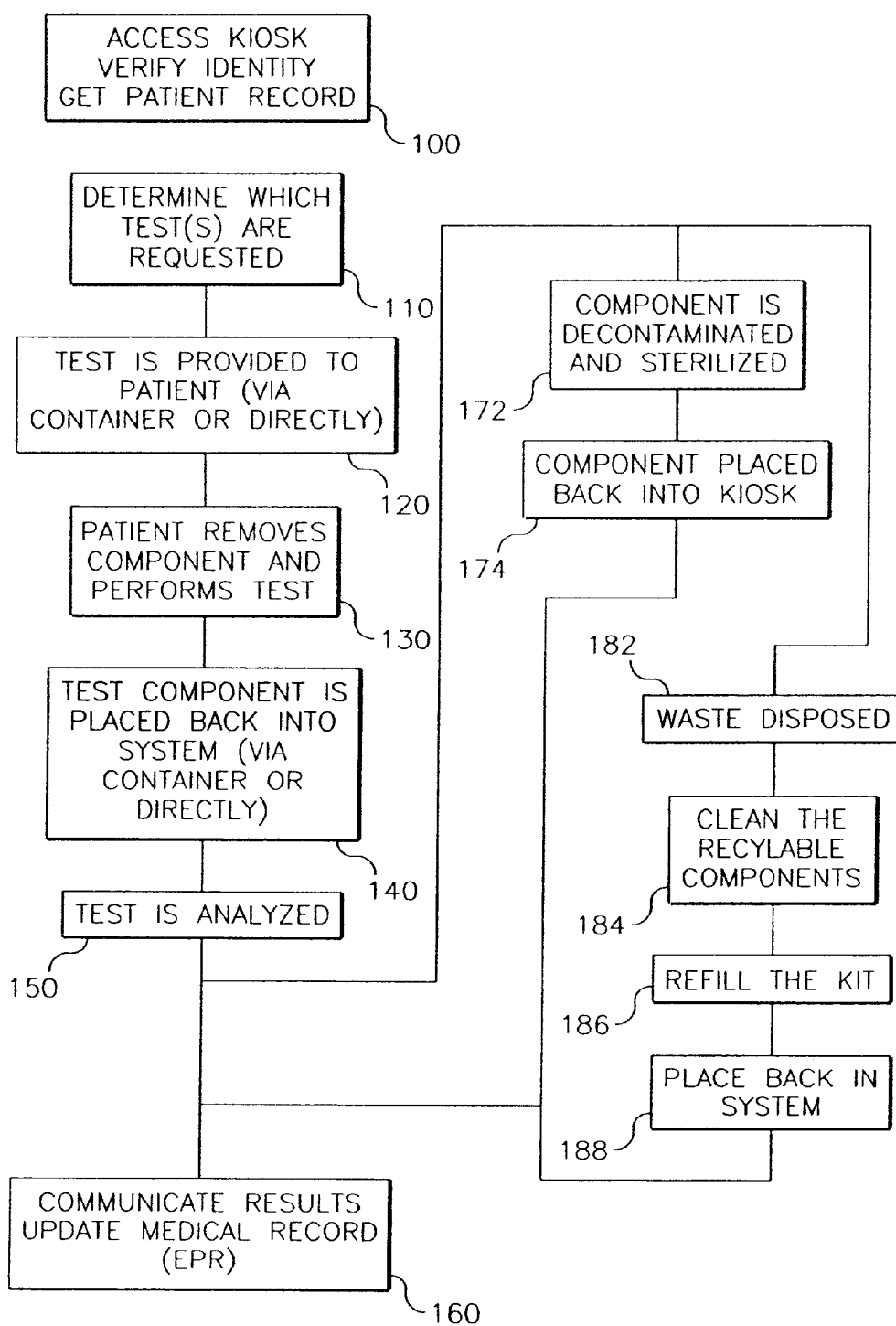


FIG. 3

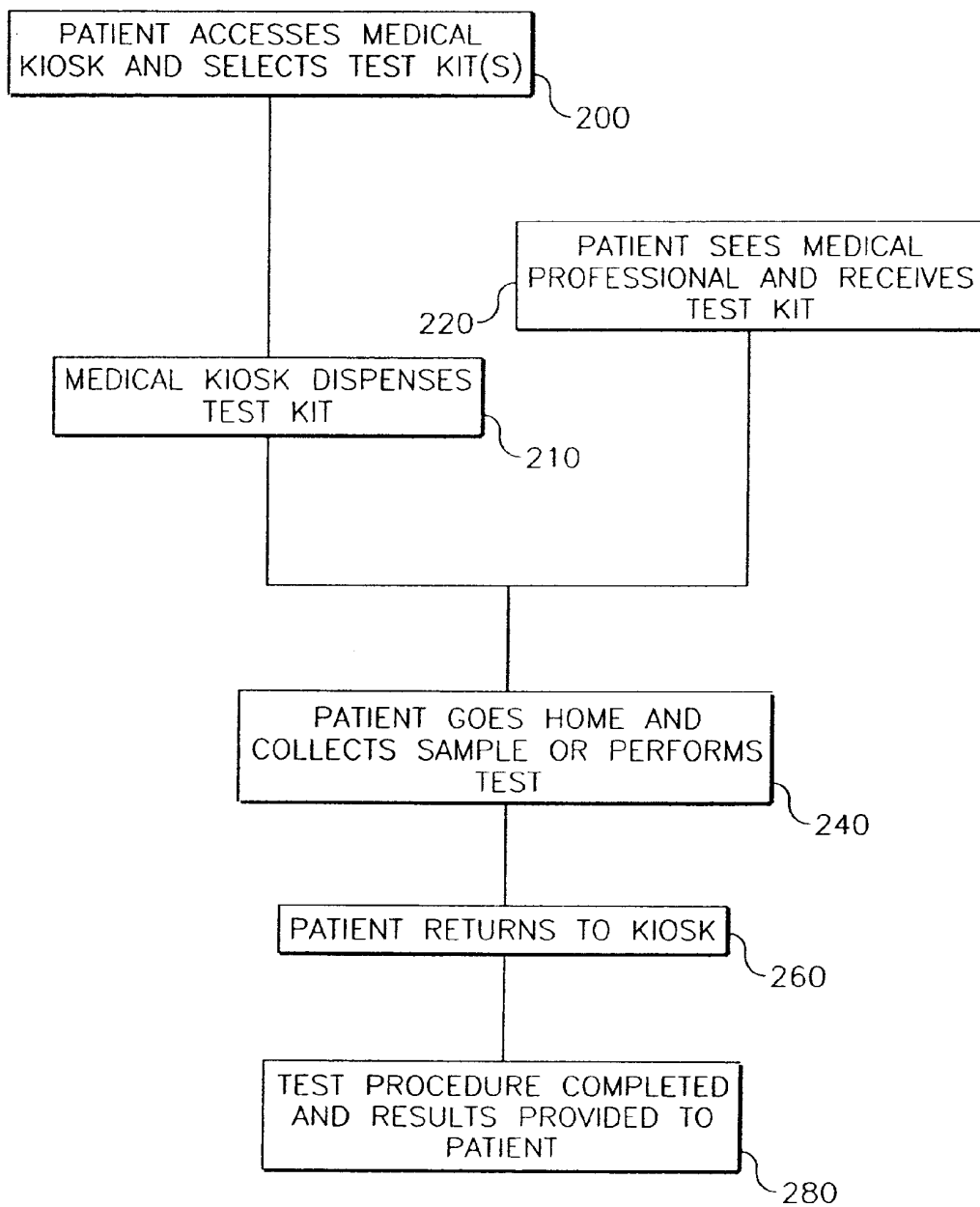


FIG. 4

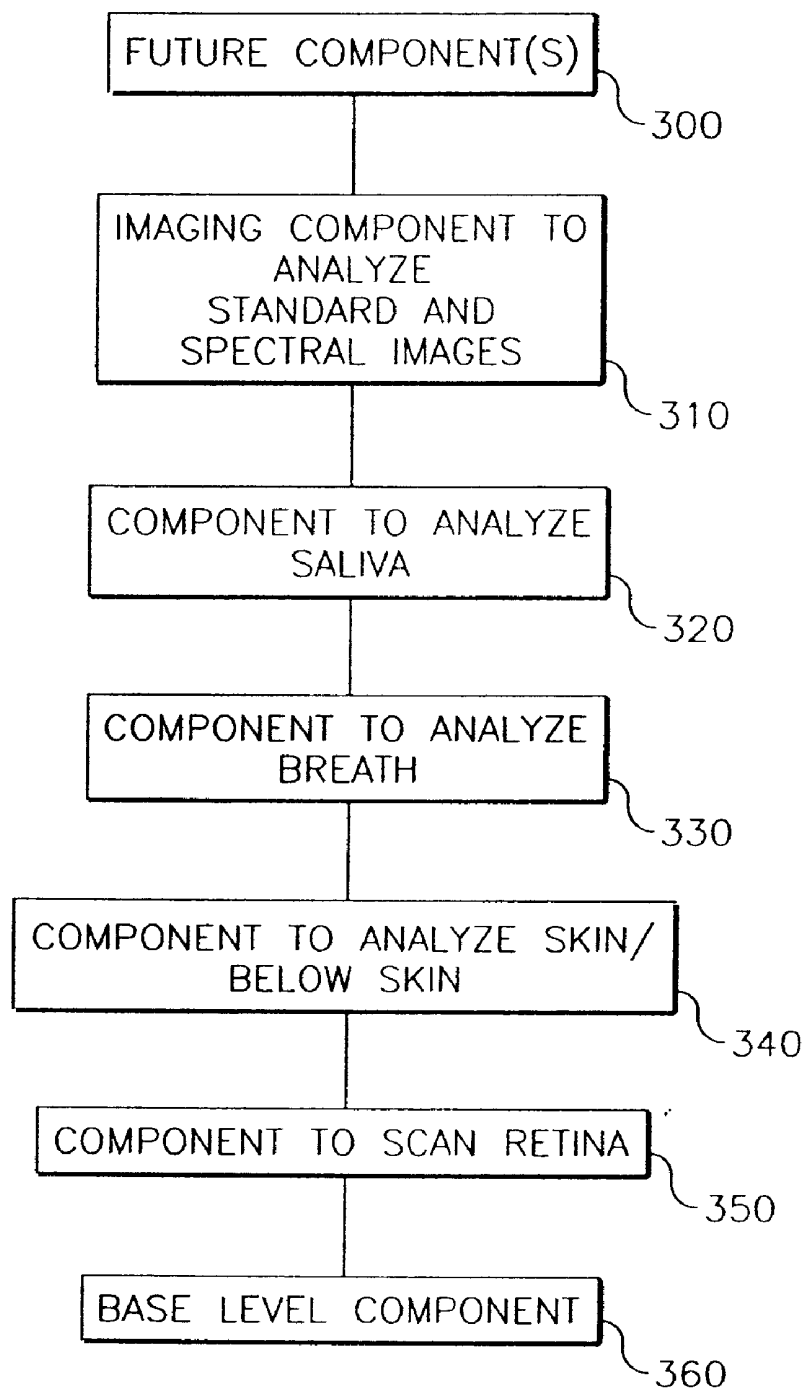


FIG. 5

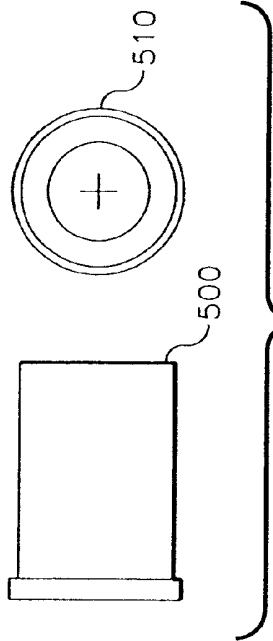


FIG. 6A

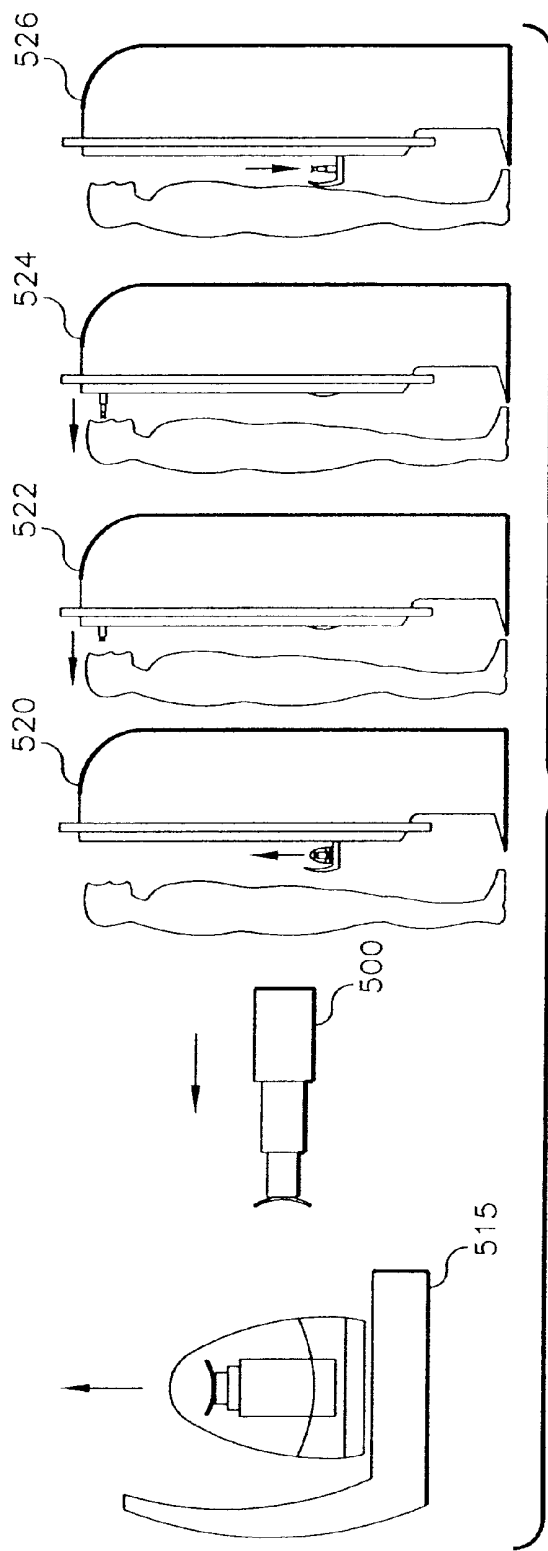


FIG. 6B

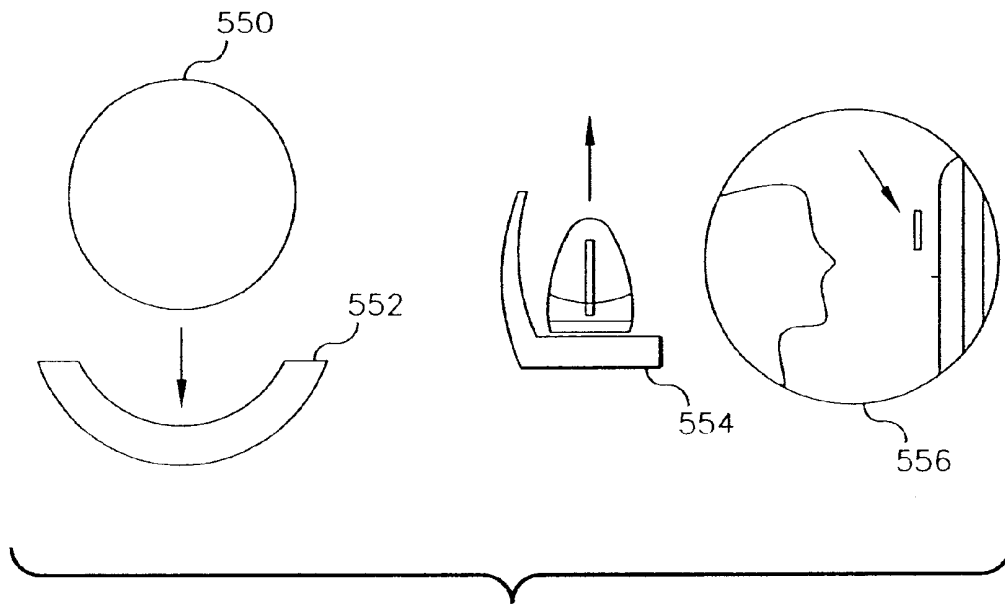


FIG. 7A

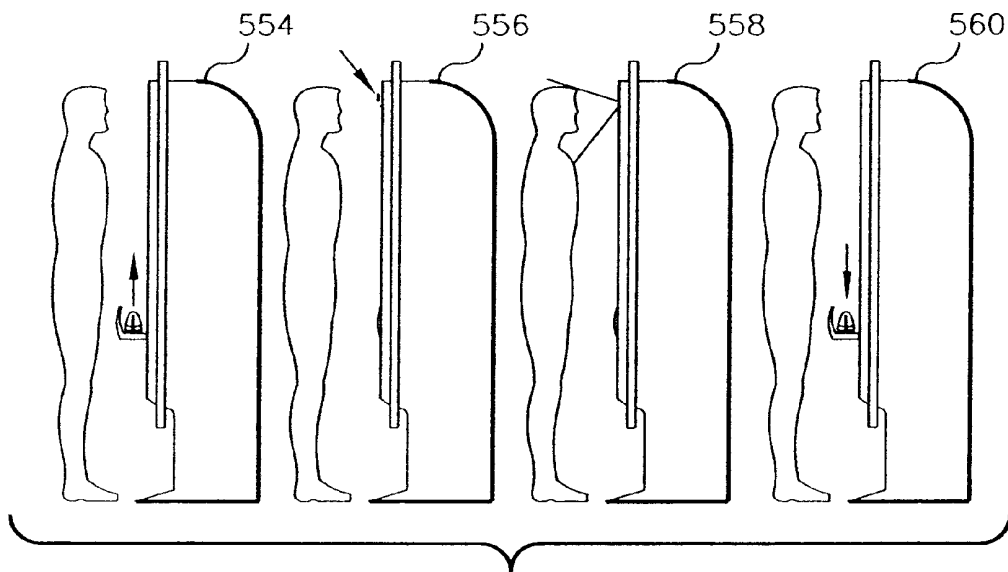


FIG. 7B

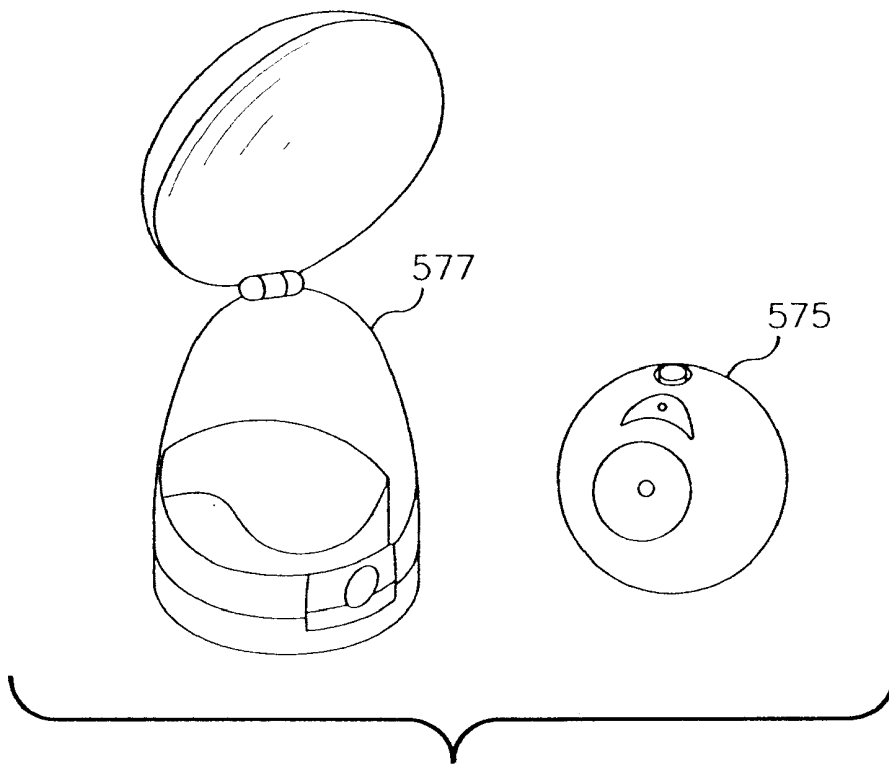


FIG. 8A

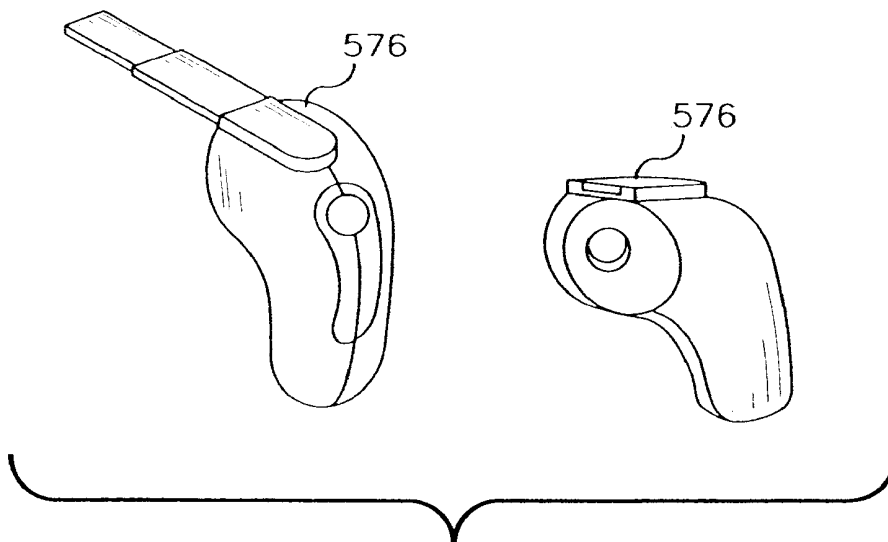


FIG. 8B

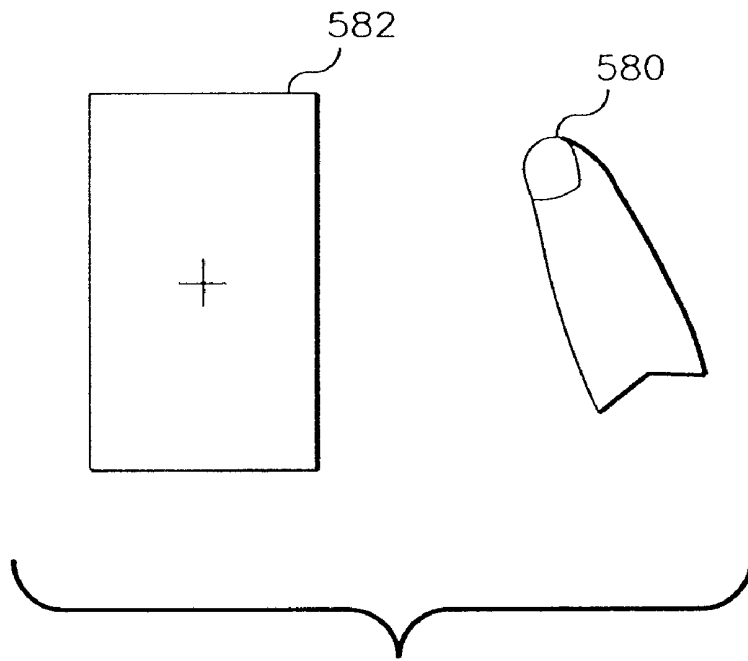


FIG. 9

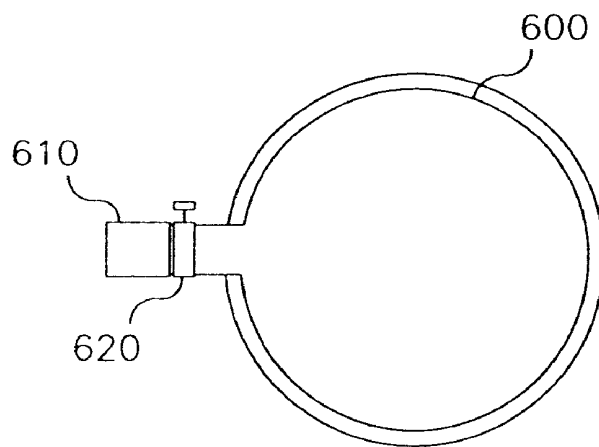
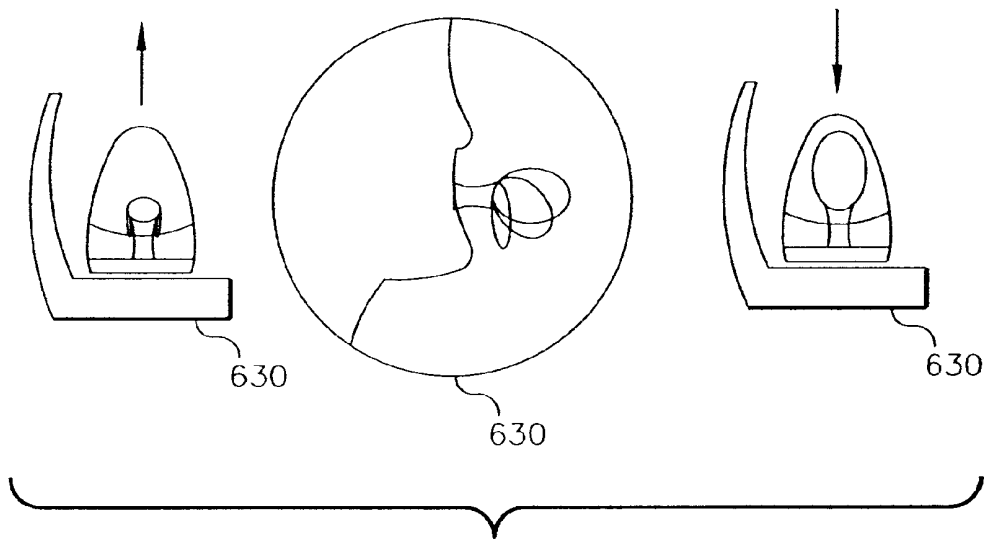


FIG. 10A



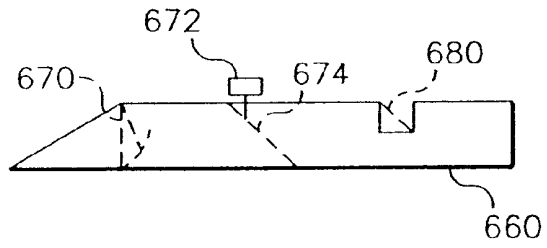


FIG. 11A

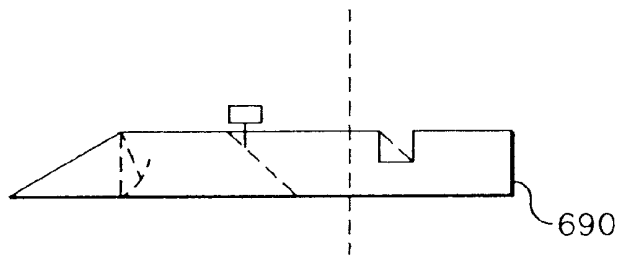


FIG. 11B

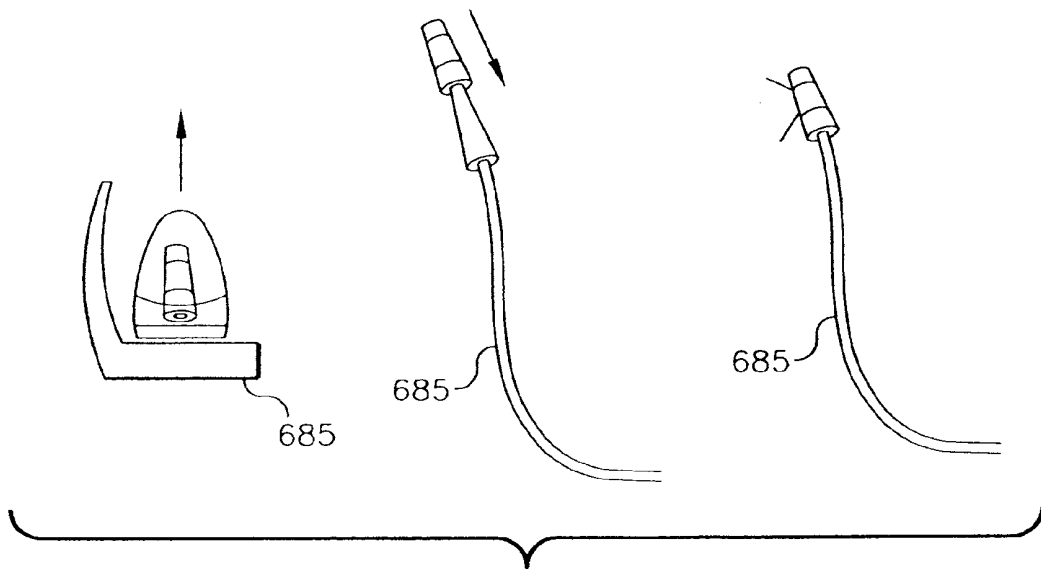


FIG. 11C

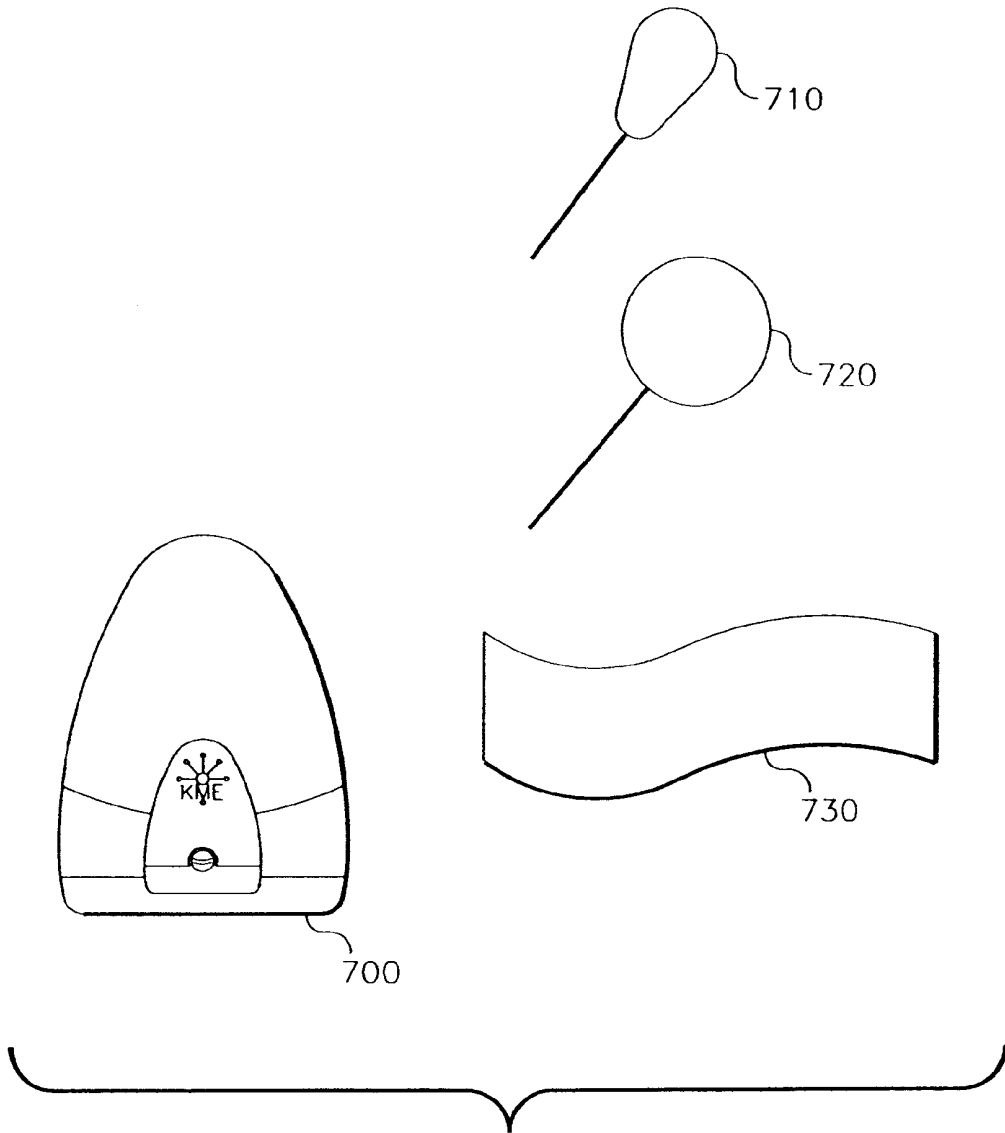


FIG. 12

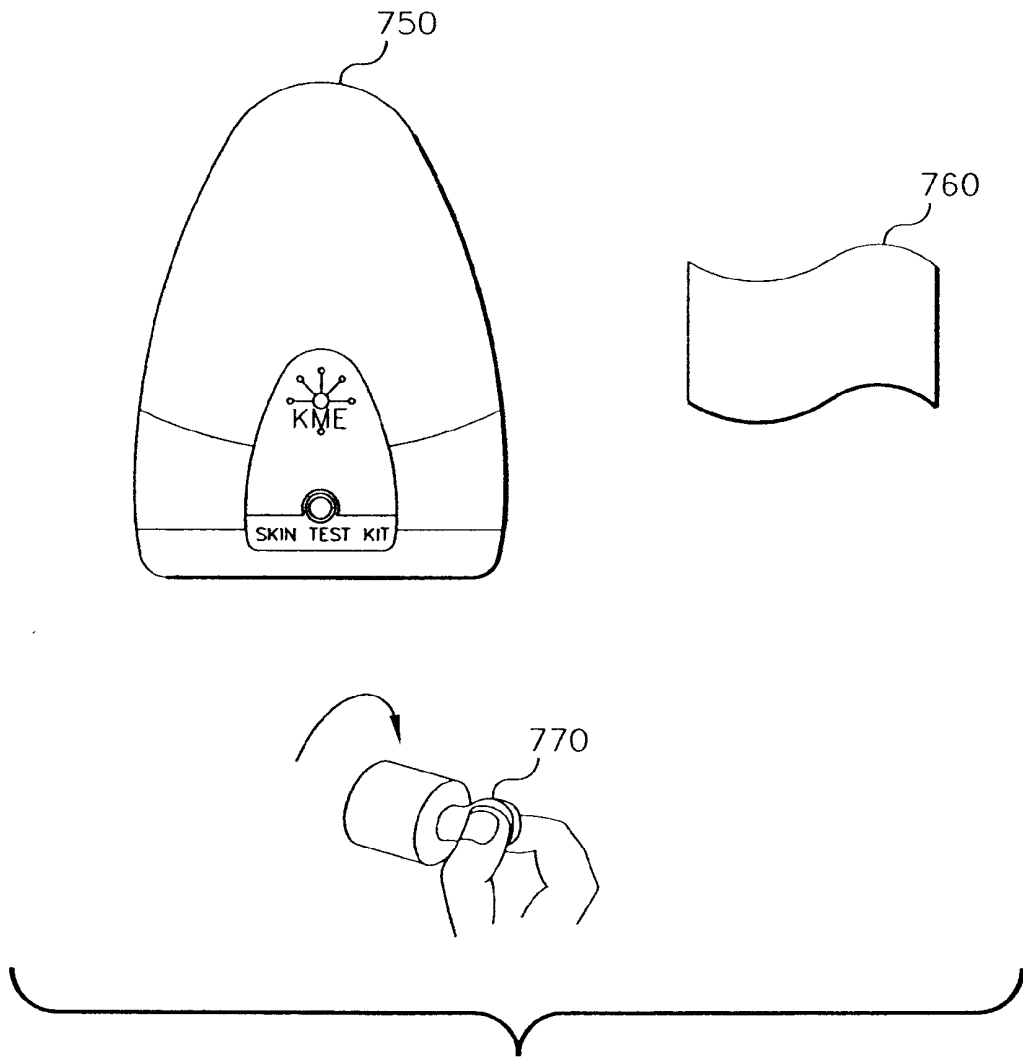


FIG. 13

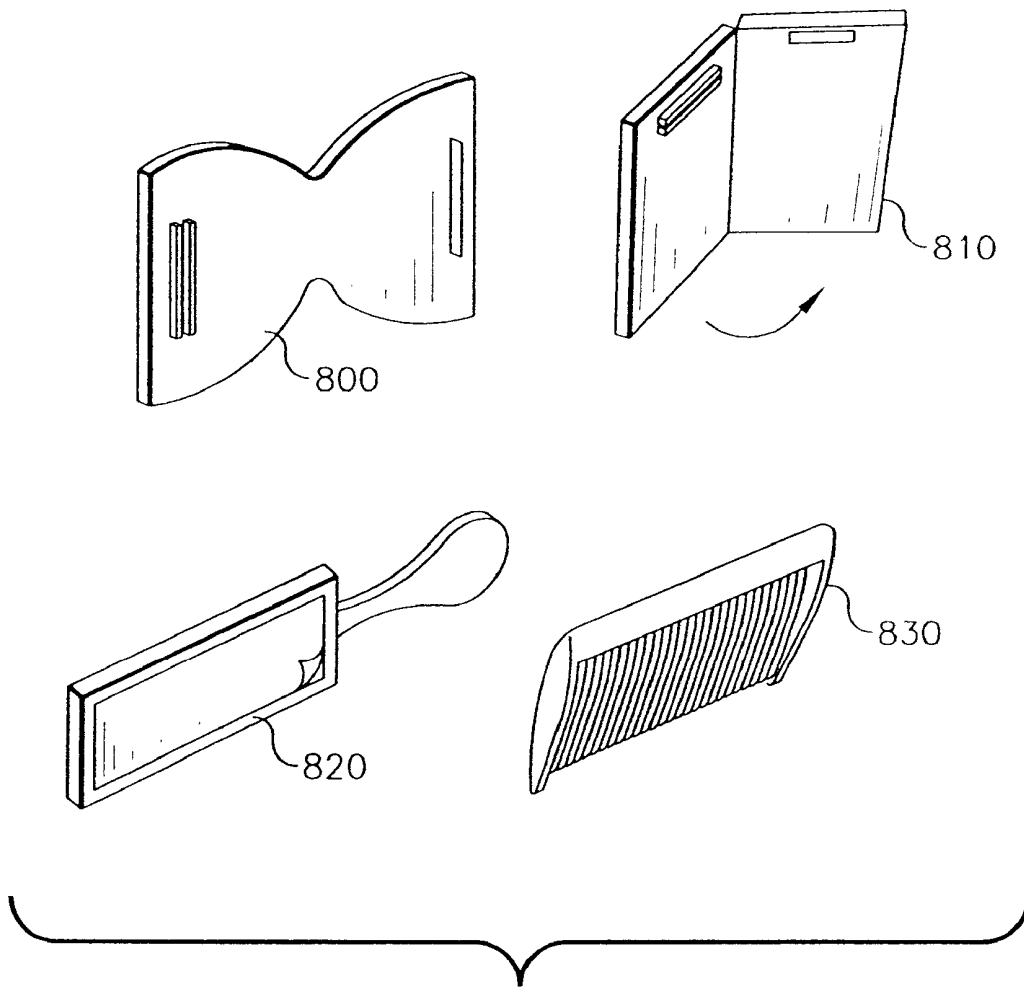


FIG. 14

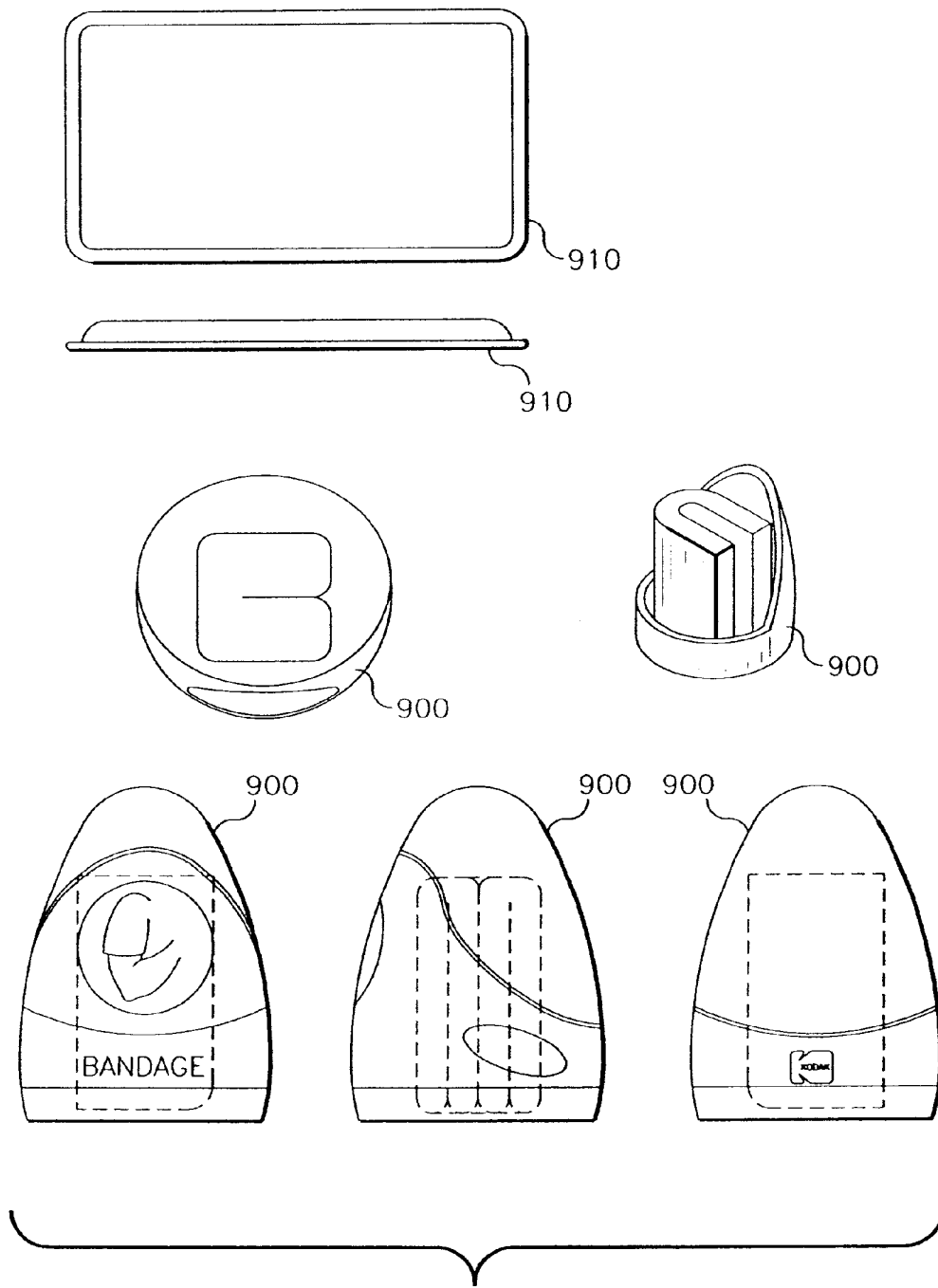


FIG. 15

**PROVIDING MEDICAL SERVICES AT A KIOSK****CROSS REFERENCE TO RELATED APPLICATIONS**

[0001] This is a divisional application of patent application Ser. No. 10/995,676, filed Nov. 23, 2004.

**FIELD OF THE INVENTION**

[0002] This invention relates to the fields of medical testing and medical kiosks, and in particular, to a method of integrating medical testing procedures or delivery and recovery of non-invasive medical test kits in an unassisted kiosk.

**BACKGROUND OF THE INVENTION**

[0003] Traditionally, many common medical testing and screening procedures have relied on trained professionals performing invasive procedures, such as drawing a blood sample or taking a throat culture. Recently, there has been an increased emphasis on the development of non-invasive testing procedures as alternatives to the existing invasive counterparts. Currently these non-invasive screening techniques analyze breath, urine, saliva, and fecal samples. Additional techniques exist to spectrally or optically analyze a patient's skin or eye (e.g. retina). The present invention teaches an unassisted medical kiosk that performs non-invasive tests: dispenses medical test kits, performs the tests, analyzes the results, and is a self cleaning system that disposes of or decontaminates used test components.

[0004] The methods of performing non-invasive tests are well known. Examples include Aerocrine Inc. ([www.aerocrine.com](http://www.aerocrine.com)), which has developed a technique for measuring the concentration level of nitric oxide (NO) in exhaled human breath to detect asthma related inflammations. SHL Telemedicine Ltd. ([www.shahal.co.il](http://www.shahal.co.il)) provides a means to measure peak expiratory flow rate for diagnosis and detection of lung disorders. NASA Glenn Research Center ([www.grc.nasa.gov](http://www.grc.nasa.gov)) has developed a number of non-invasive techniques to image the eye for detection and diagnosis of cataracts, glaucoma, diabetic retinopathy, macular degeneration, Alzheimer's, and drug screening. Numerous companies have developed techniques to measure glucose levels of diabetics using optical techniques (e.g. University of Texas Medical Branch, Department of Biomedical Engineering Texas A7M) or ionophoresis (Cygnus Inc.). Additionally, Lucid Inc. ([www.lucid-tech.com](http://www.lucid-tech.com)) has developed a laser scanning confocal microscope to detect skin cancer.

[0005] There are unassisted medical kiosks in the marketplace that provide basic vital statistics monitoring such as patient heart rate and blood pressure. See LifeClinic at [www.lifeclinic.com](http://www.lifeclinic.com). U.S. Patent Application Publication No. 2004/0044560 (Giglio et al.) discusses a device to test and output the personal data (fat analysis) of a user to a computer processor. U.S. Pat. No. 6,692,436 (Bluth et al.) teaches a health kiosk that provides blood pressure testing, a health and fitness evaluation, and a medication encyclopedia. Other unassisted kiosks aid a patient in diagnosing a condition by using question and answer scripts to reach a diagnostic conclusion. U.S. Pat. No. 6,641,532 (Iliff) teaches the art of conducting an automated diagnostic session with a patient, using a plurality of disease scripts, a patient medical record, and a disease engine to process the script

and route the changes to the medical record. Staffed medical kiosks also exist that provide a nurse to check on certain ailments. See MinuteClinic at [www.minuteclinic.com](http://www.minuteclinic.com).

[0006] All of these medical kiosks provide convenient medical services to consumers with improved accessibility over visits to a doctor's office. However, the unassisted kiosks are limited in their ability to provide comprehensive diagnostic services due to the lack of a means to locally dispense new medical test kits, analyze test results, maintain a sterile environment, and recycle and dispose of used test kits. Assisted kiosks can provide more sophisticated diagnostic testing and screening procedures for patients and can handle disposal and sterilization of used test components. However, they are limited in convenience by their hours of operation, limited number of locations, and staffing costs.

[0007] A need exists in the marketplace to further extend the utility of medical kiosks by providing a greater variety of unassisted medical screening and testing procedures in convenient, accessible locations; while ensuring hygiene and patient privacy are maintained.

**SUMMARY OF THE INVENTION**

[0008] Briefly, according to one aspect of the present invention a medical kiosk provides medical services. The medical test to be performed are determined. A test kit is dispensed from the medical kiosk. The necessary tests are performed. The test kit is decontaminated and the results of the tests are recorded.

[0009] The above need is met in the following invention by integrating non-invasive medical testing procedures or medical test kits that are delivered, retrieved, and analyzed in an unassisted medical kiosk. The medical kiosk includes, but is not limited to, monitoring existing conditions, screening and diagnosing a new condition or disease, dispensing medical supplies, and maintaining the hygiene of the kiosk and medical supplies.

[0010] The present invention discloses an unassisted medical kiosk that can:

- [0011] dispense recyclable or disposable non-invasive medical test kits;
- [0012] dispense basic health care items;
- [0013] perform test procedures using onboard instrumentation;
- [0014] analyze test results and provide status information or a diagnosis;
- [0015] present the results to the consumer and communicate results to a medical professional, insurance company or electronic patient record (EPR);
- [0016] maintain hygiene by reclaiming test kits, disposing of non-reusable test components, decontaminating itself; and
- [0017] sterilize reusable test components.

[0018] It is important that the medical kiosk be easy to use, with straightforward testing procedures, while retaining security and privacy of the patient's test results and medical information. Continued kiosk usage by the patient will

depend on the system's overall hygiene. Dispensing and reclaiming test kits must take place under strictly controlled sanitary conditions.

[0019] The invention and its objects and advantages will become more apparent in the detailed description of the preferred embodiment presented below.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. 1 is a schematic view of a testing procedures integrated into a medical kiosk.

[0021] FIG. 2 is a systems diagram and potential data forms for electronic patient record (EPR) embodiments.

[0022] FIG. 3 is a flowchart for component usage for recyclable and disposable components.

[0023] FIG. 4 is a flow chart for an alternate embodiment of using medical test kits in a medical kiosk.

[0024] FIG. 5 is a system components diagram.

[0025] FIG. 6A is a schematic view of a hardware test kit with an eyepiece used for retinal scans.

[0026] FIG. 6B is a schematic view of the use of the eyepiece shown in FIG. 6A.

[0027] FIG. 7A is a schematic view of a hardware test kit with a filter component for a digital camera.

[0028] FIG. 7B is a schematic showing use of the hardware test kit shown in FIG. 7A.

[0029] FIG. 8A is a perspective view of a hardware test kit with a portable digital camera.

[0030] FIG. 8B is a perspective view of an alternate digital camera.

[0031] FIG. 9 is a schematic view of a hardware test kit with a disposable skin sensor.

[0032] FIGS. 10A-C are schematic views of a sample collectors with a breath chambers.

[0033] FIGS. 11A-C are schematic views of embodiments of sample collectors with a whistle for breath collection.

[0034] FIG. 12 are schematic views of sample collectors for saliva collection.

[0035] FIG. 13 are perspective views of sample collectors for skin collection.

[0036] FIG. 14 are perspective views of sample collectors for hair collection.

[0037] FIG. 15 are perspective views for various health care item such as a healing with light bandage.

#### DETAILED DESCRIPTION OF THE INVENTION

[0038] The present invention will be directed in particular to elements forming part of, or in cooperation more directly with, the apparatus in accordance with the present invention. It is to be understood that elements not specifically shown or described may take various forms well known to those skilled in the art.

[0039] The general method of the invention is the use of an unassisted medical kiosk to determine tests to be per-

formed at the medical kiosk, dispense a test kit, perform said tests, reclaim and decontaminate the test kit, dispose of medical waste, and record the results of said tests.

#### Testing Procedures Integrated into a Medical Kiosk

[0040] FIG. 1 illustrates a diverse set of medical testing procedures or test kits integrated into a medical kiosk 10.

[0041] Medical tests can include, but are not limited to, cholesterol, blood glucose, drug detection, Alzheimer's, pregnancy related tests, eye exam, saliva, blood, skin, bodily fluid, body image, electrocardiogram, hyperspectral imaging, multispectral imaging, or oxygenation. Medical test kits provided to a patient at the medical kiosk 10 contain components necessary to perform the medical test in an unassisted manner. These test kits are composed of recyclable and/or disposable components and fall into three categories:

[0042] Test hardware 20: includes custom test hardware used for a medical testing procedure. Lenses for use with a digital camera for capturing retinal scans and a wireless digital camera which patients can use either at the medical kiosk 10 or take home to capture an image are two examples of test hardware 20.

[0043] Sample collector 30: includes components used for capturing a sample (e.g. breath, saliva, hair) to be analyzed for the medical test.

[0044] Health care items 40: include consumable medical supplies or health care items 40. A special bandage for accelerating the healing of wounds is one example.

[0045] While most testing procedures involve the use of a medical test kit, some procedures are performed directly by the medical kiosk 10 without additional test kit components. One example is the use of a high resolution digital camera 54 integrated on a tethered arm to capture digital images for diagnostic purposes. For example, images from this digital camera 54 can be used to monitor the progress of wound care, analyze moles, or diagnose other skin conditions.

[0046] The medical kiosk 10 itself may contain a number of additional features:

[0047] A multi-purpose digital camera 50, is used for capturing a retinal scan for retinal analysis. Additionally this camera captures real time video to allow the patient to videoconference with a medical professional and/or support person at some remote location. It can also be used to confirm the identity of the person using the kiosk using existing image identification methodologies.

[0048] The display screen 52 presents important instructions, medical information, or test results from the session to the patient. To simplify the user interface, this display can incorporate a touch screen for use in navigating through the testing process. The display screen 52 can also show a live video feed of a physician, medical professional, or support person.

Additionally, this display screen **52** could display downloaded images or video from some remote site.

#### Systems Diagram and Potential Data Forms on EPR Embodiments

[0049] Referring now to FIG. 2, illustrating a system diagram for data exchange within a medical kiosk environment. The medical kiosk can be a stand-alone apparatus, or networked with other medical kiosks **460** and a central server. As disclosed in commonly-assigned U.S. Patent Application Publication No. 2006/0106646 (Squilla et al.) this system configuration allows the medical kiosk to access electronic patient records (EPR) in order to determine medical tests to be performed, and to update the EPR and communicate test results to interested third parties such as the patient's doctor, family members or insurance agency.

[0050] When a patient accesses a medical kiosk **10**, the system will require authentication prior to performing a test procedure **100**. The EPR medical access card **470** is an example of an embodiment used to validate and verify a patient's identity. Once validated, the medical kiosk **10** will attempt to access the EPR data record **400** for the patient. The EPR data record **400** contains: patient information, electronic patient records (EPR), current care plan, user preferences, permission levels for access to medical records, and physician or insurance company information. This EPR data record **400** can be stored on the EPR medical access card **470**, on a local storage device **410** or from a central server **430** (accessible via the Internet or a LAN/WAN connection **420**). If their care plan requires that specific tests be performed, the patient will be informed of the tests that need to be completed **110**. Patients will have the option to select one of these tests, or they can choose to select another service **110**. If no care plan exists, patients will have the option to choose what service they would like to perform **110**. A standard credit card would be used as the initiation method.

Flowchart for Component Usage for Recyclable and Disposable Components.

[0051] The general method for test kit handling includes: dispensing the test kit through the test kit dispenser **70**, collecting the used test kit through test kit collector **75**, sterilizing and recycling reusable test kit components, and disposing of non reusable test kit components.

[0052] FIG. 3 illustrates handling recyclable and disposable components in a medical kiosk **10**. Once the patient is identified and desired test(s) are determined, the medical kiosk **10** will automatically dispense **120** the appropriate custom medical test kit via the test kit dispenser **70**. This kit may contain test hardware **20**, a sample collector **30**, or a health care item **40**.

[0053] The patient removes the medical test kit from the test kit dispenser **70**, and is instructed on how to perform the test procedure. These instructions are either presented on the display screen **52** or a videoconference may be established (video displayed on the screen **52**) where a trained professional will walk the patient through the test procedure.

[0054] The patient performs the test **130**. When the patient completes the test, they return all the completed equipment **140** into a test kit collector **75** on the front of the medical kiosk **10**. The test will be analyzed **150** within the medical

kiosk **10** or communicated to a remote site for analysis. During the analysis, the patient will be given either verbal or visual feedback on the progress of the procedure via the test in progress indicator **60** on the front of the medical kiosk **10**.

[0055] Once the test is completed, the patient has a number of options regarding their test results **160**. Specifically they can:

[0056] View the test results directly on the display screen **52**;

[0057] Print out results to keep as a permanent record;

[0058] Choose to add the test results to their electronic patient record (EPR); and

[0059] Choose to make the test results accessible to other family members and to submit the test results to their physician, a specialist, or their insurance company **450**.

[0060] Overall customer satisfaction and continued usage of medical kiosks **10** will require that all aspects of the system focus on maintaining strictly controlled sanitary conditions. All test kits and consumables will be reclaimed by the medical kiosk **10**, via a test kit collector **75** on the front of the apparatus. This will ensure that the kiosk environment remains clean and uncluttered. Internally, the medical kiosk **10** will determine which parts are recyclable or disposable and process the parts according to strict sanitary guidelines.

[0061] Recyclable component pieces, in the form of reusable test hardware or sample chambers will be meticulously cleaned, disinfected and sterilized **172**. For example, test components may be placed in an autoclave or washed with an approved chemical agent to sterilize component parts. Once the reusable test components have been cleaned and sterilized they will be installed in at least one additional medical test kit for later use **174**. The recyclable components may be sterilized within the medical kiosk **10** or be removed by service personnel, sterilized at a remote site, and returned in a new medical test kit at a later date. The sterilization can be done within the kiosk via standard means, like an autoclave, and replaced into the system using a sorting system like those used to sort coins (since each component will have a unique shape and size). It may be more economical to have the sterilization done as a maintenance person is restocking the components.

[0062] Disposable items from test kits will be handled as medical waste. The medical kiosk **10** will contain one or multiple disposal bins for used consumables **182**. Any items that need to be treated, as medical waste will follow approved guidelines for storage and disposal. These medical bins are designed in such a manner that unskilled professionals can service the medical kiosk **10**. For example, the bins will be designed to prevent leakage or loss of used consumables similar to bins used to dispose of hypodermic needles. The system would allow for the entire bin to be replaced.

[0063] For test kits that contain both recyclable and non-reusable components the same procedures as described above will be followed. Non-reusable components will be disposed of as medical waste **182**. Recyclable components will be cleaned **184**, refitted with new consumable components **186**, and installed in at least one additional medical

test kit for later use **188**. This can be done as a maintenance function or an automated system can be devised as a standard mechanical engineering exercise.

[**0064**] The medical kiosk **10** may also go through a cleaning cycle between patients. For example, the system may close a curtain and spray the exterior of the medical kiosk with a disinfecting agent. This can be done by a support person or automated.

Alternative Means that Test Kits can be Used in a Medical Kiosk

[**0065**] The entire cycle of determining medical tests to be performed, dispensing the medical test kits, performing and analyzing the test, and reporting the results does not need to occur entirely at the medical kiosk **10** or in one session at the medical kiosk.

[**0066**] In one alternative embodiment, the patient accesses a medical kiosk **10** and the required medical tests are determined **200**. The medical kiosk **10** dispenses a test kit **210** along with instructions on how to use the kit. The patient ends the session, and goes to a remote site (such as their home), and collects the necessary sample **240**. At some later point in time, the patient returns to a medical kiosk **260**. Due to the network capability and EPR access illustrated in FIG. **2** the patient has the option of returning to the first medical kiosk or a second medical kiosk to complete the medical test. The medical test kit is collected through the test kit collector **75** and the medical kiosk completes the test procedure, and optionally updates the electronic patient record (EPR) and sends the results to a third party **280**.

[**0067**] In a second alternative embodiment, the patient receives the medical test kit and instructions from a health care provider **220**. The patient goes to a remote site and collects the necessary sample. At some later point in time, the patient returns the medical test kit to a medical kiosk **260** to complete the medical test. The medical test kit is collected through the test kit collector **75** and the medical kiosk completes the test procedure, and optionally updates the electronic patient record (EPR) and sends the results to a third party **280**.

System Components Diagram

[**0068**] The present invention describes a medical kiosk **10** that is built upon a customizable framework as illustrated in FIG. **5**.

[**0069**] The customizable framework has significant economic, size and ease-of-use advantages. Economically because components that are not used will not be part of the cost of the system, size of the kiosk **10** is determined by the number of components, especially when input and analysis tools may be needed and ease-of-use because learning new modalities and the number of choices that are available can be confusing.

[**0070**] The medical kiosk framework can be customized to best meet the needs of the following variables:

[**0071**] Differing markets—Elder care facilities, college campuses and primary schools have needs for different medical tests due to the demographics and culture of the residents in these environments.

[**0072**] Different locales—A mall location would need to perform tests more quickly and have less privacy than a small clinic or doctor's office.

[**0073**] Different levels of complexity.

[**0074**] Levels of assistance—Some kiosk facilities may require on-site support (in any one of a number of levels; clerk, technician, nurse, etc.) due to the nature of their clientele or location.

[**0075**] Customs—Some cultures may shun certain types of tests as being associated with lower class or certain tests may indicate a type of disease that is particularly difficult to contain and contagious.

[**0076**] Owner needs—The purchaser of the kiosk may only want certain tests performed (e.g. a SARS clinic may only want to test for diseases with high temperature, for example).

[**0077**] There are six specific medical testing components of the present invention:

[**0078**] Retinal or ocular scan and analysis **350**

[**0079**] Breath collection and analysis **330**

[**0080**] Saliva collection and analysis **320**

[**0081**] Skin collection and analysis **340**

[**0082**] Image collection and analysis **310**

[**0083**] The architecture allows for anticipated additional components **300** to be added at a future time.

[**0084**] There is also a base level component **360** that has the basic components required for all of the embodiments of the kiosk. These functionalities are in addition to the basic functions of a standard personal computer such as a processor, storage, memory and the like (included on standard PCs today). Included in this base component are:

[**0085**] Blood pressure and base level cardiovascular tests

[**0086**] Software and hardware to be able to read and write patient records

[**0087**] Billing information

[**0088**] Connectivity to a central server/Internet

[**0089**] Premium services (like the ability to communicate to a doctor or a nurse for an additional fee, or transmission of images and records to a third party).

[**0090**] External and additional storage

[**0091**] Others as deemed necessary

Hardware Test Kit—Eyepiece Used for Retinal Scans

[**0092**] FIGS. **6A** and **6B** illustrate a system diagram for performing a retinal eye scan. In this scenario, the patient removes a medical test kit containing the eyepiece lens component **500** from the test kit dispenser **520**. An embodiment of a retinal lens within a component delivery system **515** is shown. The medical kiosk display screen **52** instructs the patient to insert the eyepiece into a slot on the kiosk **522**. This eyepiece could be inserted either in front of the digital camera **50** or be attached to the high resolution digital camera **52** on the tethered arm. The patient would be instructed to look into the eyepiece **524** and focus directly at the center of the target **510**. A high-resolution image is captured of the retina. This image is analyzed locally on the medical kiosk **10** or is sent to some remote location and

analyzed there. A test in progress indicator **60** informs the patient that the medical kiosk **10** is performing the ocular analysis. Analysis results are displayed on the screen **52** or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

[**0093**] Once the test is completed, the medical kiosk instructs the patient to place the eyepiece back in the test kit and return it to the test kit collector **526**. The kit is retracted back into the medical kiosk **10**. For disposable eyepieces, the medical kiosk **10** disposes of the test kit and eyepiece in an appropriate manner. For recyclable eyepieces, the medical kiosk decontaminates and sterilizes all the components and returns the medical test kit back into the system for later usage.

#### Hardware Test Kit—Filter Component for a Digital Camera

[**0094**] FIGS. 7A and 7B illustrate a system diagram for performing spectral imaging of the human body. Spectral imaging of human flesh enables analysis and diagnosis of wounds, infections and possible cancerous lesions. Filter components allow images to be captured in the near infrared or other parts of the electromagnetic spectrum.

[**0095**] In this scenario, the patient removes a test kit containing the filter component **550** from the test kit dispenser **554**. The medical kiosk display screen **52** instructs the patient to insert the filter component **550** into a camera filter holder **552** on the kiosk. This filter component **550** could be inserted either in front of the digital camera **50** or be attached to the high resolution digital camera **54** on the tethered arm **556**. The patient is instructed to place the skin sample to be analyzed directly in front to the digital camera. A high-resolution image is captured **558**. This image is analyzed locally on the medical kiosk **10** or is sent to some remote location and analyzed there. A test in progress indicator **60** informs the patient that the medical kiosk **10** is performing the skin analysis. Analysis results are displayed on the screen **52** or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

[**0096**] Once the test is completed, the medical kiosk instructs the patient to place the filter component **550** back in the test kit and return it to the test kit collector **560**. The kit is retracted back into the medical kiosk **10**. For disposable filter components **550**, the medical kiosk disposes of the medical test kit and filter in an appropriate manner. For recyclable filters, the medical kiosk decontaminates and sterilizes all the components and returns the medical test kit back into the system for later usage.

#### Hardware Test Kit—Portable Digital Camera

[**0097**] FIGS. 8A and 8B illustrate a portable digital camera **575** test kit delivered in container **577** from the kiosk. This portable digital camera offers a great deal of flexibility for capturing images. For example, a portable digital camera **575** could be used with existing medical kiosks **10** to take images of regions of the body that could not be viewed using the on board digital cameras **50**, **54**. Medical kiosks **10** could also be designed without any onboard digital camera **50**, **54**. This portable digital camera test kit **575** enable patients to capture images, perform retinal eye scans or do a spectral analysis of a skin sample or wound care (using optional spectral filters). Portable digital cameras could be physically

tethered to the medical kiosk **10** or communicate with the kiosk using a wireless protocol (e.g. Bluetooth, RF).

[**0098**] Portable digital cameras **575** could also be taken to a remote site where a patient takes a picture of their skin or wound, in private. In this scenario the portable digital camera would be battery powered and contain on-board memory to store the image. At a later time, the patient returns to any medical kiosk **10** on the network to complete the test procedure.

[**0099**] Another embodiment of a portable digital camera is with a telescoping lens **576** that can be used to obtain a close-up view or even perform a macro image on contact with the skin.

[**0100**] Portable digital cameras **575** could be either disposable or recyclable. For recyclable digital cameras, the medical kiosk **10** decontaminates and sterilizes all components in the camera kit, and places the kit back into the kiosk for later use. Disposable digital camera components are discarded using approved methodologies.

[**0101**] Analysis results are displayed on the display screen **52** or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

#### Hardware Test Kit—Disposable Skin Sensor

[**0102**] FIG. 9 illustrates a disposable skin sensor **580**. In this scenario, the patient removes a test kit containing the disposable skin sensor **580** from the test kit dispenser **70**. The medical kiosk display screen **52** instructs the patient to put on the disposable finger cot or glove **580** and place the skin sensor against the touch pad **582** on the front of the medical kiosk **10**. The touch pad **582** initiates communication the skin sensor **580** to measure skin temperature or skin moisture. The touch pad **582** may also be a light source for spectroscopic analysis or provide a small current for galvanic analysis. This information is received and analyzed locally on the medical kiosk **10** or is sent to some remote location and analyzed there. A test in progress indicator **60** informs the patient that the medical kiosk **10** is performing the skin analysis. Analysis results are displayed on the screen **52** or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

[**0103**] Once the test is completed, the medical kiosk instructs the patient to place the skin sensor **580** back in the medical test kit and return it to the test kit collector **75**. The kit is retracted back into the medical kiosk **10**, and disposed of in an appropriate manner.

#### Sample Collector—Breath Chambers

[**0104**] FIGS. 10A-10C illustrate embodiments for collecting breath samples. The collection balloon **600** represents a recyclable embodiment where the patient opens a valve **620** and blows into the mouthpiece **610**. The collection balloon **600** fills with air and is returned to the medical kiosk **10** for analysis. The medical kiosk **10** removes and disposes of the detachable mouthpiece. The collection balloon **600** is either disposed of or decontaminated and sterilized prior to being placed back in the kiosk for later use.

[**0105**] The second embodiment shows a disposable breath chamber **650** that a patient blows into. A tab pops up once the chamber is full to indicate that the chamber is full. Once the analysis is completed the breath chamber is disposed of within the medical kiosk **10**.

[0106] A method by which these embodiments can be delivered to the patient and returned to the kiosk 630 is shown.

[0107] Analysis of blood glucose in a breath sample is an example of this type of breath test. For this scenario, the medical kiosk 10 dispenses the medical test kit via a test kit dispenser 70. The patient removes the kit and follows the instructions presented on the display screen 52. The patient breathes into the sample chamber (either the collection balloon 600 or expandable breath chamber 650). The breath sample chamber is then placed in the test kit receptor 75. The medical kiosk 10 reclaims the kit and extracts air from the collection balloon 600, or expandable breath chamber 650, and analyzes the sample. A test in progress indicator 60 informs the patient that the medical kiosk 10 is performing the breath analysis. Analysis results are displayed on the screen 52 or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

#### Sample Collector—Whistle Embodiment for Breath Collection

[0108] FIGS. 11A-11C illustrate another embodiment for collecting a breath sample. The breath whistle 660 represents a disposable embodiment in which the patient blows into a whistle. As the patient blows, air pressure forces both the front air valve 670 and rear air valve 674 open, and escaping air 680 makes a whistling sound. When the patient stops blowing, both the front air valve 670 and rear air valve 674 snap shut, thus capturing an air sample. The whistle is inserted into a slot on the front of the kiosk to deliver the breath sample when the release valve 672 is depressed. The medical kiosk 10 analyzes the sample. A test in progress indicator 60 informs the patient that the medical kiosk 10 is performing the breath analysis. Analysis results are displayed on the display screen 52 or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

[0109] Another embodiment is a whistle connected to a tube connected to the kiosk 10 whereby a disposable cover is placed on the whistle and a sound is emitted when a large enough sample is collected 685.

[0110] Once the test is completed, the medical kiosk instructs the patient to place the whistle 550 back in the test kit and return it to the test kit collector 75. The kit is retracted back into the medical kiosk 10, and disposed of in an appropriate manner 690.

#### Sample Collector—Saliva Collection

[0111] FIG. 12 illustrates an embodiment for collecting a saliva sample. In this scenario the patient opens the medical test kit 700 and removes a saliva collection device. A mouth swab 710, lollipop 720, and chewing gum 730 represent three such collection methods. The mouth swab is used to swab the mouth or throat to collect a saliva sample or throat culture. The lollipop contains a porous surface where saliva would be absorbed into the interior of the sphere. The chewing gum would also absorb saliva. In each of these scenarios, the sample collectors are placed back into the medical test kit 700 and re-inserted in the test kit collector 75 where the medical kiosk would remove these embodiments, analyze the sample and dispose of the collection device in an appropriate manner. A test in progress indicator 60 informs the patient that the medical kiosk 10 is perform-

ing the saliva analysis. Analysis results are displayed on the display screen 52 or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

#### Sample Collector—Skin Collection

[0112] FIG. 13 illustrates an embodiment for collecting a skin sample. Skin samples have been shown to provide information in the areas of pulse oximetry, optical coherence tomography, fluorescence imaging, laser Doppler flowmetry, photoplethysmography, thermography, infrared spectroscopy, photoacoustic spectroscopy, Raman spectroscopy, electrochemical impedance spectroscopy, laser speckle imaging, electrocardiography, echocardiography, electromyography, confocal microscopy, and multiphoton microscopy. In this scenario, the patient opens the medical test kit 750 and removes an abrasive cloth 760. The patient is instructed to rub this cloth against their skin to remove a few skin cells, which adhere to the cloth. The abrasive cloth is embodied as a rolled up collector 770 and placed back into the medical test kit 750 and reinserted back into the medical kiosk 10 for analysis and disposal. A test in progress indicator 60 informs the patient that the medical kiosk 10 is performing the skin analysis. Analysis results are displayed on the screen 52 or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

#### Sample Collection—Hair Collector

[0113] FIG. 14 illustrates how a hair sample can be introduced into a kiosk. In addition to DNA information, hair contains information about drug usage and dosages which would be a useful test at a kiosk. Four possible embodiments of hair collection methodologies are shown. The first two methodologies show a "book" type approach 800 and 810 which would grab and secure the hair and then allow it to be placed in the kiosk for analysis. A third embodiment shows an adhesive attached to a handle 820 that can be placed on the hair and pulled away leaving a sample. Another embodiment is with a simple comb 830 with an dense array of teeth that would allow a sample to be withdrawn.

[0114] Analysis results are displayed on the display screen 52 or printed out at the patient's request. Optionally, the results can be sent to a third party using secure e-mail.

#### Health Care Item—Healing with Light Bandage

[0115] FIG. 15 illustrates a test kit 900 that contains a special bandage 910 used to accelerate the healing of wounds. In one scenario, the patient removes the bandage from the kit and places it over a wound. Once opened, the bandage begins to emit light, which speeds the healing process. The patient is able to leave the kiosk and the bandage continues to provide healing light to the wound for a number of hours. The patient removes this bandage at home at a later time and disposes of it along with their garbage.

[0116] In a second scenario, the bandage contains electrodes that are inserted into the medial kiosk. When the kiosk applies a signal to the electrodes, the bandage emits a healing light. In this scenario, the patient remains in the kiosk for 5-20 minutes. Once the session is completed, the patient is instructed to place the bandage 910 back in the test

kit 900, and return it to the test kit collector 75. The kit is retracted back into the medical kiosk 10 and disposed of in an appropriate manner.

## PARTS LIST

- [0117] 10 medical kiosk
- [0118] 20 test hardware
- [0119] 30 sample collector
- [0120] 40 health care items
- [0121] 50 digital camera
- [0122] 52 display screen/interaction area
- [0123] 54 high resolution digital camera for evaluating conditions
- [0124] 60 test in progress indicator
- [0125] 70 test kit dispenser
- [0126] 75 test kit collector
- [0127] 100 start session (verify patient identity and access electronic patient records)
- [0128] 110 determine which tests are required
- [0129] 120 test kit is provided to patient
- [0130] 130 patient removes components and perform test
- [0131] 140 test component place back into medical kiosk
- [0132] 150 test is analyzed
- [0133] 160 communicate results and update medical records
- [0134] 172 components decontaminated and sterilized
- [0135] 174 test kit place back in system
- [0136] 182 disposable items disposed of as medical waste
- [0137] 184 optional recyclable components decontaminated and sterilized
- [0138] 186 refill kit with new consumable items
- [0139] 188 place kit back into system
- [0140] 200 patient access medical kiosk and selects test procedure
- [0141] 210 medical kiosk dispenses test kit
- [0142] 220 patient sees medical professional and receives test kit
- [0143] 240 patient goes home (collects sample or performs test)
- [0144] 260 returns to medical kiosk
- [0145] 280 test procedure completed and results provided to patient
- [0146] 300 future components
- [0147] 310 imaging components to analyze standard and spectral images
- [0148] 320 component to analyze saliva
- [0149] 330 component to breath
- [0150] 340 component to analyze skin
- [0151] 350 component to scan retina
- [0152] 360 base level component
- [0153] 400 EPR data record
- [0154] 410 medical kiosk local storage
- [0155] 420 Internet or LAN/WAN
- [0156] 430 central server
- [0157] 450 external linkages
- [0158] 460 secondary medical kiosk
- [0159] 470 EPR medical access card
- [0160] 500 eyepiece lens component
- [0161] 510 target indicator in eyepiece
- [0162] 515 retinal lens in a test kit
- [0163] 520 medical kiosk dispenses test kit with eyepiece
- [0164] 522 eyepiece inserted into slot on medical kiosk
- [0165] 524 patient looks into eyepiece
- [0166] 526 eyepiece reclaimed in medical test kit collector
- [0167] 550 filter component for a digital camera
- [0168] 552 camera filter holder
- [0169] 554 medical kiosk dispenses test kit with eyepiece
- [0170] 556 filter inserted into slot on medical kiosk
- [0171] 558 patient is imaged
- [0172] 560 filter component reclaimed in medical test kit collector
- [0173] 575 portable digital camera
- [0174] 576 camera with telescoping lens
- [0175] 577 container for recyclable camera
- [0176] 580 disposable finger cot or glove
- [0177] 582 touch pad on medical kiosk
- [0178] 600 collection balloon
- [0179] 610 detachable mouthpiece
- [0180] 620 valve
- [0181] 630 embodiment within a test kit
- [0182] 650 expandable breath chamber
- [0183] 660 breath whistle
- [0184] 670 front air valve
- [0185] 672 release valve
- [0186] 674 rear air valve
- [0187] 680 air escape
- [0188] 685 tethered whistle
- [0189] 690 whistle inserts into medical kiosk
- [0190] 700 saliva test kit
- [0191] 710 mouth swab

- [0192] 720 lollipop
- [0193] 730 chewing gum
- [0194] 750 skin sample test kit
- [0195] 760 abrasive cloth
- [0196] 770 rolled adhesive cloth
- [0197] 800 hair collection book 1
- [0198] 810 hair collection book 2
- [0199] 820 hair collection adhesive
- [0200] 830 hair collection comb
- [0201] 900 healing with light test kit
- [0202] 901 bandage

1. A medical kiosk comprising:

at least one interchangeable module for performing medical tests wherein at least one said interchangeable module is selected from a group comprising a camera,

a filter for said camera, a saliva analyzer, a breath analyzer, a skin analyzer, a retinal scanner, hair analysis; and

at least one base level component.

2. A medical kiosk as in claim 1 wherein said at least one base level component is selected from a group comprising a computer, a blood pressure tester, a cardio test, a patient record module, a billing module, an Internet connection, and local storage.

3. A medical kiosk as in claim 1 wherein said camera is used for video conferencing or capturing images for image analysis.

4. A medical kiosk as in claim 3 wherein said image capture is comprised of tongue, retinal scan, skin, or any body part.

5. A medical kiosk as in claim 3 wherein image analysis is performed at said kiosk or a remote location.

6. A medical kiosk as in claim 1 wherein said hair analysis is used for drug testing or DNA testing.

\* \* \* \* \*

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摘要(译)

医疗亭 ( 10 ) 提供医疗服务。确定要进行的医学测试 ( 110 )。从医疗亭 ( 120 ) 分配测试试剂盒。进行必要的测试。对测试试剂盒进行去污染 ( 172 ) 并记录测试结果。

